A Framework for Terrestrial Climate-Related Observations: Implementation Options

Progress Report to the Subsidiary Body for Scientific and Technological Advice (SBSTA)

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1. Introduction and purpose

This report describes progress made in the definition of, and implementation options for, an international framework dealing with climate-related terrestrial observations.

In its Implementation Plan (GCOS, 2004), the Global Climate Observing System (GCOS) stated: "Many organizations make terrestrial observations, for a wide range of purposes. The same variable may be measured by different organizations using different measurement protocols. The resulting lack of homogeneous observations hinders many terrestrial applications and limits the scientific capacity to monitor the changes relevant to climate and to determine causes of land-surface changes. The Second Adequacy Report noted that these difficulties could be resolved by the creation of an intergovernmental technical commission for terrestrial observations similar to those that exist for the Atmospheric and Oceanic Domains. Such a body would *inter alia*:

- Prepare and issue regulatory and guidance material for making terrestrial observations.
- Establish common standards for networks, data management, as well as associated products and services.
- Ensure compatibility with standards and initiatives.
- Seek hosts for designated International Data Centres addressing the full range of terrestrial domain essential climatic variables (ECVs)."

Realizing this need for the development of appropriate policies to deal with climate change and based upon the GCOS Implementation Plan, the Conference of Parties in its ninth session (Decision 11/CP.9; UNFCCC, 2003):

> *"8. Invites the sponsoring agencies of the Global Climate Observing System, and in particular those of the Global Terrestrial Observing System, in consultation with other international or intergovernmental agencies, as appropriate, to develop a* ***framework for the preparation of guidance materials, standards and reporting guidelines for terrestrial observing systems for climate, and associated data and products****, taking into consideration possible models, such as those of the World Meteorological Organization/Intergovernmental Oceanographic Commission Joint Commission for Oceanographic and Marine Meteorology, and to submit a progress report on this issue to the Conference of the Parties at its eleventh session".*

Through the Global Terrestrial Observing System (GTOS), the Food and Agriculture Organization of the United Nations (FAO) commissioned a report in 2005 on the subject of establishing a framework for terrestrial climate-related observations (hereafter abbreviated as TCF). The report (GTOS, 2005) examined existing mechanisms employed by intergovernmental or international organizations for similar purposes, including those of FAO, the International Council for Science (ICSU), the International Organization for Standardization (ISO), the United Nations Environment Programme (UNEP), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the World Meteorological Organization (WMO). Desirable characteristics and needed elements of an effective framework were discussed and approaches that could meet the requirements were suggested. The report also identified the sectoral requirements for terrestrial climate-related observations and the corresponding key intergovernmental and national agencies responsible for the various sectors. Based on existing practices, the report suggested two candidate models for consideration in further development of the TCF: an intergovernmental model (e.g. the Joint Commission on Oceanography and Marine Meteorology [JCOMM]) and an international organization model (e.g. the International Organization for Standardization [ISO]). No preferred choice was identified in the 2005 report.

A progress report summarizing the above report was submitted to SBSTA/COP for its 23rd Session in Montreal, November 2005. In its response (UNFCCC, 2006, p. 16):

> *"The SBSTA welcomed the efforts by the GTOS secretariat to develop a framework for the preparation of guidance materials, standards and reporting guidelines for terrestrial observing systems for climate and encouraged the GTOS to continue its work. It also called on the GTOS secretariat to assess the status of the development of standards for each of the essential climate variables in the terrestrial domain."*

In 2006, GTOS commissioned further work to proceed with the development of the TCF, focusing on: the required mechanisms to establish such a framework, costs of establishing and running; mechanisms for the endorsement of standards and guidelines and requirements that would be needed for national endorsement and implementation, and an analysis of the advantages and disadvantages of different approaches provided to allow the adequate appraisal by the stakeholders.

The present document contains some of the elements identified above. After briefly setting out the scope of the problem, the report describes three options for establishing a TCF, and compares these from a number of perspectives. It then discusses the implementation issues associated with each option.

2. Scope

First, as noted above, the desired framework should facilitate the preparation of guidance materials, standards and reporting guidelines for terrestrial observing systems for climate, and of associated data and products. Second, from the perspective of sponsoring UN agencies, the framework should readily accommodate other terrestrial variables at a later date (GTOS, 2005). Other reasons for potentially expanding the scope of the terrestrial variables include the GCOS and GTOS dependence on data collected by countries for reasons other than climate, the likelihood of changing requirements for climate monitoring in the future, the needs for observations for climate impacts and adaptation assessments, and the improbability of establishing a separate international mechanism for non-climate terrestrial variables. Third, the framework must accommodate satellite as well as *in situ* observations as both are needed for most of the essential climate variables (ECVs) identified by the GCOS.

3. Options for TCF

The above points imply that the desired framework is one which: serves a multi-purpose role, with an initial focus on terrestrial climate variables; follows an existing successful model; facilitates inputs by users and producers of observational data, and is broadly acceptable and adopted by countries.

Following a review of the characteristics of successful international arrangements, the 2005 report (GTOS, 2005) identified several elements that must be present to help ensure the success and impact of such arrangements:

i. a mechanism for scientific or technical input from individual "interested" countries, but not insisting on input from all countries on every issue;
ii. a means for coordination at international level with groups or organizations with similar interests, including scientific programmes, international agencies, and synthesis-producing groups;
iii. a mechanism for arriving at an international scientific or technical consensus;
iv. a mechanism for producing international consensus on response (by national governments);
v. a strategy that will ensure financial and in-kind support for the activity and by national governments;

vi. a communications strategy to raise the profile of the work and raise extra-budgetary resources;
vii. means for ensuring continuity and for being responsive to changing requirements;
viii. importantly, a means for conveying the consensus to the national level for action.

Based on the 2005 review (GTOS, 2005) and work carried out since, three TCF options are outlined below for the purposes of comparison and evaluation. It should be noted that the final form of a selected option could well differ from what is described here, as it would depend on the discussions and negotiations following the choice of the preferred option.

3.1 Option A (intergovernmental): "Terrestrial Joint Commission"

This option consists of a "Terrestrial Joint Commission" (hereafter labeled TJC) established as a subsidiary body of three intergovernmental organizations that deal specifically with primary observations (FAO, UNEP, WMO). It could consist of a Management Group and initially two teams, one for hydrological and cryospheric variables (River discharge, Water use, Ground water, Lake levels, Snow cover, Glaciers and ice caps, Permafrost and seasonally-frozen ground) and one for land surface variables (Albedo and Land cover, Fraction of absorbed photosynthetically active radiation [fAPAR], Leaf area index [LAI], Biomass, Fire disturbance).

The terms of reference for the two teams could include definition of standards and guidelines as well as reporting and preparation of data and products, or separate subgroups could be charged with the two topics. A TJC Secretariat would be located in - and funded by - the lead agency, to be identified through discussions among FAO, UNEP and WMO.

Following JCOMM precedent, the TJC would operate under rules of procedure agreed to by the three United Nations (UN) organizations, with differences reconciled through negotiations and approved by the three Decision Bodies. Commission president/co-presidents would attend the meetings of the Decision Bodies to present results of their work and recommend action.

3.2 Option B (ISO): "Terrestrial Committee"

An alternative framework would adapt the approach used by the International Organization for Standardization (ISO) to establish international standards. A new group (or subgroup) would be created within ISO. In principle, this could be a new Technical Committee, a new Sub-Committee to an existing Technical Committee, or a new Working Group within a Technical Committee. Since initial contacts with the ISO Technical Management Board (TMB) indicated ISO preference for the first option, it is referred to below as "Terrestrial Committee" (TerC). The structure, the rules of operation, work plan, and reporting would be established through negotiations between the TMB and the entity coordinating this work, and would be embedded in a Memorandum of Understanding between the two organizations following existing practices and precedents. The entity would need to ensure that the mechanism meets the needs of GCOS, of the COP/UNFCCC, the Group on Earth Observations (GEO), and of other intergovernmental or international organizations or programmes as appropriate. Following ISO regulations, a TerC Secretariat would be located in a country willing to support it over at least five years.

3.3 Option C (international): "Terrestrial Observations Mechanism"

In addition to the above two options, there are other potential organizational frameworks which could achieve the results desired by the COP. The coordinating entity could be created under the umbrella of the Group on Earth Observations (GEO) which has primary concern about terrestrial observations both because of their importance to the GEO benefit areas (www.earthobservations.org/index.html), and due to the importance of standardization and harmonization of information products to the achievement of GEO objectives. As another alternative, the COP could decide to extend the mandate of the Intergovernmental Panel on Climate Change (IPCC) which has previously dealt with similar terrestrial issues under the Good Practice Guidelines (UNFCCC, 2003). Because of the lack of precise definition at this point, this option is referred to below as the Terrestrial Observations Mechanism (TOM). While IPCC or GEO could become the primary sponsors of the TCF, other intergovernmental and international entities would undoubtedly have to be involved as key members (Table 1) because of the importance of terrestrial observations to their mandates.

3.4 Comparison of the options

The above options may be assessed in various ways. In Table 1 they are compared with respect to: a) their characteristics; b) costs of establishment and operation; c) required approvals for the TCF and for adoption of the resulting products; d) the likely suitability for the tasks identified for a TCF; e) the likelihood of meeting criteria listed at the beginning of section 3., and f) the key challenges involved in implementing each option.

Table 1. A comparison of the TCF options

Table 1 – Part 1: CHARACTERISTICS						
Attribute	**Option A (TJC)**	**Comment**	**Option B (TerC)**	**Comment**	**Option C (TOM)**	**Comment**
Name	Terrestrial Joint Commission (TJC) (JCOMM type structure)		Terrestrial Committee (TerC) (ISO type structure)	A precedent for ISO Joint Committee also exists	Terrestrial Observations Mechanism	
Mechanism utilized was originally developed for	Ensuring proper technical foundation for intergovernmental (UN-type) programmes		Developing inter-national standards for (primarily) economic activities	Outputs other than standards, and for non-economic activities, are also produced	No precedent	Could be similar to TJC (Option A)
Proposed Sponsors[1]	FAO, UNEP, WMO	ICSU, UNESCO have interest but do not collect primary data	ISO within an existing committee (e.g TC211 or TC207) or under a new one.	Nominal Governing Body; TerC operating under MOU rules agreed to by the FAO, UNEP, WMO	GEO, IPCC	Intergovernmental and international organizations (specifics TBD)
Key Members[1]	FAO, UNEP, WMO, ICSU, UNESCO		ISO, UN	Role and status of other agencies would have to be defined	To be determined	Intergovernmental and international organizations
Mandate and TORs approved by	Decision Bodies[1] of Sponsors		ISO, UN	Role and status of other agencies would have to be defined	Sponsors and Key Members	
Formally tasked by/ work programme approved by	Decision Bodies of Sponsors (with inputs by users, e.g. GCOS)	Each Decision Body has control under the JCOMM model	ISO, UN	Role and status of other agencies would have to be defined		
Reporting to	Decision Bodies of Sponsors		ISO and Decision Bodies of GTOS Sponsors	As defined in the MOU between ISO and UN agencies	Sponsors and Key Members	And to others as defined by the TOM mandate
Subsidiary bodies or affiliated groups	As required	Using the current JCOMM practice	As required	Based on the current ISO practice		
Rules of Procedure	Formal intergovernmental model, with differences among rules of Sponsors reconciled and approved by Decision Bodies of Sponsors	Based on JCOMM precedent (could be laborious, refer e.g. to IOC, 2002)	ISO practices	Well established and operating	Sponsors and Key Members	Could define a new (optimal) set that meets the needs
Mechanism for approving work plans	Through mechanism agreed by participating UN organizations	Work may be undertaken at TJC own initiative (often the case in JCOMM)	Voting by ISO members	Only activities approved by voting members are undertaken	To be determined	Likely by Sponsors and Key Members

Part 1 continued

Attribute	Option A (TJC)	Comment	Option B (TerC)	Comment	Option C (TOM)	Comment
Mechanism for endorsing/adopting results of work	Decision through Body resolutions	Not all the results are presented for (or require) Decision Body approval	Voting by countries	Level of voting depends on the Output product	To be determined	Likely by Sponsors and Key Members
Principal Outputs	Technical regulations Guidance materials Reporting guidelines Standards Associated data and products Training material	These (or others) could be included because the mechanism is flexible and responsive to needs of Key Members and other needs identified by the TJC members (JCOMM approach)	International Standards Publicly Available Specifications Technical specifications Technical Reports Industry Technical Agreements	These ISO outputs represent different levels of consensus or transparency of a specification	To be determined	An optimal combination of possible outputs meeting the needs
Other Outputs	Various	Depending on the Sponsors needs and the contributions by TJC members	Guidance materials	Often accompany a Standard	To be determined	An optimal combination of possible outputs meeting the needs
Secretariat funded by	Sponsor(s)		A willing country	For a minimum of 5 years	Sponsor(s)	

Table 1 – Part 2: COSTS (to Sponsors)						
Attribute	**Option A (TJC)**	**Comment**	**Option B (TerC)**	**Comment**	**Option C (TOM)**	**Comment**
2.1 COST of Establishment	Would require available staff time and/or consultant costs	Difficult to quantify – mainly time for developing consensus on all aspects of TJC among Sponsors	Minimal	ISO handles approvals of new initiatives	Would require available staff time and/or consultant costs	Difficult to quantify – mainly time for developing consensus on all aspects of TOM among Sponsors
2.2 COST of Operating[2]						
Secretariat	2 PY (total approx. US$250 per year if UN staff) (JCOMM needs 6 PY)	JCOMM now has 5.5 PYs, ~4 (WMO) and ~1.5 (IOC)	2 PY (total approximately US$250 per year if UN staff)	A willing country hosts Secretariat and covers the costs for at least 5 years	To be determined	Likely similar to Option A
Other budget (US$/yr)	TJC: 300K (JCOMM needs 800K)	Assuming >1/3 of the required JCOMM funds (the scope of TJC problem is greater than one of the 4 JCOMM Programme Areas	0 (No cost to the central secretariat but countries/institutions cover their own costs of meeting attendance/hosting, standards preparation etc.).	Member countries sponsor; added support to developing countries' involvement highly desirable (ISO has a mechanism for this)	To be determined	Likely similar to Option A
Total annual operating	TJC: US$550K/yr (JCOMM needs US$1550K/yr)	Assuming that average cost PY is US$125K/PY	US$250 (but does not include country and institutional costs).	Costs are covered by participating countries	To be determined	Likely similar to Option A

Table 1 – Part 3: APPROVALS

Attribute	Option A (TJC)	Comment	Option B (TerC)	Comment	Option C (TOM)	Comment
National endorsement of TCF mechanism	National representatives in Decision Bodies of Key Members	Following JCOMM precedent	Vote by all ISO countries (if it is a ISO Technical Committee, refer to Section 4.2)	A Sub-Committee establishment is voted upon by members of the parent Committee	To be determined	Could be similar to Option A
Procedures for adopting Outputs internationally and nationally	Formal adoption by Decision Body upon recommendation by TJC	Decision Body resolutions are communicated officially to country representatives; adoption by a country not mandatory unless formally requested (e.g. by a Convention)	Voting by member countries, followed by publication of Standard/ work output by ISO	Adopted/ followed voluntarily unless formally requested (e.g. by a Convention) Levels of voting differ depending on Output type (e.g. only a TerC members approval may be required)	To be determined	Could be similar to Option A
Ensuring adoption of results and use by countries	"Best effort" at national level (national agencies should feel obliged to comply as members of intergovernmental organizations)	In certain circumstances has proven to be difficult (JCOMM experience)	Broad "public pressure" for making available information that is credible	ISO has good reputation and track record	To be determined	Likely similar to Option A

Table 1 – PART 4: SUITABILITY FOR PRINCIPAL TCF OUTPUTS

1= optimally/well suited; 2= also applicable

Attribute	Option A (TJC)	Comment	Option B (TerC)	Comment	Option C (TOM)	Comment
Guidance materials	2	The strength of country inputs depends on representatives in Decision Bodies	1	Broader and more structured national input, formal adoption process	To be determined	Likely similar to Option A
Standards	2	The strength of country inputs depends on representatives in Decision Bodies	1	Broader and more structured national input, formal adoption process	To be determined	Likely similar to Option A
Reporting guidelines	1-2	Better responsiveness to requirements of international conventions/instruments	1-2	Better responsiveness to national capabilities/constraints	To be determined	Likely similar to Option A
Associated data and products	1	Easier collaboration with scientific programmes developing improved products/methods	2	Process more structured, may require special attention in the MOU	To be determined	Likely similar to Option A

Table 1 – Part 5: MEETING CRITERIA in section 3.

1= designed for; 2= also suitable

Attribute	Option A (TJC)	Comment	Option B (TerC)	Comment	Option C (TOM)	Comment
A mechanism for scientific or technical input from "interested" countries, but not insisting on input from all countries on every issue	2	Through representatives of agencies from Sponsor member countries in TJC	1	Formal procedure through mirror national groups, facilitating broad representation	To be determined	Likely similar to Option A
A means for coordination at international level with groups or organizations having similar interests, including scientific programmes, international agencies, and synthesis-producing groups	1	Flexible, accommodates various approaches	2	More structured, requires initial task definition and an approval to proceed	To be determined	Likely similar to Option A
A mechanism for arriving at a scientific or technical consensus	2	Consensus within TJC (although a voting mechanism is also available but never used)	1	Voting (each country one vote); within-country consensus part of process	To be determined	Likely similar to Option A
A mechanism for producing final international consensus	2	Vote by Decision Bodies of all Key Sponsors; assumes these represent within-country consensus	1	Vote by ISO national members (within-country consensus building is part of process)	To be determined	Likely similar to Option A
A means for conveying the consensus to the national level for action	1-2	Through country representative in the Decision Body	2	Widely publicized by ISO	To be determined	Likely similar to Option A
A strategy that will ensure financial and in-kind support for the activity and by national governments	2	Depends on national funds transferred to Sponsors, and on extra budgetary or in-kind support	1	Participation by a country typically means funds allocated	To be determined	Likely similar to Option A
A communications strategy to raise the profile of the work and raise extra-budgetary resources	2	Requires effort by the TJC but supported by UN agency Sponsors	1-2	Benefits from existing ISO publicity mechanisms	To be determined	Likely similar to Option A
A means for ensuring continuity and for being responsive to changing requirements	1	Through resolutions of Decision Bodies and TJC members inputs	2	Subject to upcoming tasks being defined/ongoing need for the activity; and to ongoing national support	To be determined	Likely similar to Option A

Table 1 – Part 6. OTHER						
Attribute	**Option A (TJC)**	**Comment**	**Option B (TerC)**	**Comment**	**Option C (TOM)**	**Comment**
Principal advantage	Mechanism addresses directly the needs articulated by Key Members		Broad-based mechanism, effective for defining international consensus on technical matters, built-in connections to national agencies		Flexibility to address COP and GCOS needs	
Key challenges	* No precedent (no new joint commission has ever been established in one step) * Developing and adopting acceptable rules of procedure (challenge increases exponentially with the number of Sponsors) * Ensuring adequate budget * High administrative overhead and potential conflicts between positions of Decision Bodies	JCOMM was a merge of two already existing groups (CMM, IGOSS), yet took two years to become operational.	* Negotiating an acceptable MOU * Obtaining a Secretariat sponsor *Obtaining national member support for tasks that need to be carried out (within country coordination, technical expertise, funding) * Dealing with tasks that do not require (or are not ready for) the development of technical consensus	Suitable precedents exist, including Cooperative Agreement between FAO and TC211, and MOU between ISO and the International Labour Organization regarding WG on Social Responsibility	To be identified	Likely similar to Option A, plus establishment of a mechanism for effective international consultation and national action (degree depends on the differences between TJC and TOM)

[1] Definitions:
Governing Body: the administrative entity to which TJC or TerC would formally report
Decision Body: The top-level body of an intergovernmental or an international organization: Conference (for the FAO), Congress (WMO), General Assembly (ISO), etc.
Key Members: the primary stakeholders, i.e. intergovernmental or international organizations having an interest in TCF activities;
Sponsor: the agency willing to support the establishment and operation of the TJC or TerC.
[2] JCOMM costs: obtained from the JCOMM Secretariat at WMO.

4. Implementation issues for the three options

This section lists implementation steps for the options and also briefly discusses the main challenges in making that option function successfully.

4.1 Option A - Terrestrial Joint Commission

1. Finalize specific proposal based on the present report: terms of reference (TORs), implementation plan, budget (Figure 1).
2. Send and review with IPCC contact group and UNFCCC SBSTA.
3. Prepare a report and a presentation for SBSTA/COP.
4. Obtain SBSTA/COP approval.
5. Revise the proposal and implementation plan as required, and submit to the Decision Body of each UN Sponsor, including: FAO Conference, WMO Congress, UNEP Governing Council, as well as ICSU and UNESCO Governing Bodies if these agencies join in TJC. Consultation with the GEO should be included to ensure GOESS requirements can also be met.
6. Obtain the approval of the Decision Body of each UN Sponsor. It should be noted that this approach was used in establishing JCOMM and is consistent with the founding documents of the respective intergovernmental organizations. Although the administrative overhead and time required increase very rapidly with additional Key Sponsors, it would be difficult to shortcut the process without weakening the legitimacy of the TJC in relation to individual countries represented in Decision Bodies of the Sponsors.
7. Establish Secretariat, agree on initial priorities, appoint Chair, invite countries to send representatives, hold first meeting.

It would be anticipated that from the approval of SBSTA/COP and all the Decision Bodies, a Terrestrial Joint Commission could be functioning by (optimistically) two years after the initial approval. This period could be shortened significantly if the approvals were given by the respective Executive Boards, assuming such approvals would carry full support of all member countries of each organization. The proposed draft terms of reference for TJC are given in Appendix 8.1.

The main challenges in implementing the TJC appear to be:

- The development of consensus, procedures, and the final administrative TJC model. This is because the TJC requires multi-agency sponsorship and each organization is bound to follow its own procedures (as approved in the founding documents of the organization). There is no precedent to setting up a Commission of this type by more than two organizations. In case of JCOMM (which took several years to get underway), the two constituent groups already existed. While it is highly likely that the issues could be dealt with successfully, the length of time and level of effort are difficult to estimate.
- Ensuring adequate and stable budget. The TJC would depend fully on the sponsoring intergovernmental organizations for budget support. As a new activity, it would likely need funds presently used for another purpose, given the relatively flat budgets of UN organizations. Even if the funds can be identified initially at the required level, the continuing dependence on national government annual contributions is a structural weakness of this approach.

The JCOMM organization, practices and experience provide a good model to follow in the development of the TJC. The main difference between the two is the lack of pre-existing groups that would be merged, and the involvement of more than two UN sponsoring organizations. On the other hand, all the conceptual issues involved in setting up a TJC have been dealt with by the JCOMM, including the negotiation of a mode of operation and resolving differences in the rules of procedure (IOC, 2002). The practical

experience available through JCOMM Secretariat and from the Co-chairs would be of great benefit to the starting TJC.

4.2 Option B - Terrestrial Committee

1. Develop a concept/proposal, including key components of potential framework agreement/Memorandum of Understanding and terms of reference, based on material in this report (Figure 2).
2. Informally discuss with ISO Central Secretariat and the ISO TMB leadership (already done in part).
3. Modify proposal and formally submit to ISO.
4. Prepare a report and a presentation for SBSTA/COP.
5. Obtain SBSTA/COP approval.
6. ISO organizes voting by national members, and requests expressions of interest to participate and to host Secretariat (nominally takes three-months).
7. Appoint Chair/Co-Chairs and Secretariat, finalize initial priorities, establish structure, invite countries to identify representatives, hold first meeting.

Based on initial contacts, an ISO Technical Committee or a joint Sub-Committee between ISO/TC 211 and ISO/TC 207 would appear to be the appropriate mechanisms (Smith, 2007 and other correspondence with ISO Central Secretariat and ISO/TC 207). Based on such a framework it would be assumed a first substantive technical meeting could be held (optimistically) one year after the initial approval of SBSTA/COP. However, this period could be extended (to an unknown length) if national approvals are delayed. The proposed draft terms of reference are given in Appendix 8.1.

The main challenges in implementing a successful TerC include:

- Establishing an effective framework within ISO. ISO's traditional strength is in developing technical standards while the TCF tasks include issues that may not be ready for standardization, where measurement or reporting approaches are evolving, or where new initiatives may be needed. Thus the ability of the TerC to employ other mechanisms than technical standards and to work with other groups, e.g. experts in the research community, will be very important. The recent expansion of ISO objectives and practices lend confidence that this challenge may be dealt with successfully. Climate change and sustainable development have been identified as growth areas for ISO in the coming years (ISO, 2006c), and the ISO Working Group on Social Responsibility established precedents for ISO involvement considerably beyond the traditional technical standards related to economic activities.
- Obtaining national support for the TerC tasks. In this context, national support means: a) interest in being involved in TerC tasks (i.e. voting in favour of the tasks being undertaken); b) willingness to support national participation in the execution of the tasks [usually follows if a) is agreed to], and c) volunteering to support a TerC Secretariat (initially for a period of five years). The national support, demonstrated through voting, will also act as the test of the interest by countries in responding to the COP requirement. A positive response will not only deal with the budget problem, but will also provide basis for optimism regarding the adoption of the outputs of TerC work.

While the issues represented by the TCF differ somewhat from the activities traditionally pursued by the ISO, the recent ISO expansion into new areas, product types and practices suggest that TerC could function effectively within the ISO framework. TerC would greatly benefit from the ISO global framework and the consensus-seeking networks established in many countries, and could use with

advantage the well-defined procedures for task definition and the generation of output products. The working arrangement will need to ensure that agendas important to the international community can be addressed, which would be one of the objectives of the proposed Memorandum of Understanding (MOU) between the ISO and FAO (Table 1).

4.3 Option C - Terrestrial Observations Mechanism

Since the details for a TOM have not been worked out, it is not possible to evaluate the specific advantages and weaknesses of this option. Further discussions need to be undertaken and the GTOS has taken steps in this regard.

The main challenges in defining and implementing the TOM appear to be:

- Defining the organizational framework. This includes identification of the Sponsors and Key Members (Table 1), the decision-making process among the Sponsors, specification of the links to individual countries, and the rules of operation for the TOM.
- Defining procedures for task definition and reporting to be carried out by the TOM.
- Ensuring availability of adequate resources, both expertise and financial, needed for the effective and efficient functioning of the TOM.

GTOS has entered in contact with the IPCC to discuss the feasibility and scope of such involvement, and plans to approach other potential Sponsors to explore this option as appropriate (refer to section 6.).

5. Summary

Three options for implementing a framework for terrestrial climate related observations (TCF) are described in this discussion paper. The options build on mechanisms and practices previously employed to arrive at an international consensus on technical matters subsequently to be adopted, and acted upon, by individual countries.

Figures 1 and 2 summarize Options A and B in terms of the organizational structure, budget, steps to implementation, and an approximate timetable after a decision on the selected option is made. The two approaches involve many of the same actors and employ similar mechanisms, but they build on different strategies and offer different trade-offs. Option A (Terrestrial Joint Commission, Figure 1) follows the tradition of agreements developed by representatives of national governments who are members of the sponsoring intergovernmental organizations, with optional inputs by others. Option B (Terrestrial Committee, Figure 2) builds on the structures established by the ISO, globally as well as within individual countries. In both cases, national governments are ultimately in control, although they exercise it directly (by appointing country's representatives) in Option A and indirectly (through national standards bodies) in Option B. It should be noted that the organizational structure within the TJC and the TerC (Figure 1 and 2) is tentative and subject to change once the implementation begins.

The two options differ considerably in the required 'up-front' budget and the speed of implementation. In case of budget, option B costs are carried by willing national governments (thus show as nil in Figure 2 and Table 1), while those of option A are shared by the intergovernmental Sponsors. The longer estimated implementation of Option A is primarily due to the assumed need for the TJC proposal to be approved by all the Decision Bodies of the Sponsors, thus a 12-month period is provided for while the ISO approval normally takes three months (but can take much longer, depending on the views of interested countries).

The third option (Option C) is described in less detail in this report, primarily because its configuration has not been fully defined. While in many respects it would be similar to Option A (Table 1), details could be developed in ways that more optimally meet the requirements identified by the COP and the TOM sponsors. Two potential sponsors have been identified so far, the IPCC and the GEO, as the primary candidates from international conventions or environmental observational programmes. GTOS has initiated contacts with the IPCC, and further steps are under consideration. The main question concerns the suitability of Option C, which does not follow previous approaches and practices, for the task identified by the COP (refer to section 6).

The three options have different strengths and weaknesses but, if implemented appropriately, either should satisfy the requirements identified by the COP. The selection of a preferred solution should require careful weighing of the specific characteristics of each option, and of the likelihood that its weaknesses will be overcome or mitigated during or after implementation. Once the choice of a preferred approach is made, the implementation can follow steps identified in section 4.

6. Recommendations

This report provides evidence for various feasible options that would yield a framework for the preparation of guidance materials, standards, reporting guidelines, and associated data and products for terrestrial observing systems. It is evident that such a framework is vital for generating the tools, methodologies, data, information and support required by the UNFCCC in meeting its long-term objective to stabilize greenhouse gas concentrations in the atmosphere, and for assisting member countries in meeting their obligations when confronting the effects of climate change.

The initial task defined by the Conference of the Parties (Decision 11/CP.9; UNFCCC, 2003) identified one mechanism (JCOMM) as an option to be examined for the TCF. To ensure that the requirement is considered fully, three options for the framework are described in this report. Two (Options A, B) are developed in more detail here as they follow existing mechanisms and practices employed for similar problems. The third (Option C) is described in less detail because it has not been fully defined so far. While in many respect it would be similar to Option A (Table 1), Option C would provide the flexibility to suit the COP needs as closely as possible, subject to the agreement by the sponsors, national governments, and other stakeholders.

To permit further definition of the framework for terrestrial climate-related observations, the following recommendations are made to the SBSTA:

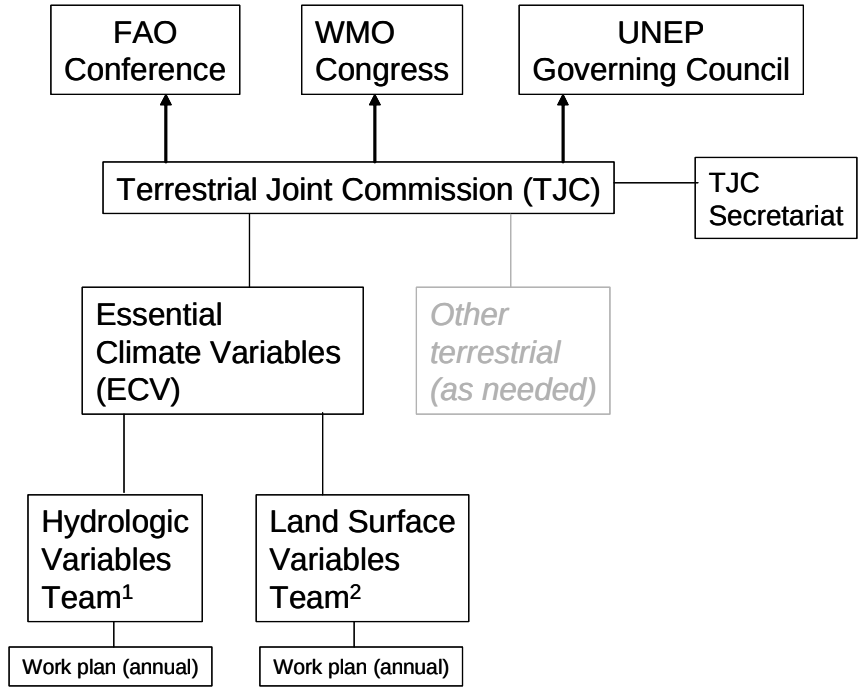
1) That the SBSTA express preference for a mechanism based on one of the three alternatives (Option A, B, or C).
2) That the SBSTA endorse the establishment of a working group to develop the details of the preferred Option.
3) That the SBSTA request the COP to secure the political, technical and financial support by national governments for implementing the framework.

Action on Recommendation 1 would permit focusing attention and resources so that more rapid progress may be made. Adoption of Recommendation 2 will permit establishment of a working group and allowing the completion of the activities. Securing national support (Recommendation 3) is necessary for any such framework to function effectively and to yield the expected and needed outcomes.

The Global Terrestrial Observing System strongly desires to support the development of a TCF mechanism and to continue collaboration with other partners and stakeholders, including the GCOS and other sister observing organizations. Nevertheless, for any system to be effective there must be the collective support by governments and international institutions as well as by other stakeholders.

Figure 1. Summary of Option A – Terrestrial Joint Commission

A. ORGANIZATIONAL STRUCTURE



1) River discharge, Water use, Ground water, Lake levels, Snow cover, Glaciers and ice caps, Permafrost and seasonally-frozen ground
2) Albedo, Land cover, Fraction of absorbed photosynthetically active radiation, Leaf area index, Biomass, Fire disturbance

B. BUDGET

1. Cost of establishing TJC:

difficult to quantify (mainly administrative overhead to Key Members)

2.Annual operating costs (in $000, based on JCOMM experience):

Salaries (2PY)	US$250K/yr
Operating	US$300K/yr
TOTAL	US$550K/yr

C. NEXT STEPS AND TIME LINES

1. Obtain SBSTA/ COP approval (May 2007).

2. Finalize the proposal and implementation plan as required, and submit to the Decision Body of each UN Sponsor, including: FAO Conference, WMO Congress, UNEP Governing Council, as well as ICSU and UNESCO Governing Bodies if these agencies join in TJC. Consultation with the GEO should be included to ensure GOESS requirements can also be met.

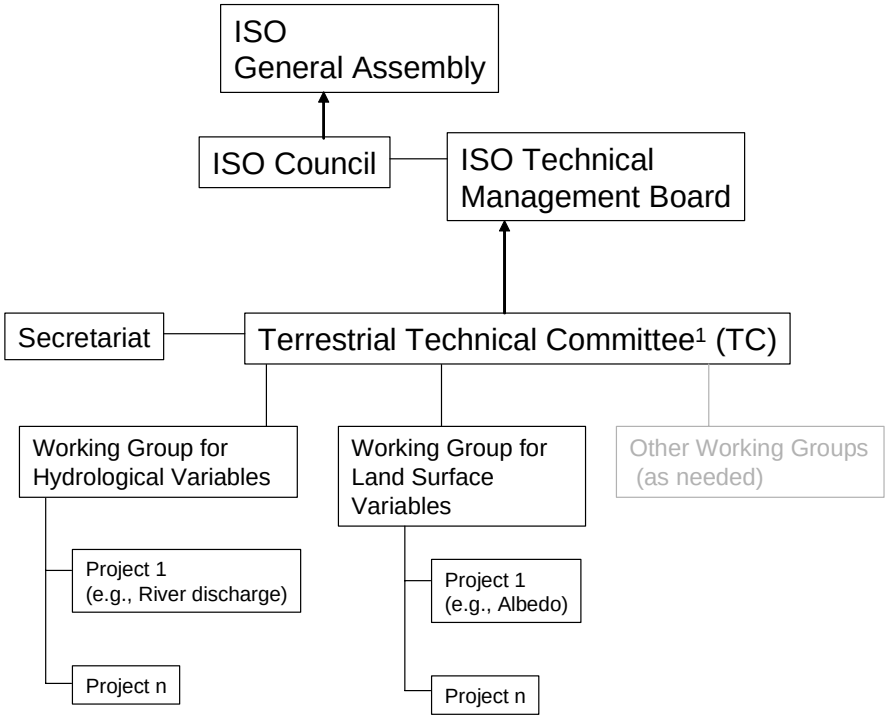
3. Obtain the approval of the Decision Body of each UN Sponsor.

4. Establish Secretariat, agree on initial priorities, appoint Chair, invite countries to send representatives, hold first meeting.

Assuming SBSTA/COP approval in May 2007 and the approvals by all Decision Bodies by December 2008, a Terrestrial Joint Commission could be functioning by (optimistically) mid- 2009.

Figure 2. Summary of Option B – Terrestrial Committee

A. ORGANIZATIONAL STRUCTURE



1) Other organizational options are a Sub-Committee (SC) to an Existing ISO TC, or a Working Group within existing TC or SC

B. BUDGET

No new funds are required because:

- Technical Committee Secretariat is supported by a willing country
- -Participation in Committee work is supported by participating countries or other organizations
- -ISO covers publicity costs.

Support may be required for developing countries involvement.

C. NEXT STEPS AND TIME LINES

1. Obtain SBSTA/ COP approval (May 2007).
2. FAO/ GTOS conclude Memorandum of Understanding with the ISO Technical Management Board.
3. ISO organizes voting by national members, and requests expressions of interest to participate and to host Secretariat (nominally takes 3-months).
4. Appoint Chair/Co-Chairs and Secretariat, finalize initial priorities, establish structure, invite countries to identify representatives, hold first meeting.

Assuming SBSTA/COP approval in May 2007, the first substantive technical meeting could be held by (optimistically) mid- 2008.

7. References

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Activities related to the development of a terrestrial framework can be viewed on the GTOS Web site: www.fao.org/gtos/topcFRAME.html

8. Appendices

8.1 TCF Draft Terms of Reference

The terms of reference for TCF may be defined in various ways. The approach taken here builds on the identified needs and the JCOMM precedent. It is anticipated that the ultimate TORs will be affected by the choice of the TCF option and by subsequent discussions among the TCF Sponsors. While the final wording will be influenced by the TCF option selected and the accompanying administrative forms, the following tasks should form the basis upon which the TORs are founded:

Under the overall direction of the Sponsors, the Commission/Committee shall:

1. Identify the standards, guidance materials or reporting guidelines for terrestrial observations and for associated data and products that are required to support international conventions or programmes.
2. Develop appropriate response to these identified needs, including the preparation of proposals for the generation of such standards, guidance materials, reporting guidelines and other appropriate materials.
3. Carry out the execution of approved proposals leading to the international approval of work outputs of the Commission/ Committee, and facilitate their adoption and use by national organizations and by international programmes or initiatives.
4. Ensure that the standards, guidance materials and reporting guidelines are regularly reviewed to meet the needs of the relevant international conventions, programmes and other entities, as identified by the Sponsors of the Commission/Committee.
5. In cooperation with other relevant international and national programmes or initiatives, support efforts at increasing the harmonization of terrestrial observations.
6. In its activities, the Commission/Committee shall:
    a. ensure that both *in situ* and satellite observational needs and specifications are fully provided for and/or considered;
    b. ensure that the needs for climate-related observations and programmes, particularly those of the UNFCCC and GCOS, are given priority;
    c. collaborate with other programmes and bodies where beneficial, in particular with scientific programmes.

8.2 List of acronyms

CBS	Commission for Basic Systems
CCl	Commission for Climatology
CD	Committee draft
CEO	Chief Executive Officer
CMM	Commission on Marine Meteorology
COP	Conference of the Parties
DBCP	Data Buoy Cooperation Panel
ECV	Essential Climate Variables
FAO	Food and Agriculture Organization
fAPAR	fraction of Absorbed Photosynthetically Active Radiation
FDIS	Final Draft International Standard
GCOS	Global Climate Observing System
GEO	Global Earth Observation
GEOSS	Global Earth Observation System of Systems
GOOS	Global Ocean Observing System
GTOS	Global Terrestrial Observing System
ICSU	International Council for Science
IGOSS	Integrated Global Ocean Services System
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
JCOMM	Joint Commission on Oceanography and Marine Meteorology
LAI	Leaf Area Index
MOU	Memorandum of Understanding
PAS	Publicly Available Specification
PY	Person Year
SBSTA	Subsidiary Body for Scientific and Technical Advice
SC	Sub-Committee
TC	Technical Committee
TCF	Framework for Terrestrial Climate-Related Observations
TerC	Terrestrial Committee
TJC	Terrestrial Joint Commission
TMB	Technical Management Board (of ISO)
TOM	Terrestrial Observations Mechanism
TORs	Terms of Reference
TR	Technical Report
TS	Technical Specification
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WCP	World Climate Programme
WG	Working Group
WMO	World Meteorological Organization
WWW	World Weather Watch