

## **Economic Commission for Europe**

### **Meeting of the Parties to the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters**

#### **Working Group of the Parties**

#### **Twenty-fourth meeting**

Geneva, 1–3 July 2020

Item 3 (b) of the provisional agenda

**Substantive issues: access to information**

### **Accompanying document for the draft updated Recommendations on the more effective use of electronic information tools**

#### *Summary*

The draft updated Recommendations (ECE/MP.PP/WG.1/2020/14 and add.1) were prepared under the auspices of the Task Force on Access to Information pursuant to decision VI/1 on promoting effective access to information (ECE/MP.PP/2017/2/Add.1, para. 13 (b) (i)), adopted by the Meeting of the Parties to the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) at its sixth session (Budva, Montenegro, 11–14 September 2017). Through this decision, the Meeting of the Parties requested the Task Force on Access to Information to update the Recommendations on the more effective use of electronic information tools to provide public access to environmental information set out in decision II/3 on electronic information tools and the clearing-house mechanism (see ECE/MP.PP/2005/2/Add.4, annex).

The present document is an accompanying document for the above-mentioned draft updated Recommendations on the more effective use of electronic information tools. The accompanying document aims to show new substantive changes and revisions in track changes made to the draft updated Recommendations circulated for comments to Parties, Signatories, other interested States Members of the United Nations, NGOs, international organizations, academia and other interested stakeholders in advance of the twenty-fourth meeting of the Working Group of the Parties. The first draft of the updated Recommendations, its compared version to the original text of Recommendations (see ECE/MP.PP/2005/2/Add.4, annex) and comments received in this round of consultations were published on the consultation web page.<sup>1</sup>

<sup>1</sup> Available at [www.unece.org/environmental-policy/conventions/public-participation/aarhus-convention/tfwg/task-force-on-access-to-information/consultation-on-the-recommendations-on-electronic-information-tools.html](http://www.unece.org/environmental-policy/conventions/public-participation/aarhus-convention/tfwg/task-force-on-access-to-information/consultation-on-the-recommendations-on-electronic-information-tools.html).

## Draft updated Recommendations on the more effective use of electronic information tools

The Meeting of the Parties recommends ~~to that~~ Parties, Signatories and other interested States ~~to~~ undertake the following measures:

### I.- Purpose

1. The present Recommendations aim to assist Parties, Signatories and other interested States in ~~promoting~~supporting the implementation of the Convention through the promotion of the development, maintenance, ~~update~~upgrade and use of electronic information tools ~~to support the implementation of the Convention~~ by applying common approaches and standards. In addition, they will support efforts to implement other relevant international commitments;
2. For the purposes of ~~these~~the Recommendations, supporting explanatory notes on terms and approaches are provided in ~~Annex~~the addendum to the present document;

### II.- General policy

3. Develop and adopt- national/state strategies aimed at promoting electronic tools to facilitate administrative processes and services relevant for assisting the public, especially those in vulnerable situations, to exercise their rights ~~in accordance with~~under the Convention, such as “e-government”, “open government”, “open data” and the “digital transformation”;
4. Take the necessary legislative, regulatory, institutional, practical and other measures to implement the above-mentioned strategies so as to make public administration more transparent, accountable and efficient in: providing environmental information of appropriate quality and dealing with requests for such information from the public; facilitating public participation in decision-making; and assisting the public ~~to seek~~in obtaining access to justice;
5. While applying the above-mentioned measures, take into account the cross-cutting nature and comprehensive scope of environmental information, ~~its linkages with~~under the Convention, and promote interoperability and data exchange between different information systems – such as environmental, geospatial, statistical, meteorological, health, Earth observation and other relevant ~~information whilst promoting interoperability and sharing between the respective information systems~~ systems – guided by the best available international standards (see also sections III and IV ~~and Annex~~below and the addendum to the present document);
6. Develop, where missing, continuously maintain and update a nationwide digital environmental information system using the best available state-of-the-art digital technologies, in accordance with the approach of “~~“open by design and by default”~~default” (see also section IV below and Annex)-the addendum to the present document, chaps. II, III and IV). The system should contain up-to-date and historical data and information, as described in paragraph 20 below, and be well structured to: inform evidence-based decision-making and policy development relating to environmental matters; enhance early notification measures; support measuring and reporting of progress towards the achievement of relevant internationally and national/statenationally agreed goals and targets ~~related to environmental matters;~~ identify emerging environmental risks and vulnerabilities; support a multi-hazard early warning system; and promote environmental awareness among the public and other stakeholders;
7. Take the necessary measures to reduce and remove social, financial and technological barriers ~~restricting that restrict~~ public access to environmental information through telecommunications networks, such as high connection costs and poor connectivity, and a lack of computer literacy. ~~Enhance;~~ enhance the inclusive use of digital ~~technology~~technologies and electronic information tools as to promote ~~exercising~~the exercise of their rights in ~~accordance with~~under the Convention by groups and communities in vulnerable situations, such as ~~such as~~ children, older ~~people~~persons, women in some societies, migrants, ~~people~~persons with disabilities, ~~those~~indigenous peoples, persons with low literacy skills or facing language barriers, ethnic or religious minorities, economically disadvantaged groups, ~~those and persons~~ without feasible access to the Internet, television or radio, ~~etc.~~);<sup>2</sup>

<sup>2</sup> See also ~~Resolution~~Human Rights Council resolutions 20/8 on the promotion, protection and enjoyment of human rights on the Internet ~~adopted by the Human Rights Council on 16 July 2012 (see~~ A/HRC/RES/20/8)\_23/2) on the role of freedom of opinion and available at: [https://ap.ohchr.org/documents/dpage\\_e.aspx?si=A/HRC/RES/20/8; Resolutionexpression in women’s empowerment](https://ap.ohchr.org/documents/dpage_e.aspx?si=A/HRC/RES/20/8; Resolutionexpression in women’s empowerment)

8. Promote and use electronic information tools to facilitate public input to and monitoring of decision-making in environmental matters, among other things, to:

- (a) Alert the public to ~~respective~~ opportunities to participate;
- (b) Ensure that the public can provide publicly documented feedback on proposed activities, plans, programmes, policies and legally binding instruments electronically; ~~and~~
- (c) Ensure that submissions received electronically are given equal weight to comments received non-electronically;

9. Ensure the ~~resource~~ mobilization and sufficient allocation of resources to design, develop, continuously maintain and update/upgrade electronic information tools to support the implementation of the Convention using best available state-of-the-art digital technologies. Use; use the gains from a reduction in the administrative burden of public authorities, especially from processing information requests, and the associated cost savings from improved efficiency to contribute to ~~the~~ resource mobilization;

10. Promote and contribute to international policy dialogue on the use of electronic information tools ~~to promote for~~ public access to environmental information and public participation in decision-making in environmental matters through the exchange of experience, ~~documentation~~ and sharing the dissemination of best practice/good practices, the transfer of know-how and the provision of technical assistance, as well as actively contribute to the development of a global environmental data strategy under the auspices of the United Nations Environment Programme;

~~11. Establish~~ 11. Use and further develop existing schemes for the transfer of technology and expertise so as to overcome or reduce the digital divide and all aspects related thereto – for example, through bilateral and multilateral projects or partnerships – and promote digital inclusion, especially in remote areas, and gender and intergenerational equality. Where resources are available, establish and, in the case of donor countries, international financial institutions and other partner organizations, provide financial and technological support for, new schemes for the transfer of technology and expertise ~~so as to overcome or reduce the ‘digital divide’ and all aspects related therewith, e.g. through bi- and multi-lateral projects or partnerships, and promote digital inclusion, especially in remote areas, and gender equality~~;

12. Base the provision, form and content of environmental/electronic information tools on ~~the assessment of~~ user needs, monitor ~~identified through surveys, the evaluation of the form and content/effectiveness of the information provided in relation to~~ tools, citizen science data, user ~~needs, feedback mechanisms, foresight methodologies and other user research tools in accordance with good practices~~; monitor and assess the impact of the information delivered, in order to raise environmental awareness ~~and~~; facilitate active engagement/effective access to information, public participation and other public engagements in environmental matters;

13. Ensure that the mandatory ~~systems~~ systems established to provide an adequate flow of information to public authorities about proposed and existing activities which may significantly affect the environment are continuously maintained and updated/upgraded using best available state-of-the-art digital technologies and international interoperability and other standards;<sup>3</sup>

14. ~~Encourage~~ Improve accessibility to environmental data and its quality, interoperability and governance to maximize the benefits of a nationwide digital environmental information system; encourage the integration of “big data”, including, but not limited to ~~remote sensing, remotely sensed~~ data, and data from other complementary sources, as appropriate, into a nationwide digital environmental information system to facilitate environmental monitoring, timeliness, openness, and spatial-temporal coverage of data, and its cost-efficiency, usefulness for discovering trends, reanalysis, forecasts, and projections, and for cross-thematic analysis;

(see A/HRC/RES/23/2) and 31/32 on protecting human rights defenders, whether individuals, groups or organs of society, addressing economic, social and cultural rights, adopted on 24 March 2016 and available at [https://ap.ohchr.org/documents/dpage\\_e.aspx?si=A/HRC/RES/31/32](https://ap.ohchr.org/documents/dpage_e.aspx?si=A/HRC/RES/31/32); (see A/HRC/RES/31/32); and paragraph 20 of the Maastricht Recommendations on Promoting Effective Public Participation in Decision-making in Environmental Matters (see document ECE/MP.PP/2014/2/Add.2), para. 20, available at <http://www.unccc.org/index.php?id=49142>).

<sup>3</sup> The Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention, article), art. 5, paragraph 1 (b) and (9).

15. Support and use ~~“Open Science”~~open science and ~~“open research data”~~ initiatives, based on robust and scientific methodologies, to inform environmental policy-making and facilitate transparent public discussions;

16. Promote ~~through electronic information tools~~ the use of citizen science, crowdsourcing and local and indigenous knowledge through electronic information tools to support the performance of public functions ~~or~~and the provision of public services related to environmental monitoring and to promote environmental awareness among the public (see section V below);

~~17. Provide~~17. Promote multilingual electronic information tools by providing information in the national language(s) and at least basic information of interest to the international community in ~~English~~the official languages of the United Nations;

18. ~~Document~~Disseminate good practices related to the application of the Convention at the national/state, subnational and local levels in areas outlined in paragraph 20 below, and share information on ~~thesesuch good practices~~ through the Convention’s clearing-house mechanism and the national nodes<sup>4,5</sup>

19. Provide information on the implementation of these present recommendations ~~and the~~, including on the obstacles encountered and how they could be overcome, through the Convention’s national implementation reports<sup>6,7</sup>, so as to support the review of progress in the implementation of the Convention and the exchange of experiences under its relevant bodies in this area;<sup>7</sup>

### III.- Priority categories types of information and its accessibility

20. Ensure, where necessary through ~~introducing~~the introduction of appropriate legislative or regulatory measures, that, subject to ~~the provisions of~~ article 4, paragraphs 3 and 4,5 (10) of the Convention:

(a) Public access to environmental information is provided in electronic form and made available through the Internet, so that information required to be publicly available under the Convention is ~~to be~~ provided in electronic form where so requested and where the information exists in that form or can be readily converted to that form at reasonable cost;

(b) Documentation which is required to be drawn up and/or submitted in the context of decision-making procedures in environmental matters that are subject to the provisions of articles 6, 7 and 8 of the Convention is required to be provided in electronic form and is progressively made accessible to the public through the Internet;

(c) ~~Nationwide~~A nationwide digital environmental information system supports public access to real-time, ~~as appropriate~~, and other dynamic and historical, up-to-date, accurate and quality-controlled, comprehensive, standardized and functional environmental information and this information is made discoverable and accessible through the Internet in forms and formats meeting the needs of different users;

~~(d) In line with identified user needs, the~~(d) The following types of information progressively become publicly accessible, in a timely manner, through the Internet, preferably through a one-stop web access point(s);

(i) Reports on the state of the environment;<sup>8</sup>

(ii) Texts, including consolidated versions, of legislation, regulations, rules and other legally binding instruments ~~or~~ relating to the environment and their drafts;<sup>9</sup>

<sup>4</sup>Decision II/3, paragraph 2, adopted by the Meeting of the Parties to the Convention (document ECE/MP.PP/2005/2/Add.4), available at: <http://www.unece.org/env/pp/mop2/mop2.doc.html>;

<sup>5</sup> See ECE/MP.PP/2005/2/Add.4, decision II/3, para.2; and section VII of the present recommendations;

<sup>6</sup> See reporting format (questions XI–XIV) endorsed through decision IV/4 of the Meeting of the Parties to the Convention (document ECE/MP.PP/2011/2/Add.1), available at: <http://www.unece.org/env/pp/reports.html>

<sup>7</sup> See Format for Aarhus Convention implementation report (ECE/MP.PP/2011/2/Add.1, decision IV/4, annex, questions XI–XIV).

<sup>8</sup> The Aarhus Convention, article art. 5, paragraphs (3) (a) and (4).

<sup>9</sup> The Aarhus Convention, article Ibid., arts. 5, paragraphs (3) (b) and (5) (a); and article-8, second sentence, paragraph (b).

- (iii) Texts, including consolidated versions, of policies, plans and programmes ~~on or~~ relating to the environment, and environmental agreements<sup>10</sup>; and their drafts;<sup>11</sup>
- (iv) International treaties, conventions and agreements on environmental issues, decisions and reports relevant to their implementation and compliance at the national/state level<sup>12</sup>; including findings and recommendations of the Convention's Compliance Committee concerning the Party in question, and environmental performance reviews conducted upon request of the country;<sup>13</sup>
- (v) Data on ~~environmentally significant~~ releases and transfers of pollutants; within the scope of the ~~Protocol on Pollutant Release and Transfer Registers~~<sup>14</sup>; Convention;<sup>15</sup>
- (vi) Documentation ~~forming an integral part of any~~ related to environmental impact assessments, state ecological expertise, licensing or permitting ~~processes~~<sup>16</sup> subject to the provisions of article 6 of the Convention (~~e.g. for example~~, public notices, applications, risk assessment and other studies, all other relevant documentation, comments of third parties, draft and final decisions and attached conditions) where it is held in, or can be readily converted to, electronic form ~~or, where~~, Where it is not available in ~~such~~ electronic form and cannot be converted to electronic form at reasonable cost, a reference to where such documentation can be accessed;<sup>16</sup>
- (vii) Documentation ~~forming an integral part of~~ related to strategic environmental assessment or other ~~processes~~<sup>17</sup> of ~~preparations~~ preparing plans, programmes; or policies relating to the environment subject to the provisions of article 7 of the Convention (~~e.g. for example~~, public notices, all other relevant documentation, including risk assessment and other studies, economic analysis and assumptions, comments of third parties, draft and final decisions) where it is held in or can be readily converted to electronic form ~~or, where~~, Where it is not available in ~~such~~ electronic form and cannot be converted to electronic form at reasonable cost, a reference to where such documentation can be accessed;<sup>17</sup>
- (viii) All information which could enable the public to take measures to prevent or mitigate harm arising from an imminent threat to human health or the environment, whether caused by human activities or due to natural causes;<sup>18</sup>
- (ix) Information on mechanisms related to access to justice, and decisions and reports of courts, information commissioners, Ombudsmen and other national human rights institutions and review bodies related to support the implementation of article 9 of the Convention; environmental matters;<sup>19</sup>
- (e) To the extent feasible and appropriate ~~and in line with identified user needs, information of types such as~~, the following types of information progressively ~~becomes~~ become publicly accessible, in a timely manner, through the Internet, preferably through a one-stop web access point:
- (i) Environmental monitoring data<sup>20</sup> held by or on behalf of public authorities ~~or crowdsourced~~, including spatially attributed historical and dynamic ~~and other~~ data with spatial attributes, both primary and processed, regarding quality and pollution of air ~~and of water in major water courses, water reservoirs and sources of other surface and underground water~~;
- (ii) ~~Other information about the state of the , soil, water and other~~ elements of the environment and factors;
- (ii) Other environmental information, such as big data or space-based data, and data contained in electronic databases, registers, cadastres and inventories;<sup>21</sup>
- (iii) ~~Eco-labelling and eco-auditing schemes, "product passports"~~ Product-specific data and information, such as those on material and other environment related product information that enables energy efficiency, toxicity, material composition, durability, repairability and recycling, to enable consumers to make informed environmental choices<sup>22</sup>; as well as other actors in value chains (for example, market surveillance and waste management) to improve their

<sup>10</sup> The Aarhus Convention, article 5, paragraphs 3 (c) and 5 (a).

<sup>11</sup> Ibid., art. 5 (3) (c) and (5) (a).

<sup>12</sup> The Aarhus Convention, article 5, paragraphs 5 (b) and (c); the Almaty Guidelines on Promoting the Application of the Principles of the Aarhus Convention in International Forums adopted through decision II/4 of the Meeting of the Parties to the Convention (document ECE/MP.PP/2005/2/Add.5) available at: [http://www.unece.org/env/pp/aarhus/almaty\\_guidelines.html](http://www.unece.org/env/pp/aarhus/almaty_guidelines.html)

<sup>13</sup> Ibid., art. 5 (5) (b) and (c); and the Almaty Guidelines on Promoting the Application of the Principles of the Aarhus Convention in International Forums (ECE/MP.PP/2005/2/Add.5, annex).

<sup>14</sup> The Aarhus Convention, article 5, paragraph 9; the Protocol on Pollutant Release and Transfer Registers, done at Kyiv on 21 May 2003.

<sup>15</sup> Aarhus Convention, art. 5 (9).

<sup>16</sup> The Aarhus Convention, article 6 and article 5, paragraph 3(d). Ibid., arts. 5 (3) (d) and 6.

<sup>17</sup> The Aarhus Convention, article 7 and article 5, paragraph 3(d). Ibid., arts. 5 (3) (d) and 7.

<sup>18</sup> The Aarhus Convention, article Ibid., art. 5, paragraph (1) (c).

<sup>19</sup> Ibid., art. 9, in particular (4) and (5).

<sup>20</sup> The Aarhus Convention, article Ibid., art. 5, paragraphs (2) (b) and (c), (3) (d), (7) (a) and (9).

<sup>21</sup> The Aarhus Convention, Ibid., article 5, paragraph (2) (b) and (c), (3) (d), (7) (a) and (9).

<sup>22</sup> The Aarhus Convention, article 5, paragraphs 6 and 8.

environmental performance;<sup>23</sup> cooperation with the private sector being essential in ensuring provision of this information; Examples include product databases, digital product passports, eco-labelling, energy efficiency and eco-auditing schemes and environmental product declarations;

- (iv) Good practice information and guidelines on better environmental management, sustainable consumption and production, best available techniques, green procurement, green and circular economy and sustainable development;<sup>24</sup>
- (v) Environmental monitoring, pollution, waste-related and other environmental data and information crowdsourced by a public authority, obtained with the use of public funds or supplied to the public authority by a third party ~~being under legal obligation to do so in accordance with the national/state framework;~~<sup>25</sup>
- (vi) Information on environmental enforcement and compliance;<sup>26</sup>
- (vii) ~~Funded~~Information on funded environmental projects, including international projects, revenues and expenditures of environment-related funds, public procurement and other ~~information~~public records on the performance of public functions or the provision of public services relating to the environment by government at all levels;<sup>27</sup>
- (viii) Standardized metadata so that the data source, date of its production and update, restrictions, production, verification and validation methods, processes, ~~and~~ legal obligations, and context of data and information collection and management are transparent, allow data discoverability and mining, machine-to-machine communication, use and ~~re-use~~reuse (see also ~~Annex, section~~chapter IV)<sup>28</sup>; of the addendum to the present document;<sup>29</sup>
- (ix) ~~Meta information~~Metainformation, including catalogues of data sources and details of the scope of information held by public authorities and mechanisms for the provision of access to environmental information;<sup>30</sup>

(f) The report on the state of the environment<sup>31</sup> to be published and disseminated in accordance with article 5 (4) of the Convention ~~should, and to~~ include information on the quality of the environment and information on ~~the~~ pressures on the environment. ~~The report,~~ should be based on national/state environmental indicators and on the relevant indicators of Sustainable Development Goals, ~~ECE and other internationally or on environmental indicators~~ agreed ~~and national/state environmental indicators and under ECE~~<sup>32</sup> or under other international processes. The report should provide ~~access~~references to underlying ~~datasets~~data sets from a nationwide pollutant release and transfer register and other sources, as appropriate. The report should be prepared through an inclusive consultation process with all interested members of the public and other stakeholders ~~in accordance with the national/state framework and good practices;~~

(g) ~~The~~Ensure that summaries and press releases relating to the information listed in subparagraphs (d)–(f) above provide a reference to the sources where these underlying data and information can be traced and accessed by the public;

(h) Open licences should be issued to promote the use and ~~re-use~~reuse of environmental information ~~should not be subject to conditions~~. However, in some cases justified by a public interest objective, a licence may be issued imposing conditions on the ~~re-use~~reuse by the licensee dealing with issues such as liability, the protection of personal data, the proper use of documents, guaranteeing non-alteration and the acknowledgement of source. If public authorities license environmental information for ~~re-use~~reuse, the licence conditions should be objective, proportionate and non-discriminatory. ~~The use and in accordance with articles 4–8 of open licences should be promoted~~the Convention;

21. The term ‘progressively’ in article 5, ~~paragraph (3)~~ of the Convention and in paragraph 20 (d) and (e) ~~of these recommendations above~~ should imply demonstrable progress with regard to the following parameters:

- (a) The proportion of members of the public that have electronic access;
- (b) The scope and quality of information that is electronically accessible;
- (c) The quality of electronic access;
- (d) The level of understanding of user needs;

<sup>23</sup> Ibid., art. 5 (6) and (8).

<sup>24</sup> The Aarhus Convention, article ~~Ibid., art. 5, paragraph (7) (b).~~

<sup>25</sup> Ibid., art. 5 (1) (b) and (9).

<sup>26</sup> The Aarhus Convention, article ~~Ibid., arts. 5, paragraph (7) (c), and article 9, paragraph (3).~~

<sup>27</sup> The Aarhus Convention, article ~~Ibid., art. 5, paragraphs (2) (b) and (c), (3) (d), (7) (c) and (9).~~

<sup>28</sup> The Aarhus Convention, article 5, paragraphs 2 (b) and (c), 3 and 9.

<sup>29</sup> Ibid., art. 5 (2) (b) and (c), (3) and (9).

<sup>30</sup> The Aarhus Convention, article 5, paragraph 2. Ibid., art. 5 (2).

<sup>31</sup> The Aarhus Convention, article ~~Ibid., art. 5, paragraphs (3) (a) and (4).~~

<sup>32</sup> See [http://www.unece.org/env/europe/monitoring/iandr\\_en.html](http://www.unece.org/env/europe/monitoring/iandr_en.html).

(e) The extent to which user needs are being met;

and that such progress should be communicated to the public, including through the report on the state of the environment;

#### IV.- Tools and infrastructure

22. Environmental information can be disseminated to the public using ~~the various~~ environmental/electronic information tools, as appropriate, including:

- (a) ~~Special (one-stop access) portal dedicated to nationwide digital environmental information system;~~
- (b) ~~General governmental portal;~~
- (c) ~~Websites of the public authorities performing public functions, or the provision of providing public services related to the environment at the national/state, sub-national, subnational and local levels;~~
- (d) ~~Single one-stop web access point (hereinafter – environmental portal) for environmental information, including types of information listed in section III above;<sup>33</sup>~~
- (e) Open Data portal;
- (f) General government or e-government portal;
- (g) Portals of other key providers of information as relevant with respect to legislation, case-law, law-making, justice, and other legal, policy and public records information;
- (h) Widgets;
- (i) ~~Special mobile~~ (g) Mobile applications;
- (j) Social media and online media;
- (k) ~~E-mail~~ Email alerts;
- (l) ~~Tools to access environmental information through bar code or QR code scanning;~~
- (m) Tools to access environmental information through bar-code or quick-response (QR)-code scanning;
- (n) Tools to access environmental information through touch-tone dialling;
- (o) ~~Short message services (SMS) and mobile messaging applications, including chatbots;~~
- (p) Public electronic information kiosks;
- (q) Telephone hotline;
- (r) ~~TV~~ (o) Television teletext.<sup>34</sup>

~~23. Develop, if missing, and continuously maintain and upgrade an environmental portal based on the nationwide digital environmental information system, to: ensure effective public access to information through the Internet; promote environmental education and awareness; and support effective public participation in decision-making and other public engagements in environmental matters (see chapter V of the addendum to the present document);~~

24. Ensure that databases, registers, lists, inventories, cadastres and other resources containing environmental information listed in section III above are developed, continuously maintained, and ~~updated/converted, where possible, or upgraded~~ in digital form by default as integral parts of the nationwide digital environmental information system ~~by promoting their interoperability, data sharing and public accessibility. A modular approach can be used to allow an autonomous upgrade of different integral parts as needed;~~

~~24. — To ensure effective public access to environmental information, including listed in section III, develop if missing, continuously maintain and update a single one-stop access point based on a nationwide digital environmental information system that:~~

- (a) ~~aggregates~~ 25. Ensure that the environmental portal:
- (a) Is user-friendly and promotes user customization and accessibility;
- (b) Aggregates data and information resulting from different sources or ~~provide link~~ provides visible links to other thematic portals (see ~~Annex, section~~ chapter V of the addendum to the present document);
- (c) ~~supports~~ (c) Supports the implementation of the national “e-governance” and “Open Data/government”, “open government”, “open data” and “the digital transformation” frameworks;
- (d) ~~supports~~ (d) Supports the implementation of the Shared Environmental Information System principles (see ~~Annex, section III~~ chapter III of the addendum to the present document);

<sup>33</sup> See ECE/MP.PP/2017/2/Add.1, decision VI/1, para. 3.

<sup>34</sup> ~~The Aarhus Convention, article art. 5, paragraph (3-).~~

~~(d) supports~~ Supports the implementation of the Group on Earth Observations Observation data-management and -sharing principles and data-management principles covering the entire data life cycle (see Annex, section chapter II of the addendum to the present document);

~~(e) promotes~~ Promotes machine-to-machine communication and ~~the~~ interoperability with statistical, geospatial, health and other information systems throughout the technical, semantic and legal dimensions;

~~(f) allows using “cloud computing”;~~

~~25. Promote~~ (g) Allows for the use of cloud computing services and other best available state-of-the-art digital technologies;

~~26. Promotes~~ the development, continuous maintenance, and ~~update~~ upgrade of online ~~general~~ portals providing access to legislation, case-law, law-making, justice, ~~and~~ other legal, policy and public records information systems using best available international standards. ~~Ensure that resources and state-of-the-art digital technologies. Resources~~ of such systems should be properly categorized ~~to~~ according to the relevant environmental matters and made discoverable and accessible to the public in accordance with the Convention ~~on the general~~ through these portals and ~~one-stop access point;~~ environmental portal;<sup>35</sup>

~~26~~ 27. To support effective public participation in decision-making in environmental matters,<sup>36</sup> the following tools can be used, without neglecting the need for traditional means of communication, such as official noticeboards, placards at proposed activity sites, notices in appropriate print and online local, regional or nationwide newspapers and television media:

(a)- ~~\_\_\_~~ Electronic official notice boards ~~noticeboards~~ of the public authorities;

(b)- ~~\_\_\_~~ Public advisory e-committees;

(c)- ~~\_\_\_~~ Web meetings ~~or town halls;~~

(d)- ~~\_\_\_~~ Public e-consultations platforms;

(e)- ~~\_\_\_~~ E-petitions platforms;

(f)- ~~\_\_\_~~ Social media groups;

(g) Mobile messaging applications, including chatbots;

(h) Teleconferences;

~~27. Encourage the use of the established emergency telephone numbers~~

~~28. In case of any imminent threat to human health or the environment, ensure that all information is disseminated immediately and without delay to members of the public who may be affected.~~<sup>37</sup> Encourage the establishment of a multi-hazard early warning system; the use of emergency telephone numbers, mobile messaging applications, including chatbots, radio emergency networks, media, including traditional media and social media, online portals and mobile applications used for the routine dissemination of environmental information to provide information to the public in case of imminent threat to human health and/or the environment as appropriate in accordance with forms and formats meeting the needs of different users<sup>38</sup>;

~~28~~ 29. Electronic information tools progressively should contain an open application programming interface to provide data and metadata as appropriate, supported by clear technical documentation that is complete and available online. The set-up and use of the application programming interface should be based on several principles: availability; stability; maintenance over ~~life cycle;~~ life cycle; uniformity of use and standards; user-friendliness ~~as well as;~~ and security. If open application programming interfaces are not possible, electronic information tools should contain a publicly available justification. ~~The progress should take into account the funds available to develop, maintain and update the tools in question;~~

~~29~~ 30. Ensure the availability of machine-readable, user-friendly and ~~easily transferable~~ open formats for the data and information listed in section III above in a way that they can be shared and ~~re-used;~~ reused (see chapter IV of the addendum to the present document);

<sup>35</sup> Ibid., arts. 5 (3) (b) and (c) and (5) and 7–9.

<sup>36</sup> The Aarhus Convention, article 5, paragraphs 3 (d) and 7, and articles 6–8. Ibid., arts. 5 (3) (d) and (7) and 6–8; and Maastricht Recommendations on Promoting Effective Public Participation in Decision-making in Environmental Matters (ECE/MP.PP/2014/2/Add.2).

<sup>37</sup> Aarhus Convention, art. 5 (1) (b) and (c), (6) and (9).

<sup>38</sup> The Aarhus Convention, article 5, paragraph 1 (e).

~~30~~31. Ensure continuous maintenance and update of electronic information tools and their content, including links, information on the reliability of the information sources and dates of the last ~~update~~updates. If ~~the competent a public authority decides can~~ no longer ~~to~~ make available certain environmental information or electronic information tools for use or ~~re-use~~reuse, or ~~has~~ to cease updating ~~those that~~ information or ~~those~~ tools, it should make ~~those decisions this~~ publicly known ~~and give reasons~~, at the earliest opportunity, by electronic means where possible;

~~31~~32. Promote and support efforts towards the development of methodologies ~~and~~, mobile applications and tools to provide the public with accessible, comprehensive, up-to-date and comparable information on ~~the~~ environmental impact of products ~~which that~~ enables consumers to make informed environmental choices;

~~32~~33. Encourage the use of pilot and lab-based projects and state-of-the-art public engagement processes to develop and ~~update~~upgrade electronic information tools or to apply new or emerging digital technologies, including ~~cloud computing services, open~~ data cubes, artificial intelligence, machine learning, blockchain, ~~remote sensing~~linked data, ~~text mining, autonomous technologies for drones and other unmanned aerial vehicles~~, and the “Internet of Things”;~~things~~;

## V.- Engagement of the public, operators and other interested stakeholders

~~33.~~

~~34.~~ Provide ~~the~~ opportunities for public participation in ~~the~~ design, development and ~~update~~upgrade of electronic information tools ~~in accordance with the national framework and established~~taking into account good practices to ensure that the needs of different users are met;

~~35.~~

~~34.~~ Take ~~the necessary measures as~~ appropriate ~~measures~~ in accordance with best available international standards to ~~make~~render electronic information tools more accessible to the users; ~~–~~ in particular to ~~persons in vulnerable situations, including older people, people~~persons, ~~persons~~ with disabilities, ~~those~~persons with low literacy ~~skills~~ or ~~facing~~ language barriers; ~~and other persons in vulnerable situations~~ – by making them ~~perceivable~~user-friendly, operable, understandable and robust;

~~35~~36. Implement the onboarding for different types of potential users (for example, decision-makers, ~~the~~ scientific community and researchers, education professionals, business operators, journalists, ~~non-governmental organizations~~NGOs promoting environmental protection, Aarhus ~~centres~~Centres, indigenous ~~people~~peoples, children and youth, other groups of the public with specific interests) tailored to each electronic information tool;

~~36-37.~~ Ensure that electronic information tools ~~provide for~~have an open source user-feedback mechanism ~~the opportunity, which provides possibilities~~ to ~~give feedback and~~all interested users comment on data and information accessibility, quality, sustainability of use and ~~re-use~~reuse, ~~as well as~~ on ~~discovered~~issues or ~~significant~~events that condition the interpretation of the data ~~as appropriate~~;

~~37~~38. Promote the use and reuse of environmental information by the public and other interested stakeholders by ~~organizing hackathons, forums, promotion campaigns, start-up incubators, public-private partnerships and other forms of engagement~~;

~~39.~~ Encourage the collection of local and indigenous knowledge, citizen science and crowdsourced data provided or generated by members of the public through citizen science observatories or other relevant initiatives, and promote the interoperability of such data in accordance with best available international standards;

~~38~~40. Promote the accessibility, ~~use~~reuse and interoperability of ~~open~~research data ~~in accordance with, taking into consideration the principles for scientific data management and stewardship and other~~ best available international standards; ~~(see chapters II–IV of the addendum to the present document)~~;

~~39~~41. Encourage operators whose activities have a significant impact on the environment to develop and use, ~~as appropriate~~, web-based, mobile and social media applications ~~in accordance with~~taking into account the ~~national framework and~~best available ~~state-of-the-art digital technologies and~~ international ~~interoperability and other~~ standards; ~~as appropriate (see paragraph 33 above and chapter IV of the addendum to the present document) to~~:

(a) ~~to inform~~Inform the public regularly of the environmental impact of ~~their~~the operators’ activities and products and other environmental information collected under a legal obligation to do so; ~~and~~

(b) ~~to inform~~Provide the public authorities ~~with an adequate flow of information about these activities through the mandatory system (see paragraph 13 above)~~ regularly and in case of ~~any~~ imminent threat to human health ~~and/or~~ the

environment ~~to ensure that all information is disseminated immediately and without delay to members of the public who may be affected~~<sup>39,40</sup>;

## VI.- Governance, institutional development and capacity-building

~~4042.~~ Establish, in physical and/or virtual environments, environmental information centres or equivalent settings that will promote public access to information and public participation in decision-making in environmental matters;

~~4143.~~ Promote access to electronically stored environmental information by establishing and maintaining Internet access points for the local population at information sites available for public use, including in Aarhus Centres, public libraries, environmental information centres, museums, archives and at other information sites;

~~4244.~~ Ensure ~~proper consideration of environmental information management and accessibility within~~that “e-governance/government” and “open data” governance frameworks integrate environmental matters;

~~4345.~~ Identify points of contact and data stewards ~~that~~who will be responsible for information management, dissemination of environmental information and maintenance of electronic information tools.<sup>41</sup>;

~~4446.~~ Promote the development and wider use of electronic information tools based on best available state-of-the-art ~~electronic information tools~~digital technologies as an effective instrument for putting into practice the Convention’s provisions, including through public-private partnerships;

~~4547.~~ Develop human capacity for the use of electronic information tools to promote the implementation of the Convention through comprehensive and forward-looking training and education programmes for public officials, the scientific community and researchers, education professionals, business operators, journalists, ~~non-governmental organizations~~NGOs promoting environmental protection, Aarhus ~~centres~~Centres, indigenous ~~people~~peoples, children and youth, women, and other groups of the public with specific interests;

~~4648.~~ Undertake measures to develop the institutional capacities of public authorities to collect, update, organize, and store ~~and disseminate environment related~~environmental data and information in electronic ~~form by~~and digital forms as the default and an easily accessible and user friendly manner through in the nationwide digital environmental information system and to disseminate them through electronic information tools;

~~4749.~~ Develop and apply comprehensive environment-related educational and capacity-building programmes, ~~including specific training programmes linking that also cover~~ the use of electronic information tools and the best available state-of-the-art digital ~~technology applications to the promotion of good environmental governance~~technologies;

~~4850.~~ Share good practices, case studies, project outcomes and other useful material through the Aarhus Clearinghouse and its online databases, and support the maintenance of its national nodes;Convention’s clearing-house mechanism (see section VII below);

## VII.- Clearing-house mechanism

~~4951.~~ Maintain a national ~~web site~~website, preferably ~~a one-stop access point~~as an environmental portal (see paragraph ~~2423~~ above and ~~Annex, section chapter V of the addendum to the present document~~), with information related to the nationwide implementation of the Convention ~~and these Recommendations~~, which will serve as the national node of the Convention’s clearing-house mechanism and provide its link to the Convention’s secretariat for uploading ~~it~~to the Aarhus Clearinghouse central node;

~~5052.~~ Designate contact points responsible for collecting, managing and updating the information contained in the national node and for providing the necessary information for the central node of the Convention’s ~~clearinghouse~~clearing-house mechanism, and undertake measures to disseminate information to the public on the ~~clearinghouse~~clearing-house mechanism; ~~and~~

<sup>39</sup> ~~The Aarhus Convention, article 5, paragraph 1 (b) and (c), 6 and 9.~~

<sup>40</sup> ~~Ibid., art. 5 (1) (b) and (c), (6) and (9).~~

<sup>41</sup> ~~The Aarhus Convention, Ibid., article 5, paragraph (2) (b).~~

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~~5453~~. Develop capacity for public officials managing and updating information for the national node, and for providing the necessary information for the central node of the clearing-house mechanism.

## ANNEX Addendum

Supporting explanatory notes

### Chapter I. Terminology

To facilitate the use of the recommendations (see ECE/MP.PP/WG.1/2020/14), the following terms apply:

“Aarhus Convention” and “Convention” means the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, done at Aarhus, Denmark, on 25 June 1998;

“accessibility” means the set of principles and techniques to be observed when designing, developing, maintaining, and ~~updating~~upgrading electronic information tools in order to make them more accessible to users, in particular persons with disabilities;

“Akoma Ntoso” defines a set of simple technology-neutral electronic representations in XML format of parliamentary, legislative and judiciary documents;

“application programming interface” (API) means a set of functions, procedures, definitions and protocols for machine-to-machine communication and the seamless exchange of data. Application programming interfaces can have different levels of complexity and can mean a simple link to a database to retrieve specific datasets, a web interface, or more complex set-ups;

“artificial intelligence” refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals;

“blockchain” refers to a growing list of records, called blocks, that are linked using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data. By design, a blockchain is resistant to modification of the data;

“citizen science” means a form of open collaboration in which members of the public participate voluntarily in the scientific process or environmental monitoring in various ways;

“crowdsourcing” means a method to obtain needed services, ideas, or content by soliciting voluntary contributions from members of the public, especially from an online community;

“data” refers to all types of data, including:

(a) ~~\_\_\_~~ dynamic data ~~that, which~~ means documents in a digital form, subject to frequent or real-time updates, in particular because of their volatility or rapid obsolescence (for example, data generated by sensors are typically considered to be dynamic data);

~~(b) big data that~~ (b) primary data, which means the environmental data received earlier and fixed in any form which could be available for processing;

(c) big data, which means data that contains greater variety arriving in increasing volumes and with ever-higher velocity;

~~(e)-d)~~ research data ~~that, which~~ means documents in a digital form, other than scientific publications, which are collected or produced in the course of scientific research activities and are used as evidence in the research process, or are commonly accepted in the research community as necessary to validate research findings and results;

~~(d)-e)~~ citizen science data ~~that, which~~ means data collected by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions;

“data catalogue” means a collection of metadata, combined with data management and search tools, that helps analysts and other data users to find the data that they need, serves as an inventory of available data, and provides information to evaluate fitness data for intended uses;

“data cube” means a multi-dimensional (“n-D”) array of values and refers to an approach to storing, processing and analysing large collections of environment-related ~~earth~~Earth observations and other data. The technology is designed to ~~meet challenges~~monitor changes in the state of ~~nationwide interest~~the environment by being agile and flexible with vast amounts of layered grid data;

“data harvesting” means a process that copies datasets and their metadata between two or more data catalogues;

“data mining” means the practice of examining large databases in order to generate new information;

“data management” refers to management of information and data for secure and structured collection, update, storage, processing and access. Data management tasks include the creation of data governance policies, analysis and architecture; database management system integration; data security and data source identification, segregation and storage;

“digital transformation” refers to the economic, societal and environmental effects of digitisation and digitalisation;

“digitisation” means the technical process of converting analogue information into digital form;

“digitalization” means the ~~conversion of text, pictures, organisational or sound into a digital form that can be processed by a computer~~ business process of the technologically-induced change within organisations, markets and branches;

“digital divide” means any uneven distribution in the access to, use of, or impact of information and communication technologies between any ~~number of~~ distinct groups;

“digital environmental information system” is an electronic system that allows sharing of all types of digital data, information, and knowledge relevant to the ~~environment~~ environmental matters to be made available, discoverable and accessible in accordance with the Convention<sup>42</sup>;

“discoverability” refers to users' ability to find data, information, applications or services;

“Earth observations” refers to data and information collected about the planet, whether atmospheric, oceanic or terrestrial;

“e-Government initiatives” encompass the activities of ~~the~~ public authorities to deploy information and communication technologies for improving knowledge and information in the service of the public;

“environmental information” means environmental information as defined in article 2, ~~paragraph (3)~~ of the Convention;

“environmental indicator” means an indicator supporting all phases of environmental policy-making, from designing policy frameworks to setting targets, and from policy monitoring and evaluation to communicating to policy-makers and the public;

“internet of things” means the interconnection ~~via~~ through the Internet of computing devices embedded in everyday objects, enabling them to send and receive data;

“interoperability” means the ability of a computer system or software to work with other systems or products without special effort on the part of the user. It includes the technical, semantic and legal dimensions;

“linked data” refers to a method of publishing structured data which is interlinked with other data so it becomes more useful through semantic queries. It builds upon standard Web technologies such as HTTP, RDF and URIs, but rather than using them to serve web pages only for human readers, it extends them to share information in a way standardized vocabularies that can be connected together and read automatically by ~~computers~~ machines with support of standard Web technologies ;

“machine learning” means the scientific study of algorithms and statistical models that computer systems use to perform a specific task without using explicit instructions, relying on patterns and inference instead. It is seen as a subset of artificial intelligence;

“machine-readable format” means a file format structured so that software applications can easily identify, recognise and extract specific data, including individual statements of fact, and their internal structure;

“~~meta data~~ metadata” means a set of data that describes and gives information about other data;

“mobile application” means application software designed and developed, by or on behalf of public authorities, for use by the ~~general~~ public on mobile devices such as smartphones and tablets. It does not include the software that controls those devices (mobile operating systems) or hardware;

“onboarding” means the ~~actor~~ process of familiarizing a new user with electronic information tools, taking into account the users' needs, behaviour, experiences, and goals;

“open data” denotes data in an open format that can be freely used, ~~re-used~~ reused and shared by anyone for any purpose;

“open format” means a file format that is platform-independent and made available to the public without any restriction that impedes the ~~re-use~~ reuse of information;

“open licence” means standardised public licences available online which allow data and other content to be freely accessed, used, modified and shared by anyone for any purpose, and which rely on open data formats (for example, custom-made licences, Creative Commons licences, Open Government licences for public sector information);

“open government data<sup>22</sup> initiatives” encompass activities to make data or information ~~or data~~ produced or commissioned by ~~governments~~ public authorities available for everyone to access, reuse and redistribute without any restrictions;

“pollutant release and transfer register” ~~means an environmental~~ refers to a coherent, nationwide system of pollution inventories or registers on a structured, computerized and publicly accessible database or inventory of potentially hazardous chemical compiled through standardized reporting. Such a system may include inputs, releases and transfers of a specified range of substances and/or pollutants released to air, products, including water and soil and transferred off, energy and resource use, from a specified range of activities to environmental media and to on-site for and offsite treatment or and disposal, sites<sup>42</sup>;

“public record” ~~are~~ means any information or documents that are made by a public authority or public official and are required by law to be kept and maintained;

<sup>42</sup> The Convention, article 5 (9).

“public-private partnership” refers to a scheme that involves cooperation between the public and the private sector aiming at financing, designing, implementing and operating public sector infrastructure and services supporting the implementation of the Convention;

“~~re-use~~reuse” means the use by the public of environmental information held by public authorities for commercial or non-commercial purposes other than the initial purpose within the performance of public functions or the provision of public services in relation to the environment for which the ~~such~~ information was collected. In technical terms ~~re-use~~reuse can be supported by data management principles (see ~~Annexes~~chapters II and III ~~below~~);

“~~search engine advertising~~” (SEA) means advertising through search engines;

“~~search engine optimization~~” (SEO) means the process of maximizing the number of users to a particular website by ensuring that the web site appears high on the list of results returned by a search engine;

“semantic web” is a mesh of information linked up in such a way as to be easily processable by machines, on a global scale;

“~~Social media optimization~~” (SMO) means the use of social media networks to manage and maximize the number of users the online presence;

“standard licence” means a set of predefined ~~re-use~~reuse conditions in a digital format, preferably compatible with standardised public licences available online;

“text mining” means the discovery by ~~computer~~machine of new, previously unknown information, by automatically extracting information from different written resources;

“~~timely manner~~” means with minimum time delays;

“user feedback” refers to a data quality component that includes information about the data directly provided by users based on their experiences using the data. It may include comments, quality assessments, discovered issues, usage reports, etc. It complements the data quality information provided by its producer-;

“~~widget~~” refers to a small piece of Web programming code that makes environmental data and information appear on a blog, wiki, or Web page. Information in a widget can feature updated information or let the user do something like use a search box.

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## **Chapter II.** Data sharing and data management principles developed by the Group on Earth Observation

1. ~~Earth observations mean data and information collected about the planet, whether atmospheric, oceanic or terrestrial.~~ This Earth observations includes space-based or remotely-sensed data, as well as ground-based or in situ data.

2.      The following data sharing principles and data management principles have been developed by the Group on Earth observations:<sup>1</sup>

(a)      data sharing principles:

(i)      data, metadata and products will be shared as Open Data by default, by making them available as part of the GEOSS Data Collection of Open Resources for Everyone (Data-CORE) without charge or restrictions on reuse, subject to the conditions of registration and attribution when the data are reused;

(ii)      where international instruments, national policies or legislation preclude the sharing of data as Open Data, data should be made available with minimal restrictions on use and at no more than the cost of reproduction and distribution; and

(iii)      all shared data, products and metadata will be made available with minimum time delay.

(b)      data management principles:

### Discoverability

DMP-1. Data and all associated metadata will be discoverable through catalogues and search engines, and data access and use conditions, including licenses, will be clearly indicated.

### Accessibility

DMP-2. Data will be accessible via online services, including, at minimum, direct download but preferably ~~sefuser~~-customizable services for visualization and computation.

### Usability

DMP-3. Data will be structured using encodings that are widely accepted in the target user community and aligned with organizational needs and observing methods, with preference given to non-proprietary international standards.

DMP-4. Data will be comprehensively documented, including all elements necessary to access, use, understand, and process, preferably via formal structured metadata based on international or community-approved standards. To the extent possible, data will also be described in peer-reviewed publications referenced in the metadata record.

DMP-5. Data will include provenance metadata indicating the origin and processing history of raw observations and derived products, to ensure full traceability of the product chain.

DMP-6. Data will be quality-controlled and the results of quality control shall be indicated in metadata; data made available in advance of quality control will be flagged in metadata as unchecked.

### Preservation

DMP-7. Data will be protected from loss and preserved for future use; preservation planning will be for the long term and include guidelines for loss prevention, retention schedules, and disposal or transfer procedures.

DMP-8. Data and associated metadata held in data management systems will be periodically verified to ensure integrity, authenticity and readability.

### Curation

DMP-9. Data will be managed to perform corrections and updates in accordance with reviews, and to enable reprocessing as appropriate; where applicable this shall follow established and agreed procedures.

DMP-10. Data will be assigned appropriate persistent, resolvable identifiers to enable documents to cite the data on which they are based and to enable data providers to receive acknowledgement of use of their data.

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<sup>1</sup> Referenced in the GEO Strategic Plan 2016-2025 and re-affirmed through the Ministerial Declaration adopted by the Group on Earth Observation at the twelfth plenary session (Mexico City, 11-12 November 2015) available at: [http://www.earthobservations.org/open\\_eo\\_data.php#](http://www.earthobservations.org/open_eo_data.php#)

### Chapter III. Shared Environmental Information ~~Systems~~System principles<sup>2</sup>

1.- \_\_\_ A shared environmental information system (SEIS) ~~means a concept~~<sup>is</sup> underpinned by a series of principles ~~designed to ensure that digitally based system of systems allows~~<sup>ensure</sup> interoperable flow of information about environmental monitoring, data, indicators, assessments, and knowledge.

2.- \_\_\_ The ~~Shared Environmental Information System (SEIS) the following~~ principles of a shared environmental information system is that information should be:

- (a)- \_\_\_ Managed as close as possible to its source;
- (b)- \_\_\_ Collected once and shared with others for many purposes;
- (c)- \_\_\_ Readily available to easily fulfil reporting obligations;
- (d)- \_\_\_ Easily accessible to all users;
- (e)- \_\_\_ Accessible to enable comparisons at the appropriate geographical scale and the effective participation of the public in the development and implementation of policies relating to the environment;
- (f)- \_\_\_ Fully available to the ~~general~~ public and at the national level, and available in the relevant national language(s);
- (g)- \_\_\_ Supported through common, free, open software standards;.

3.- \_\_\_ A functional shared environmental information system should be structured around three pillars: content, infrastructure and cooperation. First, the system needs to identify the types of content (data) required, as well as potential sources. Second, an effective, web-enabled technical infrastructure is required that takes full advantage of the best available state-of-the-art digital technologies, including web services supported by machine-to-machine communication. Third, the ~~cooperation and~~ governance structure and cooperation among information providers and users are required to manage human resources, inputs and networking.

<sup>2</sup> See <https://www.unece.org/environmental-policy/environmental-monitoring-and-assessment/areas-of-work/shared-environmental-information-system.html>

#### Chapter IV. ~~Metadata standards~~ Standards for a nationwide digital environmental information system

1. ~~All data~~ 1. All data contained in the nationwide digital environmental information system should be accompanied by traceable and linked standardised metadata developed in accordance with standards established by the International Organization for Standardization,<sup>3</sup> World Meteorological Organization<sup>4</sup>, World Wide Web Consortium,<sup>5</sup> Open Geospatial Consortium<sup>6</sup> and other international forums as mandated.

2.- ~~\_\_\_~~ All metadata should be users- and machine-readable, accompanied by an open licence and made accessible, preferably as part of an HTML Web page and via application programming interfaces (APIs).

3.- ~~\_\_\_~~ The following metadata standards ~~could for the digital environmental information system can~~ be used ~~to promote the interoperability between different information systems containing environmental information~~:

(a)- ~~\_\_\_~~ Dublin Core Metadata (DCMI) terms (DCTERMS);<sup>7</sup>

(b)- ~~\_\_\_~~ Data Catalogue Vocabulary (DCAT);<sup>8</sup>, including GeoDCAT-AP and StatDCAT-AP;

~~(c)~~ (c) Statistical Data and Metadata eXchange (SDMX);<sup>9</sup>

(d) ~~\_\_\_~~ DDI-Lifecycle standard;<sup>10</sup>

(e) ~~\_\_\_~~ [ISO 19115] EN ISO 19115-1:2014, Geographic information – Metadata;<sup>11</sup>

(f) ~~\_\_\_~~ [ISO 19139] ISO/TS 19139-1:2019, Geographic information – Metadata – XML schema implementation.<sup>12</sup>

4. ~~\_\_\_~~ Data and metadata contained in the digital environmental information system can be shared and made interoperable using the following standards:

(a) ~~\_\_\_~~ OGC Web Map Service (WMS);<sup>13</sup>

(b) ~~\_\_\_~~ OGC Web Coverage Service (WCS);<sup>14</sup>

(c) ~~\_\_\_~~ OGC Catalogue Service for the Web (CSW);<sup>15</sup>

(d) ~~\_\_\_~~ OGC Water Markup Language (waterML);<sup>16</sup>

(e) ~~\_\_\_~~ OGC Web Feature Service (WFS);<sup>17</sup>

(f) ~~\_\_\_~~ OGC GEOPackage Encoding Standard;<sup>18</sup>

(g) ~~\_\_\_~~ [RFC 7946] GeoJSON Format;<sup>19</sup>

(h) ~~\_\_\_~~ OGC Earth Observation Dataset Metadata GeoJSON(-LD) Encoding Standard;<sup>20</sup>

(i) ~~\_\_\_~~ OGC OpenSearch Extension for Earth Observation;<sup>21</sup>

(j) ~~\_\_\_~~ OGC OpenSearch Geo and Time Extensions;<sup>22</sup>

(k) ~~\_\_\_~~ XML for parliamentary, legislative and judiciary documents (Akoma Ntoso);<sup>23</sup>;

~~(d)~~ (d) Web Map Service (WMS)<sup>24</sup>;

~~(e)~~ (e) Web Coverage Service (WCS)<sup>25</sup>;

~~(f)~~ (f) Catalogue Service for the Web (CSW)<sup>26</sup>;

~~(g)~~ (g) Statistical Data and Metadata eXchange (SDMX)<sup>27</sup>;

~~(h)~~ (h) Water Markup Language (waterML)<sup>28</sup>.

<sup>3</sup> See <https://www.iso.org/standards-catalogue/browse-by-ics.html>

<sup>4</sup> See <https://public.wmo.int/en/resources/standards-technical-regulations>

<sup>5</sup> See <https://www.w3.org/standards/about.html>

<sup>6</sup> See <https://www.ogc.org/docs/is>

<sup>7</sup> See <https://dublincore.org/>

<sup>8</sup> See <https://www.w3.org/TR/vocab-dcat-2/#introduction>

<sup>9</sup> See <https://sdmx.org/>

<sup>10</sup> See <https://ddialliance.org/explore-documentation>

<sup>11</sup> See <https://www.iso.org/standard/53798.html>

<sup>12</sup> See <https://www.iso.org/standard/67253.html>

<sup>13</sup> See <https://www.ogc.org/standards/wms>

<sup>14</sup> See <https://www.ogc.org/standards/wcs>;

<sup>15</sup> See <https://www.ogc.org/standards/cat>

<sup>16</sup> See <https://www.ogc.org/standards/waterml>

<sup>17</sup> See <https://www.ogc.org/standards/wfs>

<sup>18</sup> See <https://www.ogc.org/standards/geopackage>

<sup>19</sup> See <https://geojson.org/>

<sup>20</sup> See <https://www.ogc.org/standards/eo-geojson>

<sup>21</sup> See <https://www.ogc.org/standards/opensearch-eo>

<sup>22</sup> See <https://www.ogc.org/standards/opensearchgeo>

<sup>23</sup> See <http://www.akomantoso.org/>

<sup>24</sup> See <https://www.ogc.org/standards/wms>

<sup>25</sup> See <https://www.ogc.org/standards/wcs>;

<sup>26</sup> See <https://www.ogc.org/standards/cat>

<sup>27</sup> See <https://sdmx.org/>

<sup>28</sup> See <https://www.ogc.org/standards/waterml>

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5. When complementing and not covered by chapter II, the FAIR principles for scientific data management and stewardship<sup>29</sup> should be followed to promote accessibility, reuse and interoperability of environmental research data.

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<sup>29</sup> See <https://www.go-fair.org/fair-principles/>

## Chapter V. ~~One~~Single one-stop web access point (portal) for environmental information

- 1.- ~~Develop as described below a national portal dedicated to environmental information that can serve portal serving~~ as a single one-stop web access point for environmental data and information in accordance with access to all information open data sharing principles and data ~~for the whole environmental domain, ensuring easy access to the users to other portals, maintaining individual units~~ management principles (see also sections II and III of the above-mentioned recommendations and chapters II-IV above) to ensure user customization and accessibility, effective maintenance of integral parts of the digital environmental information system and support harvesting information for through standardized reporting at the local, sub-national, national, regional and international level levels, as appropriate;
- 2.- ~~Link this national~~ the environmental portal through the use of open application programming interface, RSS feeds and ~~others~~ other interoperability tools to ~~either~~ the thematic portals, platforms, and data hubs (local, sub-national, national and international) ~~forming a system of systems where discovery, access to data, information, and knowledge can be found following open data sharing and data management principles (see also sections II and III and Annex, sections II-IV); as relevant to make environmental data and information discoverable and directly accessible;~~
- 3.- ~~Enable the use through the environmental portal of best available state of the art new or emerging digital technology tools, such as technologies, including cloud computing services, open data cubes, artificial intelligence, blockchain technology, linked data, text mining, semantic web tools, “cloud computing” and artificial intelligence~~ (see also paragraph ~~3233~~ of the above-mentioned recommendations);
- 4.4. Provide the opportunities for the public to participate in design, development and update of the environmental portal taking into account good practices to ensure that the needs of different users are met;
5. ~~Develop the onboarding system for different types of the users and take the necessary measures to make the portal accessible taking into account their needs (see also section V of the above-mentioned recommendations).~~
- 5-6. Ensure high visibility of the portal to the public through the use of search engine optimization, social media optimization and search engine advertising as appropriate;
7. ~~Ensure direct access through the environmental portal to disaggregated, real-time and other dynamic data, as appropriate, including to space-based, citizen science, crowdsourced and other data outlined in paragraph 1920 (d) and (e), citizen science and crowdsourced data) of the above-mentioned recommendations;~~
- 6-8. ~~Provide information on the points of contact to support the public in seeking access to information under this~~ the Convention;
- 7-9. ~~Ensure that each webpage of the environmental portal containing information and links should be is updated regularly and contain contains~~ the date of the last update and the information source;
- 8-10. The content of the ~~one-stop access point (environmental portal)~~ can include the following themes:
  - (a)- ~~Introduction~~
  - (b)- ~~Reports on the state of the environment~~
  - (c)- ~~Environment themes (overview of legislation, policy, programmers programmes, plans, international commitments, monitoring, data/data sources, environmental indicators, assessments, map viewers, scenarios, good practices in accordance with section III of these Recommendations the above-mentioned recommendations)~~
    - (i)- ~~Air and Atmosphere~~
    - (ii)- ~~Climate~~
    - (iii)- ~~Water~~
    - (iv)- ~~Soil~~
    - (v)- ~~Land~~
    - (vi)- ~~Ocean and Sea~~
    - (vii)- ~~Subsoil and mineral resources~~
    - (viii)- ~~Natural sites and landscape~~
    - (ix)- ~~Forests~~
    - (x)- ~~Biological diversity~~

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- (xi)- \_\_ Genetically modified organisms
  - (d)- \_\_ Factors (overview of legislation, policy, ~~programmers~~programmes, plans, international commitments, data/data sources,)
  - (i)- \_\_ Pollutant release and transfer register
  - (ii)- \_\_ Chemicals management
  - (iii)- \_\_ Waste management
  - (iv)- \_\_ Energy efficiency and consumption
  - (v)- \_\_ Noise
  - (vi)- \_\_ Radiation
  - (vii)- \_\_ Use of natural resources
  - (viii)- \_\_ Product passports and other product-related information
  - (e)- \_\_ Decision-making in environmental matters:
    - (i)- \_\_ Public consultations
    - (ii)- \_\_ Strategic Environmental Assessment
    - (iii)- \_\_ Environmental impact assessment and state ecological expertise
    - (iv)- \_\_ Licensing and permitting
  - (f)- \_\_ Activities, measures and good practices
    - (i)- \_\_ Economic-environmental accounting
    - (ii)- \_\_ Eco-labelling scheme
    - (iii)- \_\_ Eco-audit scheme
    - (iv)- \_\_ Producer responsibilities
    - (v)- \_\_ Green procurement
    - (vi)- \_\_ Public-private partnerships and environmental agreements
    - (vii)- \_\_ Funded environmental projects
    - ~~(vii)-viii)~~ \_\_ Good practices on better environmental management, sustainable consumption and production, best available techniques, green procurement, green and circular economy and sustainable development
  - (g)- \_\_ Environmental compliance and enforcement
  - (h)- \_\_ Environment-related hazards and emergencies
    - (i)- \_\_ Dashboard and maps
    - (ii)- \_\_ Situation reports and scenarios
    - (iii)- \_\_ Mitigation and remediation measures taken by ~~the~~ public authorities
    - (iv)- \_\_ Prevention, mitigation and remediation measures for the public in the affected area concerned, in particular for groups and communities in vulnerable situations;
  - (v)- \_\_ Crowdsourcing data
  - (vi)- \_\_ Media resources
  - (vii)- \_\_ Training and e-learning
  - (i)- \_\_ Public records
  - (j)- \_\_ Data explorer
  - (k) \_\_ Research and education
  - ~~(k)-l)~~ \_\_ Publications and downloads
  - ~~(l)-m)~~ \_\_ Public engagement:
    - (i)- \_\_ Official notice board
    - (ii)- \_\_ Aarhus Convention, its implementation and compliance
    - (iii)- \_\_ Access to information
    - (iv)- \_\_ Citizen science and crowdsourcing
    - (v)- \_\_ Participation in decision-making in environmental matters
    - (vi)- \_\_ Access to Justice
    - (vii)- \_\_ Accessibility menu and accessibility statement for access by persons with disabilities, and capacity-building for onboarding process tailored to different user needs
  - ~~(m)-n)~~ \_\_ Media news and resources
  - ~~(n)-o)~~ \_\_ Points of contact
  - ~~(o)-p)~~ \_\_ Specifications for ~~re-use~~reuse of data and information
  - ~~(p)-q)~~ \_\_ Use terms and conditions
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