Expected Table of Contents

* Note that chapters should start with concluding and opening paragraphs

Front Cover (little child in river with flow meter - send photo)

Preface (formation of group) (1 page Taikan)

Chapter 0 Executive Summary (about 2 pages Stewart and Taikan)

Translation into Japanese (Taikan), German (Wolfgang) and French (Harouna, Pierre), Spanish (Kate), Russian (Jeanna) And Chinese (Fu)

Chapter I Introduction (Kate)

- This chapter will include text on the uniqueness of hydrology and links to societal demands (Integrator).
- Short paragraph of overview of the entire book.
- Mission Statement

Chapter II Rationale (Johan, Kate) ***30 pages***

- Motivation such as world water crisis, urbanization trends, globalization, food production, climate variability, extremes
- Hydrology, IWRM, SD (Johan's sections 1 – 5) as it provides rationale and motivation

Chapter III World Water Resources, Water Use and Water Management (Jeanna)

Taikan's section 1.2 and 1.2 Water on Earth and Components of the Water Cycle (5 pages)

- Why global view of hydrological cycle is relevant
  - o Foundation for understanding on water resources
    - How much water is available?
    - Awareness of teleconnection, global change, etc.
  - o Indices of uncertainties in our understanding of the nature
  - o Sharing information among nations

Jeannas (20 pages)

I World water resources: areal distribution and dynamics in time
- o water resources of natural-economic regions of the world
- o water resources of the continents
- o water resources in the different countries

II Modern tendencies of water resources use in the world

III Prediction of water use in the future
  - main factors and indicators of water use
  - water use scenarios

IV Water resources and water use
  - load on water resources in the world
  - water availability, water resources deficit

V Key issues for the future
  - measures to increase the available water resources in the stress regions
  - innovated technological projects to reduce water demands in different kind of economic
  - Groundwater

Taikan's virtual water trade and world water resources (3 pages)

- Applying the knowledge of global hydrological cycle for world water resources assessment
  - Inter-annual variability and the capacity of water storage per person
  - Virtual water and world water resources assessment

Fu's work on water resources management (scales down from global to regional scale). (10 pages)

- Hydrology for Better Water Resources Management (Fu)
- Global water resources issues and activities
- Fu's work describes rationale for researching hydrological processes more closely and answering fundamental questions that haven't been answered yet.

Flooding (Fu) half page
Droughts (Stewart) half page
Land degradation (Harouna) half page
Ecosystem services (Kate and Johan) half page

Chapter IV Contemporary Issues in State of the Art (Stewart)

The Hydrological System: Processes and Concepts (Susan, Stefan - 5 pages)

- Figure and highlights of W.Quantity, W. Quality and Biogeochemical Hydrology)….few key references
- System concept, holism, integration
- What we recognize as important
  - heterogeneity are importance and accepted concepts
  - scaling
  - feedback mechanisms
  - space-time patterns and variability
  - biogeosciences
  - regionalization
  - integration/assimilation
  - non-linear processes (part of feedback)

Measurement

List techniques and technologies that are new and innovative and can help to solve some of our problems (perhaps in the future) and then describe examples (ie.for Precipitation, ET/ Interception..Losses, Surface Runoff , Soil moisture , RS), Vadose Zone, Groundwater, Snow and Ice (RS), Erosion – Water Quality) how they are used. (Caterina to lead

RS (Satellite), Novel Point Sensors, Hydrogeophysics, network sensors, Geodesy (GPS), HydroGIS, Radar (remote, insitu) (etc.), Eddy flux correlation measurement techniques, tracer type for sediment yield (Harouna) (10 pages)

Water Quantity and Quality Fluxes

Modelling and Prediction (20 pages)

- Propogation of uncertainty (Stewart, Stefan)
- Disaggregation of uncertainty in sources
- Data Integration/Assimilation
- Model Augmentation
- Numerical Implementation
- Regionalization
- Calibration and Verification
- Global Hydrological Modelling: (Taikan)
- Estimates of global hydrological cycles
    - Statistics
        - Physically based conceptual/empirical models, e.g., Budyko, Baumgartner, etc.
    - Model estimates
        - Global data sets, 4DDA, remote sensing for forcing/parameter sets
        - Model/computer capabilities
    - Latest estimate for example:
        - Water flux is relevant for water resources. Water storage is related to the stabilization (link to water security) of hydrological variability, and for probably water quality.
- Global Climate Modelling (“Integrating” models intended for different scales) (Stewart)
- Flood forecasting (Caterina)
- Operational modeling (Caterina)
- Incorporating socio-economic modeling (Agent, Universal Models) (Stewart)

Chapter V Intersection of Hydrology and Other Disciplines (Kate)

Examples of Hydrology integrated with other disciplines. Examples of the need for an integrative approach.

- Global Change and hydrological cycles (Taikan, Stewart, 5 pages)
    - Global Land use change
    - Climate change: future global hydrologic cycle and water balance, and their variability, natural and human induced.
    - Direct human interventions:
        - Reservoirs
        - Water withdrawals
        - Water pollution
    - Messages to be presented:
        - Hydrological cycle is variable and water resources depend on flux/flow.
        - Real hydrological cycle is far from natural.

- Urban Systems (Caterina, Kate – 5 pages)
    - Water quality in stormwater ponds
    - Water recycling
    - Small scale modeling
    - Cold climate issues, flooding
    - Rain water tanks
    - Water supply – Developing Countries
    - Water sensitive urban design
    - Wastewater issues – implications for water quality guidelines
    - Increasing urbanization issues
- Agriculture (FAO Report, local and regional, Johan, Kate and Susan – proposal text – 1 page)
- Eco-hydrology (definition) (Kate – 3 pages)
    - Environmental flows
    - Rehabilitation, restoration
    - Habitat Susceptibility (lake levels)
    - Guidelines, policy motivating involvement by hydrologists
    - Gaps between ecologists and hydrologists

Chapter VI Scientific and societal obstacles, gaps, bottlenecks, Social demands, future technologies (Susan – 10 pages)

Society associated bottlenecks can be "solved" by improving hydrological statement.

Scientific	**Technological/Practical**	**Organizational Capacity and Communications**
• Incomplete understanding of hydrological processes • Vadose Zone • Links with other spheres of the earth system. • Interaction and fluxes between boundary • Feedback mechanisms • Develop realistic representations of coupled phenomenon • Data integration • Scaling • Predictive inability (uncertainty) • Modelling (approaches) • Rigorous comparison between models • How we evaluate models.	• Inexpensive access to data (Long term commitments to establishing and maintaining monitoring networks; inexpensive or free accesss to hydrological data ** Resolution 40). • Measurement technologies (macro-nanosensors, RS, calibration evaluation standards, river discharge). • Database (lack of worldwide information…) • Water management (RT forecasting, operational forecasting relying less on intuitive feel). • Computer literacy (skills in computer programming) and balance in application of computer technology for hydrological research.	• How can we better integrate science in decision making. • How do we facilitate hydrology-community consensus about hydrology research directions. • Make tools more widely available • The establishment of a large governing body or extension of current bodies that deal with water policy, coordinated research management, archiving, etc., education outreach, public awareness, technology transfer*** National coordinating mechanism. • Information and application dissemination of scientific results. • Build capacity in developing countries. • Hydrological education is too fragmented (compartimentalized) for both students and those applying it. • Water management (dynamic interaction characterization, stakeholders) • Research not being

		guided by community (Pitfalls of over-marketing: sensationalism) • Democracy – risk capital

- Future and Vision, incl. timeline and road map (led by Caterina – 5 pages)

Chapter VII Conclusion: Key messages, Recommendations, Concluding remarks (Stefan)

- Individual hydrologists/water related scientists and engineers
- Policy makers/decisionmakers/NGO's
- Funding bodies/research agencies
- Science associations

References (Pierre)

Appendix (Fu)
Previous report and Photos