

出席 2011 海岸地區海陸交互作用 (LOICZ) 公開科學大會
返國報告

服務機關：行政院環境保護署

姓名職稱：邱政務副署長文彥

派赴國家：中國大陸 (烟台)

出國時間：100 年 9 月 11 日至 9 月 16 日

報告日期：100 年 10 月 6 日

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開幕典禮



圖一、開幕典禮貴賓致詞 (由左至右)

1. Ping Shi (施平), Director of Yantai Institute of Coastal Zone Research (pshi@yic.as.cn)
2. Weimin Fan (范蔚茗), Director of Bureau for Resources & Environment, CAS, Xiuqing Yang, Deputy Mayor of Yantai City
3. Xiuqing Yang (Deputy Mayor of Tantai City)
4. Alice Newton, LOICZ Chairperson (葡萄牙)
5. Deliang Chen (陳德亮), Executive Director, International Council of Scientific Unions (ICSU)
6. Franciscus Colijn, Helmholtz-Zentrum Geesthacht (德國)
7. Hartwig Kremer, LOICZ CEO (德國)

一、背景說明

LOICZ (Land Ocean Interactions in the Coastal Zone) 譯為「海岸地區海陸交互作用」，是「國際地圈生物圈計畫(International Geosphere-Biosphere Programme, IGBP) 與「全球環境變遷國際人文面向計畫 (International Human Dimensions Programme on Global Environmental Change, IHDP) 共同規劃推動的核心計畫，主要是研究全球變遷及人類活動對於海岸帶的生態與環境的影響與衝擊。LOICZ 網頁在 <http://www.loicz.org/>, IGBP 網頁在 <http://www.igbp.kva.se/>, IHDP 網頁在 www.ihdp.orgdk3ej/可供參考。

LOICZ 為 IGBP 於 1990 年成立之第六個核心計畫。其目的在由地區性及全球性之觀點來探討地球上海、陸、空 (大氣) 相交之海岸地區動力交互作用之性質，其外在營力所引起之改變對人類福祉之影響等，以達未來海岸地區最適當之經營管理及永續利用之目的。其他已通過或執行中之 IGBP 核心計畫為 BAHC, GCTE, IGAC, JGOFS, PAGES, LUCC 及 GLOBEC (Global Ocean Ecosystem Dynamics). LOICZ 與其他計劃間聯繫及整合之工作則另有 IGBP-DIS (Data and Information System)、GAIM (Global Analysis, Interpretation and Modeling 工作小組)、及 START (System for Analysis Research & Training) 等三個組織於 1993 年 5 月於美國 Raleigh 召開第一次開放科學會議 (OSC)，提出其科學計畫書 (我國係由 IGBP 委員會指派邵廣昭及施學銘兩位出席)，並於當年 11 月於荷蘭之 Netherland Institute for Sea Research 成立 Core Project Office。歷經數次會議，於 1994 年 9 月完成 Implementation Plan 初稿，經各國專家審訂後，於澳洲之 IGBP 科學會議中正式提出，並正式出版發行 (IGBP Report No.33)。邵廣昭、陳章波、謝蕙蓮、施學銘、陸雲、洪佳章教授等曾出席菲律賓馬尼拉奎松市菲律賓大學所召開之 LOICZ 第二次開放科學會議。該次會議正式對各國說明 LOICZ 的落實計畫 (Implementation Plan)，並研商未來具體推動之策略與方法。

目前全球已有 44 國正式或非正式地成立各該國之 IGBP 國家委員會，參與此一國際性學術活動。我國中山大學教授陳鎮東現任 IGBP 副主席。而我國之 LOICZ 係屬於 IGBP 委員會下之一非正式之 Subcommittee (對外則為正式之 National Committee)，目前暫由 IGBP 委員邵廣昭代表。國內 LOICZ 工作曾在國科會環發會資助下於曾文溪河口海岸地區先行展開 LOICZ 之國內整合研究計畫。

整體而言，海岸地區海陸交互作用計畫 (LOICZ) 是為了探討海水面上漲對海岸地區的衝擊，「海岸地區海陸交互作用」(Land-Ocean Interaction in the Coastal

Zone, LOICZ) 於 1993 年正式列入 IGBP 的核心計劃。LOICZ 的總目標是：對海陸交互作用的動態行為發展出具有預測性的瞭解，進而探究全球變遷中海岸地帶的反應及因應之道。

LOICZ 成立之初有四個研究重點：

- (1) 海陸之間物質與能量的交換；
- (2) 碳通量及微量氣體的排放；
- (3) 海平面升降的影響；
- (4) 海岸地帶變遷的人文面向。

另根據 LOICZ 規劃之研究進度 (1996-2004)，計畫之落實可分為三期：

第一期 (1996~1999)：重點在於收集資料及初步發展模式。

第二期 (1999~2002)：發展與驗證區域模式。

第三期 (2002~2004)：整合全球資料及全球性模式的建立。

在 2004 後，LOICZ 在歷經十年的推動後，為配合 IGBP 進入新的階段與 ICSU 成立新的地球系統科學夥伴計畫 (Earth System Science Partnerships, ESSP；整合 WCPR, IGBP, IHDP 與 DIVERSITA 之橫向計畫)，並冀望能與著重人文社會面向的 IHDP 有更緊密的互動，LOICZ 在轉型期中(2003-2005)重新規劃了第二階段(2006-2015)的研究重點與五項主題：

- (1) 海岸系統的脆弱性與對人類社會的可能危害(Vulnerability of coastal systems and hazards to human societies)
- (2) 全球變遷與陸海使用對海岸帶發展的影響 (Implications of global change and land and sea use on coastal development)
- (3) 人為活動對河川流域與海岸帶交互作用的影響 (Anthropogenic influences on the river basin and coastal zone interactions)
- (4) 海岸與陸棚帶物質的傳輸與流向(Fate and transformation of materials in coastal and shelf waters)
- (5) 透過治理陸海交互作用邁向永續的海岸系統(Towards coastal system sustainability by managing land-ocean interactions)

同時，新階段的 LOICZ 將著重在四個熱點陸海系統：極區海岸 (arctic coast)、小島系統 (small island)、河口域 (estuary and coast)與海岸巨型都市(megacity and coast)。

我國曾於 1994 年開始推動 LOICZ，首先以曾文溪口海岸帶為範圍，針對區域內七股潟湖進行建構模式之整合研究 (1994-1999)，係少數於 LOICZ 初期即以群體計畫推動參與的國家；此期間，我國 LOICZ 計畫發表了國際間第一個亞熱帶海岸潟湖之生態系模式，成果甚受注目。之後接續在高屏海域進行第二階段人為影響評估與生態系經營管理研究 (1999-2004)，以大鵬灣內蚵架移除前後之生態環境對比，探討復育之成效。這兩項主題研究案，無論是內容或成果均符合 LOICZ 初期之精神與目標，對區域模式的發展、驗證與全球資料整合上均有相當之貢獻，可惜相關研究在 2004 後已經中斷停止。

二、會議情形

出席 2011 海岸地區海陸交互作用 (LOICZ) 公開科學大會行程及議程如下：

- 9 月 11 日 台北—上海—山東烟台 (去程)
- 9 月 12 日 烟台國際研討會
- 9 月 13 日 烟台國際研討會/巨型都市專題研討會
- 9 月 14 日 烟台國際研討會/巨型都市專題研討會
- 9 月 15 日 參觀中國科學院烟台海岸帶研究所
- 9 月 16 日 山東烟台—上海—桃園 (返程)

此次會議共計有 20 餘國三百餘位代表出席。大陸則由中國科學院烟台海岸帶研究所承辦。我方有若干大學教授自行報名參加 LOICZ OSC 會議，同時出席 IGBP-LOICZ 合辦「巨型都市及海岸 (Megacities and the Coast)」專題會議的學者專家共有五位，包括行政院環境保護署副署長邱文彥、中國文化大學地學研究所所王鑫、國立台灣大學海洋研究所劉倬騰、中研院生物多樣性中心陳宣汶及彰化環保聯盟蔡嘉揚。其中，蔡嘉揚博士由中山大學邀請參加並負擔其經費，其餘由 IGBP 邀請和資助。大會會場位於烟台市東方海天酒店(烟台財金培訓中心)。會議主席為 LOICZ—SSC 科學執行委員會主席 Alice Newton。

1. 會議時間：12-15 September 2011, Yantai, China
2. 會議名稱：LOICZ OSC 2011 “Coastal Systems, Global Change and Sustainability
3. 會議目的： 集合國際間海岸帶研究學者與使用者，探討陸海交互作用及其變遷之議題以期能建立一跨領域之社群，激發新的研究架構與理論，建立新概念與落實能力，並能實地應用科學成果。LOICZ 開放科學會議旨在整合不同的領域與學科，對海岸帶治理政策的擬定與落實能產生新的見解。同時進行的青年 LOICZ 論壇，則針對正在起步的年輕學者提供完善的訓練課程與機會，更進一步了解海岸系統變遷的原因、形塑他們在未來的海岸治理上的專業角色。
4. 平行論壇：青年 LOICZ 論壇 Young LOICZ Forum
5. 會議範疇
 - (1) 綜合 LOICZ 已往研究
 - (2) 規劃未來
 - (3) 亞洲區域討論
6. 會議架構
 - Track A：社會－生態系統與尺度 Socio-Ecological systems and Scales
 - Track B：生物地球化學 Fluxes and Biogeochemistry
 - Track C：海岸脆弱度與治理 Coastal Vulnerability and Governance
 - Track D：個案研究與方法應用 Case Studies and Method Applications
7. 開幕式及專題演講
 - (1) Prof. Deliang CHEN (陳德亮), ICSU Executive Director
Visioning: Towards a new initiative on Earth system research for global sustainability.
 - (2) Alice Newton
A Vision Towards Coastal Sustainability.



圖二、LOICZ 主席 Alice Newton 於開幕致詞中特別感謝我國政府
(Government of Taiwan) 資助經費

(3) Jilan Su (蘇紀蘭院士)

Ecosystem Issues Facing Sustainable Development of China's Ocean and Coasts.

(4) Franciscus Colijn

Sea Use Change: Challenges for German Marine Science.

(5) James P.M. Syvitski

The Anthropocene: Are We There Yet?

8. 分組論文發表

A：社會－生態系統與尺度 Socio-Ecological Systems and Scales

- (1) 聯結海岸及海洋社會－生態系統區域動力(dynamics)與全球可持續性；
- (2) 極地海岸作用，人與社會；
- (3) 變遷中的海岸地帶土地利用：現在與未來；
- (4) 小島發展狀況(熱點)；
- (5) 與 C1 合併；
- (6) 生態系貨品與服務以及環境經濟；
- (7) 海岸及海洋部門：管理變遷。

B：生物地球化學 Fluxes and Biogeochemistry

- (1) 海岸水域及集水區的營養鹽收支；
- (2) 集水區—河口：自然與人類的交互作用(熱點)；
- (3) 觀察、監測與建模；
- (4) 河口與海岸的生態水文(熱點)；
- (5) 優養化與藻害；
- (6) 海岸生化循環與氣候變遷。

C：海岸脆弱度與治理 Coastal Vulnerability and Governance

- (1) 海岸與海洋規劃與治理；
- (2) 海岸地帶的大都市與 resilience (熱點)；
- (3) 海岸災害、脆弱度與調適；
- (4) 整合科學與政策。

D：個案與方法應用

- (1) 海岸地帶以及高度利用地區的植物多樣性；
- (2) 海岸生態系長期變化與穩定度的個案；
- (3) 從微生物角度看海岸生態環境；
- (4) 應用遙測追蹤海岸地帶環境變化；
- (5) 應用同位素追蹤陸向海的污染源；
- (6) 大河三角洲與河口前緣的極端氣候與碳的生地球物化學；
- (7) 河口與沿岸海域：相互作用、交界帶與氣候。

第一天 開幕式及專題演講之後，依 LOICZ 四個會議架構 (Track A to 4：分組)之順序分 session 討論。

9. 壁報發表 (議程)

Sunday 11 Sep. 2011	Monday 12 Sep. 2011					Tuesday 13 Sep. 2011					Wednesday 14 Sep. 2011					Thursday 15 Sep. 2011																																																																
	07:30-8:30 Registration					08:30-12:30					08:30-12:30					10:20-10:40 Tea break					10:30-10:50 Tea break																																																											
	Room Shanghai					Room Shanghai	Room Yantai	Room HongKong	Room Dalian	Room Qingdao	Room Shanghai	Room Yantai	Room HongKong	Room Dalian	Room Qingdao	Room Shanghai																																																																
	8:30-12:30 Opening Ceremony and Plenary Presentations					B3: Observation, Monitoring and Modeling					C4: Bridging the Science-policy Gap					A4: Small Island Developing States					D2: Case Studies of long term Change or Stability in Coastal Ecosystems					D7: Estuaries and Coastal Seas: Interactions, Front and Climate					C3: Coastal Hazards, Vulnerability and Adaptation					B2: Catchment-Estuary - Nature and Human Interaction					B6: Coastal Biogeochemical Cycles and Climate Change					A6: Ecosystem Goods and Services and Environmental Economics					B5: Eutrophication, Hypoxia and Algal Blooms					Concluding Plenary Session																								
						12:30-13:30 Lunch					12:30-13:30 Lunch					12:30-13:30 Lunch					12:30-13:30 Lunch					08:30-9:30 Rapporteurs of LOICZ Synthesis Sessions																																																						
						13:30-18:30 max					13:30-18:30 max					13:30-18:30 max					13:30-18:30 max					09:30-10:30 Rapporteurs of Track A-D Sessions																																																						
						15:20-15:40 Tea break					15:20-15:40 Tea break					15:20-15:40 Tea break					15:20-15:40 Tea break					10:50-12:05 Rapporteurs of Hotspots																																																						
						Room Shanghai	Room Yantai	Room HongKong	Room Dalian	Room Qingdao	Room Shanghai	Room Yantai	Room HongKong	Room Dalian	Room Qingdao	Room Shanghai	Room Yantai	Room HongKong	Room Dalian	Room Qingdao	12:05-12:20 Rapporteurs of Megacities-Workshop (IGBP Synthesis)																																																											
	A1: Linking Regional Dynamics in Coastal and Marine Social-ecological Systems to Global Sustainability (LOICZ Synthesis)					B1: Nutrient Accounting in Coastal Waters and Watersheds (LOICZ Synthesis)					C1: Planning and Governance in Coastal and Marine Areas (LOICZ Synthesis)					A3: Changing Land Use in Peoples and Societies (Physical, Ecological and Socio-Economic Perspectives)					B3: Observation, Monitoring and Modeling					C2: Megacities and Resilience in the Coastal Zone (IGBP Synthesis)					D2: Case Studies of long term Change or Stability in Coastal Ecosystems					D4: The Application of Remote Sensing on Tracking the Change of Coastal Zone Environment					D1: Polar Biodiversity in Coastal Zone Area and Intensive Utilization					B2: Catchment-Estuary - Nature and Human Interaction					A7: Coastal and Marine Sectors: Managing Change					B6: Coastal Biogeochemical Cycles and Climate Change					D6: Climate Extremes and Carbon Biogeochemistry in Large-River Delta Front Estuaries					A6: Ecosystem Goods and Services and Environmental Economics					B4: Estuarine and Coastal Ecology					Field Trips				
	14:00-18:00 Registration opens					18:30-20:30 Ice-Breaker Reception					18:30-20:30 Welcome Banquet at Oriental Haitian Hotel Banquet Hall					18:30-20:30 Poster Session with Refreshments					18:30-20:30 Conference Dinner at Haitian Hotel Award Ceremony (Posters and Young LOICZ Forum)																																																											



圖三、LOICZ OSC 會議與海報展示情形



三、巨型都市與海岸專題會議

會議第二天（9月13日）及第三天（9月14日）下午時段，共舉行十場分組及綜合討論，另提大會閉幕報告，我國代表集中出席下述我國資助的會議：

LOICZ Workshop on Megacities and the Coast

Sponsored by the Government of Taiwan

(September 13)

Session I (13:30~15:20) Formal paper presentation to identify key themes

Session II (15:50~18:30) Working on the structure and authorship for the

IGBP--LOICZ Synthesis Report on Megacities and the Coast

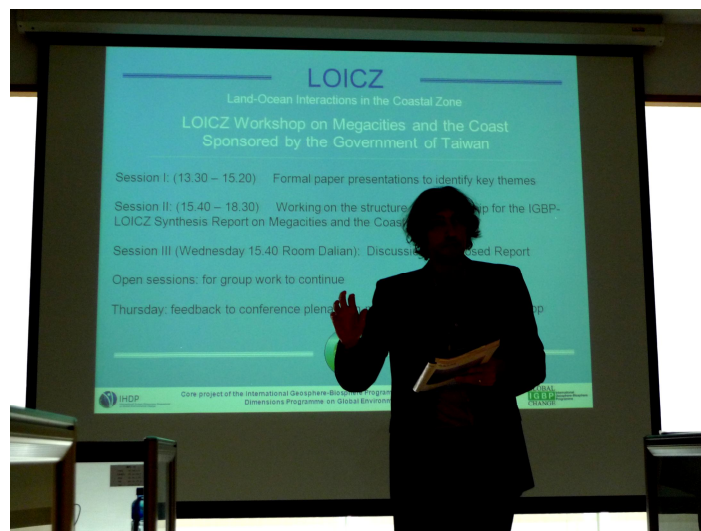
(September 14)

Session III (Wednesday 15:40 Room Yantai) Discussion of proposed Report

Open sessions for group work to continue

Thursday: feedback to conference plenary on megacities hotspot and workshop

專題會議開始，由計畫主持人、英國King's College地理系教授Mark Pelling進行綜合報告。Pelling教授在報告前，特別聲明和感謝我國政府（行政院環境保護署）所提供的經費資助，繼而說明計畫目的、預定進度、未來提供IPCC納入其第五次報告之初步架構等，我國中山大學陳鎮東教授（IGBP副主席）並予以補充說明；隨即進行分組討論，研擬具體之章節架構和初步建議作者群。



圖四、英國Mark Pelling教授進行綜合報告



圖五、IGBP副主席我國中山大學陳鎮東教授補充說明初步架構

IGBP-LOICZ 巨型城市與海岸綜合報告

The IGBP-LOICZ Synthesis Report on Megacities and the Coast

1. 目的 Aims

- (1) 增進對大規模海岸都市化過程之特性、衝擊與風險的了解。 To better define the unique characteristics, impacts and risks of large-scale urbanization processes and systems located on the coast.
- (2) 以現有之實證研究案例提供IPCC的第5號評估報告參考。 Using evidence based, empirical studies to inform the Intergovernmental Panel on Climate Change 5th Assessment Report.
- (3) 提供ICSU/Belmont關於未來研究經費贊助討論的證據參考。 Providing evidence to on-going ICSU/Belmont discussions on the future of research funding.

2. 進度 Time-table

- (1) May 2011: Scoping meeting held In London, supported by IGBP.
- (2) September 2011: Report planning meeting, supported by Government of Taiwan.
- (3) 1 October 2011: Report structure, authorial team and roles finalized.
- (4) Mid-December 2011: First draft of report submitted by chapter Lead Authors.
- (5) End January 2012: Comments to Lead Authors from editorial committee and

external reviewers.

(6) End February 2012: Final version submitted by Lead Authors.

(7) March 26 2012: Launch of report at Planet under Pressure conference London.

3. 初步架構 Draft Structure

- (1) 海岸帶都市化之規模與軌跡。 Scale and trajectory of urbanization on the coast.
- (2) 巨型城市對海岸環境、生態系財貨與服務、經濟與福祉之衝擊。 Impacts of megacities on the coastal environment, ecosystem goods and services, economy and welfare.
- (3) 汙染對人類健康之衝擊。 Impacts of pollution on human health.
- (4) 全球環境變遷(如：海平面上升) 對巨型城市的影響。 Effects of global environmental change (e.g., sea level rise) on megacities.
- (5) 巨型城市對區域與全球環境影響。 Contributions of megacities to environmental changes at regional and global scales.
- (6) 政策與科技對巨型城市及其周遭網絡在防災、減災與汙染防治上的貢獻。 Policy/technological responses for reducing risk from natural hazard and pollution In megacities and associated networks.
- (7) 風險管理對氣候變遷調適與發展的收益。 Co-benefits or cancellation of benefits from risk management for climate change mitigation and development.
- (8) 運用已有的知識評估巨型城市的未來風險與衝擊。 Using past and present knowledge to assess future risk for and the impacts of megacities.
- (9) 主要訊息。 Key messages.

4. 分組討論 (召集人、研討室)

- (1) Impacts of megacities on the coastal environment, ecosystem goods and services, economy and welfare (Antje Bruns, Room 4).
- (2) Effects of global environmental change (e.g. sea level rise) on megacities (Wen-Yan Chiau, Room 5).
- (3) Policy/technological responses for reducing risk from natural hazard and pollution in megacities and associated network (Jessica Lamond, Room 6).
- (4) Co-benefits or cancellation of benefits from risk management for climate change mitigation and development (Joern Birkmann, Room 3).

- (5) Using past and present knowledge to assess future risk for and the impacts of megacities (Qingnian Yu, Room 10).
- (6) Scale and trajectory of coastal urbanization. Impacts of pollution on human health AND Contributions of megacities to environmental changes at regional and global scales (Mark Pelling, Room Yantai).

分組討論後，在**第三天（9月14日）**的會議中，報告與討論撰稿大綱（案例如**附錄**）。當日我國代表利用餘暇參訪附近之大會主辦單位「中國科學院烟台海岸帶研究所」，並參與學生論文、壁報頒獎晚宴。**第四天（9月15日）**早上為所有LOICZ會議之綜合討論及結論。由 Megacities and the Coast 會議主席 Dr. Mark Pelling 將分組和綜合討論共計十場次之成果，整合為八章的撰稿大綱（參見附錄），向大會報告，未來並將提供IPCC第五次報告之參考。會議結束後，次日清晨全體代表旋即搭機返國。



圖六、我國代表參訪、和與會人員合影

5. 後續工作

- (1) 2011年10月1日決定各組的撰稿團隊；
- (2) 2011年12月中將個人初稿交由各組的主筆整合；
- (3) 2012年1月底，編輯委員會及外部審查人的意見 交由主筆群修改；
- (4) 2012年1月底，主筆群提出完稿；
- (5) 2012年3月26日，在倫敦舉辦的 Planet Under Pressure 會議中提出報告。

四、與會心得

1. 本次會議雖在中國大陸烟台舉行，但 IGBP/LOICZ 主席 Alice Newton 在開幕致詞中，仍然特別感謝我國政府（Government of Taiwan）出資協助推動 Megacities and the Coast 計畫，各國代表亦於會期中紛紛對我表達謝意和敬意，顯見我國行政院環境保護署之資助已受到國際重要組織高度的肯定，對台灣之國際能見度助益頗大。未來我國相關機關應該儘可能參與和資助重要國際組織之活動或研究計畫。此外，依據規劃進度，本次會議所撰寫之共同報告將在 2012 年 3 月 26 日倫敦舉辦的 Planet Under Pressure 會議中提出報告，我國應該繼續派員參加，一方面檢核計畫績效，另一方面表達台灣支持和重視國際重要組織，從而增益台灣之國際能見度，拓展國際參與空間。
2. 在此次會議，有數個主題演講特別強調在全球環境變遷下海岸系統之脆弱性與其對濱海巨型城市(megacity)可能帶來危害之評估研究；我國若干學術機構曾進行類似計畫，例如中央研究院在八八風災後，曾經就環境議題提出了數個與防災、減災科技相關之院主題計畫，其中特別強調監測與預報科技的重要性；未來若能在其目前既有架構之下，整合海岸保全與濱海都市防災議題，不但得以增進台灣之國土保安、也可在 LOICZ 相關議題上對國際學界與社群作出貢獻。是以，類似計畫應該鼓勵繼續進行。
3. 國內於 1994-2004 先後支持過兩個 LOICZ 相關研究案，成果也頗為豐碩，可惜據稱國科學曾支持之 LOICZ 相關計畫已停擺，其他長期或業務性研究也頗為欠缺，殊為可惜。尤其，LOICZ 為 IGBP 和 IHDP 共同支持之核心計畫，在 2004 年後面臨轉型，比過去更強調生態系統在變遷時對人文、社經面向的影響（即 IHDP 重點）；而國內相關團隊在提出整體計畫時，與人文、社經研究的橫向整合不易、相關的計畫經費也不被支持，是我國在此領域研究不易向前的因素之一。舉例來說，在高屏陸海交互作用計畫中，曾經對造成大鵬灣瀉湖水質不佳的主因—灣內的蚵架，進行拆除，後續研究也證實蚵架拆除對當地瀉湖生態有正面影響；然而，對當地蚵農與周遭養殖業者轉型後之社經角色分析、對周遭海岸土地利用改變之整體規劃、與從生態系健全觀點的治理方案落實，均欠缺後續之追蹤研究，實屬可惜。建議未來可由科研機構針對相關海岸生態系統的結構、功能與治理，重啟跨領域之整合研究，並透過強調生態系財貨與服務面向，與在地社會、經濟領域研究結合，確實達成生態系永續與人類福祉雙贏之目標。由於 LOICZ 兼顧地圈生物圈的科學面向，以及人文社經的面向，完全符合永續發展之意涵，建議政府相關之環保、科技、農業等機關能大力支持該一計畫。

4. 此次 LOICZ OSC 會議頒發青年學生之論文和海報獎項，如獲 Young LOICZ 獎項者實屬殊榮，且受到國際組織和人士高度肯定。因此，未來我國參與國際重要組織時，除應邀之專家學者外，凡提交論文、自籌經費前往的學者應多加鼓勵和肯定。尤其是在外留學生出席會議發表論文者，以及參與青年論壇的同學尤應鼓勵。此次會議我國共有三位學生(含一位留德留學生) 獲得青年論壇的資助參與訓練課程，並分別發表論文；其研究主題分別為澎湖群島之海岸漁業經營管理、綠蠵龜之救傷與保育宣導、綠色消費意願之調查；這些研究議題均著重在生態系管理、環境教育與社經面向，過去較少為國內科學界所注重，值得肯定。建議未來除加強基礎科學研究之外，對科研成果在海岸治理上的實地應用，也應予強調。對於年輕科學家和人文學者都應併同重視和鼓勵。
4. 台灣地狹人稠，北高兩個主要都會區均緊鄰海岸帶，未來因應氣候變遷風險脆弱性如何評估、如何因應減緩災變，以及如何強化其回復力等，都是值得與國際同步研究的重大議題。此次會議中由我國環保署支持、我方代表積極參與之「海岸與巨型都市」熱點研究論壇，益彰顯其重要性。此一議題不但在國內研究甚少，國際上相關研究成果也不多。其議題之本質不但包含原有海岸系統之陸海生態環境交互作用，更融入了都市化過程中人為活動與全球環境變遷對海岸系統，以及其所支持的都市生態體系之衝擊，顯然是一項高度複雜且具極具挑戰性之跨科技領域研究。在國科會的支持之下，今年由中研院謝蕙蓮研究員領軍的淡水河流域生態系功能與服務研究，可算是國內首度嘗試對臨海都會生態系統進行了解之整合性研究，未來若能順利執行，當可成為我方在 LOICZ 此一重要議題上進展之開端。但更多面向的參與和研究，仍屬必要。另鑑於目前國內的 LOICZ 總計畫中斷，此次會議中呈現的成果純屬來自個人的研究。為回應國際對於此一主題之重視和發展趨勢，建議我國宜指定主導機關，整合各單位研究成果，才應能化零為整。
6. 會中我國代表團曾訪問中國科學院烟台海岸帶研究所，該所在五年內，聘用近百位博士，建了三棟十餘層的研究大樓，專職人員加上研究生達到三百人。該所有國際合作組，每年預算六百萬人民幣，以加速學術研究。該所有組織的研究團隊、完善的設備、專業統籌研究資源的管理系統，十分值得臺灣研究單位和政府管理機制之參考。
7. 本次會議中，中國大陸有不少的專題報告彰顯其近年來在海岸帶研究與治理上之長足進展。除前述所成立之專業「海岸帶研究所」，大陸所投資大批物力與人力，從海岸物理化學環境監測、水質分析與污染防治、水生生物基礎調

查與天然產物之利用、到生態系功能、服務評估與海岸防災、減災治理，均多有令人深刻之進展。更令人佩服的是，其行政體系由上而下，交付研究機構對其所轄內一萬八千公里長的大陸海岸帶，進行整體「海洋功能區劃」；其內容不但包含了常態性的環境水質、生態、物種指標監測，更依據其海岸形態、生態與產業特性，規劃出不同之空間分區使用類型與綜合治理方針，目前為全球最為進步的案例。相較於台灣近二十年來在海洋與海岸事務上，不但「海岸法」、「國土計畫法」已在立法院數進數出，難以通過立法，海洋事務權責也迄無一專責規劃與治理機構，相信未來政府與學界需要努力的空間仍然極大。參與國際組織和學術研討會，可知己知彼、交流學習，應該大力鼓勵。尤其 LOICZ 為 IGBP 和 IHDP 共同支持之核心計畫，IGBP 副主席為我國中山大學陳鎮東教授，該兩組織之上的最高組織「國際科學會 (ICSU)」新任主席又為我國前中研院院長李遠哲院士，我國對於這些國際組織更有充分理由積極參與和大力支持。

五、攜回資料

LOICZ Open Science Conference 2011 的會議手冊

http://www.loicz.org/imperia/md/images/loicz/osc/OSC-2011-Conference-Booklet-1_120x169.jpg

附錄 擬提IPCC參考之報告架構

IGBP-LOICZ
Megacities and urban regions on the coast
Synthesis Report

Lead Editors

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Chapter 1:

Urbanization on the coast: scale and trajectories (10 pgs)

Lead Author: Cesar Augusto Marques da Silva [cesar@nepo.unicamp.br]

Contributing Authors:

1.1 Introduction (0.5 page)

1.2 What is a megacity (2 pages)

- ◆ What is urban, rural and megacity? Discussion and possibilities of analysis. Identify list of megacities (1) over 5million, (2) over 10 million, (3) over 15 million – for the globe and coastal. These lists will guide case study selection in subsequent chapters.
- ◆ Standard governance mechanisms for large cities – ie. to note multiple layers, and civil society, state and private sector actors (though the balance differs by development context).

1.3 What is the coast (1.5 pages)

- ◆ Definitions of the coastal zone, how far it extends, including atmospheric and sub-service processes in this analysis. Key ecosystem services and hazards associated with coastal zone locations.
- ◆ Teleconnected relationships (jumping from place to place) and contagion across sectors, countries etc as a product of globalization which means practices in cities can impact on coastal zones at distance.
- ◆ Standard governance systems for the coast (do they apply to urban coasts?). At least this section should identify the administrative and governance challenges that urban coasts have

1.4 The urban transition (1 page)

- ◆ Urbanization patterns in coastal areas across the time, land use and land cover change, rural-urban migration.
- ◆ Drivers of urbanization (public and private sectors interactions and roles)
- ◆ Urban expansion and sprawl (includes migration).
- ◆ How cities affect population trends in comparison with rural areas

(decreasing fertility rates, for instance) and how it may reflect on sustainable use of space.

1.5 The demographic transition. (1 page)

- ◆ Population trends that will affect the population size and composition, specifically in coastal zones.
- ◆ Stages among regions and countries
- ◆ Present and future population dynamics
- ◆ Demographic transition and opportunities to cities

1.6 Coastal zones cities distribution and intra-urban inequalities (3 pages)

- ◆ Discuss socio-economic data, map social conditions and inequalities (income, education, access to urban infra-structures)
- ◆ Cities by size and network.
- ◆ Discussion of coastal cities, current status and growth trends by world region (use UN regions (i.e. you could take this analysis from UN HABITAT Reports). The aim is to characterize the challenges and opportunities that are likely to characterize each world region. Include a boxed case study for each region (just a few lines each).

1.7 Conclusion: Major current tendencies (1 page)

- ◆ Highlight the major trends and associated challenges for sustainable development faced by human populations in coastal megacities.

References

Chapter 2:

The Environmental Impacts of Megacities on the Coast (10-15 pages)

Lead Authors (to be complemented)

NN

Dr. Antje Bruns (antje.bruns@geo.hu-berlin.de)

Contributing Authors (to be complemented)

Prof. Dr. Shin Wang (swang@ntu.edu.tw)

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NN

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2.1 Introduction

2.2 Human activities in coastal megacities

A discussion to characterise different kinds of coastal megacity, and to describe different activities that will happen in coastal urban areas and will have differential environmental impacts. Include some initial sense of the importance of each sector to urban economies (formal and informal), how amenable they are to urban planning/regulation and how far they tend to be most common in richer/poorer cities.

2.2.1 Primary sector (Urban Agriculture, Urban Fishing)

2.2.2 Industrial activities (Energy, Transport, Mining, Ship Breaking, Hazardous Waste Storage...)

2.2.3 Infrastructure (Dams, Dikes, canal construction, Housing, Transport (with Shipping and Ports), Waste/Water discharge)

2.2.4 Tertiary sector: Tourism in coastal megacities

2.3 Impacts on the Lithosphere

2.3.1 Erosion

2.3.2 Sedimentation

2.3.3 Mining of sand

Case Study: Human Impact on geomorphological processes in large urban Deltas (Sedimentation/Erosion)

Case Study: Indonesia

2.4 Impacts on the Atmosphere

2.3.4 Thermal effect (e.g. particularities of urban heat island effect within a maritime microclimate)

2.3.5 Air flow effect

2.3.6 Air quality (e.g. emissions from ships in ports)

2.5 Impacts on the Hydrosphere (Marine, Coastal)

2.3.7 Urban water balance (changes in water availability, demand/Groundwater/runoff)

2.3.8 Water quality (land-based pollution)

2.3.8.1 Nutrients (Eutrophication)

2.3.8.2 Toxic discharge (Heavy metals, Hormones)

2.3.8.3 ...

Case Study:

2.6 Impacts on the Biosphere

2.3.9 Change of Habitats (e.g. new habitats in ports)

2.3.10 Change of Species diversities

2.3.11 Change of Species interactions

Case Study: Jakarta (coral mining for concrete production)

2.7 Impacts on the Anthroposphere

2.3.12 Ecosystems functions/goods/services

2.3.13 Socio-economic System (Demographic changes, land-use and inequality as VERY significant drivers for human vulnerability to environmental risk (arguably more so than environmental change and any work discussing this for coastal cities would be very welcome)

2.3.14 social-ecological Interactions

2.3.15 translocal impacts (also very welcome)

Case Study: Fishing Communities (e.g. Accra: Fish is harvested and smoked in Ghana and sold in Benin – good as a ‘hidden’ livelihood)

2.8 Conclusion

Urban forms and functions and their respective environmental impact (a dense city with a large proportion of sealed surface has other impacts than “rurban” Mega-Cities...)

Timelines: Urban impacts on the local environment in the course of time (rate of change really matters in terms of response strategies)

→ Linkages between environmental impacts and response strategies are important; necessary to identify gaps within science-policy – Chapter 6, Responses)

Final comments on the relative contribution of urban processes on environmental and human systems for shaping consequent risk.

References

CH 3: Environmental Hazards and Human Health (10 pages)

Coordinating Author: Joyashree Roy (Jadavpur University)

joyashreeju@gmail.com –LA 2nd choice

Sharon Friel (The Australian National University, Australia) –Lead author 1st choice

Lead authors:

Marco Akerman (Faculdade de Medicina do ABC, Brazil)

Françoise Barten (Radboud University Nijmegen, The Netherlands)

Daniel Becker (Centro de Promoção da Saúde, Brazil)

Jean-Cristophe Fotso (African Population and Health Research Centre, Kenya & International Society for Urban Health)

Trevor Hancock (Ministry of Healthy Living and Sport, British Columbia, Canada)

Tord Kjellstrom (The Australian National University, Australia)

Jacob Kumaresan (WHO Centre for Health Development, Japan)

Sergio Meresman (Latin American Center of Human Economy, Uruguay)

Patricia Monge (WHO Collaborating Centre in Environmental & Occupational Health, Costa Rica)

Nelly Salgado (Instituto Nacional de Salud Pública, Mexico)

Carlos Santos-Burgoa (National Academy of Medicine, Mexico)

Shaaban Sheuya (Ardhi University, Tanzania)

This chapter presents data drawn from global review papers and individual studies on the impact of pollution (atmospheric, water and solid; direct and as a contributing factor to wider wellbeing and health) on human health in coastal urban places. Data specific to the coast is likely to be limited so that the introduction fulfills an important task in presenting briefly the more generic linkages between urban pollution and human health (with examples from coastal cities where possible). Subsequent sections have been defined to focus on those health and pollution issues that are most important for coastal places and especially for the urban poor resident in coastal megacities, though here to overlap with general health processes is large.

3.1 Introduction: The bigger picture

Key themes needed to understand the relationships between

environmental hazard and human health in cities, and importantly the role of poverty and governance in shaping this. Exemplified where possible by data derived from coastal megacities

3.1.1 Human wellbeing, human health in urban areas with special reference to coastal cities

3.1.1 Contribution of social determinants of health- where people grow, live, work and age

3.1.3 Health inequity in coastal cities

3.2 Sources of health vulnerability in megacities on the coast

3.2.1 Demographic structures: Aging population in cities especially in coastal cities in many countries (case studies)

3.2.2 Infrastructure: urban design

3.2.2.1 Unplanned urbanization

3.2.2.2 Inadequate infrastructure (e.g., old cities planned low levels of temperature and humidity-resultant heat stress factors, heat island effect; or have extensive physical infrastructure e.g. drains and sea-defenses, buildings with basements including hospitals or mass transit that were not planned with global environmental change in mind or are approaching their useful lives).

3.2.2.3 The inaccessibility of marginalized lands inhabited by the poor.

3.2.3 Disasters driven health issues: water borne, communicable diseases from flood (water), salinity (desalinization),

3.2.4 Climate parameter driven: vector borne

3.2.5 Special social implication of coastal economic activity drivers: Trading, commerce, commercialisation: HIV/AIDS, communicable disease.

3.3 Upstream and networked health risks

The exacerbation of geogenic and anthropogenic sources.

3.3.1 arsenic (water, food chain-Bengal Basin, Thailand...)

3.3.2 heavy metals (in food chain-fish population , marine products, ..)

3.3.3 other???

3.4 Health actions in urban policies, governance, adaptation:

Successful and failed approaches to preparing for novel health risks or special health concerns of coastal megacities.

3.4.1 Preventive vs curative

3.5 Case Studies

A small group of case studies (perhaps no more than 3) will be useful to avoid losing the richness and interactions across sectors and between impacts and the generation of risk and with human vulnerability and resilience. Case studies would be most interesting that illustrate different kinds of cities and can in this way provide scope for discussing the challenges of projecting that the kinds of uncertainties in different development contexts.

3.6 Conclusion

References

Chapter 4:

Impacts of Global Environmental Change on Megacities (10 pages)

Lead Author:

Contributing Authors:

Wen-Yan Chiau (Coastal policy, planning and management);

chiau@mail.ntou.edu.tw

Ralf Weisse (Physical effects sea level, storm surges, storms, waves);

Chia-Yang Tsai (Coastal ecosystem);

Andrea Young (Urbanization and sea level rise effects);

andrea@cpa.unicamp.br

Debarati Chakraborty (Physical and social effects of global environmental change in urban region);

Ivonne Radjawane (Local Inundation and Physical effects on sea level rise).

Some more authors to be invited after the meeting.

This chapter is interested in the extent to which observations and predicted trends associated with global environmental change can be associated with coastal megacities and urban regions. There is a large literature on generic shifts and observations and this can be presented where there is nothing specific to coastal cities but the added value of this report is to consider the economic, social and ecological impacts for cities. For example, of the environmental hazards listed only the urban heat-island and sea-level rise are associated with climate change with reasonable confidence and these might then be given priority in the discussion. Where possible give an indication of economic losses, populations at risk etc, consider also combinations of hazards that urban coasts generate (e.g., through industrial and energy sites in urban estuaries/flats).

1. Introduction (1 page)

1.1 Global environmental change

– “Environmental change is defined as a change or disturbance of the environment by natural ecological processes.”

- Global-scale changes that affect the functioning of the Earth System
- Much more than climate change
- Socio-economic as well as biophysical effects

1.2 Definition and characteristics of megacities in processes of risk creation. Megacities themselves will be defined and discussed in

Chapter 1. Here you could usefully note that while the chapter is interested in global environmental change as a local hazard driver, it also acknowledges that in many cases rapid urbanization (especially where regulation and land-use is inappropriate or weakly implemented) will be more important in shaping observed risk than global environmental change.

2. Physical effects (positive) (1 page)

2.1 Transportation benefits (e.g., Shipping in the arctic areas)

2.2 Others (e.g., energy saving)

3. Physical effects (negative) (2 pages)

3.1 Typhoons / hurricanes / monsoon shift – numbers, Intensity and frequency

3.2 Heavy rain and flood

3.3 Heat waves

3.4 Drought

3.5 Sea level rise

3.6 Storm surge

3.7 Land subsidence – over-pumping groundwater, salt water intrusion

3.8 Wave intensity, height and erosion

3.9 Secondary hazards: landslides and tsunami

4. Ecological effects (2 pages)

4.1 Changes and/or human disturbance: Acidification, warm ocean surface temperature, pollution, eutrophication.

4.2 More artificial structures (e.g., dykes, seawalls, jetties) will cause significant coastal changes (erosion, sedimentation, decreasing freshwater supply to estuaries).

4.3 Affect health of terrestrial/marine ecosystems of the coastal cities (e.g., coral reef bleaching, red tide, green tide, damage of spawning/nursery grounds, vegetation diseases, balance of ecosystem).

4.4 More maintenance cost (e.g., city park/open space need more water).

4.5 Negative effects on landscape and economic activities / industries (e.g., marine tourism and recreation).

5. Social effects (positive and negative) (2.5 pages)

5.1 Effects on primary industries

- Fisheries: fishing ground change (regime shift), unstable or loss of fishermen's income; growth rate (positive effect).
- Agriculture: decrease of total production or changes of crop type, lack of experience/knowledge to grow new crop species;
- Forest: more diseases, fires.

5.2 Expenses and emotional effects of relocation (e.g., setback from coastlines, migration, resident relocation from disaster areas);

5.3 Tax and budget increase – project priority, welfare, social equity (e.g., public health and epidemic prevention, public works for preventing natural disasters)

5.4 More energy consumption but more green industries/jobs.

6. Case studies (1.5 pages)

Up to three case studies to illustrate the ways in which global environmental change drivers are felt and mediated by local environmental and human systems.

7. Conclusion (1 page)

7.1 Identify main points and discuss need

7.2 more local research and/or local assessment on;

- 7.2.1 To provide information on global environmental change that is useful at the urban and community levels – downscaling and improving the resolution.
- 7.2.2 To know more about the existing local environmental and human drivers of vulnerability and adaptive capacity (see subsequent chapters)
 - Protection and restoration of coastal sensitive areas (e.g., mangroves, lagoons, estuaries, sand dunes);
 - Use of traditional knowledge;
 - Application of ecological engineering (eco-tech);
 - Integration among different agencies, all stakeholders;
 - Multidisciplinary approach (dialogue channel and decision-making process)
 - Finance
 - Capacity building

References

Chapter 5:
Contributions to environmental changes at regional and global scales

Lead author: Sue Grimmond sue.grimmond@kcl.ac.uk

Chapter 6:

Responses for reducing risk from natural hazard, pollution and climate change in megacities and associated networks (10-15 pages)

Lead Author: J Lamond J.Lamond@wlv.ac.uk

Contributing Authors:

Prof. Dr. H. Sterr,
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Dr R Ramesh
R Francis,
T Schlurman
Bruce Goldstein
Harriet Bulkeley
Qingyian Yu
M Aris Marfai
M Pelling

6.1 Introduction J Lamond (1/2 page)

Include discussion on learning systems, science-policy communication, participatory development, resilience-transformation debate (M Pelling)

6.2 Urban Planning and risk management (3 pages)

Generic for all urban areas, sections can include a list of techniques but should then open into a discussion on the limits of their applicability – eg what kinds of cities tend to do something well, why, what affects the balance between public, private and community led activities? Any comment on the relative importance of particular approaches for COASTAL urban areas would be especially welcome, and in these cases should be supported with reference to literature to support statements. Given the patchy literature this may well reflect

evidence from a small number of cities and should not indicate a view based on comprehensive data.

6.2.1 Spatial Planning at all scales Joerg Knieling, B Jirkman, Andreas Kannen, J Lamond, Qingyian Yu

- Hazard zoning,
- acceptable development,
- urban masterplans,
- infrastructure planning,
- greening,
- building adaptation building regulations,
- resettlement/relocation,
- maritime spatial planning
- Urban growth boundary.

6.2.2 Environmental Regulation Wen-Yan Chiau, C Booth

- pollution controls,
- groundwater regulations
- Zero carbon policy
- Traffic limitation
- Water pricing
- Energy tax

6.2.3 Risk assessment Prof. Dr. H. Sterr, C Booth, P Mason

- Hazard assessment and mapping,
- vulnerability assessment,
- Risk mapping
- Monitoring
- Forecasting

6.2.4. Emergency management Wen Yan Chui, M Aris Marfai, J

Lamond

- Monitoring,
- forecasting
- early warning systems,
- awareness,
- preparedness, emergency planning,
- emergency response,
- indigenous coping strategies,
- recovery, reconstruction

6.3 Climate Change Mitigation (1.5 pages)

The most fundamental form of risk management and with special opportunities in coastal cities (low costs/energy loss in electricity transmission)

6.3.1 Renewable Energies A Kannen. A O.Hagan (1 page)

- Offshore wind,
- waves
- Tidal
- Soar desalination plant
- Ocean Geothermal energy

6.3.2. Sustainable transport J Lamond (1/2 page)

- Electric vehicles
- Containerisation
- Public transport
- Traffic limitation

6.4 Managing the Risks of a Coastal Location (5 Pages)

Technological responses that can help focus the generic techniques discussed in 6.2. Again here, after an initial listing and some reference to examples text should focus on the limits of application. This might include the technological and costs limits of technology, and importantly any comment on how far they are appropriate/desirable in urban areas would be useful (ie., these may already have no ecological defences or be busy ports, or come under extreme pressure for land reclamation...as above please try to reference any judgements offered at least to a case study experience even if no more comprehensive statement can be offered.

6.4.1 Coastal erosion defences Hocine Oumeraci, R Ramesh (2 pages)

- engineered structures, sea walls, groynes
- Offshore reef
- Bioshields mangroves, dunes, bamboo dykes
- Reclamation
- Geotubes..
- Geotextiles?

6.4.2 Flood/storm defenses R Francis, Hocine Oumeraci, T Schlurman (2pages)

- Dykes, polders,
- flood walls, barriers
- Channels, floodways
- Wetlands

6.4.3 Water supply, treatment and management J Lamond (1 page)

- Dams and the issues of conveyance, sedimentation,
- Groundwater management,
- Urban drainage,
- Desalinization,
- Wastewater treatment
- Infiltration, rainwater harvesting

6.5 Adaptation and capacity building for coastal cities (2.5 pages)

Capacity building all scales/sectors. Any comment on the ways in which adaptation in particular places/by particular actors impacts on the capacities for others to adapt would be very welcome, eg market adjustments or government zoning policy impacts on individual capacities., Bruce Goldstein, Harriet Bulkeley (1 page)

6.5.1: Government actions

- urban management,
- waste management,
- poverty reduction
- Finance /insurance

6.5.3: Community level and civil society actions

- local risk management (from infrastructure provision to early warning and emergency services: especially in poor, unplanned neighbourhoods prone to flooding or other hazards)
- micro-finance and micro-insurance

6.5.2. Market responses J Lamond (1/2 page)

- Supply chain management
- Work adjustment
- Insurance
- Land price adjustment

12 Case Studies (1 page)

A small group of case studies (perhaps no more than 3) to avoid losing the richness and interactions across sectors. Case studies would be most interesting that illustrate different kinds of cities and can in this way provide scope for discussing the challenges of projecting that the kinds of uncertainties in different development contexts.

12. Conclusion (1/2 page)

To draw out the particular challenges and opportunities of coastal cities, and how far this differs for cities in different development or environmental contexts. EG Big port cities, service centres, rich/poor cities, rapidly expanding/stable populations...

References

Chapter 7:
**Interaction between risk management, climate change adaptation,
climate change mitigation and development: Co-benefits and
cancellation of benefits (10 pages)**

Lead author: Joern Birkmann birkmann@ehs.unu.edu

Contributing Authors: Bruce, Marcello, Mark...

7.1 Introduction

Question: What are key synergies and constraints between risk management, climate change mitigation /adaptation and development in Megacities?
(clarification GC or CC)

7.2 Risk and its management in coastal megacities

Summary discussions drawing out key generic risks/management options for megacities but with special focus on coastal contexts. To identify limits of risk and the objectives and limits of risk management.

7.2.1 Major hazards / risks addressed by risk management in M-Cities
(Mark)

7.2.2 Themes in climate change mitigation and adaptation for Megacities
- also focusing on environmental change (Marcello)

7.2.3 Megacities and human development (poverty, access to land, information, new systemic risks, financial risks) (Joern)

7.3 Case Studies - Lessons learned (means to bring it together):

7.3.1 Tensions and synergies between risk management, CCA and dev.

7.3.2 Recovery / Reconstruction after disasters in Megacities (Bruce)

7.3.3 Speed of development and infrastructures (risks, adaptation, CC-mitigation) [measures, decision-making-processes] (Bruce; Joern)

7.4 Recommendations on how to improve the synergies between risk management, CCA, CC-M and development (JB)

7.4.1 Managing change and adaptation in a radical changing environment

7.4.2 Improve the identification and evaluation of mismatches and constraints between risk management, CCA, CC-M and development

7.4.3 Recommendations for specific types of Megacities

Length: 1,2,3 (3 pages); 4 (4 pages); 5 (3 pages, 1 p./ a, b, c)

Chapter 8 Projecting future urban risks and environmental impacts

Coordinating Author: Qingnian Yu (Amy), qingnian.yu@yahoo.com.cn

Lead authors:

In each section, coastal megacities in Asia, Africa, North America, South America, and Europe will be discussed respectively.

In section 1, 2 and 3, the forecasting methods, data sources, or the modeling scenarios of the referred literatures will be clarified (maybe as the footnote or endnote?) when putting forward the projections for discussion in section 4.

1 Introduction: Coastal megacities in the future

In this section, future urbanization status of coastal megacities as projected in Chapter 1 will be summarized to frame discussions below. Themes to include are: population change, land-use change, changing patterns in urban systems and possible new challenges to urban sustainability. This should offer an account of work projecting the ways in human vulnerability and capacity for resilience may change over time under different development scenarios if such work exists, and the scope for new kinds of risk to be produced through teleconnection leaps over space or contagion from one urban system to another through thickening of globalised or regional networks of linkage.

2 Future risks to coastal megacities

Extending discussions made in Chapter 2, this section presents the findings of research that has used different methodologies to project future risks from natural hazards, pollution and other risk sources including those associated with climate change or driven by human development (eg subsidence, or water security concerns) for urban areas.

A summary of work that has focused on specific hazard types and possible future scenarios for urban regions, or areas of coast with large urban concentrations.

2.1 Hazard associated with climate change and variability (to consider: sea-level rise, flooding, storm surge, heat/cold waves).

2.2 Geo-physical natural hazards (to consider: volcano, earthquake and tsunami).

2.3 Hazard generated by urban processes (to consider: air, water and ground pollution in the city and in coastal waters, subsidence, water security)

3 Future impact of coastal megacities on environmental change

This section will discuss work that has proposed possible future impacts of urban regions and megacities on local, regional and global environmental systems and include comment on (though there is likely little written about) teleconnected impacts and contagion risks.

3.1 Future impact on coastal environment (to consider: air quality, water quality, coverage of coastal vegetation, land subsidence, coastal stability).

3.2 Future impact on coastal ecosystem goods and services (to consider: biodiversity, coastal and marine flora and fauna, fish stock, groundwater resources, energy production capacity).

4 Methodology evaluation

In this section, methodology adopted to conduct the previous projections of each aspect will be compared, and then evaluated to understand research difficulties and limitations, assess the reliability of the projections, and point out the prospect of future study.

4.1 Methodology comparison

4.1.1 Future risks projections

4.1.2 Future impacts on environmental change

4.2 Methodology evaluation

4.2.1 Difficulties and limitations

4.2.2 Reliability

4.2.3 Prospect

5 Case Studies

It is likely that most (if not all) of the available literature for this chapter will be written for specific urban regions and particular environmental phenomena. It is useful to review this literature and disaggregate what is known into the structure above. In addition the best studies will be presented as a small group of case studies (perhaps no more than 3) to avoid losing the richness and interactions across sectors and between impacts and the generation of risk and with human vulnerability and resilience. Case studies would be most

interesting that illustrate different kinds of cities and can in this way provide scope for discussing the challenges of projecting that the kinds of uncertainties in different development contexts.

6 Conclusion

References

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