ESA/STAT/AC.108
UNCEEA/Prelim/13b

DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS
STATISTICS DIVISION
UNITED NATIONS

Preliminary Meeting of the UN Committee on Environmental-Economic Accounting
New York, 29-31 August 2005
Two United Nations Plaza
Conference Room 23rd floor

HANDBOOK ON INTEGRATED ENVIRONMENTAL AND ECONOMIC ACCOUNTING FOR WATER RESOURCES

United Nations Statistics Division

Introduction

1. The general principles of water accounts are discussed in Chapters 7 and 8 of the SEEA-2003. Water accounting is a relatively new area as compared to other natural resources. It has developed in the past few years given the high policy interest in integrating economic, environmental and social aspects related to water. The European Water Framework Directive as well as World Summit on Sustainable Development in Johannesburg have highlighted the need for information for integrated water resources management (IWRM). Country experiences in the implementation have also increased in recent years. In Europe, the pilot projects carried out by Eurostat have been instrumental for gaining experience on the compilation of water accounts.

2. Building on the policy interest, the practical experience in countries and methodological progress made during the revision of the SEEA, UNSD, in cooperation with Eurostat developed an annotated outline for the handbook on water accounting. Further, UNSD, in cooperation with the United Nations Division for Sustainable Development set up and electronic discussion group (EDG) presenting terms and definitions related to water accounting with the objective of harmonizing definitions and classifications in water accounting as well as harmonizing definitions used in international questionnaires with the water accounting framework.

3. The London Group on Environmental Accounting identified in its meeting in Rome in November 2003 water accounting as one of its priority areas of work, given the increasing policy interest in the topic. A Subgroup on Water Accounting, moderated by UNSD, was created with the objectives of (a) finalizing the handbook on water accounting and (b) contributing to the EDG on terms and definitions related to water accounting.

4. The members of the subgroup include mostly environmental accountants and a few hydrologists from Australian Bureau of Statistics, China, Columbia University, European Environment Agency, Eurostat, Federal Statistical Office Germany, Statistical Office of Morocco, Moldova, Statistics Canada, Statistics Denmark, Statistics Netherlands, Statistics New Zealand, Statistics South Africa, Statistics Sweden, NSCB Philippines, UN Division for Sustainable Development, UNSD and the World Bank.

5. Draft chapters of the handbook on water accounting were discussed during the London Group meeting in Copenhagen in September 2004. A complete draft of the handbook (except the first introductory chapter) was discussed at a meeting of the Subgroup on Water Accounting which took place in New York in May 2005. The minutes of the meeting are attached in Appendix 1 of this document.

Handbook on Water Accounting

Structure

6. The handbook comprises 10 chapters. A brief description of each chapter in the handbook is provided below:

Chapter 2: The Water Accounts Framework – It provides an overview of the water accounting framework and the relationships between the various accounts in the framework. It describes at length in a non-technical way the hydrological system, the economy and their interaction using diagrammatic format. It also introduces the readers to those national accounts concepts which are relevant for water accounts.

Chapter 3: Physical Water Supply and Use Tables. The Chapter describes water flows, in physical units, within the economy and between the environment and the economy. These accounts follow the quantity of water from its abstraction from the environment by the economy, its use and supply within the economy and its discharge back into the environment. They can be used for the assessment and monitoring of the pressure on water quantities exerted by the economy, for the identification of the economic agents responsible for abstraction and discharges of water into the environment, and for the evaluation of alternative options for reducing water pressure.

Chapter 4: Emission Accounts. The Chapter describes flows of pollutants transported in the water from its abstraction, supply and use within the economy and discharge into the environment. Emission accounts can be used for the assessment of measures against water pollution, the development of new regulations to reduce emissions, impact studies of new technologies, and the analysis of the relationships between economic activities and state of the environment. In particular, water emission accounts allow for the identification of the pollutants released into water resources and the economic agent (industry or households) responsible for such emission.

Chapter 5: Accounts for Economic Activities and Products Related to Water and Other Transactions. The Chapter analyses monetary accounts for water related activities and products. The accounts presented in this chapter are fully consistent with the conventional accounts although they present a higher level of disaggregation to meet the need of monetary information for water management purposes. The Chapter introduces water protection and management expenditures as well as the financing of these expenditures (e.g. by which agent and by means of which instrument - sales of services, environmental taxes, etc.). This information is very useful to assess whether the cost of collection, purification and distribution of water or the costs of water treatment are being recovered or the government is financing them.

Chapter 6: The Asset Accounts. This Chapter describes the stocks of an asset at the beginning and at the end of an accounting period and the changes due to human and natural processes that took place during this period. In particular, it focuses on the description of the quantity of water in a country/territory and its quantitative uses in order to assess the quantitative depletion of the resource.

Chapter 7: Quality Accounts. This Chapter describes the water bodies in terms of their quality that is the physical, chemical and biological properties of water which, in turn determine its suitability for use and its ability to maintain the health and integrity of aquatic ecosystems. Their implementation is still experimental and water quality accounts concepts are still very new. Nevertheless, given the importance of water quality in determining the use of water resource, they are included in the handbook.

Chapter 8: Implementing the Accounts. The chapter provides practical guidelines on how to implement the water accounts. It gives some general idea of how to establish cooperation among the different water information producing agencies and integrate the information in the accounting framework. It further provides a step-by-step approach on the types of the accounts that can be compiled by countries according to priorities and data availability. It also presents an analysis of the differences/similarities between the water accounting tables and the existing water statistics questionnaires.

Chapter 9: Examples of Policy Uses and Applications of Water Accounts. This Chapter discusses policy uses of water accounts with examples drawn from countries that have compiled water accounts. In particular it describes the most common indicators used to evaluate the current patterns of water use and supply, and pollution. It begins with macro-level indicators that provide 'warning' signs of a trend that may be unsustainable or socially undesirable, often at the national level. It then progresses to more detailed indicators and statistics from the water accounts that shed light on sources of pressure on water resources, opportunities for reducing the pressure, and contribution of economic incentives (such as pricing) to the problem and possible solutions. It also discusses the analysis of more complex water policy issues based on economic models that incorporate the water accounts (e.g. projecting future water demands or estimating the impact of water pricing reform)

Chapter 10: Valuation of Water Resources. The Chapter deals with economic valuation of water, beyond the observed water prices. It discusses the usefulness of different valuation techniques for the water accounts and addresses some additional issues that arise in monetising water accounts such as aggregation of water values from the local to national level. Further, it provides a detailed overview of various economic valuation techniques and it discusses the strengths and weakness of each technique using empirical examples.

Set of standard tables: A set of simplified standard tables to be compiled by all countries has been agreed. More detailed tables that could be compiled by countries with more advanced water information systems have also been agreed. Eurostat will use the set of standard table (possibly with additional details) to start a new data collection of water accounts.

SEEAW Land data set: A fictitious and internally consistent data set has been created for illustrative purposes. All numerical tables in Chapters 3-5 have been filled in with this fictitious data set. It shows the amount of water abstracted from the environment, used within the economy returned back to the environment, the emission of pollutants by the economy in the water and all the monetary flows related to water.

Outstanding tasks to complete the handbook

7. The meeting of the Subgroup on Water Accounting in May 2005 recommended a number of changes some of which have been implemented and some which have to be implemented. In addition to editorial changes throughout the handbook, the following remains to be implemented.

Chapter 1: Introduction: A detailed outline of the chapter has been prepared. The chapter needs to be drafted.

Chapter 2: The Water Accounts Framework: No fundamental changes.

Chapter 3: Physical Flow Accounts: A revised draft has been prepared. The following issues have been raised:

(a) *Treatment of losses in distributions*
Losses in distribution include the volume of water lost during transport (through leakages and evaporation) between the point of abstraction and a point of use ad reuse" (OECD/Eurostat Questionnaire). There are two opinions on how to record the losses in distributions. A note attached in the Appendix 2 provides a numerical example and describes more in detail the issue.

The majority view is that the supply and use of water within the economy is recorded NET of losses in distribution. The part of losses caused by leakages is recorded as a return flow to the environment in the supply table, while the rest is included in water consumption. Losses in distribution can be calculated as a difference between water abstracted for distribution and supply of water to industries/households. They are allocated to the supplier of water.

A minority view is that the supply and use of water within the economy are recorded GROSS of losses in distribution. These losses are allocated to the supplier of water and recorded first as a use (within the economy) by the supplying industry and then as a return flow to the environment.

Discussions are taking place within the subgroup and hope to reach an agreement soon.

(b) *Treatment of illegal tapping*
In many countries, especially developing countries, illegal connections to the water distribution network from households and industries is frequent. The question is how to treat illegal tapping in the water accounts and, more in general, in the national accounts. The following two options come to mind:

- Water used as a result of illegal tapping could be considered a loss and thus included as part of water consumption. In this case, the flows in the physical supply and use table (PSUT) would correspond to the flows in the monetary SUT, but, for example indicators of water efficiency by industry would be misleading. Also, whom should the water consumption be allocated to? To the industry that collects, purifies and distribute water (ISIC 41)?
- Water used as a result of illegal tapping could be allocated to the end user. In this case, the production of water by (ISIC 41) is a legal activity but consumption is illegal. While the SNA discusses the treatment of illegal

production (e.g. drugs), it does not explicitly mentions how to treat illegal consumption. If we allocate the water used as a result of illegal tapping to the users, the following questions arise: what value for the production of water should be used (e.g. imputed at purchasers' price)? Should we impute some type of transfer from say ISIC 41 to the households or industries? How should these transfers be classified? (They cannot be social transfer as they are from a corporation to household)

The issue of illegal activities is currently being discussed as part of the update of the 1993 SNA. The handbook will follow the recommendations adopted by the AEG.

Chapter 4: Emission Accounts: The recommendations of the meeting of the Subgroup need to be implemented.

Chapter 5: Accounts for Economic Activities and Products Related to Water and Other Transactions: The recommendations of the meeting of the Subgroup need to be implemented.

Chapter 6: The Asset Accounts: The chapter is complete. One issue which came about during the meeting is the treatment of water in an artificial reservoir. Considerable money is spent to build dams to retain the water from flowing downstream to the sea. Also, continuous control and management of the water resources is exercised both in the case in which the water is used for abstraction, purification and distribution, or for other uses such as hydro-electric power generation. Therefore, in line with the definition of cultivated assets in the SEEA and now agreed in the SNA revision process[1], water in the reservoirs should be considered a produced asset. In parallel with the treatment of natural growth of cultivated forest and fish as produced asset, precipitation and inflows of water in the reservoirs should be considered as capital formation. As a result, water in the reservoir should be added to the classification of produced asset.

It is unlikely that a consensus on the treatment of water as a produced asset can be reached before the publication of the handbook. This approach will only be mentioned as being under discussion.

Chapter 7: Quality Accounts: A revised chapter has been prepared. Water quality accounts are still experimental and several methodological issues remain to be solved. They include:

(a) What aspects of water quality can be meaningfully presented in an accounting framework, considering that water quality is highly variable over time and space?

(b) How should quality classes be defined?

(c) How to aggregate across pollutants to obtain a quality index?

[1] Cultivated assets are defined as: "livestock for breeding, dairy, draught, etc. and vineyards, orchards and other trees yielding repeat products ***whose natural growth and/or regeneration is*** under the direct control, responsibility and management of institutional units. (SEEA -2003 para 7.58)

(d) How to aggregate over space and over time?

(e) What is the link between changes in quality of water and emissions?

These issues are likely not to be solved before the publication of the handbook. It is suggested to take a pragmatic approach that is, the handbook, instead of proposing solutions it raises the issue and presents existing experiences.

Chapter 8: Implementing the Accounts: The recommendations of the meeting of the Subgroup need to be implemented.

Chapter 9: Examples of Policy Uses and Applications of Water Accounts: The recommendations of the meeting of the Subgroup need to be implemented.

Chapter 10: Valuation of water: The chapter has been redrafted and moved at the end of the handbook to reflect the consideration that economic valuation of water outside the SNA framework is more removed from the core accounts. Nevertheless, it is important to have this chapter in the handbook in recognition of the policy interest to treat water as an economic good. Several issues remain unsolved and water valuation should be included in the future research agenda.

SEEAW land data set: The dataset has been completed and has to be included in the various chapters.

Looking ahead

8. The handbook is near completion. Some minor changes remain to be implemented. It is expected that a final complete draft will be ready by the end of 2005 and the draft will be submitted to the UN Committee for its approval. Upon finalization of the handbook, UNSD plans to promote its implementation in as many countries as possible. Until present, only environmental accountants and few environment statisticians are familiar with the concepts and methodologies of water accounting. A promotion strategy has to be developed in order to make the users community as well as the producers of hydrological information familiar with the usefulness of the water accounting.

9. In order to promote the water accounts, UNSD plans to undertake, in cooperation with a Group on Water Accounting, which will report both to the London Group on Environmental Accounting and to the UN Committee, the following activities:

(a) Work towards the harmonization of the UNSD/UNEP water statistics questionnaire with the water accounting concepts. To this end, an analysis identifying similarities and differences between the UNSD/UNEP and OECD/Eurostat questionnaire has already been undertaken and discussions on possible modification of the questionnaires are already on-going;

(b) Encourage the implementation of water accounts in as many countries as possible through the organization of workshops, international meetings and country projects. A workshop on water accounting and statistics in the ESCWA region will be organized in December 2005 with the objective of making

accountants and hydrologists familiar with the accounting framework and data collection in water statistics;

(c) Organize an international meeting in 2006 bringing together producers and users of water accounts. Countries will be invited to present their experience in the compilation of water accounts and in particular analyses that have or could be undertaken using the water accounting framework;

(d) Develop promotion material so as to ensure that the water accounting methodology and its uses are disseminated;

(e) Work with existing international mechanisms (e.g. UN Water, EU Water Framework Directive, etc.) to ensure that the water accounting framework is internationally recognized in the users' community.

Questions to the Committee

(a) Does the Committee agree with the structure of the handbook and the plans of the subgroup to finalize it?

(b) What is the opinion of the Committee on the approval of the Water Accounting handbook? Should a mechanism be devised so that the Committee can approve documents in-between meetings?

(c) Does the Committee agree with the plans for promoting the handbook?

(i) Should the composition of the Group be expanded to include not only producers but also users of the accounts?

(ii) Would the Committee like to suggest additional activities that the Group should undertake to promote water accounting?

Appendix 1

Minutes of the meeting
of the Subgroup of the London Group on Water Accounting
New York, 11-13 May 2005

A. Summary of the meeting

The meeting was organized and hosted by the United Nations Statistics Division (UNSD). It was opened by Mr. Paul Cheung, Director of UNSD, who thanked the members of the London Group and in particular the participants in the meeting for their contributions to the handbook on *Integrated Environmental and Economic Accounting for Water Resources*. He stressed the importance of water resource accounting for decision making. Mr. Cheung emphasized the need for promoting the handbook and encouraging the implementation of water accounts in as many countries as possible. He briefed on the soon-to-be-established UN Committee on Environmental-Economic Accounting describing its objectives and main activities. Mr. Cheung suggested the handbook on water accounting be submitted to the UN Committee for its approval.

The meeting was chaired by Mr. Ivo Havinga, Chief Economic Statistics Branch of UNSD. The agenda and list of participants is included in Section D and Section E respectively.

The objectives of the meeting were (a) to discuss the draft chapters of the handbook on *Integrated Environmental and Economic Accounting for Water Resources*; (b) to identify issues that need to be resolved; (c) to agree on how to address them and (d) to agree on a timeline and process to finalize the handbook.

The handbook was well received by participants. The discussion brought up a number of issues and comments to improve the current draft. The list of the suggested changes to be included in the handbook is reported in Section B. Participants agreed to contribute to the finalization of the handbook by providing additional text and examples to address the issues raised during the meeting. Section C provides the detailed list of contributions by participant.

The last session of the meeting was dedicated to the discussion on the next steps to finalize the handbook. The following was agreed:

(a) The time line for providing comments and contributions to the draft handbook is **June 15 2005**. UNSD will finalize the handbook by **Mid July**;

(b) The Secretariat of the London Group, Statistics Canada, will inform the London Group members on progress made in the drafting of the handbook, the conclusions of the meeting of the Sub-group and the steps for finalizing the handbook, agreed by the Subgroup. In this regard, the Secretariat will encourage members of the London Group to comment on the existing draft before its finalization;

(c) Once the handbook is finalized, it will be submitted to the UN-Committee on Environmental-Economic Accounting for approval during its first meeting in the fall 2005;

(d) UNSD will contact Eurostat and provide the set of standard tables agreed during the meeting in order to ensure consistency with the data collection exercise that Eurostat plans to undertake.

The group also discussed issues related to the implementation of water accounts. Some participants offered to assist in technical cooperation activities. The World Bank informed the group on the possibility of using its Trust Funds for Statistical Capacity Building to support the implementation of water accounting in the developing countries.

B. Agreed list of actions

Cross cutting issues

The handbook will present a set of standard simplified tables (those in chapter 3 to 6) as well as more elaborated tables. UNSD will coordinate the work with Eurostat in order to align the set of standard tables for water accounting.

The terminology for water use in 'hydropower generation' should be consistent throughout the handbook. Currently, terms such as 'hydropower generation' and 'hydroelectric power generation' are used in the handbook.

The tables should present numerical examples in order to facilitate their understanding. To the extent possible, the tables will be linked throughout the handbook.

Countries were encouraged to submit their case studies in water accounts to be posted on the UNSD website.

CHAPTER 1 (UNSD)

1. Even though this chapter was not discussed during the meeting, it was suggested that the following would be emphasized in this chapter: (a) the handbook takes the perspective of the economy and integrates hydrological information to the SNA accounts and (b) the accounts allow for macro/basin -analysis, although recognizing the importance of other types of analysis, which however are not

within the scope of the handbook and (c) water accounts could be developed in various stages of implementation using in its first stag, a minimum set of water statistics (either at water basin or national level) to support a minimum of macro/basin analysis.

CHAPTER 2: The water accounts framework (UNSD)

2. If possible, Figures 2.2 and 2.3 should be combined in one single figure. Figure 2.2 and Figure 2.3 could be presented in the relevant chapters (Chapters 3 and 6).
3. Additional text to be included in a box on NAMWA will be provided by Martine. The text would cover the alternative presentation of the supply and use tables using the matrix presentation. (Martine ten Ham).
4. It was recommended to add some text to acknowledge stocks of sea water and water in the atmosphere as sources of water in the economy.
5. It was agreed that the water accounts take the perspective of the economy and therefore hydrological data should be adapted to economic data. The reference period should be the 12-month accounting period of the national accounts. Ideally, having quarterly water accounts linked to quarterly economic accounts would be useful to provide flexibility to the analysis based on the hydrological cycle. However, it was not considered feasible.
6. The notion of the accounting catchment as the unit to undertake sub-national accounting was considered useful. The accounting catchment would be a large enough area for which economic information is available thus allowing the compilation of water accounts. The accounting catchment could be an aggregation of river basins. It was recognized that physical information is often available at a level of temporal and spatial disaggregation higher than the economic data. It is often easier to adapt the hydrological information to the economic information.
7. It was mentioned the need to discuss the link of the water accounts to the social dimension. The text should include reference to possible expansion of the accounting framework to include the social dimension.

CHAPTER 3: Physical supply and use tables (UNSD)

8. Figures:
    - Figure 3.1 should be replaced by a figure similar to those presented in Chapter 2.
    - Figure 3.2 should include other sources of water and reuse of treated wastewater.
9. The following changes to the tables were agreed:
    - Delete tables 3.1, 3.2 and 3.3, and present only full supply and use tables (table 3.4), which combines the previous three tables);

- In table 3.4 further disaggregate total abstraction in "abstraction for own use" and "abstraction for distribution". Explain how to derive total water use in order to avoid double counting of water abstracted for distribution;
- In table 3.4, further disaggregated 'Abstraction form other sources' into 'abstraction from the sea' and 'collection of precipitation';
- Insert numerical example to help clarifying the presentation of the tables;
- Ensure that the tables presenting countries' examples are consistent with the definitions used in the handbook.

10. The text should make more explicit the link between supply and use tables and assets accounts. The breakdown of abstraction and return flow relates to the asset classification of water resources.
11. The text should mention that abstraction and returns should be further disaggregated, if data is available, in
    - Hydropower generation
    - Water losses in distribution (because of leakages)
    - Mine water
    - Urban runoff

    Within the economy supply and use of 'reused water' could be separately identified.
12. Use of water in rainfed agriculture: the treatment of water used in rainfed agriculture should be changed in the handbook. Currently, water use in rainfed agriculture is recorded as the amount of water that evapotranspires from the crop (hence there are no returns into the environment). The tables should record, instead, water use in rainfed agriculture as the amount of precipitation that falls onto agricultural fields, and water return from this activity as the excess of water that infiltrates into water resources or otherwise runs off to rivers and lakes.
13. Losses during distribution were discussed. In particular, the following issues were raised:
    - The term "losses" has different meaning in different contexts: while water lost in distribution is a loss for the economic system, it is a resource for the environment. It was agreed that the term 'losses in distribution' would be retained and an explanation would be added to the text.
    - It was agreed to explicitly show the water abstracted by ISIC 41 for cleaning pipes etc. This would appear in the tables as 'abstraction for own use'.
    - There was no agreement on the recording of losses in distribution in the tables. The current approach, which is in line with the SEEA-2003, records the supply of water within the economy net of the losses in distribution and the losses in distribution due to leakages are recorded as a return to the environment. It was argued that the supply within the economy could also be recorded gross. In this case, the losses in distribution would be recorded first

as a use (within the economy) by ISIC 41 and then, those due to leakages as a return into the environment. There are no substantial differences between the two ways of recording losses as in both cases the same type of analysis can be performed. UNSD will circulate a note including a numerical example on the two approaches to recording losses in distribution with the objective to reach a consensus.

- The text should explicitly mention that losses in distribution may include various components such as malfunctioning metering and illegal tapping.

14. It was agreed that supplementary information on the number of people with access to safe drinking water and sanitation would be added to the tables in Chapter 3.

15. Insert case studies of accounts at regional level from New Zealand and Australia.

CHAPTER 4: Emission accounts (UNSD)

16. Tables should be modified as follows (Marianne Eriksson and Christine Flachmann will provide revised tables):

    - The tables should clearly distinguish discharges of untreated and treated water (including self-treated water). The discharges should be disaggregated according to the receiving media (rivers, lakes, reservoirs, sea).

    - The tables should include a numerical example.

    - Include explicitly other industry in the tables.

17. The scope and coverage of emission accounts should be made clear in the handbook: which emissions are included. Describe other sources of pollution such as acid rain and its links to ecosystem approach.

18. The list of pollutants should be modified. The pollutants could be grouped in three categories: (1) those primarily linked to households water use and the treatment of households sewage (e.g. BOD, COD, suspended solids, phosphorus and Nitrogen), (2) linked to urban areas (e.g. zinc, copper, nickel, lead), and (3) linked to industrial water use (e.g. mercury) (Philippe Crouzet will provide a list of pollutants)

19. The text should explain if and how the emissions in the direct discharges of raw sewage are recorded in the tables.

20. Include emission accounts example at river basin level (Marianne Eriksson will provide the example).

21. Table 4.4 may be misleading as it does not relate emission to the source. Text explaining this should be added to caution the use of such coefficients. Table 4.4 will be deleted.

22. Add text on data sources in section 5 - mentioning the difference between agricultural surplus and the volumes of water reaching water resources – and section 6 – mentioning as other sources (a) the EPER database at the EU level

(cautioning, however, that the information is not consistent with economic activity classification and that only emissions above a certain threshold are included -Philippe Crouzet will provide this text) and the World Bank's project NIPR which is the primary source for materials produced by the World Bank's Economics of Industrial Pollution Control Research Project. (Saeed Ordoubadi will provide more information on this project).

23. Add a paragraph on the emission by transport. Discuss the Netherlands example on how to redistribute the emission to the various sources. (Martine ten Ham)

24. Expand the part on environmental themes. (Martine ten Ham)

CHAPTER 5: Accounts for economic activities and products related to water and other transactions (UNSD)

25. Tables:

- Include hydropower as a water-related product throughout the monetary tables. The issue was raised of whether other services provided, for example by the water distribution network, should not be included as water-related products (e.g. Internet services may use the water infrastructure for the distribution of the services) but it was decided not to include them.

- Simplify Tables 5.1 and 5.2 by deleting the disaggregation of distributed water into drinking, non-drinking and distribution services. Describe in the text that according to countries condition, the value of the supply and use of water distribution could be separately calculated for different types of water (e.g. drinking and raw water).

- In Table 5.2 disaggregate actual final consumption by households into final consumption expenditures and social transfer in kind in order to make clear who is paying for water distribution and treatment (households or government).

- In Table 5.3 delete the distinction between market and non-market output as this would be mostly taken care of by the institutional dimension since government is commonly the sector that supplies services at insignificant prices.

- In Table 5.5 delete the distinction between market and non-market output. Delete the separate categories of EP services and adapted and connected products under intermediate consumption.

- Table 5.7 is not easy to follow. (Michael Vardon will try to simplify it).

26. Include text on the implementation of monetary accounts at the regional level. Mention issues in the implementation of the accounts at the regional level. (Marianne Eriksson and Michael Vardon will provide their country's examples)

27. Include text on the possibility of compiling asset accounts (in physical and monetary units) for hydraulic infrastructures in the SEEAW. Additional data

sources and data collection activities may be necessary to separately identify those assets in monetary terms already included in the standard national accounts as well as to obtain information on the physical characteristics of these structures (e.g. number, capacity, lifetime, etc.). The text should explicitly mention the relevance of these accounts in evaluating progress towards the MDG target 10 to halve, by 2015, the proportion of people without sustainable access to safe drinking water and sanitation, even though there may not be a direct link between these indicators and the stocks of hydraulic infrastructures.

28. Marianne Eriksson to provide text on how to calculate monetary tables for ISIC 41 and 90 when the activities of collection, purification and distribution of water are integrated with wastewater treatment activities.

29. Explain that ISIC 40 as well as other industries may distribute water as their secondary activity. In this case, it is important to separately identify these activities and care should be taken to coverage. Obtaining information on secondary activities can only be done through special surveys trying to be as comprehensive as possible.

30. It was recommended to show ancillary activities with the ISIC of the primary activity. Regrouping ancillary activities under the relevant ISIC group was not considered analytically relevant as this would disjoint the expenditures from the emissions.

31. Michael Vardon offered to improve the text on financing (Section D.2 of chapter 5).

32. All capital costs, including construction of dams, should be included in the pricing for water aimed at cost recovery. It was noted that there may be practical difficulties in allocating these costs in the case of multi-purpose dams.

33. Management costs should also be considered as part of the total cost of water distribution. No guidance is given at the international or national level of which costs to be included for obtaining full cost recovery (could be very broad or very narrow). Additional text to be written on trying to clarify the scope of the management cost to include (Glenn Marie Lange. Michael Vardon to provide example on the legal text on pricing in Australia to Glenn-Marie Lange).

34. Include a section on asset valuation within the SNA framework. Add the New Zealand case study as and example.

CHAPTER 6: Asset accounts (UNSD)

35. Add water in the atmosphere as a source of water (para 6.21).

36. Combine snow, ice and asset glaciers in one category in the asset classifications.

37. Although it was agreed not to change the current treatment of water in artificial reservoirs, it was considered important to mention in the handbook the on-going discussion of treating water in artificial reservoirs as a produced asset.

38. It was recommended that an issues paper describing the arguments for and against treating water in artificial reservoirs as a produced asset and the implications in the accounts be prepared. The handbook could mention that this discussion is in progress. (Micheal Vardon + UNSD)

39. Add some text in para 6.13 noting that the boundaries between the different categories in the asset classification, in particular between lakes and artificial reservoirs and rivers and lakes/reservoirs, may not be clear cut. It was noted that this problem is mostly a hydrological problem and does not have impact on the accounts. In cases where the separation between rivers and lake is not possible, one could introduce another category which would cover the "gray areas".

40. It was mentioned that in some countries it may be relevant to further classify the rivers on the basis of their periodicity (permanent vs. non-permanent). Classification on the basis of size was not considered important.

41. Mention in the text that some variables (e.g. actual evapo-transpiration, natural transfers between rivers and groundwater, etc.) can only be estimated through modeling and may be a rough approximation.

42. Move the concept of dependable water from para 6.35. The concept is general and does not apply only to rivers.

43. Add two indicators, developed yield and economically allocated water in Section E of this chapter (Michael Vardon will provide some text and tables on these indicators).

CHAPTER 7: Quality Accounts (Philippe Crouzet)

44. The chapter was considered very important; however, they are more experimental as compared to the accounts discussed in the previous chapters. The following issues were identified:

- Water quality accounts should address changes in water quality that are due to economic activities (abstraction, emissions and/or expenditures). At present, the quality accounts only describe, through a single index not internationally agreed, the quality of water resources. No link is made between the quality and the pressure exerted by the economy. Michael Vardon will initiate an electronic discussion on defining the boundary of water quality accounts and problems in allocating changes in quality to the economic activities causing them. The circulation list will include Philippe Crouzet, Christine Flachmann, Martin Lemire, Jean Michel Chéné, Jeremy Webb, Alessandra Alfieri, Ivo Havinga and Ilaria DiMatteo.

- The compilation of quality accounts is the result of modeling exercise which requires significant amount of detailed (spatially and temporally) disaggregated data. The existence of GIS was considered an important element in the compilation of these accounts.

CHAPTER 8: Valuation (Glenn-Marie Lange and UNSD)

45. Move text related to the link between water price and water value (water accounting vs. water economics) to Chapter 1.

46. It was recommended to strengthen the text which links the accounting valuation with economic valuation. (Glenn Marie Lange)

47. It was considered important to present the various economic valuation techniques and their consistency with the national accounts. It was also recognized that the implementation of the valuation techniques recommended in Chapter 8 is very costly and would not be applied at the macro-level but more as the sub-national level. (Glenn Marie Lange)

48. The chapter was considered too long and it was suggested to condense it. One option could be to present the examples together with the description of the valuation methods. (Glenn Marie Lange)

49. Chapter 8 was considered a useful chapter although not directly related to the core accounts, which are in line with the SNA.

50. It was decided that the parts of the chapter more closely related to national accounts would be moved in the relevant chapters (for example, the valuation of water used in hydropower generation would be moved to chapter 5). The rest of the chapter would be moved after the chapter on policy uses and applications. (Glenn Marie Lange and UNSD)

CHAPTER 9: Implementation of the accounts (UNSD)

51. Figure 9.1 should be revised to represent data flows for the accounts and links with indicators.

52. It was emphasized that the accounting framework should be used as a way to organize existing information and identifying data gaps. It was stressed that countries starting programs in environment statistics should be aware of the accounting framework and start data collection and compilation according to a standard set of classifications.

53. UNSD has carried out an analysis of the links between water accounts and water statistics collected by the UNSD/UNEP and OECD/Eurostat Questionnaires on Water Statistics. This analysis showed that the concepts and definitions used in Questionnaire are in general consistent with those in water accounts. Efforts are being made to align the UNSD/UNEP Questionnaire with the concepts and definitions used in water accounting.

54. It was suggested to expand the text explaining the step-by-step approach of the environmental accounting which can be compiled in different stages depending on the priority of countries. Some practical examples on which part of the accounts may be useful to what type of analysis or policy concern was considered useful.

55. Insert a diagram in section C which explains the cyclical process necessary in the compilation of water accounting which starts from the definition of objectives, the

establishment of priorities and ends up with the compilation of the accounts which in turn help to redefine the objectives and repeat the process. In addition, organizing the information according to the accounting framework would also be a more systematic way than a loose list of indicators to answer to users needs which tend to change over time. (Michael Vardon will provide the diagram)

56. More text should be added on the differences between definitions used in the questionnaires on water resources and the information necessary for the compilation of physical water accounts (the treatment of water used in hydropower generation and the collection of urban runoffs were mentioned as examples of the differences).

CHAPTER 10: Policy uses and applications (Glenn-Marie Lange)

57. Examples of policy uses and applications should be linked to the tables presented in the previous chapters and to the stages of development of the accounts.
58. In Figure 10.5 care should be taken in presenting per-capita figures. They may lead to misleading conclusions and do not take advantage of the value added of the water accounts.
59. Strengthen the text on using the accounts for scenario modeling for long-term impact of economic policies.
60. Make explicit reference in the text to de-coupling indicators.
61. Strengthen the text on the importance of I-O modeling.
62. Add Australia example of analytical uses of the accounts in addition to I-O modeling. (Michael Vardon will provide some text)
63. Include indicator of water Indicator of water-re-use intensity as defined by Margat. (Jean Michel Chéné will provide more info regarding this indicator, Glenn Marie Lange will incorporate in the text)
64. Denmark, the Netherlands, Australia, Sweden and Germany will provide time series of indicators derived from the accounts to be included in this chapter.
65. Analysis of the accounts at river basin level should be included in the chapter. (Marianne Eriksson and Christine Flachmann will provide countries' example)
66. Marianne Eriksson and Christine Flachmann will provide text and data forecast of water use at river basin level.
67. Add more text on the MDGs related to water. (Glenn Marie Lange)
68. Include more text on the Water Framework Directive (Philippe Crouzet will provide the text)
69. Include some text and example of uses of quality accounts. (Philippe will provide text).
70. Finalize Table 10.11 (UNSD will ask to Jean Luis Weber)
71. Revise table 10.12 (Jean Michel Chéné)

72. Section F to be moved in the Annex since it is a recap of what was already presented in previous chapters. (Glenn Marie Lange)

C. List of contributions by participant

Tasks	
Editorial comments Country case studies to be posted on the UNSD website	All
Draft and circulate Chapter 1 Insert changes in and include contribution on Chapters 2-6, 9 Contact Eurostat on the set of standard tables	UNSD
Text on the scope of management costs for pricing water (Chapter 5 or 10) Revise Chapter 8 in cooperation with UNSD Revise Chapter 10	Glenn Marie Lange
Example on emission accounts at river-basin level (Chapter 4) Modification of emission accounts tables and data for the numerical example of these tables in cooperation with Christine (Chapter 4) Example on how to disaggregate in the SUT ISIC 41 and 90 when the activities are integrated (Chapter 5) Example on regional monetary accounts (Chapter 5) Comments on the links between the water physical SUTs and the Questionnaires (Chapter 9) Environmental-economic profile – time series and text on their analysis (Chapter 10) Text and indicators on the accounting catchment (Chapter 10) Text on model used to forecast water use at the river-basin level (Chapter 10)	Marianne Eriksson
Example of physical accounts at river basin level in Australia (chapter 3) Example on regional monetary accounts in Australia (Chapter 5) Improve text of the Section on Financing (including simplifying Table 5.7) (Chapter 5) Some text on the requirement on pricing in Australia (Chapter 5) Issues paper on water in artificial reservoirs as a produced asset Initiate the electronic discussion on the boundary of water quality accounts and links with the economy (Chapter 7) Diagram on the cyclical process of implementation of the accounts (Chapter 9) Text and tables on developed yield and economically allocated water indicators (Chapter 6 and maybe 10) Environmental-economic profile – time series (Chapter10) Text on modeling approaches additional to I-O (Chapter 10)	Michael Vardon

Text on NAMWA for a box (Chapter 2) Text on treatment of mobile source equipment (Chapter 4) Text on environmental themes (Chapter 4) Water accounts and environmental-economic profile – time series (Chapter10)	Martine ten Ham
Inform the London Group on the status of the handbook	Martin Lemire
Example of PSUT from Germany (more recent) (chapter 3 and 10) Modification of tables in Chapter 4 (in cooperation with Marianne) Text and indicators by laenders (Chapter 10) Water accounts and environmental-economic profile – time series (Chapter10)	Christine Flachmann
List of pollutants (Chapter 4) Text for the section of data sources and methods in particular part 5 and 6 of section E (Chapter 4) Text and examples on quality accounts (Chapter 10) Water accounts and environmental-economic profile – time series for France (Chapter10) Text on WFD (Chapter10)	Philippe Crouzet
Data for the SEEAW data set in the format of existing tables Water accounts and environmental-economic profile – time series (Chapter10)	Thomas Olsen
Include World Bank study on emission by industry (NIPR)	Saeed Ordoubadi
Indicator on effective water use (Chapter 6 and maybe 10) Revise Figure 9.1 (Chapter 9) Revise figures in table 10.12 (Chapter 10)	Jean Michel Chéné

D. Agenda

Meeting of the Sub-group of the London Group on Water Accounting
New York, 11-13 May 2005

Wednesday, 11 May

10:00 – 10:15	Opening (United Nations Statistics Division)
10:15 – 11:00	Introduction of participants and organization of the meeting Objectives and organization of the meeting
11:00 – 11:30	Break
11:30 – 1:00	Chapter 2- Water Accounting framework Presentation of the chapter and issues (presenter: UNSD) Open discussion Conclusions
1:00 - 2:00	Lunch break
2:00 – 3:30	Chapter 3 – Physical Supply and Use tables Presentation of the chapter and issues (Thomas Olsen, Denmark) Open discussion Conclusions
3:30 - 4:00	Break
4:00 – 5:30	Chapter 4 – Emission Accounts Presentation of the chapter and issues (UNSD) Open discussion Conclusions

Thursday, 12 May

9:30 – 11:00	Chapter 5 – Accounts for economic activities and products related to water Presentation of the chapter and issues (UNSD) Open discussion Conclusions
11:00 – 11:30	Break
11:30 - 1:00	Chapter 6 – Asset Accounts Presentation of the chapter and issues (Martine Lemire, Canada) Open discussion Conclusions
1:00- 2:00	Lunch break
2:00-3:30	Chapter 7 – Quality Accounts Presentation of the chapter and issues (Philippe Crouzet, EEA) Open discussion Conclusions
3:30- 4:00	Break
4:00 – 5:30	Chapter 8 – Valuation Presentation of the chapter and issues (Glenn-Marie Lange, USA)

Open discussion
Conclusions

Friday, 13 May

9:30 – 11:00	Chapter 10 – Policy Uses and Applications
	Presentation of the chapter and issues (Glenn-Marie Lange, USA)
	Open discussion
	Conclusions
11:00 – 11:30	Break
11:30 - 1:00	Chapter 9 – Implementation of water accounts
	Presentation of the chapter and issues (UNSD/ Jean-Michel Chene)
	Open discussion
	Conclusions
1:00- 2:00	Lunch break
2:00 – 3:00	Future direction
3:00 – 4:00	Conclusion of the meeting

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Appendix 2

TREATMENT OF LOSSES IN DISTRIBUTION IN THE SEEAW

1. The objective of this note is to clarify the different options for recording losses in distribution in water accounting in order to reach an agreement. At the end of this note some questions will be asked to the Group. You are also invited to provide any additional comments you may have.

2. This note focuses on losses in distribution. It also marginally address issues related to the treatment of *illegal tapping* in the distribution network has been raised during the meeting in New York and has not been addresses in the current version of the handbook.

3. In this note it is assumed that *illegal tapping* is a subcategory of *losses in distribution.* In addition, *losses in distribution* are split in:

(a) *losses in distribution* because of leakages which are recorded as a return flow to the water resource system;

(b) *losses in distribution* because of factors other than leakages (evaporation, illegal tapping etc.) which are recorded as part of *water consumption*. This is because in this case water is lost or otherwise removed from the water resource system.

Independently on the treatment of illegal tapping in water accounting, the considerations below on water losses in distribution remain valid.

1. Definition of *losses in distribution*

4. Losses during distribution are defined as

> "Volume of water lost during transport (through leakage or evaporation) between a point of abstraction and a point of use, or between points of use and reuse." (OECD/Eurostat Questionnaire)

5. Losses in distribution though evaporation generally occur in the case of distribution through open channels (e.g. agriculture). When water is distributed through pipes, losses in distribution occur primarily because of leakages.

6. Note, however, that losses in distribution which are the difference between the water supplied and water delivered, may be the results also of other factors including illegal tapping, malfunctioning metering, etc.

7. The definition of water losses during distribution may have to be changed to reflect the other factors affecting the distribution water as follows:

> "Volume of water lost during transport between a point of abstraction and a point of use, or between points of use and reuse. Losses in distribution may be caused by leakages, evaporation, illegal tapping, malfunctioning metering etc."

2. Recording of *losses in distribution* in the SEEAW (Option 1)

8. The SEEA and SEEAW have considered losses in distribution due to leakages and evaporation exclusively. The treatment of losses during distribution is the following:

- The supply and use of water within the economy are recorded NET of losses in distribution;

- The part of the losses caused by leakages is recorded as return flow to the environment in the supply table, while the rest is included in water consumption. Losses in distribution are allocated to the supplier of water.

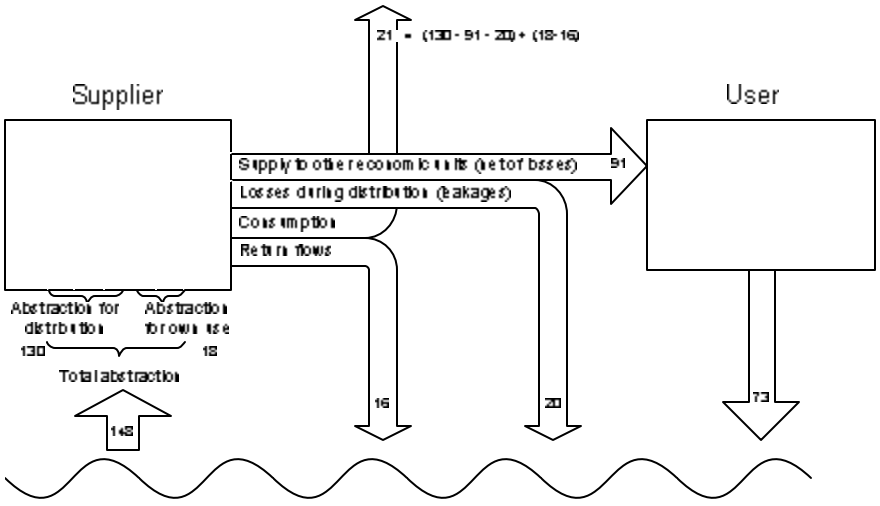
9. Figure 1 presents schematically how the losses are recorded in the SEEAW. For sake of simplicity, there are only two industries: a water supplier and a water user. A number, representing the volumes of water involved, is associated to each flow to better follow the description of these flows in the supply and use tables in Table 1.

10. The supplier abstracts a total of 148 m^3 of water of which 130 are for distribution and 18 are for own use (cleaning pipes, etc.).

16 of the 18 m^3 of water abstracted for own use are discharged into the environment after use and the rest is assumed to be consumed.

91 of the 130 m^3 of water abstracted for distribution are actually delivered to the user, the rest, namely 39 m^3, is lost in distribution. In the example, it is assumed that 20 m^3 are lost because of leakages (hence recorded as a return into water resources) and the rest, 19 m^3 of water are assumed to evaporate or otherwise be removed from the water system, hence they are recorded as *water consumption*.

Figure 1:



11. Table 1 shows how the situation above would be recorded in the supply and use tables in the SEEAW (note that the supplier is identified in the table as ISIC 41).

Table 1: Physical SUT (net supply)

Use table

		ISIC		
		ISIC (user)	ISIC 41 (supplier)	Total
From the environment	U1 - Total Abstraction:		148	148
	Abstraction for own use		18	18
	Abstraction for distribution		130	130
Within the economy	U2 - Use of water received from other economic units	91	0	91
U=U1+U2 - **Total use of water**		91	148	239

Supply table

		ISIC		
		ISIC (user)	ISIC 41 (supplier)	Total
Within the economy	S1 - Supply of water to other economic units	0	91	91
From the economy	S2 - Total returns	73	36	109
	Losses in distribution (leakages)		20	20
	Other returns		16	16
S=S1+S2 - **Total supply of water**		73	127	200
Consumption (= U - S)		18	21	39
Of which: Losses in distribution (evaporation, Illegal tapping, etc.)			19	19

12. Note that *abstraction for distribution* is considered as the gross water supply of ISIC 41. Similarly, losses in distribution (including those due to leakages, evaporation and other factors) could be obtained from the tables as a difference between abstraction for distribution and supply to other economic units:

$$\text{Losses during distribution} = \text{Abstraction for distribution} - \text{Supply to other economic units} = 130 - 91 = 39$$

13. An indicator of efficiency of the distribution network could be calculated as:

$$\frac{\text{Supply of water to other economic units}}{\text{Abstraction for distribution}} = \frac{91}{130} = 0.7$$

14. Note that *illegal tapping, broken metering system* and so on are considered here as part of consumption as they are not returned to water resources (if we decide to keep this approach, the definition of consumption should explicitly include these cases).

3. Alternative recording of *losses in distribution* (Option 2)

15. The alternative approach to recording the losses in distribution is the following:

- The supply and use of water within the economy are recorded GROSS of losses in distribution;
- These losses are allocated to the supplier of water and recorded first as a use (within the economy) by the supplying industry and then as a return flow to the environment by the same industry;

16. Figure 2 shows the same example as presented in Figure 1 with the alternative recording of the losses in distribution. Similarly, Table 2 shows how the supply and use tables would change under this approach.

Figure 2

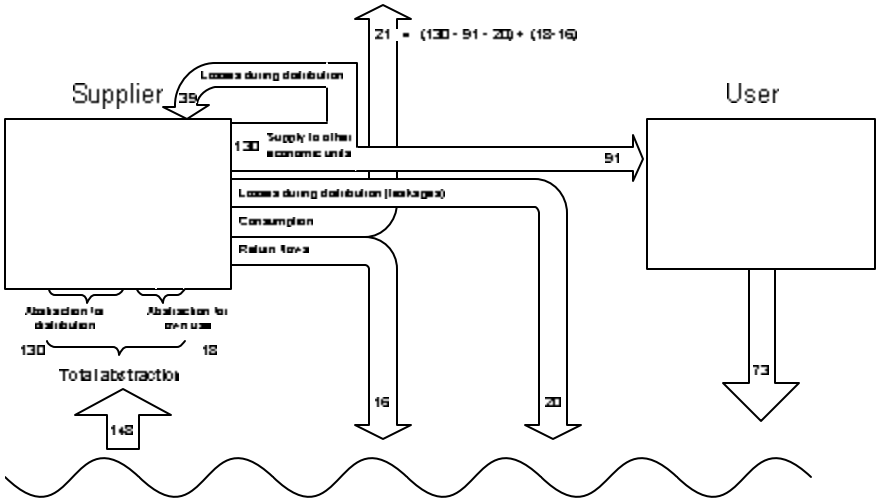


Table 2: Physical SUT's (gross supply)

Use table

		ISIC		
		ISIC (user)	ISIC 41 (supplier)	Total
From the environment	U1 Total Abstraction:		148	148
	Abstraction for own use		18	18
	Abstraction for distribution		130	130
Within the economy	U2 - Use of water received from other economic units	91	39*	130
	Of which losses in distribution		39	39
U=U1+U2 - **Total use of water**		91	187	280

Supply table

		ISIC		
		ISIC (user)	ISIC 41 (supplier)	Total
Within the economy	S1 - Supply of water to other economic units	0	130	130
	Of which losses in distribution		39	39
From the economy	S2 - Total returns	73	36	109
	Losses in distribution (leakages)		20	20
	Other returns		16	16
S=S1+S2 - **Total supply of water**		73	166	239
Consumption (U-S)		18	21	39
Of which: Losses in distribution (evaporation, Illegal tapping, etc.)			19	19

* this cells corresponds to the losses in distribution

Grey cells are those which differs from the corresponding cells of Table 1

4. Conclusions on Losses in distribution

17. The two options for the recording of losses in distribution do not produce contradicting results in the sense that there is no loss of information using the two methods and indicators on efficiency of the distribution network can be derived in both cases.

18. The advantage of using Option 1 is that the net supply of water within the economy (net of losses in distribution) reflects more closely the monetary SUT's as ISIC 41 does not actually receive a payment for water lost in distribution (even though it has costs associated with it) while for the other industries the monetary tables reflects these payments.

19. In addition, recording losses in distribution as a use within the economy of ISIC 41 (under Option 2) would conceptually correspond to considering losses in distribution as an input into the production process (intermediate consumption) which is not the case: rather than an input into production, losses in distribution are the result of a production process.

5. Some issues related to *illegal tapping*

20. Illegal tapping from the distribution networks may often be a significant problem in some countries. It not only affects the efficiency of water distribution network but at times could cause major problems within the system and also cause contaminants to be sucked into water mains via back-siphonage.

21. Currently, the handbook does not explicitly address the issue of how to record illegal tapping. When illegal tapping occurs, it is important to have it explicitly recorded in the tables. There seem to be two options in recording this quantity:

Option 1: Record illegal tapping as a part of water consumption (see previous tables)

Advantages: The link with the monetary tables is kept as the water use is related to the (direct and indirect) payments made for it.

Disadvantages: Recording illegal tapping simply as part of water consumption would not provide information on the units responsible for illegally connecting to the distribution network. Supplementary tables would be necessary to show this information when available.

Option 2: Record illegal tapping as a use of water within the economy (thus part of the core tables)

Advantages: ??

Disadvantages: (a) Information on the type of (illegal) water user has to be available in order to allocate the illegal tapping to a user (which generally corresponds to households). (b) Under this option, the returns of water illegally received have also to be estimated in order to follow the complete cycle of water from abstraction to return flow. (c) The link with the monetary tables is not as direct as under option 1:

Questions:

A) Does the Group agree with the new definition of losses in distribution in paragraph 7?

B) Which option does the Group prefer for the recording of losses in distribution: option 1 or 2?

C) What is the opinion of the Group with regard to the treatment of illegal tapping?

- Should it be recorded as consumption?
- Should it be allocated to the users in supplementary tables (as described in option 1, section 5)? Or in the core tables (as described in option 2, section 5)?