

Agenda Item 2

Forest Ecosystem Services - development of new indicators

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Introduction:

In response to the mandate given by 22nd meeting of the MP WG¹, this item of agenda will deal with enhancement of soil and water indicators under Criterion 4 and possibly other criteria with justifications associated. It seems to be appropriate and practical to agree on common basic new indicators so as to enhance Criterion 4 scope. Japan will propose a new soil erosion analysis method for discussion. The measurable conditions through this new method are from soil and floor surface, however, they will tell us the information grasping Criterion 4 as a whole. The discussion in this agenda will also imply the alignment of Criterion 4 in the framework of all Criteria 1 to 6 as well as the revision of the Technical Notes concerned. This revision should be dealt under agenda 1 as well. We will use an Ecosystem Services framework approach in our discussions

Current indicators directly related to soil and water are:

4.1 Protective function

4.1.a Area and percent of forest whose designation or land management focus is the protection of soil or water resources

4.2 Soil

4.2.a Proportion of forest management activities that meet best management practices or other relevant legislation to protect soil resources

4.2.b Area and percent of forest land with significant soil degradation

4.3 Water

4.3.a Proportion of forest management activities that meet best management practices, or other relevant legislation, to protect water related resources

4.3.b Area and percent of water bodies, or stream length, in forest areas with significant change in physical, chemical or biological properties from reference conditions

Current indicators indirectly related to soil and water are:

6.3 Employment and Community needs

6.1.c Revenue from forest based environmental services

6.3.c Resilience of forest-dependent communities

¹ The Montreal Process Working Group asked the Technical Advisory Committee to identify appropriate indicators and mechanisms that provide a stronger foundation for describing how sustainably managed forests conserve soil and water resources and related services and functions.

6.3.d Area and percent of forests used for subsistence purposes

6.4.b Number, type, and geographic distribution of visits attributed to recreation and tourism and related to facilities available

Comment:

- These indicators represent the best knowledge as at 2009 when the fourth edition of the MP C&I was published.
- Since then there have been further developments in SFM C&I thinking and the opportunity to test the revised indicators sets by member countries.
- This led to the paper by Australia and Argentina presented at the 22nd MPWG on use of the indicators to tell the water story (and as the two are intertwined, the associated soil story).
- The TAC was tasked with exploring issues related to soil and water common to the member countries and whether enhancement of the indicator set might be necessary to fully tell the soil and water story.
- At the 13th TAC meeting in Russia it was identified that indicators may be necessary to better cover the concept of forest ecosystem services (FES).

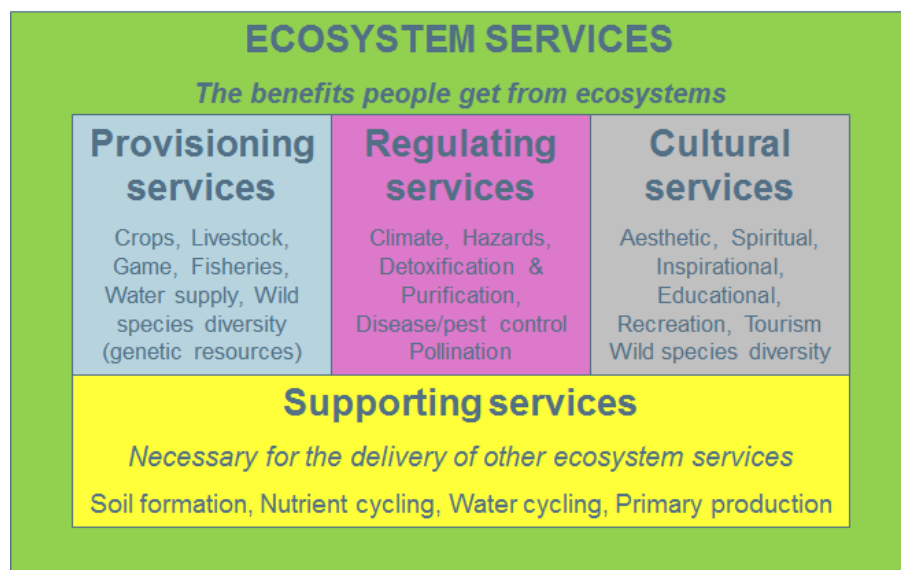
This paper outlines discussion points for the Tokyo meeting related to the current indicators and the FES concept, focussing on soil and water.

Question:

- *Are the current indicators adequate, do any modifications need to be made in Criterion 4 or other Criteria?*

The Ecosystem Service Approach.

The Millenium Ecosystem Assessment framework is a useful one to use as a foundation for our work on the soil and water story.



It is possible to map the Montreal Process Indicators into the four service categories and also to define what services we expect forests to provide. A gap analysis should then tell us whether there are any possible gaps in the indicator set that we may need to fill in order to get a full picture of the soil and water story.

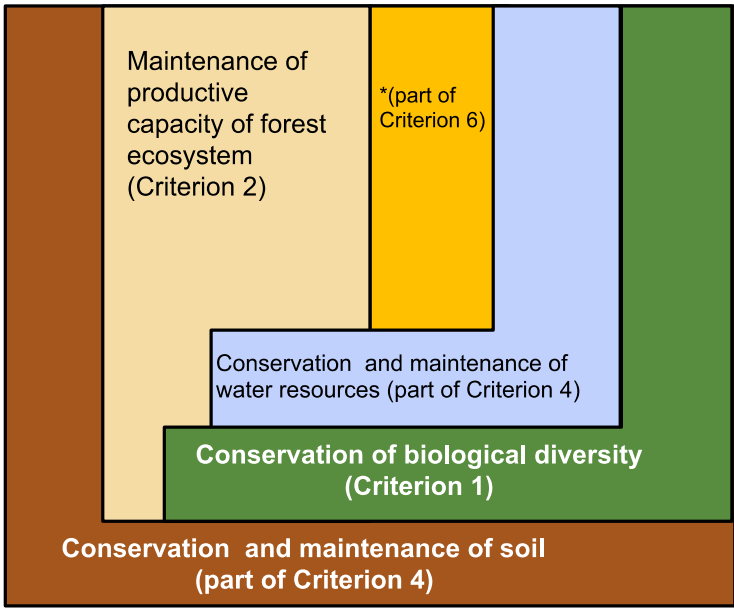
Soil and water related indicators can be allocated to each of the four service categories

- Criterion 4 – soil and water (4.1.a, 4.2.a, 4.2.b, 4.3.a, 4.3.b) fits firmly in the **Supporting Services** category
- 6.1.c – revenue from forest based environmental services fits in **Provisioning Services**
- 6.3.c, 6.3.d, 6.4.a, and 6.4.b fit in the **Cultural Services** category

Interestingly no indicators identified as soil and water related fit within the **Regulating Services** category. We know that forests do play a strong regulating role with regards water flows and regulation, water quality and erosion and sediment mitigation. This would suggest therefore that we do need to expand the indicator set to account for regulating services.

Currently one could argue that 6.1.c (on reading the technical notes) covers the various soil and water characteristics. But presenting data purely as revenue in the provisioning services category will miss the quantum of the regulating services provided and that this may be very important data in their own right.

The Hierarchical structure of forest ecosystem services introduced by Japan at the 13th TAC meeting in Suzdal is also worth considering. Dependencies of various services and functions should be clearly defined and expressed within C&I framework. It would help all stakeholders think of a priority in their activities in forests.



Question 1 for the TAC to consider is:

Does indicator 6.1.c in its current form adequately represent the information required to tell the soil and water story or does it need to be expanded to more explicitly present soil and water information

A second question for the TAC to consider is whether the indicators in Criterion 4 fully express the information required when considered as a **Supporting Service**. Currently the base information (such as river length) considered in support of the indicators is not explicitly referred to or reported in its own right – this might be important fundamental information when considering forests in the wider land use context. It is rather used to allow the calculation of data for indicators showing where forest management activities have caused variation to the baseline.

Question 2 for the TAC to consider is:

Is there a need for an additional soil and water indicator within Criterion 4 to explicitly present base data related to the forest?

A third area to consider with regard to supporting services and Criterion 4 is more specifically related to soil, and specifically indicator *4.2.b area and percent of land with significant soil degradation*. Japan has been developing some new soil erosion field techniques (which we will see on the field trip) and their thinking follows. The TAC needs to consider how these new approaches might contribute to Criterion 4 – as a standalone new indicator, or as more detail and methodology within the Technical Notes associated with C4 – especially 4.2.b.

Question 3 for the TAC to consider is:

Is there a need for a new indicator related to soil erosion or could this be covered by amendments to the technical notes for 4.2.b?

Supporting information related to question 3.

Proposal of survey items for developing a new indicator for Criterion 4 ('Soil erosion' of NFI, Japan):

Japan would like to propose a methodology for the above under a concept of "Forest Floor Cover Management". Under the concept of SFM, primary concern in the current management target has placed in maintaining the forest crown cover for the sake of identification of "forest"². However, the condition of forest floor should be taken into account with forest crown condition when the state of SFM is discussed. Maintaining forest floor cover and conserving soils must be an integral part of the requirements for realization of SFM over a long period of time. Moreover, as grasping the state of "forest degradation", monitoring the change of forest floor coverage in addition to the change of forest crown

² It is because that the definition of forest includes the ratio of canopy/crown cover.

coverage is essential and thus the forest floor coverage could be used as an indicator for analyzing the forest health and its vitality holistically.

The three elements are to be measured in NFI of Japan as follows:

- (1) Floor cover percentage (FCP)
 - (2) Boulder and rock percentage
 - (3) Evidence of soil erosion
- } Floor coverage

This method is designed based upon a hypothesis, i.e. “evidence of soil erosion” will represent the degree of soil erosion, floor coverage by “FCP” and/or “boulder and rock percentage” will represent stable area against soil erosion, and the reduction of “floor coverage” will mean the increase of risk of soil erosion. Measurement of FCP and boulder and rock percentage will be conducted visually in 10% rounding, and evidence of soil erosion will be scaled at from “soil pillar” then “rill” and up to “gully” along with its increase. The proposed method does not require any special tool and will just take only a few minutes. Without significant increase of operational and running cost of NFI, this method will capture the conditions of forest in terms of soil erosion.

Advantages identified of this method are summarized as follows:

- (1) Detecting a sign of erosion will be based upon a precautionary principle and consistent with the concept of SFM.
- (2) Detecting a sign and monitoring a degree of erosion will be done simultaneously.
- (3) Elements collected are all measured without any specific tool and data will tell us the change.
- (4) High reproducibility of measured results was confirmed.

Countermeasures against a sign of erosion or progress of erosion will be also considered as follows:

- (1) Natural recovery of floor coverage by understory through thinning
- (2) Natural recovery of floor coverage by litter and/or understory through conversion of species composition
- (3) Physical recovery of floor coverage through spreading stems and branches onto skid trails

On the other hand, the following additional aspects should be clarified or tested prior to putting this concept into a practical indicator under Criterion 4:

- (1) Wide validity in different climatic zoning and other topography
- (2) Limited scope of the measurement target – erosion which will represent only one scope of soil related degradation.
- (3) For practical use of the data related to floor coverage and evidence of soil erosion, an analysis will be needed on relation between the attributes of the elements measured and the level of forest ecosystem services including soil and water. The threshold values will be defined by the respective governments. The baseline values will be also defined. A two-year long case study in Japan indicates clear relationships among floor cover conditions, evidences of soil erosion and

sequestered carbon in soil.

- (4) Even in the forests with high floor cover percentage, information related to the level of function of soil was not clear as an agent providing forest ecosystem services.

We will discuss the basis for this proposal in the following section.

Rationale for importance of forest floor cover management for soil conservation:

Current Technical Notes clearly state that soils support forest productivity and other ecological and hydrological functions³. It is understood that the basic concept of a hierarchic structure of forest ecosystem services indicated by Japan's presentation in Suzdal in July 2012 has already been shared within the context of Montreal Process C&I. In the course of proposal of a specific new method related to soils, the following three elements should be pointed out for enhancing this concept.

(1) Organic matters indispensable to soil formation and development

Organic matters are indispensable to restart soil formation and development. Supply of organic matters produced from photosynthesis of plants and biological activities decomposing organic matters are definitely indispensable for soil maturing. These organic matters and living organisms are accumulated in a range of a couple ten-centimeter space between the soil surfaces. Conservation of "forest floor", where organic matters and living organisms are accumulated, will be meant by prevention of soil erosion as well as by conservation of the habitat where the most indispensable activities for soil maturing are taken place. These facts deem to provide a stronger foundation for describing how SFM conserves soil and water resources and the related services and functions, which is a mandate to be described by the MP TAC. It is therefore a conclusive fact that maintaining stable forest floor is essential to achieving SFM should be logically induced.

(2) Time scale/span related to soil

We should remember that there is an unbalanced time scale related to forest soil between formation/maturation and erosion. Forest flora and fauna could be destroyed in a short period of time but could be recovered within several years or decades in most cases. On the other hand, soil could not be recovered within such period of time. It is obvious that the forest, formed on the soil which has not been recovered fully, can provide its ecosystem services limited to a level which is not fully recovered. This "super" long-term span requirement in soil formation is definitely different feature from other forest ecosystem services. In this connection, soil has been placed in the foundational position in a hierarchic structure of forest ecosystem services.

(3) Soil and water relationship

Soil and water, under the current MP C&I framework, are treated equally as an element of forest ecosystem services. As mentioned in the section (2) above, function of water depends on a

³ See the preamble paragraph respectively in page 28 and 31 of the Technical Notes.

degree of soil development and thus soil should be regarded as a regulating factor of water. There seems to be a hypothesis that if soil has been matured through maintaining sound forests, functions related to water resources supply or mitigation of flooding have been automatically ameliorated. However, we should consider two different aspects of water functions, one for resources we use and the other for disasters we suffer through flooding or debris flood. These two aspects cannot be discussed in the same line, and forest related agents other than soil are deeply connected in some areas. Careful discussion on soil related issues, prior to discussion on water, will be useful for sorting out the issues related to water.

The above three sections (1) – (3) should be discussed in the context of the Technical Notes revision for enhancing the concepts related to soil and water.