中国应对极端气候战略高级圆桌会议

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Proceedings of High - Level Roundtable on Strategy of Extreme Climate Adaptation

全球水伙伴中国委员会
Global Water Partnership China
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前　言

在全球气候变化大背景下，干旱、洪涝、高温热浪和低温冷害等极端气候事件对全球自然生态系统产生了明显影响，对人类社会生存与发展构成了严重挑战。近年来，极端气候事件在多个国家不断发生；近50年以来，中国极端气候重要事件发生的频率和强度也出现了趋多、趋强的明显变化。

中国幅员辽阔，气候条件复杂、生态环境脆弱，易受极端气候事件的不利影响。中国又是一个发展中国家，人口众多、经济发展不平衡，防灾减灾能力不强。极端气候事件已经对经济社会发展构成了巨大威胁，主要体现在干旱、洪涝、风暴潮、低温冷害和高温热浪等灾害，影响到水利、农牧业、林业、交通和能源等行业，对于生态脆弱地区和沿海地区的影响尤为显著。应对极端气候已经成为中国当前面临的十分迫切和严峻的任务。

为认真贯彻中共中央、国务院关于加快水利改革发展的决定，研讨中国应对极端气候防灾减灾战略；探讨极端气候对水资源的影响及对策，全力保障防洪安全、供水安全、粮食安全、生态安全和能源安全；促进建立行业部门及区域间应对极端气候的合作机制以及积极借鉴国外先进经验，2011年4月22日，在中国水利部、中国环境保护部和中国气象局的支持下，由全球水伙伴中国委员会、亚洲开发银行与国家防汛抗旱总指挥部办公室主办，联合国教科文组织北京办事处、联合国儿童基金会驻华代表处、大自然保护协会、世界自然基金会北京代表处、水利部防洪抗旱减灾工程技术研究中心和水利部应对气候变化研究中心等协办的中国应对极端气候战略高级圆桌会议在北京召开。

全国政协张梅颖副主席出席会议并致辞，水利部陈雷部长、环境保护部吴晓青副部长和中国气象局许小峰副局长分别做了主旨演讲。亚洲开发银行东亚局副局长许延根先生、联合国儿童基金会驻中国办事处代表吉莲.梅尔索普女士、世界自然基金会北京代表处总监朱春全先生、全球水伙伴总部高级顾问卡里德.穆塔杜拉先生出席会议并致辞。国家防汛抗旱总指挥部办公室副主任张旭等7位专家做了主题报告。

国务院各相关部委、水利部有关司局、联合国各驻华机构及10多个国际组织的官员和专家，科研单位、高等院校、企事业单位和非政府组织等单位及有关媒体的代表共130多人到会。会后，多家中央媒体对会议进行了详细报导。

本次会议是全球水伙伴中国委员会举办的第八次高级圆桌会议，旨在研讨中国应对极端气候防灾减灾战略；探讨极端气候对水资源的影响及对策，全力保障防洪安全、供水安全、粮食安全、生态安全和能源安全；促进建立行业部门及区域间应对极端气候的合作机制以及积极借鉴国外先进经验。会议收到多方代表的良好反馈和合作意向，达到预期目的并取得圆满成功。

会议认为，应对极端气候是全球性问题，无论是发达国家还是发展中国家都应该共同面对。会议代表指出，中国应对极端气候形势严峻，已经成为制约社会经济可持续发展的主要因素之一。随着工业化、城镇化的深入发展，增强防灾减灾能力的要求越来越迫切，强化水资源节约、保护和管理的工作越来越重要。

通过此次会议，各方达成共识：应对极端气候涉及多部门、多行业，需要制定政府相关部门和行业的协调与合作机制；同时，应对极端气候也需要进一步扩大社会公众参与，政府在决策过程中需要广泛听取专家和公众的意见，实现科学、民主决策。与会专家还呼吁进一步加强关于应对极端气候的科学研究工作。

为使会议取得的成果在水资源综合管理领域中发挥更大的作用，决定由全球水伙伴中国委员会秘书处编辑出版此次会议材料汇编。

由于编辑时间仓促，加之水平有限，难免有不足和错误之处，敬请批评指正。

全球水伙伴中国委员会秘书处

2011年7月

Preface

Under the situation of the global climate change, in recent years and 2010 in particular and in a number of Asian countries, the extreme climate events such as extraordinary floods, severe droughts, typhoon, high and lower temperature disasters frequently occurred which affected the global natural eco-system and brought about great challenges to the human's living and the social development.

In the past 50 years, there had been more extreme climate events with higher intensity in China. China, as a developing country with large population, complex climatic conditions and fragile ecology and environment, is more easily affected by the extreme climate events. The impact of the extreme climate events to the eco-system and the social and economic development in China is mainly represented in sectors such as water, agriculture, forestry, transport and energy and in the coastal and eco-fragile areas. To adapt to the extreme climates has become an important and urgent task for China.

This High-Level Roundtable aims at better implementing the <Decision on Speeding Up the Reform and Development in Water Sector> by the Central Government of China ; discussing about strategies for disasters control due to extreme climates and the impact of extreme climate on water resources and the relevant countermeasures; ensuring the security of flood control, water supply, food, ecology and energy; and finally establishing effective cooperation and coordination mechanisms between different regions to learn experiences from other countries. With the theme of the Strategy of Extreme Climate Adaptation in China, the High-Level Roundtable meeting is jointly sponsored by Global Water Partnership China, Asian Development Bank and the Office of State Flood Control and Drought Relief Headquarters, on April 22nd, 2011 in Beijing, with the co-sponsors of UNESCO Office Beijing, UNICEF Office for China, The Nature Conservancy (TNC), WWF Beijing Office, Research Center on Flood and Drought Disaster Reduction of the Ministry of Water Resources and Climate Change Research Center of the Ministry of Water Resources.

Mme Zhang Meiying, Vice Chairperson of the China People's Political Consultative Conference (CPPCC) opened the meeting as the first addressing at the opening session followed by the keynote speeches given by Mr. Chen Lei, the Minister of Water Resources, Mr. Wu Xiaoqing, Vice Minister of Environmental Protection and Mr. Xu Xiaofeng, Vice

Administrator of China Meteorological Administration. Slots were also given to Mr. Edgar Cua, Deputy Director General, East Asia Department of ADB, Mme. Gillian Mellsop, Resident Representative of UNICEF China Office, Mr. Zhu Chunquan, Head of Conservation Operations of WWF Beijing Office and Mr. Khalid Mohtadullah, Senior Advisor of GWP for the addressings. The presentations were given by Mr. Zhang Xu, Deputy Director General of the Office of State Flood Control and Drought Relief Headquarters and other six invited specialists after the keynote speeches.

The meeting attracted more than 130 participants from the key water-related ministries under the State Council, and relevant departments of the Ministry of Water Resources, UN organizations' offices in China, foreign embassies in Beijing, universities, research institutes and NGOs. The results of the meeting were also wide reported by several national media.

This is the eighth High Level Roundtable organized by the Global Water Partnership China, aiming at discussing the strategies of extreme climate adaptation in China and the impact of extreme climates on water resources and relevant countermeasures; ensuring the safety of flood control, water supply, food, ecology and energy; promoting cross-sector and inter-department cooperation mechanism regarding extreme climate issues and introducing advanced experiences of other countries.

The results of the meeting prove that the extreme climate adaptation is a global issue and a common task for all the countries in the world. According to the representatives, there is a serious situation on extreme climate adaptation in China which is one of the main factors limiting the sustainable social and economic development. Therefore, along with the rapid industrialization and urbanization, there is an urgent need to enhance the disasters control and reduction capacity and strengthen the water resources conservation and protection.

This High Level Roundtable meeting was resulted with the following common understanding and consensus:
The extreme climate adaptation involves all related sectors and a mechanism for better coordination and cooperation is very much needed; the extreme climate adaptation also requires the social and public participation; the governments must be open to the voices of experts and the public in the process of making decisions with the scientific and democratic manner. The participants of this meeting also called for more scientific research on extreme climate adaptation.

In order to enable the meeting achievements to be shared by others and contribute to the climate change adaptation, The GWP China Secretariat edits and publishes this proceedings.

There are inevitable shortcomings and mistakes that are subject to your correction owing to the short time and limited ability.

Global Water Partnership China Secretariat

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Keynote Speeches and Addresses

▶
全国政协副主席张梅颖女士
Ms. Zhang Meiying, Vice Chairperson of the Chinese People's Political Consultative Conference (CPPCC)

◀
水利部陈雷部长
Mr.Chen Lei,
Minister of Water Resources of PRC

主旨演讲与致辞
Keynote Speeches and Addresses

全球水伙伴中国委员会主席汪恕诚
Mr. Wang Shucheng,
Chair of Global Water Partnership China

环境保护部副部长吴晓青
Mr. Wu Xiaoqing,
Vice Minister, Ministry of Environment Protection of the PRC

中国气象局副局长许小峰
Mr. Xu Xiaofeng,
Vice Administrator,
China Meteorological Administration

主旨演讲与致辞
Keynote Speeches and Addresses

亚洲开发银行东亚局副局长许延根
Mr. Edgar Cua,Deputy Director General, East Asia Department, ADB

联合国儿童基金会驻中国办事处代表
吉莲·梅尔索普
Mme. Gillian Mellsop, Resident Representative, UNICEF China

世界自然基金会北京代表处总监朱春全
Mr. Zhu Chunquan,Conservation Director of Operation, WWF Beijing Office

全球水伙伴总部高级顾问卡里德·穆塔杜拉
Mr. Khalid Mohtadullah, Senior Advisor of GWP

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Invited Reports

亚洲开发银行东亚局水资源管理主任专家张庆丰
Mr. Zhang Qingfeng, Principal Water Resources Management Specialist, ADB

亚洲开发银行东亚局水资源管理专家小林嘉章
Mr. Yoshiaki Kobayashi, Water Resources Management Specialist, ADB

国家防汛抗旱总指挥办公室副主任张旭
Mr. Zhang Xu, Deputy Director General, Office of State Flood Control and Drought Relief Headquarters

国家发改委能源研究所副所长李俊峰
Mr. Li Junfeng, Deputy Director of Energy Research Institute, National Development and Reform Commission (NDRC)

特邀报告
Invited Reports

中国农科院研究员蔡典雄
Mr. Cai Dianxiong, Researcher, China Academy of Agriculture Sciences(CAAS)

中国水科院副总工程师程晓陶
Mr. Cheng Xiaotao, Deputy Chief Engineer, China Institute of Water Resources and Hydropower Research(IWHR)

山西省水利厅厅长潘军峰
Mr. Pan Junfeng, Director General of Water Resources Department of Shanxi Province

贵阳市水利局副局长郑勇
Mr. Zheng Yong, Deputy Director General of Guiyang Water Resources Bureau

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在中国应对极端气候战略高级圆桌会议上的讲话

全国政协副主席　张梅颖

各位来宾，女士们、先生们：

大家上午好！

芳菲四月，在水之湄。在这春光明媚的美好季节，我第三次应邀出席全球水伙伴中国委员会组织的高级圆桌会议了，每次与来自各界的新朋故友相聚一堂，共同探讨中国的水问题，都感到分外亲切。在这里，我谨代表全国政协对本次会议的召开表示衷心的祝贺，对各位远道而来的朋友表示热烈的欢迎。

极端气候及其引发的水安全问题深刻影响人类的生存和发展，是各国共同面临的重大挑战。妥善应对极端气候及其引发的水安全问题，事关各国经济社会可持续发展和全人类的福祉。令人忧心的是，由于种种原因，各国在气候问题上至今仍难达成可“立即行动”的有效协议。全球温室气体排放总量还在继续增长，未来的全球气候很可能会更加极端化，作为最易受气候变化影响的国家之一，中国还将面临更为严峻的挑战，而在气候灾难面前最脆弱的环节之一当属水资源。近年来，受极端气候的影响，中国水资源时空分布不均和水资源固有的脆弱性更加明显。目前，中国人均可利用水资源量不足700立方米，远远超过国际公认的严重缺水警戒线。刚刚过去的2010年，极端天气引发的灾害几乎影响整个中国大地，局部地区的强降雨、高温干旱以及超强台风等极端天气灾害出现的频率和强度显著上升，水旱灾害的突发性、异常性、不可预见性日渐突出。

. “ 跲。事前定，则不困。行前定，则不疚。”大意是说“任何事情，事前有准备就可以成功，没有准备就要失败；说话先有准备，就不会词穷理屈站不住脚；做事先有准备，就不会遇到困难挫折；行事前计划先有定夺，就不会发生错误后悔的事。”目前的气候变化，全球科学家的共识是有90%以上的可能是人类自己的责任。当前，需要特别关注的是，随着极端气

候常态化的趋势日益加强，我们必须转变以往应对极端气候及其引发灾害的理念和行为方式，不能把应对灾害只当作应急任务，在灾害到来时才采取措施。事实上，在人类现有的科技手段和经济力量不能完全阻止灾害发生或不能完全预知灾害发生的情况下，人类将在一个相当长时间内不得不与灾害共生共存，这种状况要求我们要像关注人类自身的生存和发展一样，关注应对和处置灾害问题，将防灾减灾纳入实现经济和社会可持续发展的全部行动之中，在与灾害共生共存中学会管理灾害和控制灾害。

中国作为负责任的发展中国家，高度重视极端气候及其引发的水安全问题。今年的中共中央、国务院一号文件开宗明义指出“水是生命之源、生产之要、生态之基。兴水利、除水害，事关人类生存、经济发展、社会进步，历来是治国安邦的大事。”明确提出，未来十年，全社会水利年平均投入将比2010年提高一倍，即今后十年国家每年将投入4000亿元加强水利建设，这一重大举措无疑将对我国水利发展和保障水安全产生极大的推动作用。

从长远来看，中国必须将应对气候变化、预防极端水旱灾害事件上升到国家安全的战略高度重视，一是要按照科学发展观的要求，加快转变经济发展方式，积极推进减缓气候变化的政策和行动。要统筹考虑经济发展和水资源承载能力，既要考虑当前又要惠及子孙，采取一系列应对气候变化的政策和措施，以发展低碳经济、优化能源结构、加强环境保护和建设为重点，控制和减缓温室气体排放，努力减轻因人类自身原因加剧的极端气候灾害事件。

二是要加强防御水旱灾害薄弱环节建设，不断提高适应极端气候常态化的能力，切实保障中国水安全。尤其要从整体上增强水利应对极端气候和抗御洪涝干旱灾害能力，以水资源的可持续利用保障经济社会的可持续发展。

中国有一句有名的成语，叫做“唇亡齿寒”。它提醒人们，灾害是没有国界的，任何一个国家都不可能单独面对。应对极端气候，保障水安全是全人类的共同责任,世界各国人民只有团结协作，相互支持，才能最终减轻灾害的破坏影响。今天的水安全高级圆桌会议，就是一个促进各国专家和学者相互学习和交流应对极端气候经验的战略平台，我们坚信，通过各国家、各部门、各行业和全社会的共同努力和通力合作，极端气候应

对一定能够取得新进展，水资源永续利用的目标一定能够实现！

最后，我衷心祝愿此次高级圆桌会议圆满成功。并祝各位来宾身体健康，在北京度过一段愉快的时光。

谢谢大家！

在中国应对极端气候战略高级圆桌会议上的讲话

亚洲开发银行东亚局副局长　许延根

尊敬的各位来宾，女士们，先生们，大家早上好：

我非常荣幸能够在中国应对极端气候战略高级圆桌会议上发言。我谨代表亚洲开发银行，对全球水伙伴中国委员会及中国国家防汛抗旱总指挥部办公室组织这次论坛所付出的艰辛努力表示衷心的感谢，同时热忱欢迎来自不同部委、科研单位、高等院校及其他非政府组织的与会代表。我们也非常高兴能在这里共同举办这次重要会议。

概述:

今天我们要讨论的话题是气候变化，这一问题已经逐渐成为威胁全人类的最严重的一个问题。

我的讲话重点是气候变化如何严重影响到生态系统服务以及人类提高生态系统管理应对这一问题的必要性。

气候变化已经导致诸如洪水、火灾、旱灾之类的气候灾害的发生越来越频繁，也越来越严重，同时，还引起了生态系统的退化。反过来，生态系统及人类社会应对气候变化影响的弹性恢复能力也在降低，灾害风险逐渐提高。生态系统的退化主要影响到自然系统的碳吸存能力（碳吸存能力可以逐渐将自然系统中的森林碳汇固定在植被中），最终加快恶性循环。后面我会引用中国的三个案例来说明气候变化、生态系统退化及气候灾害日益增加这一恶性循环的风险。

首先就是普遍的沙漠化问题。气候变化加重了沙漠化，原本环境业已严峻的畜牧业发展越来越艰难。从西部的天山山脉到戈壁沙漠的东部边缘，300平方公里的宽广土地都面临着沙漠化和土地退化的危险，直接影响到1亿人民的生活。在中国，有27%的土地都遭受着不同形式的沙漠化，愈加严重的沙尘暴已经至少影响到16个省市，对社会、经济

和生态都来了极大的负面影响。尽管气候变化不是引起沙漠化的唯一原因，但它已经对农业生产效率和食品安全带来愈加严重的威胁。持续干旱、耕地不合理扩张、过度放牧以及不合理使用地下水资源都将不断地恶化已经干旱的地区的环境。气候变化要求我们必须要加快提高现有保护措施的有效性。

其次，海平面上升及海洋生态系统退化。中国海岸线海平面上升比率略高于全球平均水平，因此，这一点加重了洪水、海岸侵蚀以及海水入侵。越来越多的台风和风暴也进一步加剧了其所带来的危害。诸如珠江三角洲以及上海、天津和海口市在内的人口众多的沿海城市也都受到了影响。一些海洋生态系统，例如海岸湿地、红树林以及珊瑚礁都在退化，生物多样性也在降低。这一点严重影响了海洋生态系统的恢复能力，也降低了人类社会应对海平面上升和日益增加的灾害危险的能力。

最后，生态系统退化过程已经降低了生态系统缓解气候变化带来的冲击的能力。因此，生态系统退化让自然和人类更易遭受例如洪水、滑坡以及干旱之类的自然灾害。2010年，中国西南部就经历了一次几十年不遇的旱灾，5000万人受灾。同年，干旱后随之而来的暴雨致使几个省份7000万人受灾，导致多人死亡及重大的农作物损失。气候变化，特别是影响水循环系统的不断升高的气温，被认为是导致极端事件发生越来越频繁、越来越严重的罪魁祸首，它影响了从能源部门到农业部门在内的所有经济部门，也给公众健康带来了威胁，同时带来了经济损失。

中国政府的回应：同样重视生态安全

在这样的背景下，令人欣慰的是，中国已经意识到了生态安全的重要性。2011年1月31日，中共中央和国务院做出了一项重大决定，而这一决定其他几乎没有国家有政治能力或经济能力可以办到。中央一号文件阐明了年度中央政府的政策重点，指出力争今后10年全社会水利年平均投入比2010年高出一倍，特别是确立了水资源管理制度的“三条红线”。未来十年的水利投资将达到4万亿人民币（约合6080亿美元）。大力度投资反映了中国迫切想扭转城市环境污染、加快重点项目投资以及确保食品生产的愿望。

很明显，一号文件将生态安全与经济安全和国家安全视作同等重要。水利部部长陈雷认为这是党的文件中第一次将水利提升到关系经济安全、国家安全的战略高度。中央政府鼓励更多的资金投资于水利部门，同时也鼓励更多的私人部门加入进来。

对于一部分人来说，一号文件如此关注水利可能也不算惊讶，因为2010年中国西南地区发生大范围干旱灾害、洪水，部分地方突发严重山洪泥石流灾害，造成了巨大损失，受灾人数众多，影响了我们的环境，同时也引起了较为严重的食品短缺。一号文件特别提出，到2020年，要基本建成全面的防洪抗旱减灾体系。鼓励各级部门通过水价机制节约用水。

亚洲开发银行在行动：促进弹性气候发展

为了减轻气候变化对全球带来的影响，亚洲开发银行已经在亚太地区的发展中成员国推进了弹性气候发展项目。其中，气候变化问题是我们工作执行的重点。除了给予资金支持之外，亚洲开发银行还通过加强良好的管理与政策来帮助应对气候变化问题。我们在各个层次上推进能力建设，包括帮助政府各部委制定应对气候变化的政策，以及协助国家利益相关方更好地了解气象科学以及适合各国特殊情况的良好的气候变化应对措施。

2010年，由亚洲开发银行执行并制定了2011年中央一号文件中的几项有关重大水利问题的研究和战略。其中两项研究属于国家级立项研究。例如，中国国家旱灾管理战略就对中国旱灾的历史发生趋势及地理分布因素作了分析，研究发现：国家旱灾管理系统“陷”在一种被动模式中，而水灾管理也是同样的情况，直到灾害发生后才有响应机制。旱灾管理系统指南严格根据水灾管理系统指南制定。与旱灾研究结论相同，《国家洪水灾害管理战略》研究也认为，需要加强风险评估、风险监测及早期预警系统，这样才能大幅度降低反应次数，同时减少因灾害引起的不必要的损失、灾害及重建成本。

此外，亚洲开发银行还提供了政策及技术指导，以帮助解决农业、基础设施、交通运输、卫生、水利及其他部门的气候变化及气候可变性问题。我们的水利动议是革命性的，通过降低水资源损失以及用综合性的水资源管理方法来提高社区及经济部门对气候变化的弹性恢复能力。

亚洲开发银行针对水利部门的重点应对措施为：促进江河流域综合开发，增强城市水服务对气候变化负面影响的适应性。农业部门方面，亚洲开发银行将监测气候发展趋势，以自身在水资源管理和灌溉方面的经验，支持水利及节约用水技术的发展，以增强部门和农业对气候变化的适应性。

分享亚洲开发银行与中国国家发改委联合出版的一本中文版书目：
《生态服务及生态补偿付费：中国的实践及创新》

在这个世界，气候变化导致天气模式反复无常，海平面上升，暴雨愈加频繁也愈加严重，由生态系统提供的调节服务对于应对气候变化及降低灾害风险至关重要。此类服务包括气象及水利管理，防止洪水、雪崩之类的自然灾害，水及空气净化，碳吸存以及疾病病菌控制等等。

然而，鉴于与生态保护相关的生态工具还没有完全成熟，因此保护方和受益方的生态利益及经济利益分布还存在不平等。因此，自然生态系统继续退化或以惊人的速度消失。实际上，许多人都认为社会没有有效补偿保护生态服务是导致生态系统迅速变化并破坏环境的主要因素，这种生态系统破坏在中国特别严重，但全球范围内也都存在此类现象。

因此，生态服务付费（PES）已经在全球变成一个越来越重要的政策工具，为持续生态系统服务提供支持，另外帮助解决诸如农村贫困人口的生存问题（例如为贫困地区提供永久的资金帮助），并促进气候弹性发展。我在这里高兴地告诉大家，亚洲开发银行和中国国家发展改革委员会已经成功地联合出版了一本有形知识产品，即《生态服务及生态补偿付费：中国的实践及创新》。

今天，我们感到非常高兴，可以与大家分享昨天刚刚面世的以中文编著的这本书。本书主要作者之一——张庆丰以及小林嘉章会在稍后与你们以本书研究成果为基础，探讨生态系统服务问题及气候变化应对问题。

结论

尊敬的各位来宾，女士们，先生们，尽管中国已经下决心致力于应对气候变化问题并降低灾害风险，但我们同时也看到，到目前为止，在应对气候变化影响的恶性循环、生态系统退化及愈加严重的气候灾害问题时，还缺乏一种综合性方法执行国家相关政策，各地方的应对行动也缺乏综合性。将生态系统管理系统地融入到气候变化应对以及减灾政策框架和实践的过程中，非常需要得到政府的支持。此外，我们强烈建议设置恰当的金融激励机制，例如针对生态服务、技术及知识资源的生态补偿或以市场为基础的

支付，将这一机制融入到应对气候变化及减灾框架的生态系统管理中。

今天的会议为高层政策制定人及科学社会提供了一次前所未有的合作机会，来共同应对气候变化、灾害以及持续的生态系统退化的威胁。我相信，通过这次开放坦诚的互相交流，我们将会在生态系统管理、气候变化应对以及减灾方面形成更为紧密的纽带。

让我再次表达对全球水伙伴中国委员会及中国国家防汛抗旱总指挥部办公室对协调并举办这次研讨会所付出的艰辛努力。预祝本次会议在如何最好地设计基于生态系统的气候变化应对战略方面硕果累累。

谢谢。

在中国应对极端气候战略高级圆桌会议上的讲话

主席先生，女士们，先生们：

来到中国还不久就能参加这次高层圆桌会议，我感到非常高兴。

我非常高兴地看到，中国政府已经在应对气候变化方面做出了很大努力，特别是体现在2011年中共中央和国务院共同签署的一号文件，该文件聚焦如何保证水利安全的问题。

众所周知，气候变化会导致气温上升。尽管气候变化也有有利的一面，例如促进粮食增产，提高木材供应，降低中高纬度地区供热系统能源需求，然而，气候变化对社会也带来了负面影响，并且负面影响要远远超过正面影响。所有的负面影响中，气候变化带来的极端气候是其中最为严重的。去年中国西南地区的严重干旱灾害，新疆北部地区的洪水灾害以及今年中国北方的严重干旱天气都极好地说明了这一点。

联合国儿童基金会的主要宗旨是维护儿童的权利，而以下几个方面一旦发生变化，儿童就会成为其中最易受害的群体，包括：食品安全和营养不良；水资源短缺，痢疾和其他水源性疾病；疟疾和其他媒介生物性疾病，室内使用生物质燃料引起的死亡和疾病；以及国家经济和社会结构崩溃带来的影响。

我们的工作是致力于实现儿童的人权并帮助其健康发展。我们通过以下几种方式协助中国政府提供安全饮用水：提高部门工作能力，鼓励各地方参与农村水资源供给管理，发现诸如地下水砷中毒在内的新问题，协助建立合理标准以及为政策制定提供研究支持。

目前，联合国儿童基金会正在积极地通过各种不同方式应对气候变化。在西班牙千年发展目标基金的支持下，我们正与中国水利部合作，实施一个名为“气候变化对地下水的影响研究”项目，目前国内外还没有关于气候变化与水质及水量关系相关的研究。

此外，我们还积极地应对自然灾害带来的影响，在联合国机构中起到了表率作用。我们与中国政府机构合作降低水供给压力及卫生设施供给压力，特别要提出的是，我们为学校提供了饮用水及卫生设施。目前我们与水利部合作发起“水安全计划”，致力于提高饮用水质量并降低污染危险，提高为特殊阶段供水设立应急计划的能力。以上的动议都致力于在全面考虑气候变化对水质的影响及危害的前提下，保证供水的持续性。

同时，气候变化问题还是联合国儿童基金会战略地区的一个“交流媒介”。此外，我们也正在与相关政府部门合作，计划将气候变化问题融入到我们的学校水及环境项目中去。该项目致力于教育在校学生采用低碳生活方式，教育他们以及他们身边的人如何防灾以及如何适应气候变化带来的影响。在减轻并接纳气候变化带来的危害的道路上，我们还有很长一段路要走。而作为我们的未来、我们的希望的儿童，必须要成为我们所有工作的重中之重。

主席先生，朋友们，借助这次机会，我谨代表联合国儿童基金会，真诚地感谢您和全球水伙伴中国委员会对这次会议的组织工作。通过这次会议，来自不同部门的代表可以共聚一堂，共同探讨今天的话题。

我们期待与您有更多的合作。

预祝本次会议取得成功！

谢谢。

在中国应对极端气候战略高级圆桌会议上的讲话

世界自然基金会北京代表处总监　　朱春全

尊敬的张梅颖副主席、水利部陈雷部长、原水利部部长全球水伙伴中国委员会主席汪恕诚先生，各位来宾、女生们、先生们，

上午好！今天，全球水伙伴中国委员会、亚洲开发银行和国家防汛抗旱总指挥部办公室共同主办的高级圆桌会议在北京隆重召开。本次会议以“中国应对极端气候战略”为主题，秉承“人水和谐”的基本理念，来自水资源保护与利用相关领域的决策者、研究者、执行者共济一堂，为维护国家生态安全建言献策，具有重要意义。在此，我谨代表世界自然基金会对本次会议的举办表示热烈的祝贺，向参加会议的国内外各界朋友和专家学者表示诚挚的敬意。

近年来，全球气温增高、海平面上升、极端天气和气候灾害事件频发，这些气候波动不仅影响自然生态系统和人类生存环境，而且也影响世界经济发展和社会进步。气候变化已成为当今国际社会普遍关注的全球性问题，2009年世界自然基金会在《长江流域气候变化脆弱性与适应性研究》中指出：长江流域内147个气象站点资料显示，相对于1961～1990年的平均值，20世纪90年代整个流域的年平均气温增加了0.33℃,而2001～2005年升温幅度达0.71℃。在过去几十年气候变暖的过程中，长江流域发生洪涝灾害的频率呈增加趋势，而未来这一情况可能进一步加剧，极端严重的洪涝灾害、冰雪灾害及干旱事件有增加的趋势。报告中还分析了气候变化对森林、湿地、水资源、草地、农田、河口的具体影响，发现湿地受气候变化的影响最为明显，气候变化将导致全球湿地破碎化程度加剧。水温升高和水位下降已经威胁到湿地的生物多样性，而未来的气候变化将会进一步加剧我国湿地生态系统的脆弱性，降低湿地生态系统的服务功能。

但另一方面，国内外的研究也同时揭示，湿地在气候变化适应中扮演着极为重要的角色。湿地是淡水的天然“储存库”，储存了全球96%以上的可利用淡水资源；湿地是“地球之肾”，其强大的降解污染和净化水质功能，对于保障人们能够长久喝上干净的水，维持多种生物的水环境安全具有不可替代的作用；湿地是降低自然灾害风险的“缓冲器”，具有调洪蓄水、抵御风暴、预防侵蚀、抗御干旱、调节气候等重要功能，对于构建防灾减灾体系、维护国家生态安全、应对极端气候等发挥着独特的战略作用；湿地是物种“基因库”，保存了大量濒危野生动植物的特有基因，孕育了世界上极为丰富的生物多样性。湿地还具有强大的生态功能，可以增加全球生态系统对于极端气候变化的

适应性和回弹力，是人类社会赖以生存和发展的重要自然资源和生态支持系统。

因此，今天在中国应对极端气候战略高级圆桌会议这样一个汇集各行业高峰人士、水资源保护与利用各方面决策者、执行者共同研讨未来战略举措的平台上，为推进我国经济与生态环境的可持续发展，我呼吁：

以流域综合管理手段推动湿地生态系统保护工作，社会各界共同适应气候变化维护生态安全。维护湿地生态系统功能健康，是减缓和适应气候变化的重要战略措施之一，对于保持水源、净化水质、维护流域生态安全，促进经济社会可持续发展，具有十分重要的意义。世界自然基金会在2007年就发起并建立了长江流域湿地自然保护区网络，并用三年的时间从长江中下游推广到整个长江流域，目前已有102个保护区网络成员，保护面积超过185万公顷，为维护长江流域的生态安全做出了重要贡献。过去，湿地保护由于涉及的利益相关方复杂，受到水利、林业、能源、交通等各行业的广泛关注；现在，长江流域湿地保护区网络的成功范例正在为我们带来启示：只有推行跨部门的管理方式和协商透明的原则，才能让管理者、决策者、执行者今后在开展生态系统保护和资源利用时，能够采取一种更全局、整体的办法，共同制定能够被有效采纳和实施的管理措施，从而更有效地协商处理各种利益得失关系，确保生态系统服务功能的长期有效发挥；未来，我们希望继续以流域综合管理为途径，促进湿地保护的理念和行动纳入到应对气候变化国家战略、水资源综合管理、水污染防治、国家主体功能区划等国家相关战略规划和计划中，并发挥积极的作用。

朋友们，女士们、先生们：

今后，让我们一起在科学发展观和“十二五”规划的指引下，建立人与自然和谐发展的新秩序，为捍卫国家生态安全，应对全球气候变化与极端气候灾害事件，维护自然生态系统服务功能，不断提高民生和福祉共同努力！

最后预祝本次圆桌会议圆满成功！

谢谢大家！

在中国应对极端气候战略高级圆桌会议上的讲话

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尊敬的全国政协副主席张梅颖阁下，尊敬的陈雷部长，尊敬的全球水伙伴中国委员会汪恕诚主席，各位来宾，

女士们，先生们：

今天上午，在这里我很高兴能够代表全球水伙伴总部，特别是要转达来自全球水伙伴主席及秘书长热情的问候。至于我本人，每次来到伟大的中国，我都有宾至如归的感觉，我希望这种感觉能一直保持下去。

正如大家之前的发言所指出的，极端气候事件在中国正在日益威胁人类生命和经济基础设施，在此，我谨祝贺全球水伙伴中国委员会已经成功组织了与亚洲开发银行和国家防汛抗旱总指挥部办公室建立伙伴关系的这次重要活动。

在中国和巴基斯坦最近发生的洪水事件提醒我们要重视该问题的严重性。在巴基斯坦发生的洪水事件中，在去年汛期，大约2000万人受到影响，洪水造成超过100亿美元的基础设施的损坏。该地区的经济已经严重受挫于不良安全环境，而洪水的爆发，无疑是雪上加霜，对经济造成的影响是极其不利的。

我非常高兴地告诉各位，全球水伙伴非常积极地参与气候变化有关的知识共享，并且在全球所有论坛上强调了采取行动的紧迫性，特别是水资源问题，其影响是分布在全球、区域和地方的。

在这方面，我想指出的是，全球水伙伴中国委员会最近把全球水伙伴技术委员会第14号报告翻译成中文。各级的所有利益相关方都需要学习该报告，并且能够正确理解这一现象，并在减排和适应战略的制定上应用这方面的知识。

中国此次活动的组织形式可以非常好地将各利益相关者聚集在一起共同讨论问题，

并为中国的决策者采取进一步行动提出合理建议。因此，全球水伙伴总部为全球水伙伴中国委员会及其合作伙伴在这方面所作出的努力提供全力支持。

全球水伙伴认为，气候变化的影响在水资源的各个方面所反映出来的影响是最严重的，而使这一问题变得更困难的是，目前还没有专门的科学能够处理这一问题，正是因为缺少这一专门的科学。所以，我们强烈建议，确保合理适应气候变化的最好的方法，是必须有一个健全的水资源管理战略。仅此一点就可以提供所需的适应性，使得各国能够吸收严重气候事件造成的气候冲击，今天上午大多数发言者在发言中都提到了这些气候冲击。

正如中国水利部部长陈雷所说，中国取得了很大的进步，这些经验应该得到许多国家和地区的认可和借鉴：

1. 它能够在人与自然和谐共存的框架中大幅度提高水资源利用效率；

2. 它实现了安全饮用水供应的目标，较千年发展目标的时间表要求提前六年完成了该目标；

3. 它已经在水利基础设施方面进行了巨大的投资，这些水利基础设施使得它能够成功地应对灾害事件；

4. 它在农业方面，在实现农业增产的同时，取得显著的节水成果。我们看到：中国拥有全球6%的水资源和全球9%的耕地，却养活了占全球22%的人口；

5. 它通过有效的立法和监管框架大大加强环境保护；

6. 最重要的是，它在强调绿色环保和可再生能源（水能，风能和太阳能）方面取得了巨大进步，据统计，绿色环保和可再生能源为该国供应了接近35%的能源供应。

虽然仍需要完成许多工作，但是类似这样的行动能够让国家具备必需的适应性，以应对与气候变化有关的极端事件。

我们在全球水伙伴中与全球水伙伴中国委员会及其合作伙伴并肩战斗，共同努力，更好地理解全球气候变化现象，开发有利技能，制定政策措施，以期能够更有效地应对气候变化问题。

最后，我谨代表全球水伙伴主席、秘书长和我本人，祝愿本次会议取得圆满成功。

谢谢大家！

增强水利保障能力
积极应对全球气候变化
——在中国应对极端气候战略高级圆桌会议上的讲话

水利部部长　陈雷

尊敬的张梅颖副主席，汪恕诚主席，各位来宾，女士们、先生们：

很高兴参加全球水伙伴中国委员会、亚洲开发银行和中国国家防汛抗旱总指挥部办公室联合举办的中国极端气候应对战略高级圆桌会议。首先，我谨代表中华人民共和国水利部，对会议的召开表示热烈的祝贺，向长期关心和支持中国水利事业的联合国相关机构、有关国际组织和金融机构，以及有关国家政府和各界人士表示衷心的感谢！

气候变化深刻影响着人类的生存和发展，已成为世界各国共同面临的重大挑战。中国是一个人口众多、经济发展迅速的发展中国家，人多水少，水资源时空分布不均，水资源承载能力与生产力布局不相匹配是中国的基本水情。近年来，受全球气候变化影响，中国极端天气事件明显增多，水旱灾害的突发性、反常性、不可预见性日显突出，局部地区强暴雨、极端高温干旱以及超强台风等事件呈突发、多发、并发的趋势；水资源南丰北缺的趋势更为凸现，主要江河的实测径流量多呈下降趋势，北方地区水资源短缺形势不容乐观；春季物候期提前，主要农业区的干旱面积呈现扩大趋势，作物病虫害早发高发，农业生产的不稳定性增加；冰川与冻土面积减少，北方一些河流断流、湖泊萎缩消失，水库蓄水减少，湿地功能下降，河道水体污染加剧，海平面上升引起海岸侵蚀、海水入侵、土壤盐渍化、河口海水倒灌等一系列生态问题。应对极端气候，防御水旱灾害，保障水安全，实现水资源的可持续利用，是中国在全面建设小康社会、加快推进现代化进程中必须着力加以解决的重大课题。

中国政府高度重视应对全球气候变化，把节约资源和保护环境作为基本国策，大力发展循环经济，推广低碳技术，开发建设水电、太阳能、风电等低碳和可再生能源，促进经济社会发展与人口资源环境相协调。在2009年哥本哈根气候大会前，中国政府作出

承诺，在2020年单位GDP二氧化碳排放比2005年下降40%-45%，非化石能源占一次能源消费的比重达15%左右，森林面积比2005年增加4000万公顷，森林蓄积量比2005年增加13亿立方米。“十二五”规划纲要对应对全球气候变化、加快转变经济发展方式进一步作出全面部署，提出明确要求。水资源是受全球气候变化影响最为明显的重点领域，加强水利建设是适应气候变化特别是应对极端气候事件的重要基础。今年中央1号文件《关于加快水利改革发展的决定》将水安全提高到国家安全层面，把水利作为国家基础设施建设的优先领域，把防灾减灾体系建设摆上应对气候变化的突出位置。

“十二五”期间，我们将坚持减缓与适应并重、开发与保护统一、建设与管理衔接、科技创新与制度创新并举、政府主导与全民参与并行，全面贯彻落实中央决策部署，加快水利基础设施和防汛抗旱体系建设，加强水资源节约保护和管理，提高水旱灾害应急管理能力，在新的起点上推进水利改革发展新跨越，从整体上提高水利应对极端气候的能力，为促进我国经济长期平稳较快发展、夺取全面建设小康社会新胜利提供坚实的水利保障。

第一，突出加强防洪薄弱环节建设。针对近年来严重洪涝灾害暴露出的突出问题，着力加强中小河流和大江大河重要支流治理、小型病险水库除险加固、山洪灾害防治、病险水闸除险加固等防洪薄弱环节建设，力争在“十二五”时期全国洪涝灾害年均直接经济损失占同期GDP的比重降低到0.7%以下。

第二，加快夯实农田水利基础。完成70%以上的大型灌区和50%以上的重点中型灌区骨干工程续建配套与节水改造任务，净增农田有效灌溉面积约260万公顷，新增高效节水灌溉面积约330万公顷。加大小型农田水利重点县建设力度，因地制宜兴建小水窖、小水池、小塘坝、小泵站、小水渠等“五小”水利工程，加强灌区末级渠系节水改造和田间工程配套，解决农田灌溉“最后一公里”问题。

第三，全面推进节水型社会建设。把落实最严格的水资源管理制度作为节水型社会建设的战略举措，抓紧划定水资源开发利用控制、用水效率控制、水功能区限制纳污“三条红线”，全面落实水资源有偿使用、水资源论证、取水许可等管理制度，强化水资源管理责任与考核，全国万元GDP用水量降低到140立方米以下，万元工业增加值用水量降到80立方米以下，农业灌溉水有效利用系数提高到0.53。

第四，大力提高城乡供水保障能力。继续推进农村饮水安全工程建设，全面解决农村饮水不安全问题。加快南水北调工程建设，构建“四横三纵、南北调配、东西互济”的水资源战略配置格局。大力推进江河湖库水系连通，全面提升水资源调控水平。加大海水淡化、中水回用、雨水积蓄利用等非常规水资源开发利用力度。全国新增供水能力400亿立方米左右，全国干旱灾害年均直接经济损失占同期GDP的比重降低到1.1%以下。

第五，切实搞好水土保持和水生态保护。实施国家水土保持重点工程建设，加强重点区域及山洪地质灾害易发区的水土流失防治，全面开展坡耕地综合治理，继续推进生态脆弱河流和地区水生态修复。在保护生态和农民利益前提下，加快水能资源开发利用，大力发展农村水电，未来五年新增农村水电装机容量约500万千瓦，增加年发电量215亿度，每年可减少二氧化碳排放量1800万吨。

第六，着力强化水资源战略储备。制定特殊时期的水资源安全保障预案，针对不同地区的具体情况，采用多种措施建立应急水源。对海河和辽河等地下水供水比重较高的缺水流域，严格控制地下水开采总量，禁止深层地下水开采，利用南水北调水置换超采地下水，逐步恢复地下水的涵养能力，增加地下水战略储备；对于西北地区，加强产水区生态保护和水源涵养，加速骨干水利工程建设，增加流域储水能力，增强对干旱的应对能力；在西南丰水区，加强水源工程和配置工程建设，增强流域水资源调控能力，同时充分利用地下水的涵养能力，为应对极端干旱提供应急水源。

第七，进一步提高防汛抗旱应急能力。加强防洪非工程措施建设，强化防汛抗旱行政首长负责制，完善水文监测体系和防汛指挥系统，构建“纵向到底、横向到边”的预案体系，落实预警到乡、预案到村、责任到人的防御措施，建设专业化与社会化相结合的防汛抗旱应急抢险救援队伍，健全保障有力的防汛抗旱物资储备体系，着力提高防汛抗旱应急管理水平。

第八，积极开展国际合作与交流。我们积极参与应对气候变化科学研究领域的国际合作与交流。自上世纪90年代起，长期参加政府间气候变化专门委员会（IPCC）全会和工作组会议，先后与联合国开发计划署合作开展了中国气候变化影响与脆弱性研究项目，分别与联合国儿童基金会和联合国教科文组织合作开展了气候变化对中国地下水资源影响和对黄河流域水资源影响研究项目，与英国、加拿大、瑞士等国的科研机构也开展了多种形式的交流与合作。杭州国际小水电中心通过积极开展小水电“点亮非洲”、

小水电清洁发展机制以及小水电站设计和设备输出等合作项目，帮助非洲发展中国家开展低碳清洁能源的开发利用，减缓气候变化。今后，我们将继续推进政府和民间的国际合作与交流，学习国际先进经验和做法，努力减缓和适应气候变化对中国水资源的影响。

女士们、先生们！积极应对极端气候，科学防御水旱灾害，努力保障水安全是全人类的共同责任。中国愿意继续加强与有关国际组织和国家的交流与合作，携手应对全球气候变化挑战，为实现水资源可持续利用，促进经济长期平稳较快发展和社会和谐稳定做出新的更大贡献！

最后，预祝会议取得圆满成功！

谢谢大家！

切实加强环境保护 积极应对气候变化

——在中国应对极端气候战略高级圆桌会议上的讲话

环境保护部副部长 吴晓青

尊敬的张梅颖副主席、陈雷部长、汪恕诚主席，各位来宾、女士们、先生们：

上午好！很高兴也很荣幸参加全球水伙伴中国委员会、亚洲开发银行和国家防汛抗旱总指挥部办公室联合举办的“中国极端气候应对战略高级圆桌会议”。首先，我谨代表中华人民共和国环境保护部对此次会议的召开表示热烈祝贺。同时，借此机会，我想就中国政府加强环境保护，积极应对气候变化的有关情况，与在座的各界朋友一起进行交流和探讨。

众所周知，全球气候变化已成为各国共同面临的重大威胁，深刻影响着世界的能源安全、生态安全、粮食安全、水资源安全和公众健康，事关人类生存和发展。改变传统的高碳发展模式、寻求绿色低碳发展路径，已经成为当前国际社会应对气候变化与解决常规环境污染问题的重要共识。

研究表明，气候变化与环境污染及生态退化在一定程度上具有互为因果的关系。从产生途径看，常规大气污染物和温室气体主要源于化石燃料的燃烧，其来源具有一定的同步性；从物质属性看，《京都议定书》规定的六种温室气体中除二氧化碳外，其它五种温室气体均属于污染物控制范畴；从政策应用看，有利于污染物减排的相关环保措施与应对气候变化的要求在本质上是一致的；从控制手段看，提高能效和结构调整是实现两者协同控制的主要举措。

作为国家应对气候变化领导小组成员单位，环境保护部高度重视应对气候变化相关工作，在加强环境保护、促进低碳发展等方面开展了大量的有益尝试。

一是以污染物减排促进污染物与二氧化碳的协同控制。近年来，各级环保部门切实加强环境监管，实施了管理减排、结构减排和工程减排等三大措施，我国的主要污染物

减排工作取得了突破性进展。截至2010年底，中国的化学需氧量和二氧化硫排放量分别比2005年下降了12.45%和14.29%。国家“十一五”规划确定的二氧化硫减排约束性指标提早一年实现，化学需氧量减排约束性指标提早半年实现。这些实实在在的减排成效，不仅减少了大量常规污染物的排放总量，同时对减少社会经济活动中温室气体排放总量也具有显著的协同效应。有专家对中国攀枝花地区进行的案例研究表明，“十一五”期间，每减排1吨二氧化硫相当于减排约38吨二氧化碳。此外，环境保护部还牵头负责《蒙特利尔议定书》的履约工作，截至2009年底，中国提前实现了淘汰全氯氟烃（CFC）的目标，相当于减排了约4亿吨二氧化碳当量的温室气体，为减缓全球气候变暖做出了积极贡献。

二是以强化环境影响评价为抓手推动产业结构的调整。近年来，各级环保部门不断强化环境影响评价工作，严格落实循环经济和清洁生产的相关政策、标准和措施。2006年以来，环境保护部对简单低水平重复建设、“高耗能、高污染和资源性”行业（即“两高一资”行业）、产能过剩行业和不符合要求的813个项目环评文件做出退回环评报告书、不予受理、不予审批或暂缓审批等决定，涉及投资额约2.9万亿元。“十一五”期间，充分运用污染减排倒逼机制，累计关停小火电机组7000多万千瓦，提前一年半完成关闭5000万千瓦的任务；淘汰落后炼铁产能1.1亿吨、炼钢6860万吨、水泥3.3亿吨、焦炭9300万吨、造纸720万吨、酒精180万吨、味精30万吨、玻璃3800万重量箱，努力从源头防范环境污染和生态破坏，促进了经济结构和产业布局的低碳化转型。

三是以清洁发展机制（CDM）为契机切实减少温室气体排放。环境保护部环境认证中心成为国内第一家获得联合国清洁发展机制执行理事会正式授权的指定经营实体。在相关部门的支持下，环保部门积极开发清洁发展机制项目，在化工、风力发电、垃圾填埋气回收利用、工业废能回收利用以及生物质等多个领域实施清洁发展机制项目的咨询服务。截至2010年底，共产生经联合国清洁发展机制执行理事会签发、核证的减排量约9600多万吨二氧化碳当量，约占同期中国签发总量的36%和同期世界签发总量的19%，从而为应对全球气候变化做出了实质性的贡献。

四是以低碳产品认证引领全社会绿色消费。建设环境友好型社会的基本任务是建立可持续生产与可持续消费模式，形成节约资源能源和保护环境的产业结构、增长方式和消费模式。中国环境标志是推动可持续消费的重要工具，近年来环境保护部先后颁布了71项环境标志标准，已经有1600多家企业生产的3万多种规格型号的产品获得了中国

环境标志认证，形成了年产值1000多亿元的环境标志产品群体，成为中国社会选择绿色产品的重要依据。从2009年开始，环境保护部以中国环境标志为基础，积极探索开展低碳产品认证相关工作，环境认证中心已分别与德国技术合作公司和英国标准协会签署了合作备忘录。开展低碳产品认证，一方面帮助生产商和销售商更好地传播低碳产品在保护气候方面的信息，为消费者提供一定的判断依据，另一方面也通过公众的消费选择来引导和鼓励企业开发低碳产品和低碳技术，促进形成低碳的生产模式和消费模式。截至2010年11月，已发布《家用制冷器具》、《家用电动洗衣机》、《数字式多功能复印设备》、《数字式一体化速印机》四项中国环境标志低碳产品标准，共有11家企业生产的12类100多个规格型号的产品通过认证。

五是以科学研究为重点加强应对气候变化的能力建设。环保部门组织对温室气体统计、监测以及低碳技术、低碳发展模式等重要课题进行深入研究，并取得了一些阶段性的成果。例如，以第一次全国污染源普查为基础，开展了中国2007年工业行业的二氧化碳排放核算研究，从企业层面出发开展了全面的“自下而上”的核算，初步掌握了电力、钢铁等重点工业行业的二氧化碳排放量、排放强度和区域分布特征。从行业分布来看，火电行业二氧化碳排放最多；从排放强度看，东部经济发达省份的二氧化碳排放强度整体相对较低；从产品排放看，电力、钢铁等重点行业的单位产品二氧化碳排放量整体偏高。组织开展了环境税、绿色贸易和排污权交易等相关研究，部分成果已在中国的环境经济政策制定过程中加以采纳。此外，环保部门还充分发挥在污染物监测、统计、监管等方面的优势和经验，在温室气体监测等方面取得积极进展。“十一五”期间，环境保护部在全国31个省会城市（含直辖市所在地）建设了温室气体城市代表站点，能够实现二氧化碳和甲烷的自动在线监测，在福建武夷山、山东长岛等地建设了4个温室气体区域代表站，今年上述31个城市站点和4个区域站已经全面启动温室气体试点监测。

女士们，先生们！

应对气候变化的工作任重而道远。2009年中国政府提出到2020年单位GDP二氧化碳排放量较2005年下降40%-45%，近期审议通过的《国民经济与社会发展第十二个五年规划纲要》进一步明确，到2015年非化石能源占一次能源消费比重达到11.4%、单位国内生产总值能源消耗降低16%、单位国内生产总值二氧化碳排放降低17%、化学需氧量和二氧化硫排放分别减少8%，氨氮和氮氧化物排放分别减少10%、森林覆盖率提高到21.66%、森林蓄积量增加6亿立方米,这些约束性指标都与控制温室气体排放和减缓气候变化密切

相关。下一步，各级环保部门将继续以科学发展观为指导，按照国家应对气候变化工作的总体部署，进一步加强环境保护工作，积极探索绿色低碳的发展道路，重点做好以下几个方面的工作。

一是继续大力推进污染减排工作。配合有关部门，严格执行产业政策和国家下达的落后产能关停计划。加快实施环保重点工程，继续抓好城市污水处理厂、燃煤电厂脱硫脱氮等减排项目建设。强化减排目标责任制，加强对减排工作的监督检查。以火电行业为重点，大力削减钢铁、有色、水泥行业的大气污染物排放量；以造纸行业为主攻方向，重点削减化工、酿造、印染行业废水污染物排放量；进一步实施节能减排与温室气体的协同控制，研究从单一的区域污染物到包括温室气体排放在内的联合控制战略，提高温室气体和主要污染物这两者之间的协同治理能力。

二是加强重要生态功能区适应气候变化工作。大力推进生物多样性与气候变化国家战略及行动计划，以主体功能区划和生态功能区划为基础，系统评估气候变化对我国重要生态系统、物种和生物多样性保护优先区域的影响，确定对气候变化特别敏感的生态系统、物种和遗传资源清单。加强极端气候与人类活动对物种和生态系统叠加影响的研究，加快制定评估指标体系；研发气候变化对生物多样性影响的监测技术，建立相应的监测体系；加强生物多样性适应气候变化的预警体系建设，积极探索生物多样性保护优先区的生态补偿机制，有效提高重要生态系统适应气候变化的能力。

三是大力开展低碳产品认证工作。结合国家应对气侯变化的总体部署，配合国家节能减排和低碳试点相关要求，对现行中国环境标志标准进行科学分类，从中识别出适合开展低碳产品认证的产品种类，制修订相应的低碳产品认证标准和可以市场化的低碳产品认证种类。开发适合国情的碳足迹计算工具，积极参与国际低碳产品标准和规则的制定，提高中国环境标志产品的国际竞争力。引导和鼓励企业使用基于中国环境标志的低碳产品标识，推动将其纳入政府绿色采购范畴，逐步扩大低碳产品认证范围和影响力。

四是积极探索温室气体相关标准的制修订工作。目前，在煤层气、机动车等部分国家污染物排放标准中已经设置了部分温室气体排放相关的指标；部分清洁生产标准中也包含了能耗控制的要求，通过能耗指标可以从生产源头来间接控制温室气体排放。今后，环保部门在制定部分重点行业的大气污染物排放标准时，将适时增设相应的温室气体控制指标，充分发挥环保标准在控制温室气体排放和推动低碳发展方面的重要作用，

为我国温室气体排放管理提供的技术支持和保障。

五是加大宣传教育并鼓励公众参与。要充分利用已有的环境宣传教育网络体系，开展气候变化相关知识的宣传和普及，制定宣传教育计划和行动，完善信息公开制度，发挥政府的引导和示范作用。通过举办各类培训和宣传活动等形式，增强公众低碳环保意识，鼓励社会各界的广泛参与，形成有利于应对气候变化和促进低碳发展的社会氛围。

六是加强国际交流与合作。积极参与国际合作，学习借鉴国外的先进经验和制度设计理念，加强环境标准、低碳产品认证和绿色贸易等重点领域的交流，提高国际环境履约和防范环境风险的能力。通过联合研发和推广新的低碳技术，促进有利于应对气候变化、节能减排和低碳发展的技术转让，加快技术成果的应用及产业化。

女士们，先生们！

加强环境保护，积极应对气候变化，既是中国加快经济发展方式转变和推动可持续发展的需要，也是中国树立负责任大国形象、为全球应对气候变化做出贡献的需要。全球水伙伴中国委员会、亚洲开发银行和国家防汛抗旱总指挥部办公室在推动应对气候变化方面做了大量卓有成效的工作，所倡导的区域合作与协调机制已成为应对极端气候、适应气候变化和保障生态安全方面的重要理念。让我们携手努力，加强各部门、各行业和全社会的通力协作，更加广泛地开展国际环境交流与合作，积极探索有利于应对气候变化的低碳发展之路，为构建和谐世界、保护人类赖以生存的地球家园、促进人类的文明进步做出更大的贡献。

最后，预祝本次论坛取得圆满成功！

谢谢大家！

积极应对我国极端气候
为保护全球气候作出贡献
——在中国应对极端气候战略高级圆桌会议上的讲话

中国气象局副局长　　许小峰

尊敬的张梅颖副主席，各位来宾、女士们、先生们：

上午好！首先，我代表本次会议的联合支持单位——中国气象局，向本次会议的成功召开表示热烈的祝贺！向会议主办方为组织此次会议所付出的努力表示衷心的感谢！

伴随着经济社会的快速发展，气候变化问题已成为人类面临的严峻挑战，正在深刻影响着人类生存环境和社会发展方式。科学应对气候变化，是当今国际社会共同面临的重大问题和挑战。中国是一个气候条件复杂、生态环境脆弱、自然灾害频发、易受气候变化影响的国家。受全球气候变暖的影响，我国极端气候事件呈多发、重发、突发的趋势。应对气候变化和防御极端气候事关人民福祉安康和经济社会可持续发展，需要多部门共同参与决策、全社会广泛参与行动。今天，以“中国极端气候应对战略”为主题，召开高级别圆桌会议，将有助于提高全社会对气候变化和极端气候的理解与认识，推动政府与各部门、各行业在应对极端气候方面开展更加积极有效的工作。

基于人类现有的科技水平和对自然的认知水平，我们尚难以肯定所有的极端天气气候事件都起因于气候变暖，但是我们可以肯定的是，与全球气候变暖趋势相类似，极端天气气候事件也呈现增多增强的趋势。一些地方发生了从未发生过的灾害，一些地方接连发生过去几十年或者上百年才会发生一次的灾害，我们从中可以找到全球气候变暖的影响因子。

随着人类对气候、气候变化以及气候变化与人类活动之间关系等问题的研究力度加大，认识也逐渐加深。人类或许对自身活动对全球气候变暖的影响还报有一些怀疑，但是全球气候变暖对人类生存、生产、生活的影响已经十分现实地摆在了我们的面前。应对全球气候变化，我们一方面要采取积极的措施，遵循科学的认识和科学的规律，减轻

人类活动对气候的影响强度，尽可能减缓气候变化，另一方面，更加现实、紧迫、直接的工作就是要采取科学的方式，应对极端天气气候事件对经济社会发展和人民安全福祉的影响，尽可能适应已经变化了而且还将继续变化着的气候。从这个角度来认识，我国政府把加强适应气候变化特别是应对极端气候事件能力建设摆在“十二五”时期的重要战略位置，体现的就是一种负责任的精神和科学务实的态度。

下面我从两方面谈一些意见。

一、极端气候是我国可持续发展面临的重大挑战

在以全球气温升高为特征的气候变化背景下，我国极端天气气候事件频繁发生。近百年来全球气候快速的变化，正使全球一些重要的系统失去原有的平衡，产生不稳定，这包括北大西洋温盐环流调整，北极海冰快速融化，冰川和格陵兰冰盖快速退却，西南极冰架崩溃，亚马逊雨林破坏，西非长期干旱与亚洲季风减弱，海洋与大气环流模态改变等。这种不稳定性的增加，最直接的威胁就是极端天气气候事件发生的频率增加，强度增强，从而引发更加极端的气象灾害，给经济社会发展和人民生命财产安全带来更大威胁。近20年来，我国极端天气气候事件的频率和强度确实出现了明显变化：一是夏季高温热浪增多，35℃以上的高温日数持续增多，显著高于多年平均。二是区域性干旱加剧，近50年干旱灾害发生频次已经成为各项自然灾害之首，成灾率呈上升趋势，特别是华北地区最近20多年中有8年发生干旱，干旱发生之频繁、干旱范围之广、损失之大，是1886年以来最严重的；2006年，四川、重庆等地发生了百年一遇的严重高温干旱，2009至2010年我国西南地区发生了历史罕见特大干旱，都对当地的生产生活造成了重大影响。三是强降水增多，最近20年是继20世纪50年代之后长江和淮河流域洪水灾害高发期，年平均直接经济损失高达1250多亿元。特别是近5年来，频繁发生了超历史气象记录的极端天气事件。2007年，50年一遇超强台风“桑美”登陆浙江，淮河发生了仅次于1954年的流域性大洪水；2008年，南方地区发生了历史罕见的低温雨雪冰冻气象灾害；2009年，强台风“莫拉克”导致我国台湾南部地区发生近50年来最严重水灾；2010年，华南、江南地区连遭14轮暴雨袭击；因强降水导致甘肃舟曲县发生新中国成立以来最为严重的特大山洪、泥石流灾害，贵州关岭山体滑坡、江西抚河唱凯堤决口等突发事件也极大危害了人民的生活和生命安全。就在前不久，4月17日广东多地又出现了突发性短时强降水、雷雨大风或冰雹等强对流天气，造成17人因灾死亡。

极端天气气候给经济社会发展造成重大影响。我国频繁发生的极端天气气候事件在给人民群众生命财产造成重大损失的同时，也给农业、水资源、自然生态系统等带来了严重影响。干旱、洪涝、高温、冰冻导致农产品产量剧烈波动，影响农业种植结构和布局，气象灾害还使得病虫害加重，生产成本和投资进一步增加。极端事件导致旱涝分布不均匀性加强。由于干旱，1950年以来，我国六大江河的径流量减少，北方部分河流发生断流，地下水资源锐减。同时，局部地区发生的洪涝灾害，特别是1990年以来，长江、珠江、松花江、淮河、太湖、黄河均连续发生多次大洪水，洪灾损失严重，我国水资源供需矛盾加剧。气候变化和极端气候事件的发生，也对我国生态系统产生不同程度的影响，近50年我国大部分地区冰川面积缩小了10%以上，90年代以来冰川退缩加速，已导致干旱区内陆河流的径流显著增加，但也存在冰湖溃决等灾害的潜在风险。西藏冻土最大缩减了4～5米，森林类型的分布出现了北移和上移，内陆湖泊和湿地萎缩加速。在目前的发展阶段，经济增长的资源环境约束强化，生态文明建设面临新的要求，应对包括极端气象灾害在内的各种自然灾害的任务十分艰巨。经济结构性矛盾仍然突出，能源资源利用效率较低，控制温室气体排放面临着巨大的压力，是我国实现可持续发展的重大制约因素。

二、积极应对极端气候不断增强可持续发展能力

极端天气气候事件，从发生的背景和机理来看，与全球气候变化有着紧密的联系。因此，应对极端天气气候事件，离不开对全球气候变化问题的科学认识。虽然目前对于气候变化及其成因与影响还存在不同看法，但是，我们不能因此应对极端天气气候事件增多问题的重要性和紧迫性，也不能否定应对气候变化行动的艰巨性和现实性，更不能影响我国应对气候变化的决心和行动。对于极端天气气候事件，从发生后的应对与处置来看，与国家防灾减灾能力有着紧密的联系。因此，应对极端天气气候事件，离不开国家防灾减灾体系的构建与完善，离不开我国不断加强防灾减灾整体能力的提升。

积极应对气候变化，需要减缓与适应并重。减缓是长期的、艰巨的，而适应是更为现实的和紧迫的。要将应对极端气候放在国家应对气候变化的重中之重，将防范极端天气气候事件放在国家防灾减灾工作的重中之重。以发展经济为核心，以节约能源、优化能源结构、加强生态保护和建设为重点，以科技进步为支撑，转变经济增长发展方式，不断提高应对气候变化和防灾减灾能力。同时，也应充分认识到积极采取措施应对气候变化，必将有利于落实科学发展观，促进经济社会可持续发展。为此，我提出以下五点

建议：

第一，加强应对气候变化和极端气候的科技创新。在当前社会各界高度关心全球气候变化及其影响、气候变化及其可能影响又存在许多科学不确定性的情况下，我们应当更加重视科技创新，加强我国气候变化的观测、分析、预测、评估和科学研究工作，研究极端天气气候事件变化规律及其适应措施，研究全球气候变化对农业生产和粮食安全、生态建设和生态安全、疾病防控和公共卫生安全、水资源保护和用水安全的可能影响及其适应措施。科学修订气候变化脆弱行业的灾害防御标准，建立重大工程、项目的气候可行性论证制度，制定自然灾害防御法律法规，引导人居环境和重要的战略基础设施远离自然灾害多发区、易发区和自然环境脆弱区。

第二，加强应对气候变化和极端气候的广泛合作。科学应对气候变化，离不开国际、区域和各部门的合作。应建立跨区域灾害防御和适应体系。建立多边合作机制，大力推进极端事件和灾害区域联防体系建设，探索区域内各国和地区之间共同应对气候变化的新途径，在极端气象灾害综合监测、预警和评估，灾害风险管理和协调，区域灾害监测网络和信息共享等方面开展务实合作，提高区域整体应对极端灾害能力。要加强国内相关部门间的信息、资源共享和协同，共同推进我国应对极端气候灾害工作的开展，为保护地球气候环境和人类可持续发展作出贡献。

第三，着力提高极端气候监测预报预警和评估水平。加强中小河流域防洪抗旱区、山洪地质灾害易发区气象灾害监测预报预警能力，着重提高对台风、洪涝、干旱、滑坡、泥石流以及高温热浪等易发频发灾害的预警预报能力；加强重大江河流域气候变化综合影响评估，科学开发利用空中云水资源，加强地下水资源保护与利用。高度重视在经济建设和城乡建设中气候评价和灾害风险评估，加强基础设施和重大工程的科学规划和设计，夯实应对气候变化及其风险的工程基础。

第四，着力增强极端气候应对处置能力。要建立健全防御极端气象灾害的体系和机制，完善应对极端气象灾害的应急预案、启动机制以及多灾种早期预警机制，完善部门联合、上下联动、区域联防的防灾机制，增强应对极端气候的组织和实施能力。

第五，着力增强全社会应对极端气候的意识。应对极端气候灾害，需要全社会共同行动。我们应当充分发动社会各方面的力量和资源，组织做好应对气候变化和防灾减

灾科普教育，让全社会了解和理解极端气候灾害发生规律，以及防御各种灾害的科学措施；要建立健全重要地区的气象服务信息发布网络，建立针对农村、特殊人群、重要场所的预警信息传递机制，努力降低自然灾害和气候变化的影响。

女士们，先生们，

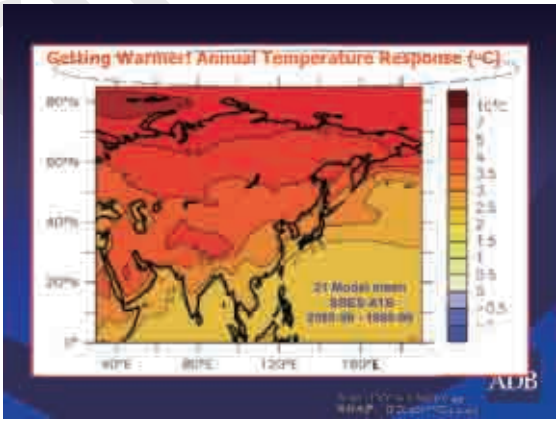
中国气象局作为国家应对气候变化基础性科技部门，在气象灾害、气候和气候变化的监测、检测、预测和预警以及影响评估的科研、业务、服务方面具有良好的基础。初步形成了地基、空基和天基相结合，门类比较齐全，布局基本合理的气象综合探测系统。开展了气候资源普查评估区划、气象灾害风险评估、气候变化对全国八个区域、11个重点流域的评估和气候可行性论证工作。大力推动应急管理组织体系建设，高度重视气象防灾减灾科普宣传，注重发挥科技在气象防灾减灾中的重要作用，不断提高气象防灾减灾的综合能力。另外，中国气象局联合科技部、中科院编写了《第二次气候变化国家评估报告》，重点对极端天气气候事件进行了评估。牵头政府间气候变化专门委员会IPCC第五次评估报告的编写工作，刚刚提交了《管理极端事件和灾害风险、推进气候变化适应》特别报告的中国政府意见。我们将按照党中央、国务院的部署和要求，与各部门通力协作，依靠科学力量，努力在国家防灾减灾和应对气候变化工作中发挥更大的作用，提供更加有力的科技支撑，为全社会、各行各业提供更主动有针对性的气候服务，为建设资源节约型、环境友好型社会，提高生态文明水平作出新的贡献！

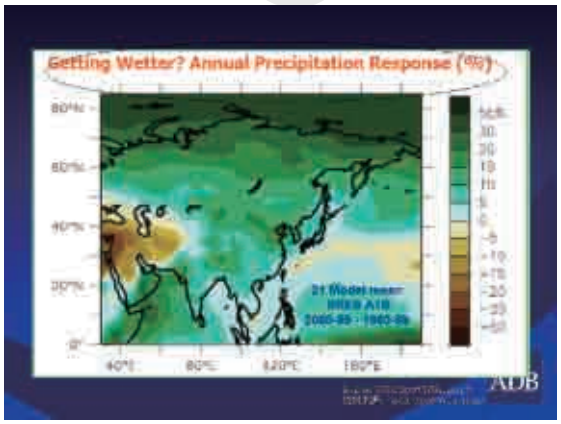
最后，预祝本次会议取得圆满成功！

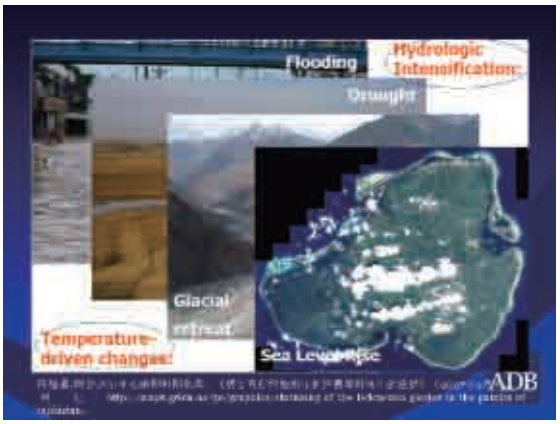
谢谢大家！

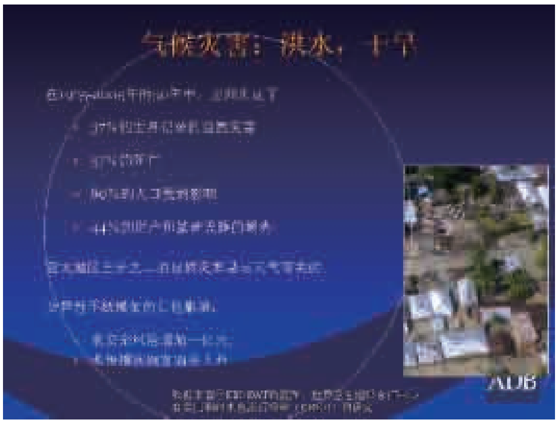
生态系统服务和应对气候变化

亚洲开发银行东亚局
张庆丰, 小林嘉章








气候灾害：洪水，干旱
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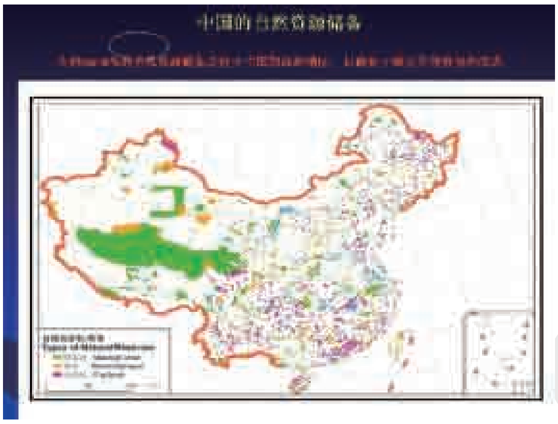

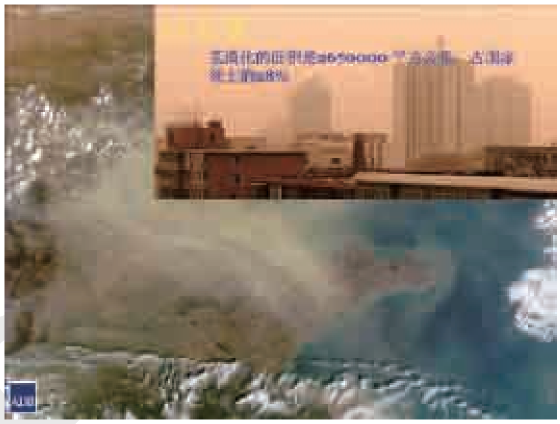


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BEIJING
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生态系统退化，灾害风险增加和气候变化的螺旋关系
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UNEP, 2009


II. 基于生态系统的适应性
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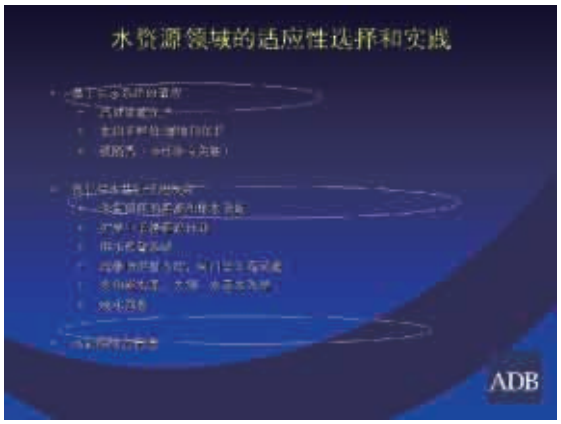
水资源领域的适应性选择和实践
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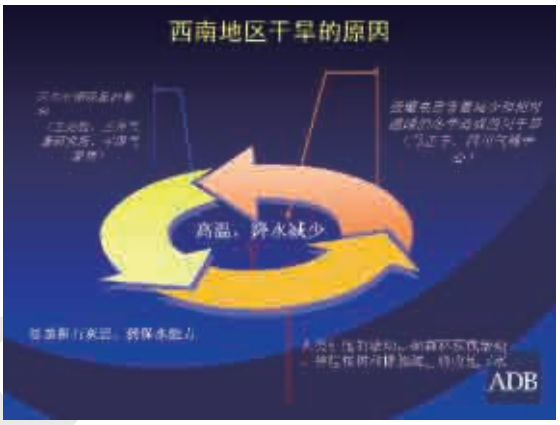
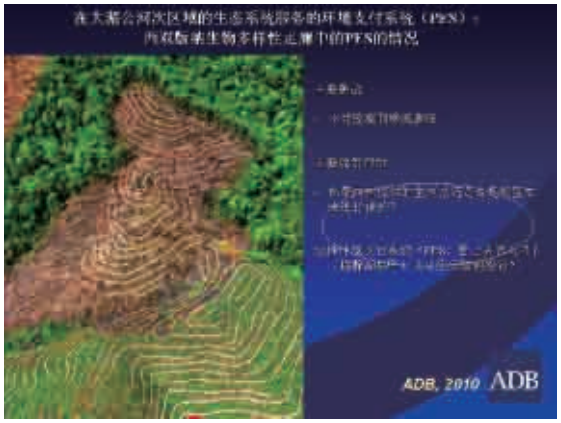
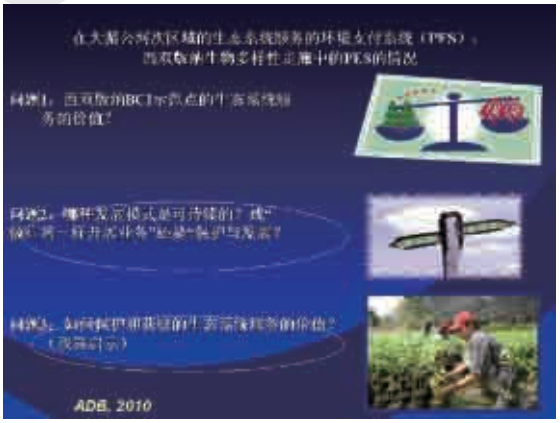
Policy makers
Ecosystem-Based Adaptation
Society
Scientists


打破恶性循环
UNEP, 2009
ADB


西南地区干旱的原因
高温，降水减少
ADB


在大湄公河次区域的生态系统服务的环境支付系统（PES），
西双版纳生物多样性走廊中的PES的情况
ADB, 2010
ADB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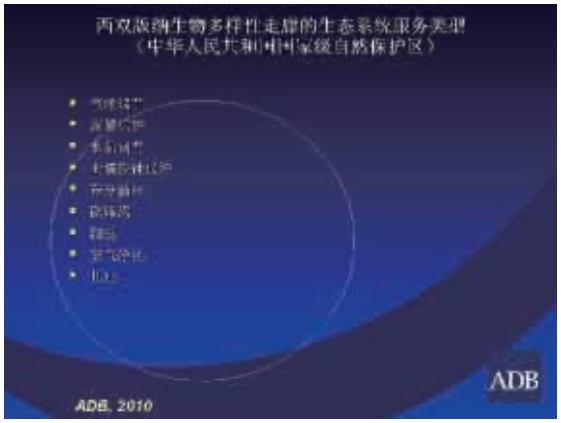
西双版纳生物多样性走廊中的PES的情况
ADB, 2010


西双版纳生物多样性走廊的生态系统服务类型
（中华人民共和国国家级自然保护区）
ADB, 2010
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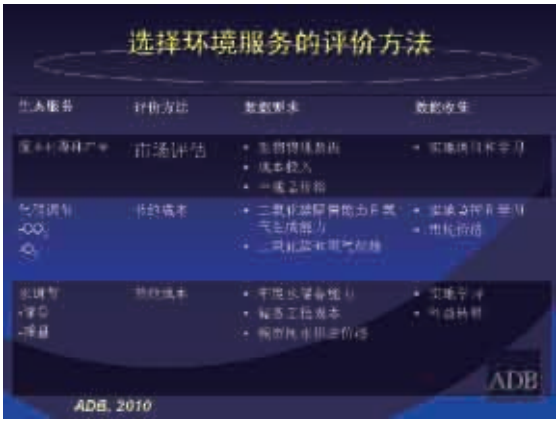
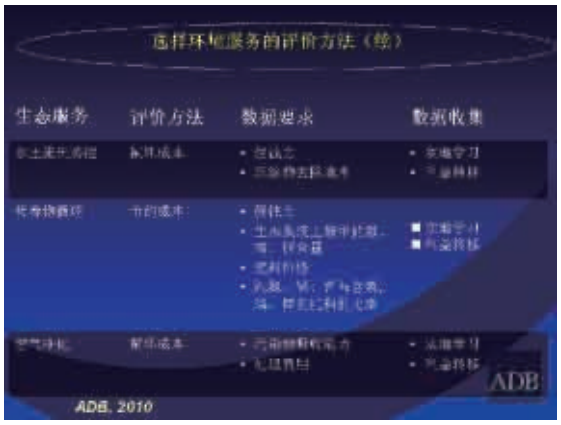

选择环境服务的评价方法
生态服务
评价方法
数据要求
数据来源
市场评估
ADB, 2010
ADB


选择环境服务的评价方法（续）
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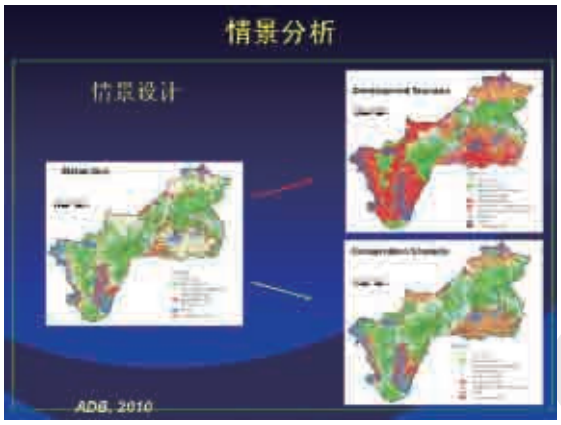
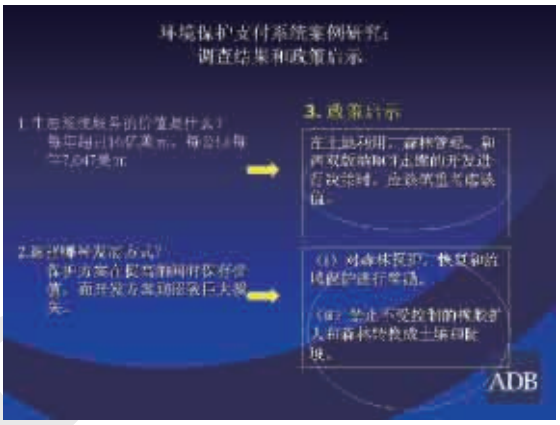
评价方法
数据要求
数据收集
ADB
ADB, 2010


VES总结
ADB
ADB, 2010


情景分析
情景设计
ADB, 2010


环境保护支付系统案例研究：
调查结果和政策启示
3. 政策启示
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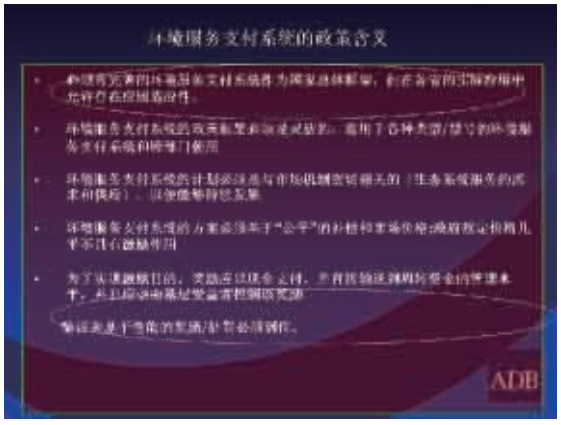
环境服务支付系统的政策含义
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III.亚洲开发银行参与的相关活动
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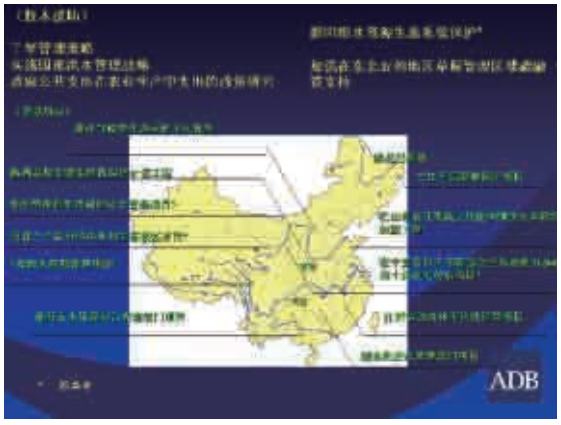
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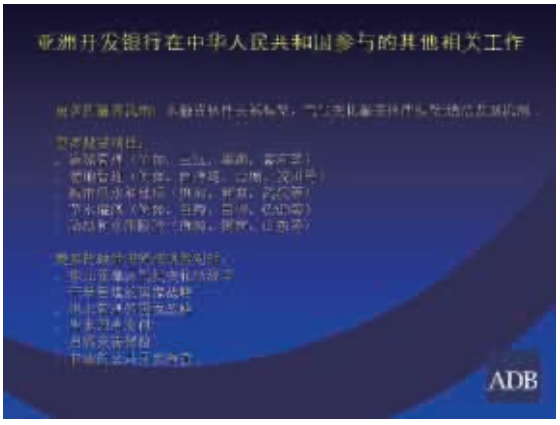
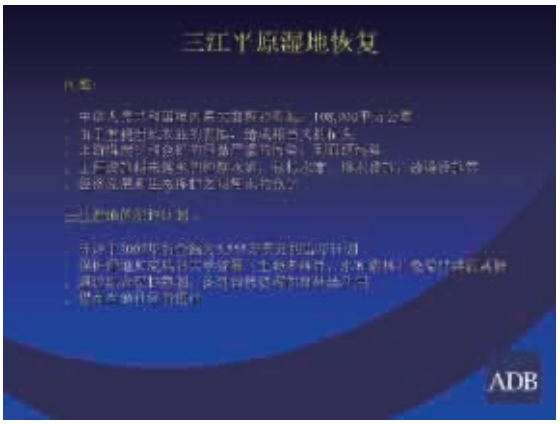
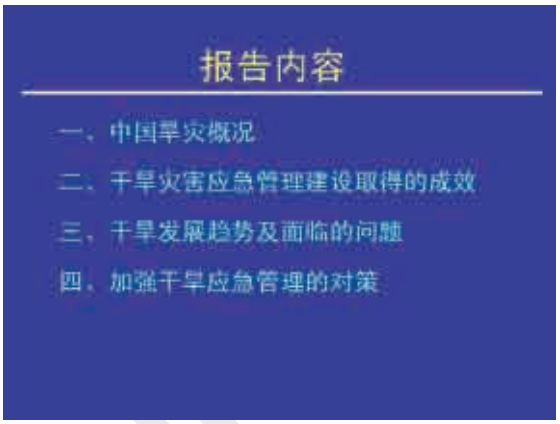
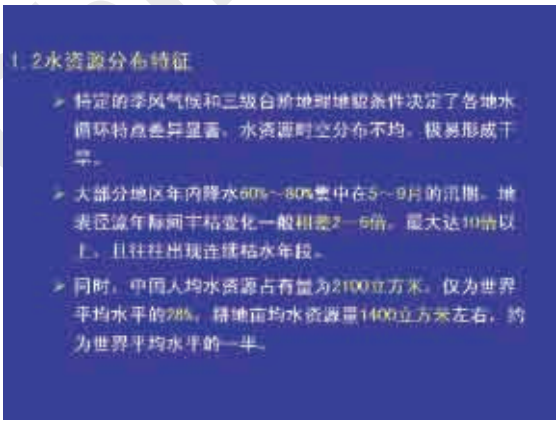

亚洲开发银行在中华人民共和国参与的其他相关工作
ADB

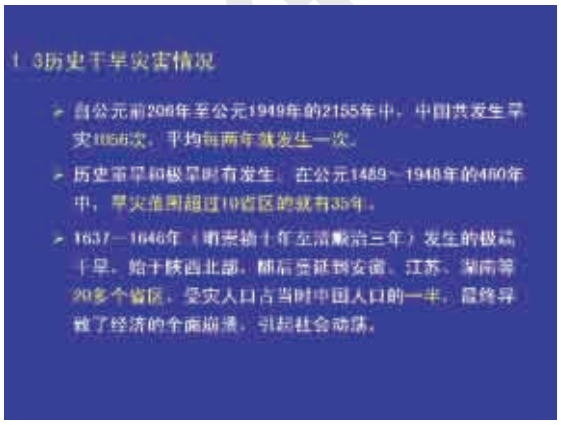


中国干旱灾害应急管理

国家防总办公室　　张旭





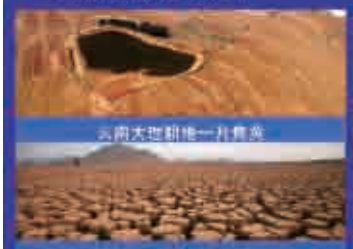


1.3历史干旱灾害情况

- 新中国成立以来，经过大规模的水利建设，初步形成了供水保障体系，抗旱能力有了大幅度提高，但抗旱减灾体系建设仍严重滞后，干旱灾害频发重发。
- 2000年发生的全国性特大干旱，因旱受灾面积6.08亿亩，因旱粮食损失近1200亿斤，有2770万人因旱发生饮水困难，18个省的620座城镇缺水。
- 2009年，北方冬麦主产区特大干旱，旱情高峰时受旱面积达1.53亿亩，占全国作物受旱面积的95%。
- 2010年西南五省区大旱，耕地受旱面积达到1.01亿亩，因旱饮水困难人数达到2008万人。

1.3历史干旱灾害情况

- 2010年西南5省区大旱



云南大理耕地一片裂痕

云南陆良彩云湖格海子水库干涸

云南玉溪干枯的甘蔗

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一、中国旱灾概况

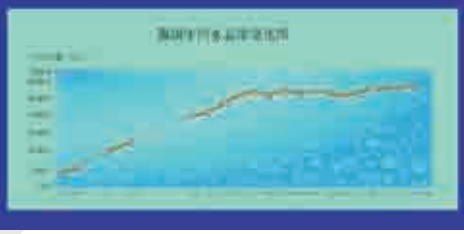
二、干旱灾害应急管理建设取得的成效

三、干旱发展趋势及面临的问题

四、加强干旱应急管理的对策

2.1水资源配置能力大幅提高

- 新中国成立以来，中国先后修建了大中小型水库8.7万座，兴建蓄、引、提供水工程480万座，供水能力达到7400多亿立方米，中等干旱年份可基本保障城乡供水需求。



2.2农业灌溉能力显著增强

- 建成万亩以上灌区6414处，建成各类小型农田水利工程2000多万处。通过对大型灌区的续建配套和节水改造，目前，全国农田有效灌溉面积已由新中国成立之初的2.4亿亩扩大到8.9亿亩，占世界总灌溉面积的20%，保证了国家粮食的安全。

2.3农村饮水困难得到明显改善

- 已修建各类饮水工程315万处，累计解决了2.72亿农民的饮水困难和2.13亿农村人口的饮水不安全问题，基本结束了中国农村严重缺乏饮用水的历史。

2.4抗旱水量调度手段不断增强

- 为应对持续、大范围的干旱灾害，中国政府通过加强水利工程的建设，强化水量统一管理调度等手段，大大增强了跨流域、跨省区抗旱水量的应急调度和管理能力。
- 先后多次成功实施了引黄济津、引黄济冀、长江嘉陵江、湘江、赣江枯水期应急调水、珠江枯水期水量调度、引江济太、引岳济淀、引滦济津、南四湖生态应急补水、扎龙湿地应急调水等，有效保障了天津、澳门、珠江三角洲、长江沿线许多重要城市的供水安全和工农业生产及生态用水，维护了社会稳定和区域生态环境的良性发展。

2.5抗旱应急保障能力不断加强

- 目前中国已有2144个县、11753个乡镇建立了抗旱服务队，2011年中央财政投入16亿元，重点装备800支县级抗旱服务队，还在部分重点旱区储备了2亿元的抗旱应急物资，通过加强抗旱专业化队伍和抗旱应急物资储备，大大提升了干旱灾害应急处置能力。

抗旱服务队跑地送水

2.6抗旱法规和预案体系基本建立

- 近年来，中国政府颁布实施了《抗旱条例》，制定了《国家防汛抗旱应急预案》及相关规程规定和实施办法等一系列法律法规，印发了抗旱应急预案编制大纲。
- 各级地方人民政府根据国家有关抗旱的法律法规，相继制定了本地区的配套法规和实施细则，构成了中国抗旱法律、法规和预案体系，为抗旱工作的规范化、法制化提供了有力保障。

2.7旱情监测预警能力不断提高

- 为满足抗旱工作需要，中国各级政府防汛抗旱指挥机构先后建设了1500多个土壤墒情监测站点，在2372个易旱县和城市建设市、县级旱情采集站。
- 气象、农业部门结合各自工作需求，也组织开展了相关工作。
- 这些站点采集的旱情信息与降雨、水库蓄水、河道来水、地下水、历史旱情数据库等信息相结合，在抗旱指挥决策中发挥了重要作用。

2.8干旱基础研究取得较大进展

- 组织开展了大量干旱应急管理基础工作研究：
  - 编写了《中国抗旱战略研究》
  - 出台了《旱情等级标准》、《抗旱预案编制导则》、《抗旱规划编制导则》、《跨流域跨省区（区域）水量应急调度预案编制大纲》
  - 开展了干旱频率、特征值、干旱区划及风险评估、抗旱能力评价等基础课题的研究

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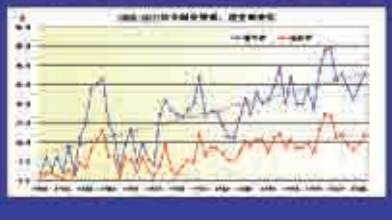
3.1干旱发展趋势

随着全球气候变化和人类活动的加剧，水资源时空分布不均问题更加明显，极端干旱事件发生几率增大，气候变化直接导致中国干旱灾害发生频率升高，重、特大旱灾年份增多，灾害损失加重。

- 干旱频次增加
- 受旱范围扩大
- 持续时间趋长
- 旱灾损失加重
- 抗旱难度增大

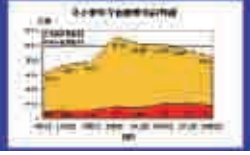
3.1.1干旱频次增加

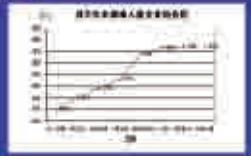
- 1950～2010年61年间发生重旱以上干旱为24年，发生频次为39%，其中1990～2010年21年间发生重旱以上干旱年份为11年，发生频次为52%，平均每2年全国就要发生一次严重、特大旱灾，旱灾发生频次呈现明显增长趋势。



3.1.2受旱范围扩大

- 以往中国旱灾高发区域主要在干旱缺水的北方地区，特别是西北地区。
- 近年来，在北方旱情加重的同时，南方和东部多雨区旱情也在扩展和加重，旱灾范围已遍及全国。
- 同时，旱灾影响范围已由传统的农业扩展到工业、城市、生态等领域，工农业争水、城乡争水、超采地下水和挤占生态用水现象越来越严重。





3.1.3持续时间趋长

- 近年旱灾还呈现出持续时间长、连季甚至连年干旱突出的情势。
- 2000—2001年连续2年发生全国性大旱，2006年夏季至2007年春季川渝大旱为夏秋冬春四季连旱。
- 2008年10月至2009年2月北方冬麦区冬春连旱，2009年9月至2010年5月西南五省区大旱，2011年北方冬春连旱等，造成重大影响和损失。
- 各种迹象都表明旱灾持续的过程有拉长的趋势。

3.1.4旱灾损失加重

- 旱灾造成的经济损失涉及粮食生产、经济作物和林牧渔业以及城市工业、水电和航运等多个方面。
- 因旱农业成灾面积由50年代的年均0.56亿亩增加到2000年以后年均2.18亿亩，因旱粮食损失由50年代的435万吨增加到2000年以后年均3493万吨。
- 1990—2008年，全国旱灾多年平均经济损失量约1509亿元，约占同期全国年均GDP的1.47%。

3.1.5抗旱难度增大

- 中国尤其是北方地区水资源的开发利用程度已经相当高，其中黄河流域近70%，海河流域达到90%以上。依靠挖掘本地区、本流域水资源潜力和优化调度现有水量解决干旱缺水问题的难度越来越大。

3.2干旱应急管理面临的问题

- 水资源供需矛盾更加突出。预测到2030年前后中国用水高峰时，年缺水量由目前的约400亿立方米，增加到600亿立方米左右。
- 抗旱基础设施建设仍然薄弱。现有灌溉设施还不完善，水利工程标准不高，灌溉保证率较低。
- 法规制度和预案体系有待完善。目前，还有一半多的省份没有出台抗旱法规，制订的抗旱预案还不完善，可操作性不强。

3.2干旱应急管理面临的问题

- 旱情监测预警体系手段不够先进。目前大部分省（区、市）在旱情信息采集、传输、分析等方面所采用的技术还不够先进，旱情监测评估和预测分析能力滞后。
- 抗旱减灾保障还不健全。大部分抗旱服务队装备水平不高、人员少、技术力量不强，抗旱物资储备不足，资金投入有限。

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4 加强干旱应急管理的对策

- 中国当前和今后一个时期，干旱应急管理建设要着重抓好以下几个方面：
  - ✓ 一要进一步落实抗旱工作责任制
  - ✓ 二要进一步强化风险管理
  - ✓ 三要全面增强抗旱减灾综合能力
  - ✓ 四要全面提升抗旱科学技术水平

4.1要进一步落实抗旱工作责任制

- 建立健全各级人民政府行政首长负责制的抗旱责任制，强化各级抗旱指挥机构责任制，建立健全抗旱督察制度和责任追究制度，将应急管理纳入各级领导干部的绩效考核内容，使全社会形成统一指挥、协调有序、职责明确、步调一致的抗旱联动机制，保证抗旱工作高效有序进行。

4.2要进一步强化风险管理

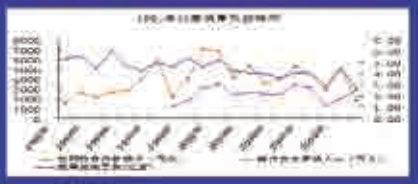
- 通过加快抗旱预案体系建设，编制完成各级总体预案、专项预案和水量应急调度预案，开展重点流域和区域干旱灾害保险试点，着力推进干旱灾害风险基础研究和干旱风险图的编制，大力推进抗旱工作由单一抗旱向全面抗旱转变，由危机管理向风险管理转变，提高全国防旱减灾能力。

4.3要全面增强抗旱减灾综合能力

通过编制和实施《全国抗旱规划》，全面增强抗旱减灾综合能力

4.3.1拓展和挖掘水利工程的抗旱功能

- 全面加强城乡水利基础设施建设，加强流域和区域水资源配置工程的联合调度，充分发挥现有水利工程体系的抗旱功能，提升水资源对经济社会发展的保障能力。



4.3要全面增强抗旱减灾综合能力

4.3.2建立和完善抗旱应急备用水源工程体系

- 因地制宜建设各种类型的抗旱应急备用水源工程，优化整合各类抗旱资源，科学调度抗旱用水，全面提高抗旱应急供水能力，保障旱期人畜饮水安全，最大限度减少因旱造成的粮食损失和经济损失。

贵州山区抗旱应急水源工程

4.3要全面增强抗旱减灾综合能力

4.3.3建设旱情监测预警和抗旱指挥调度系统

- 加快旱情监测站网建设，构建旱情监测预警系统平台，实现旱情实时监测、旱情信息服务和旱情分析预测评估，及时有效地进行旱情预警。加强抗旱指挥调度系统平台的建设，提高抗旱决策和指挥调度水平。

旱情监测站点

4.3要全面增强抗旱减灾综合能力

4.3.4健全抗旱管理服务体系

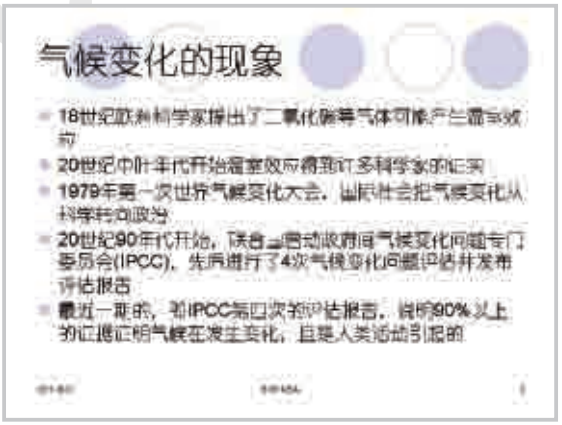
- 建立健全抗旱组织机构体系，加快推进抗旱政策法规体系建设，完善抗旱预案制度，大力加强抗旱减灾基础研究及新技术应用和抗旱宣传培训。
- 加大对基层抗旱服务组织的投入，进一步提高干旱期间机动送水能力和抗旱浇地能力。
- 建设中央级和省级抗旱物资储备仓库，建立健全抗旱物资储备制度。

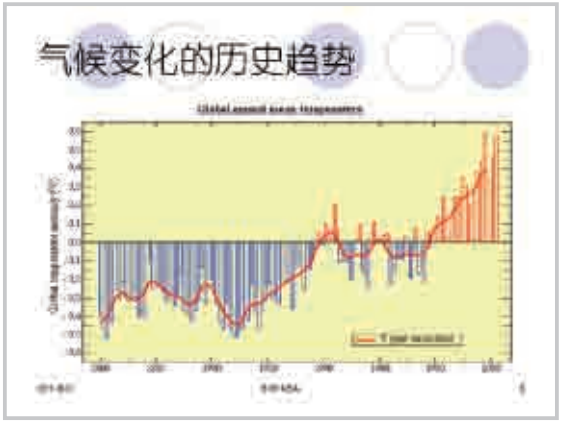
4.4要全面提升抗旱科学技术水平

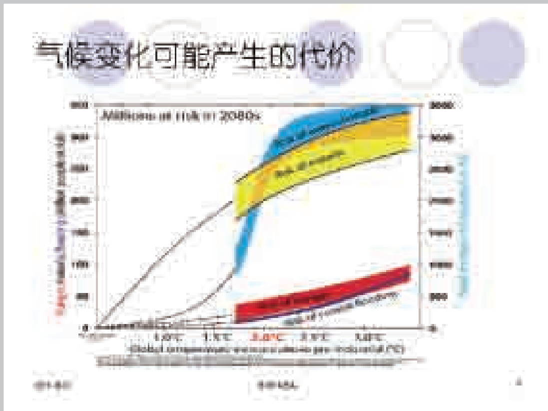
- 组织开展对干旱预警指标体系、旱灾评估体系、干旱规律、干旱灾害影响机理等研究工作和抗旱新技术、新材料、新设备、新工艺推广和应用工作。
- 通过加强国际交流与合作，充分吸收借鉴国外先进经验，不断提高中国抗旱的科技水平，实现科学抗旱和主动防旱。

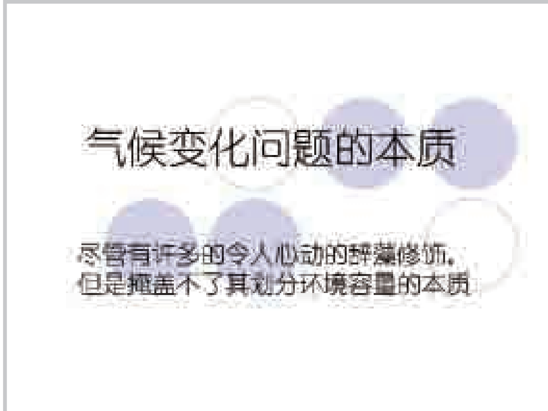
气候变化与低碳发展

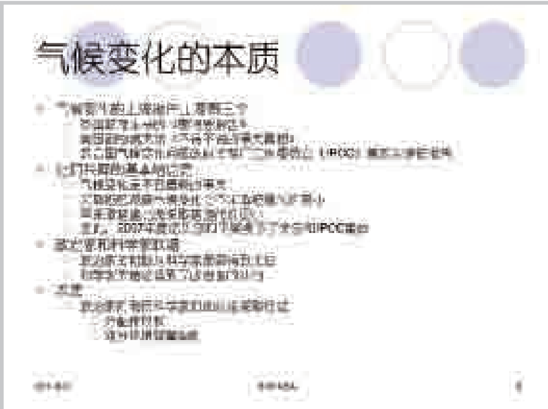
国家发展改革委能源研究所
中国资源综合利用协会可再生能源专业委员会
李俊峰

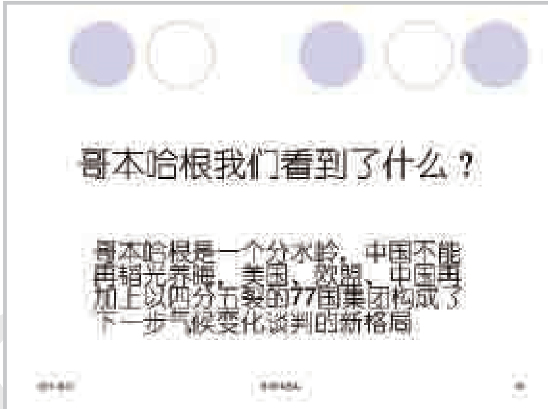


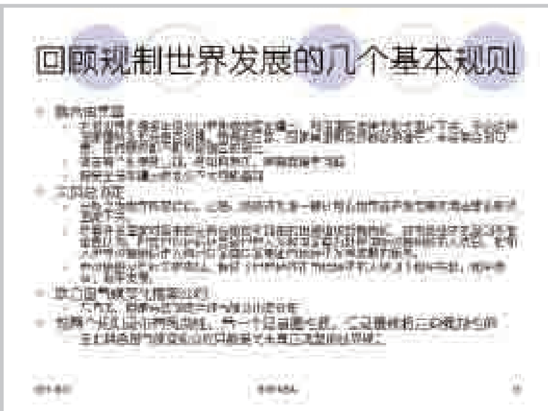


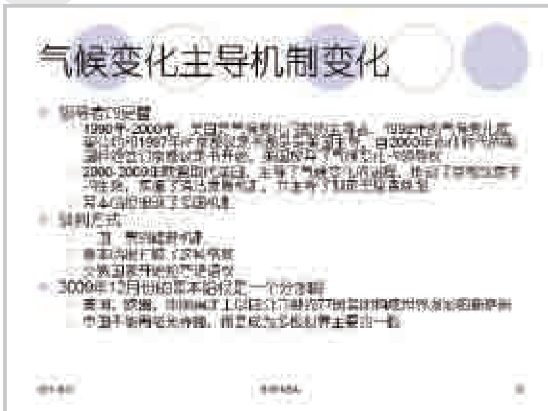

气候变化可能产生的代价
Millions at risk in 2080s

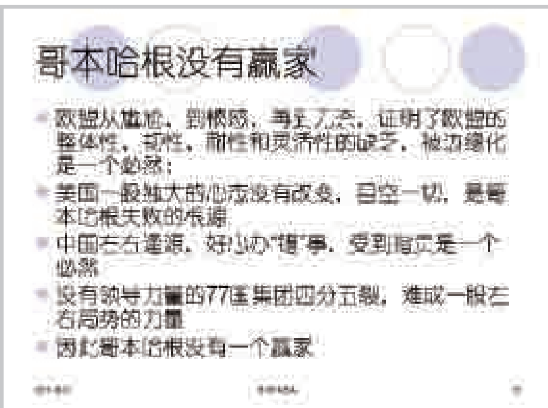

气候变化问题的本质
尽管有许多的令人心动的辞藻修饰，
但是掩盖不了其划分环境容量的本质

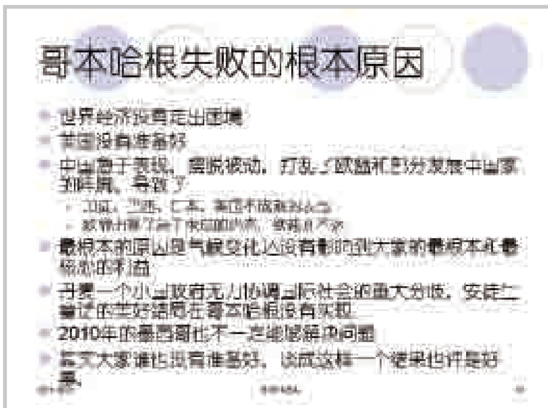

气候变化的本质


哥本哈根我们看到了什么？
哥本哈根是一个分水岭，中国不能再韬光养晦，美国、欧盟、中国再加上以四分五裂的77国集团构成了下一步气候变化谈判的新格局


回顾规制世界发展的几个基本规则

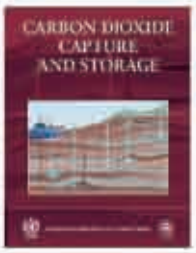

气候变化主导机制变化


哥本哈根没有赢家
欧盟从尴尬、到懊恼，再到无奈，证明了欧盟的整体性、韧性、耐性和灵活性的缺乏，被边缘化是一个必然；
美国一股独大的心态没有改变，目空一切，是哥本哈根失败的根源
中国左右逢源，好心办"错"事，受到指责是一个必然
没有领导力量的77国集团四分五裂，难成一股左右局势的力量
因此哥本哈根没有一个赢家


哥本哈根失败的根本原因
世界经济没有走出困境
美国没有准备好
2010年的墨西哥也不一定能够解决问题

气候变化问题所呈现的商机

气候变化的商机-低碳经济



低碳经济的基本内涵

中国在哥本哈根的承诺

- 中国将进一步把应对气候变化纳入经济社会发展规划，并继续采取强有力的措施。
  - 一是加强节能、提高能效工作，争取到２０２０年单位国内生产总值二氧化碳排放比２００５年下降40-45%。
  - 二是大力发展可再生能源和核能，争取到２０２０年非化石能源占一次能源消费比重达到１５%左右。
  - 三是人力增加森林碳汇，争取到２０２０年森林面积比２００５年增加４０００万公顷，森林蓄积量比２００５年增加１３亿立方米。
  - 四是大力发展绿色经济，积极发展低碳经济和循环经济，研发和推广气候友好技术。

低碳经济是生态文明的技术选择

哥本哈根之后的困局

按照两度的概念，到2050年全球温室气体的排放上限是136亿吨，低限是105亿吨，这是一个无解的难题

欧盟陷入了极度的迷茫之中

- 北欧陷入极度失望之中
- 德国不在气候变化的领头羊
- 英国政府更替气候变化的政策还不明朗
- 南欧陷入了金融危机的泥潭
- 东欧继续观望

美国政府受到各种因素的掣肘

- 奥巴马一帆风顺掩藏着危机，他唯一的筹码就是气候变化
- 美国共和党的智囊们仍然坚信减排温室气体会极大影响美国的经济利益
- 在美国上流社会盛传气候变化问题已经死了
- 总体上来看美国人对气候变化的认识还不一致

其他国家的态度

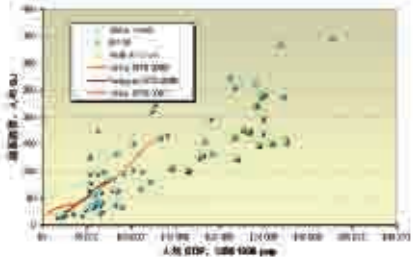
- 受美国的影响，多变的加拿大、澳大利亚和日本态度暧昧
- 77国集团陷入分裂
  - 小岛国集团也感到备受重弄
  - 事却四国各怀鬼胎难成大器
- 俄罗斯隔岸观火
- 中国左与逢源贵人不讨好
- 欧盟：尽管欧盟有了初步的协议，但是德国如何发展还不明朗

能源与气候变化

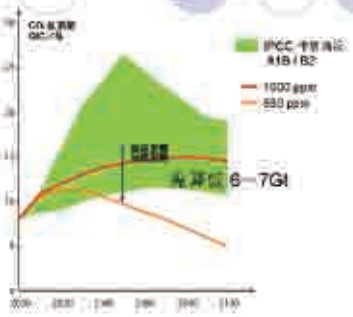
能源支撑经济增长的同时，又产生了温室效应，对此人们难以取舍

增长、发展与能源需求

- 基本问题——能源消耗与经济增长率息息相关



实现可接受的 CO_2 稳定排放

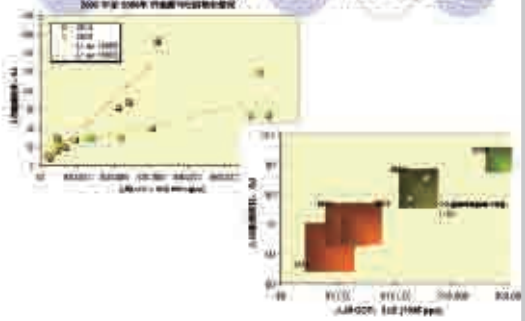


卡亚等式

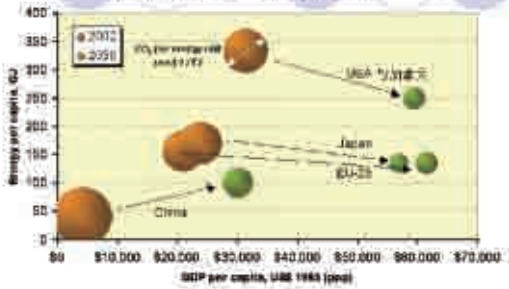
$$CO_2\text{排放量} = \text{人口} \times \frac{GDP}{\text{人口}} \times \frac{\text{能源}}{GDP} \times \frac{CO_2}{\text{能源}}$$

- 人口　　人口
- 生活水平　　人均 GDP
- 能源使用强度　　能源强度（能源效率）
- 能源结构　　影响单位能源的 CO_2 排放的因素

经济增长、能源与碳排放量的管理

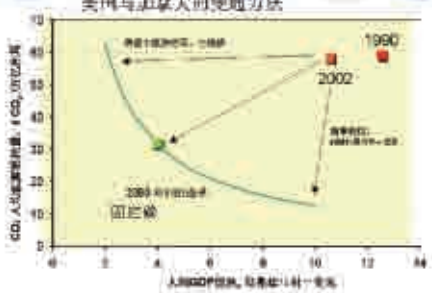


……按照地区统计的情况



能源利用效率与脱碳之间的取舍

美州与亚太的两种方法



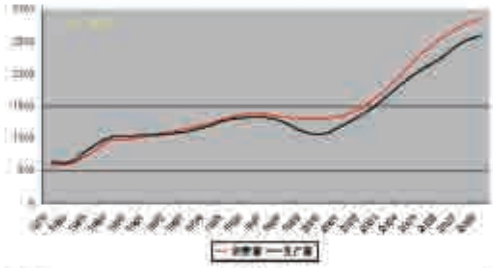
我国低碳发展的难题

在发展是硬道理的前提下，
节能减排只能是一句空话

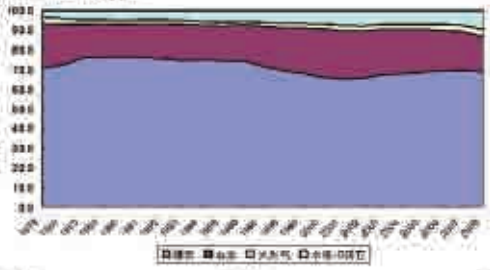
供应不足将长期困扰我国

- 国民经济持续增长和人口不断增加
  - 改革开发以来GDP增长平均近9%左右
  - 每年1500左右的人口增加，
- 经济转型道路不畅
  - 速度型发展模式带动了能源需求的不断增加
  - GDP增长质量不高
- 技术进步抵消不了总量的快速增加
  - GDP单耗国际降幅和总量消耗增长同步
  - 发电单耗和输供电单耗下降无法抵消总量增长

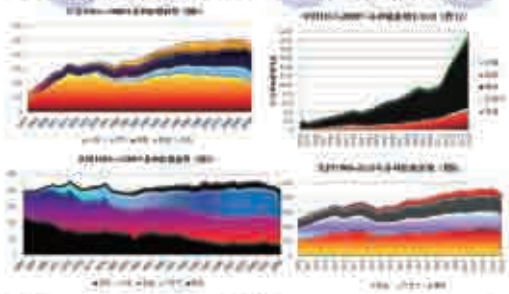
中国能源消费需求的历史回顾



能源消费结构的变革



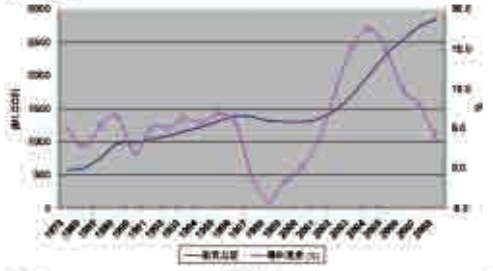
我国能源消费结构与主要国家比较



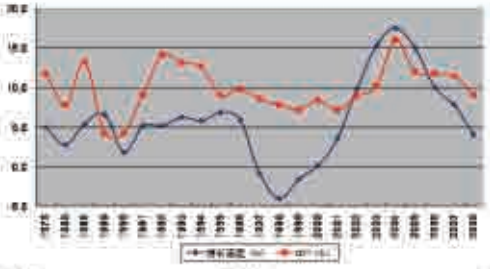
发展中国家天然气发电的比例

- 印度 31%
- 越南37%
- 泰国77%
- 菲律宾70%
- 中国几乎是零

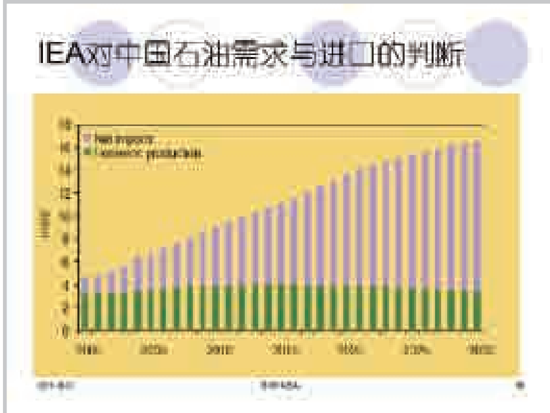
消费总量与增长速度



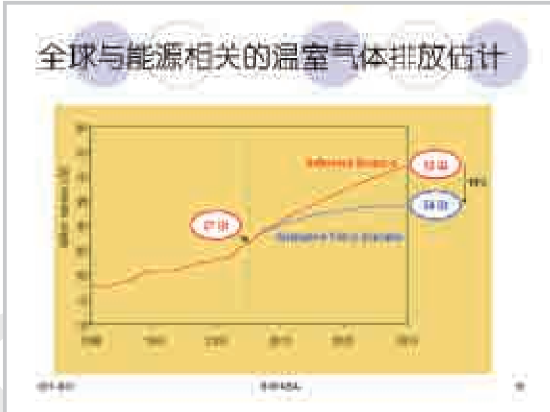
能源与GDP的增长关系

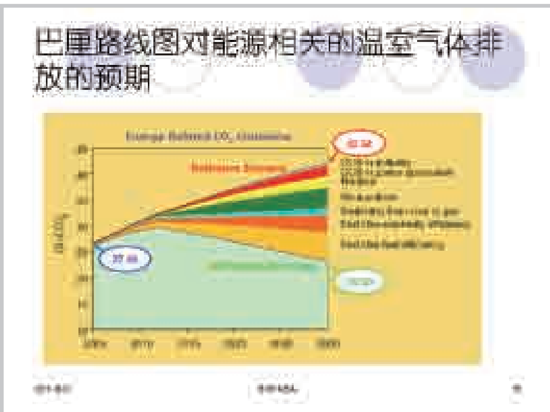


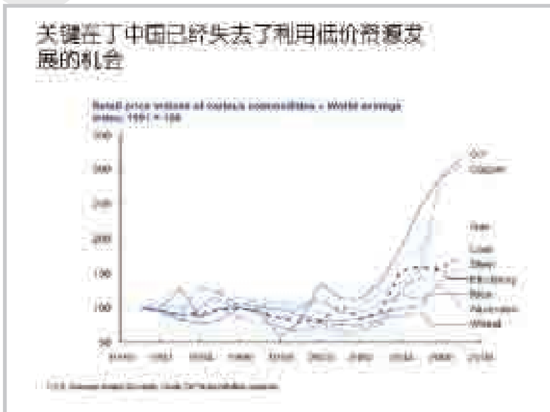

IEA对中国能源需求的形式的判断

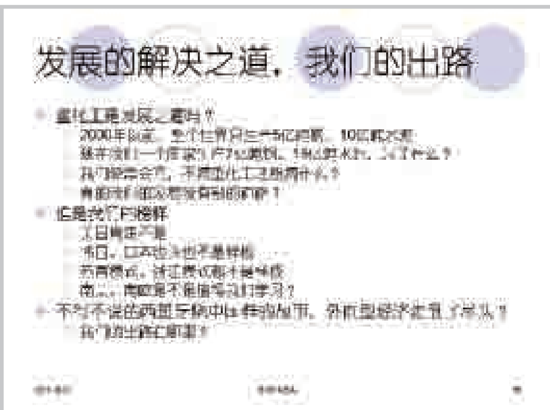

IEA对中国石油需求与进口的判断

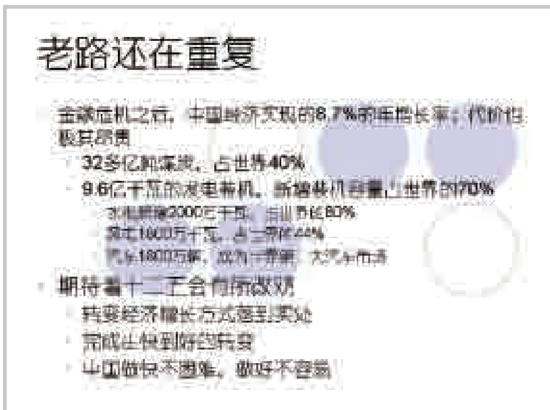

IEA对中国温室气体排放的估计

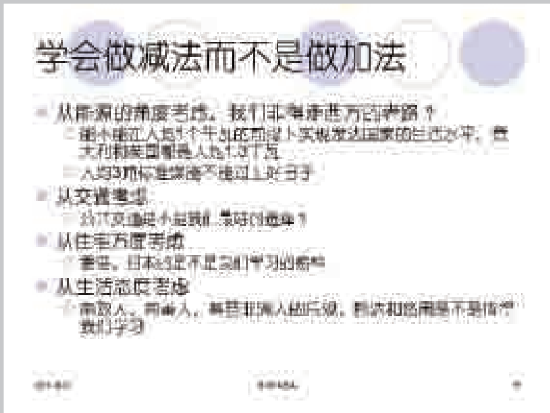

全球与能源相关的温室气体排放估计

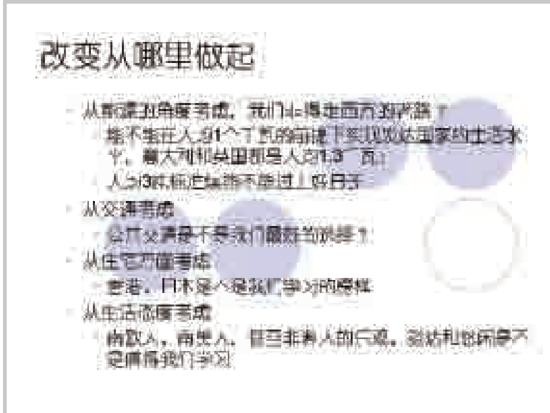

巴厘路线图对能源相关的温室气体排
放的预期

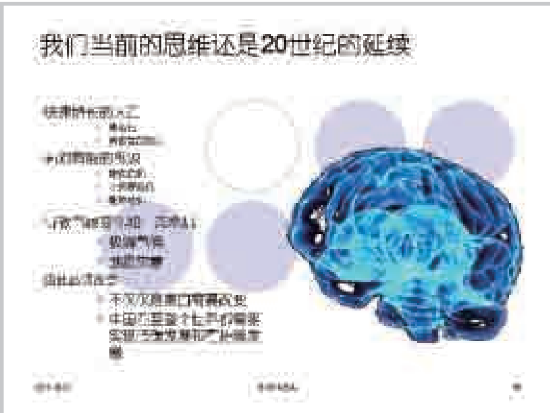

关键在于中国已经失去了利用低价资源发
展的机会

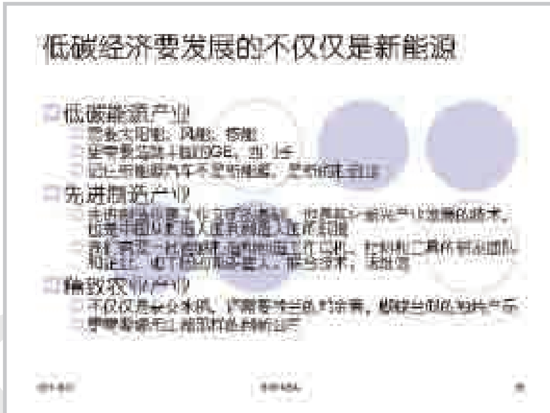

发展的解决之道，我们的出路
重化工是发展之需吗？
但是我们的榜样

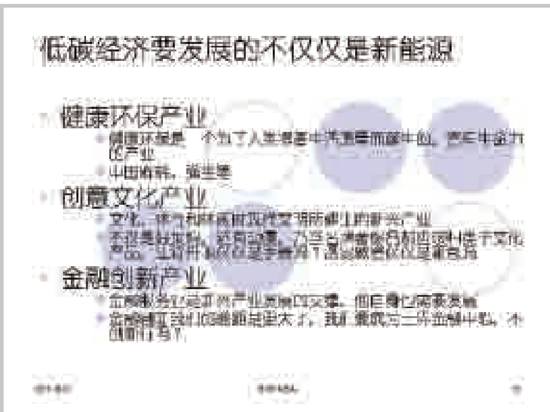

老路还在重复
金融危机之前，中国经济实现的8.7%的年均增长率，代价极其昂贵
32多亿吨煤炭，占世界40%
9.6亿千瓦的发电装机，新增装机容量占世界的70%
期待着十二五会有所改观
转变经济增长方式落到实处
完成比较到位的转变
中国做快不困难，做好不容易

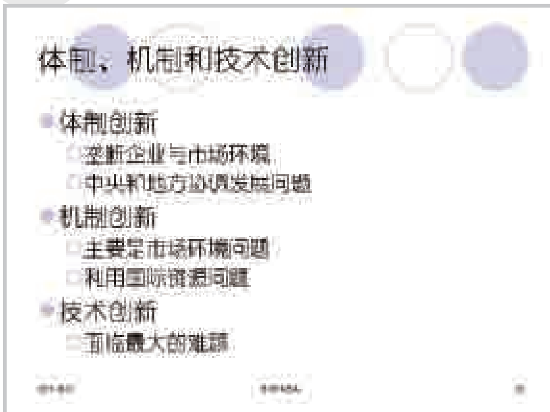

学会做减法而不是做加法
从能源的角度考虑，我们非得走西方的老路？
人均3吨标准煤能不能过上好日子
从交通考虑
从住宅角度考虑
从生活态度考虑

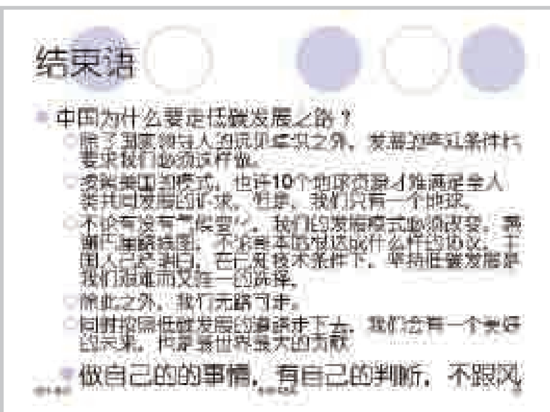

改变从哪里做起
从能源的角度考虑，我们非得走西方的老路？
能不能在人均1个千瓦的前提下实现发达国家的生活水平，意大利和英国都是人均1.3千瓦
人均3吨标准煤能不能过上好日子
从交通考虑
公共交通是不是我们最好的选择？
从住宅角度考虑
香港、日本是不是我们学习的榜样
从生活态度考虑
南欧人，南美人，甚至非洲人的乐观，豁达和悠闲是不是值得我们学习


我们当前的思维还是20世纪的延续


低碳经济要发展的不仅仅是新能源
低碳能源产业
先进制造产业
精致农业产业


低碳经济要发展的不仅仅是新能源
健康环保产业
创意文化产业
金融创新产业


体制、机制和技术创新
体制创新
垄断企业与市场环境
中央和地方协调发展问题
机制创新
主要是市场环境问题
利用国际资源问题
技术创新
面临最大的难题


结束语
中国为什么要走低碳发展之路？
除此之外，我们无路可走。
做自己的的事情，有自己的判断，不跟风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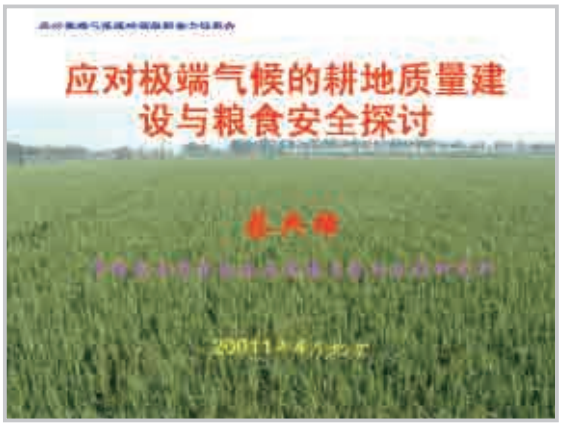
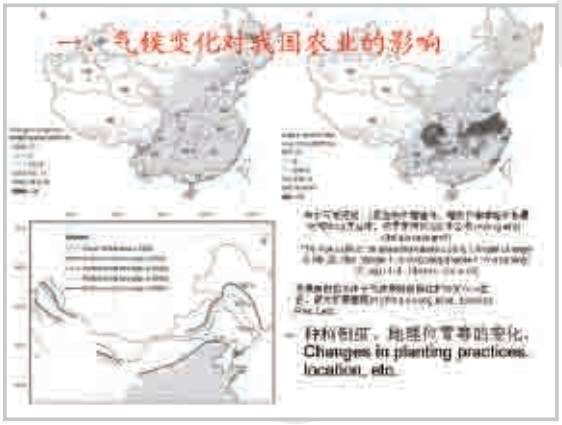
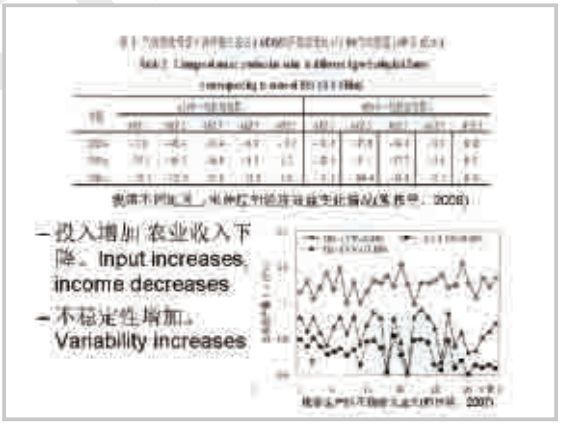
Website: www.eri.net

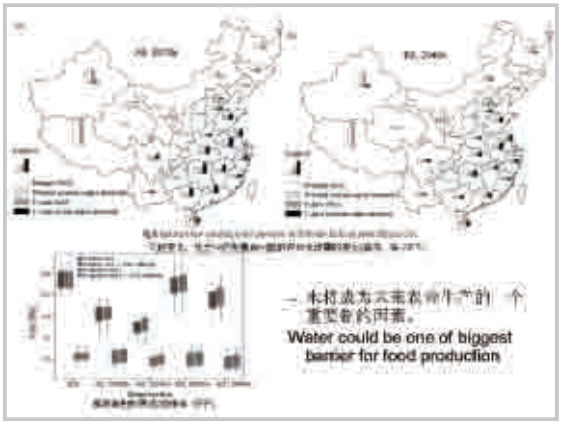
应对极端气候的耕地质量建设与粮食安全探讨

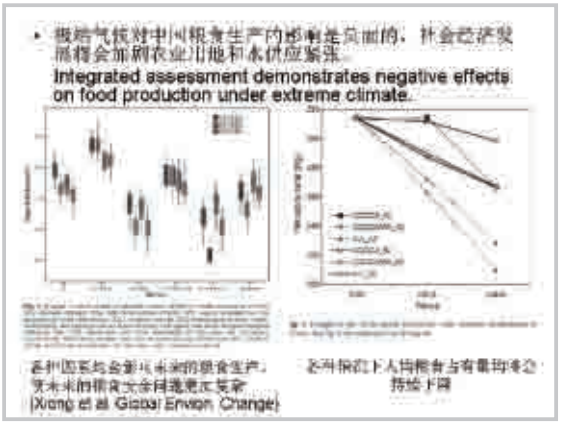
中国农业科学院农业资源与农业区划研究所
蔡典雄





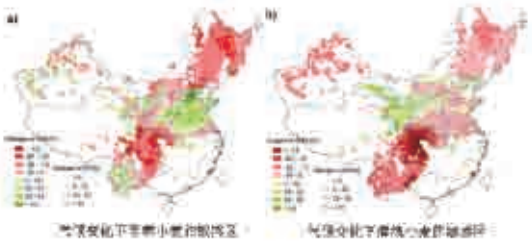






• 气候变化影响的地域差异明显，各有侧重。

Lager regional variation exists which need regional specific acaptation strategies



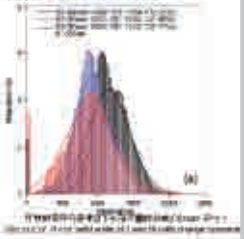
气候变化对中国农业的影响

Results: Impacts of climate change on China's agriculture

• 气候变化下的农业气象灾害 Climate disaster

– 气象灾害发生的频率增多，强度增大加大。

The frequency and intensity of climate disaster increase



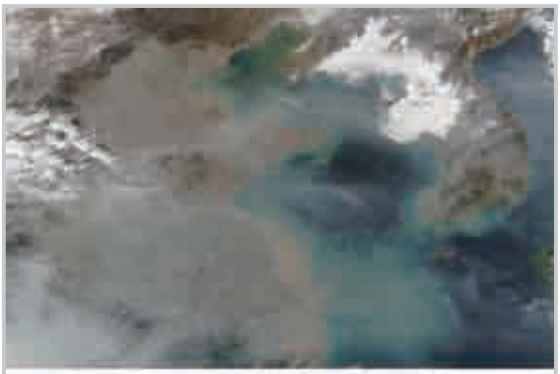
• 极端气候情况下解决未来中国粮食安全的出路但如何适应?

What is the way to solution for food security and how ?

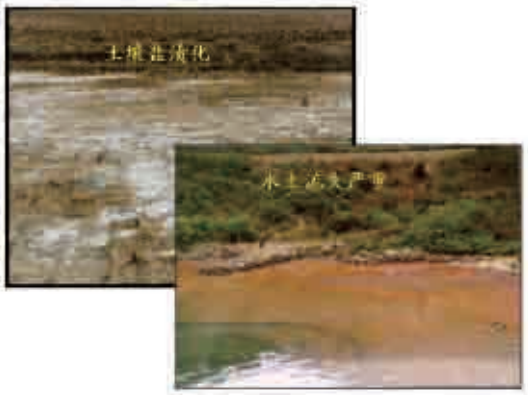
耕地质量提高是农业应对极端气候和保障粮食安全重点

二、极端气候对土壤质量影响

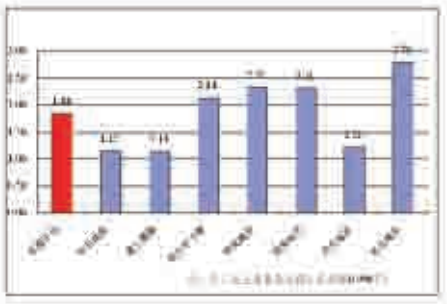
对土壤质量影响



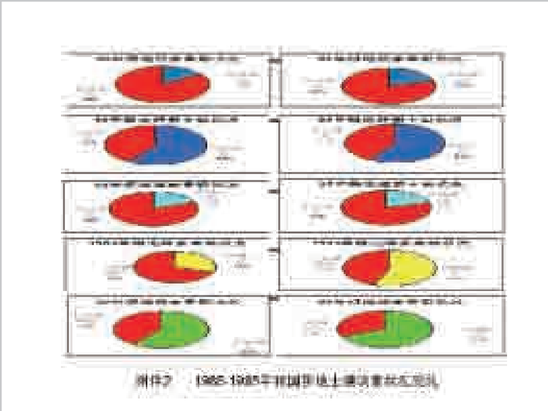
水土养分流失, 2002

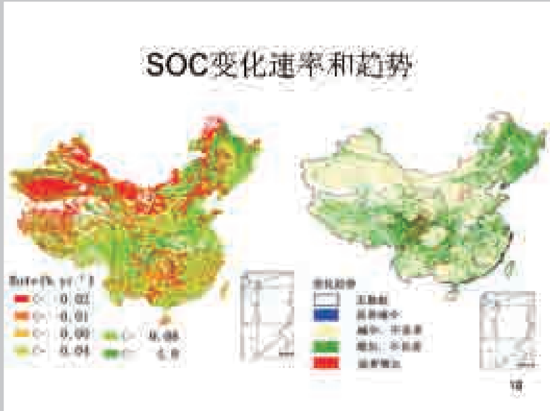


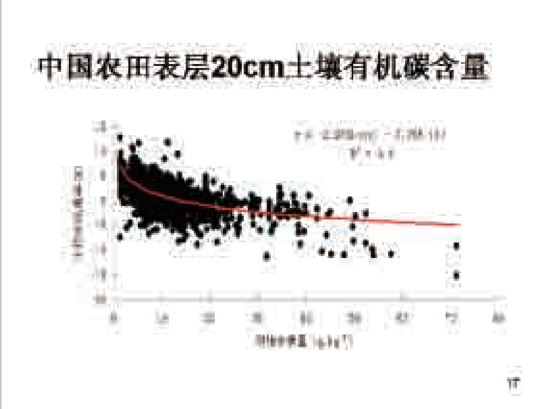
耕地面临 重金属复合污染

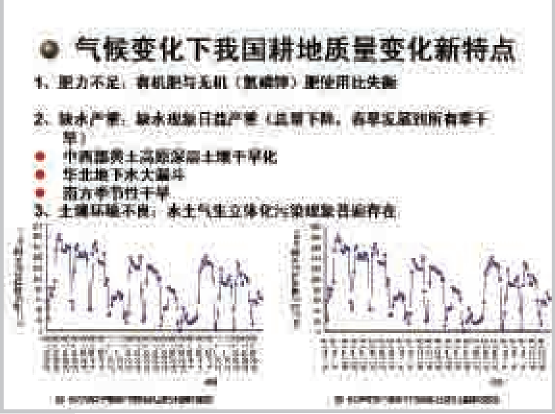


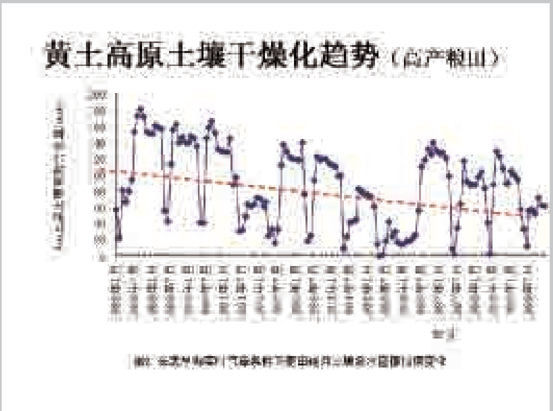
附件1 全国耕地土壤有机质平均含量

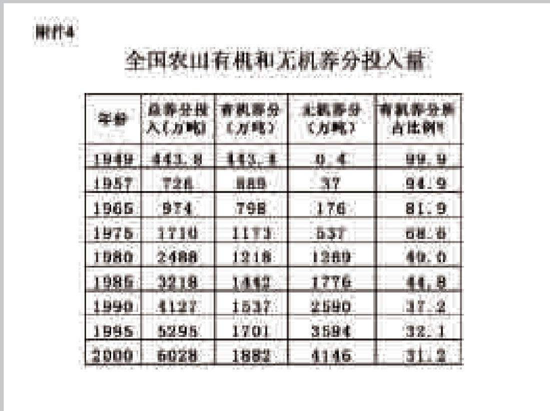










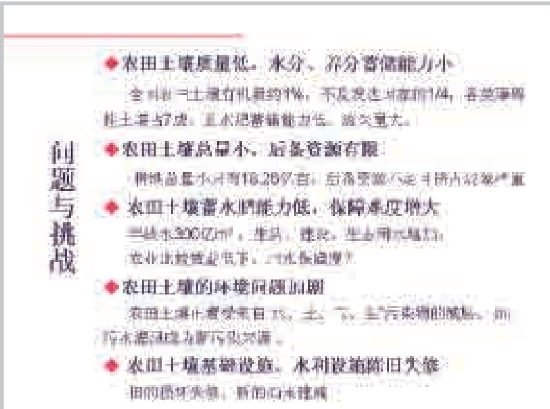

附件4

全国农田有机和无机养分投入量

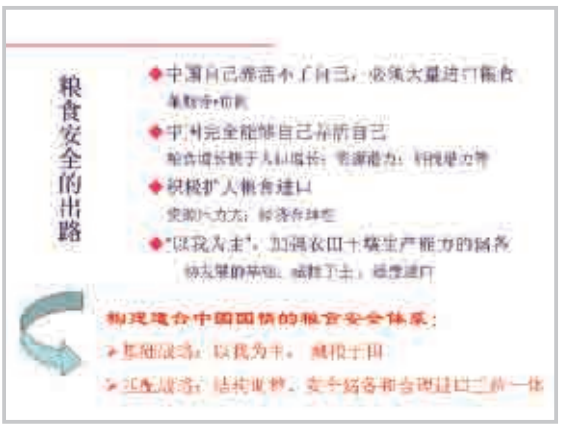
年份	总养分投入（万吨）	有机养分（万吨）	无机养分（万吨）	有机养分所占比例%
1949	443.8	443.4	0.4	99.9
1957	726	689	37	94.9
1965	974	798	176	81.9
1975	1710	1173	537	68.6
1980	2488	1218	1269	49.0
1985	3218	1442	1776	44.8
1990	4127	1537	2590	37.2
1995	5295	1701	3594	32.1
2000	6028	1882	4146	31.2

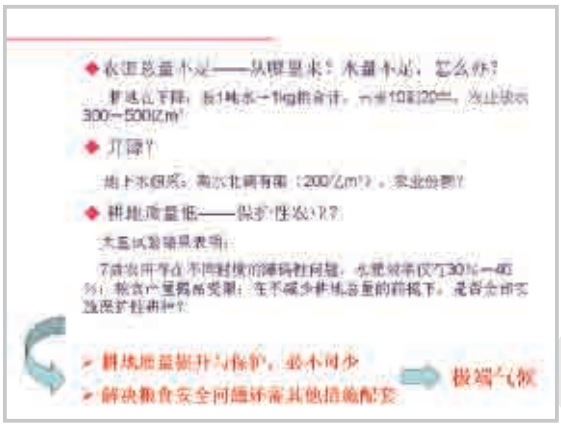

秸秆还田

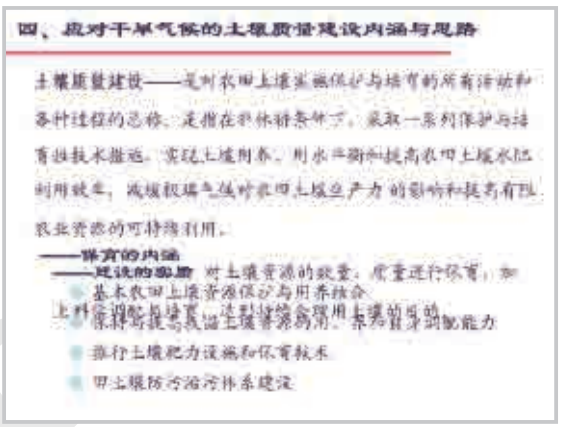
	农业土壤流失CO₂（Tg）	作物固定C量（Tg）	秸秆还田率（%）
中国	366	293	18
美国	812	884	90
	2倍	3倍	

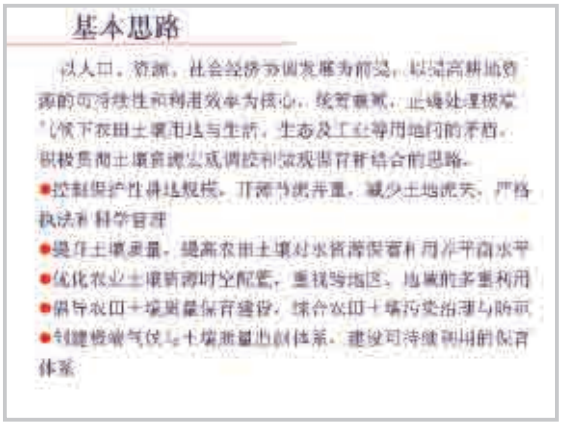


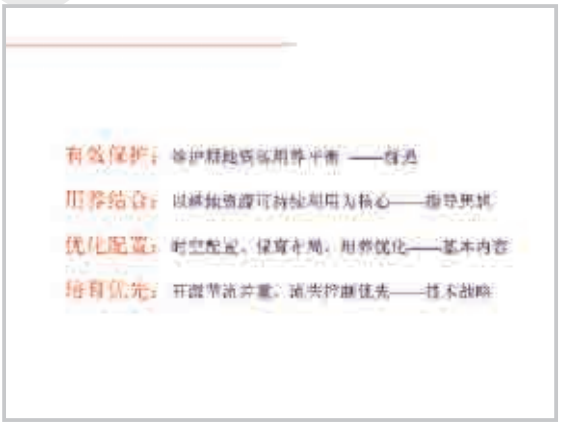

三、粮食安全对土壤质量需求
粮食安全的基本形势
◆受土壤质量的制约，整体处于紧平衡状态
◆结构性供求矛盾（品种、质量等）加剧
◆区域间生产供给能力不平衡
◆生产者利益的实现——粮食安全的重要条件
◆国际粮食与贸易形势的制约


粮食安全的出路
◆中国自己养活不了自己，必须大量进口粮食
◆中国完全能够自己养活自己
◆积极扩大粮食建以
◆"以我为主"，加强农田土壤生产能力的保养
构建适合中国国情的粮食安全体系：


◆农田总量不足——从哪里来？水量不足，怎么办？
◆开源？
◆耕地质量低——保护性农业？？
➢耕地质量提升与保护，缺一不可
➢解决粮食安全问题还需其他措施配套
极端气候


四、应对干旱气候的土壤质量建设内涵与思路
土壤质量建设——
——保育的内涵
——建设的思路


基本思路
以人口、资源、社会经济可持续发展为前提，以提高耕地资源的可持续性和利用效率为核心，统筹兼顾，正确处理极端气候下农田土壤和地与生活、生态及工业等用地间的矛盾，积极贯彻土壤资源变成调控和谐观保育并结合的思路。
●控制保护性耕地规模，开源节流并重，减少土地流失，严格执法和科学管理
●提高土壤质量，提高农田土壤对水资源保蓄利用水平和水平
●优化农业土壤资源时空配置，重视等地区，地膜的多重利用
●保护农田土壤质量保育建设，综合农田土壤污染治理与防治
●创建极端气候与土壤质量监测体系，建设可持续利用的保育体系


有效保护：
用养结合：
优化配置：
培育优先：


四、应对极端干旱气候的粮食安全战略对策
——人力发展农田土壤保育措施
◆保育总论
◆质量建设
◆保育技术


——发挥教育、政策和管理的作用
◆形成全民保护耕地的良好氛围
◆鼓励投资抗旱、节水产业和土壤保育行业；
◆加大农田土壤保护与质量提升
◆制度化管理

——积极处理污染土壤，发展清洁生产

污染农田是我国农田土壤很重要的资源—开发小低毒又可能污染农田—节省

—— 实施农田土壤资源优化配置

- 集约、保护、调配的农田土壤时空优化配置
- 农业、生活、工业、生态用地优化配置
- 效率与可持续用养平衡

—— 发展以水为中心的农田土壤保育技术

- 适用养地作物
- 有限水资源下的用地养地的作物轮作单元
- 保墒的保护性耕作
- 减少水分流失的秸秆覆盖还田技术
- 增加土壤蓄水能力的土壤构改良与生化试剂

●成本推动的连续增产带来的危机？

耕地质量影响粮食稳定生产的主要因素

1. 质量性因素
2. 资源性因素
3. 结构性因素
4. 技术性因素
5. 社会经济性因素

→ 耕地休养生息

● 应对极端气候的我国稳定粮食生产主要途径

观点1：粮食是国民经济基础（农业）的基础，耕地质量是粮食安全的基础

观点2：肥力提高+耕种管理+水肥利用+高产优种=产量升级效应

观点3：环境+质量+资源+管理+政策与法规=粮食安全

观点4：休养生息+地力培育=藏粮于田+产量持续增长

科学施肥，有机无机合理配施

- 据32个长期定位试验的观测，实行有机无机配合施肥，20年平均提高了土壤有机碳含量26%，按此增幅，全国仅耕地就可每年固定碳素180-540万吨。
- 把有机肥：化肥>1施用战略
- 农业废弃物的还田利用，将农业有机废弃物还田利用的比例由目前的34% 提高大约1倍。
- 有机肥、绿肥的推广利用

观点5：粮食安全与土壤资源安全的双向优化战略

现实基础：立足不同耕地质量保育，拓展耕地生产空间，保障粮食生产安全和国家安全

重要策略：在保障国家粮食安全的前提下，多选口一些粮食，不失为一种很好的策略

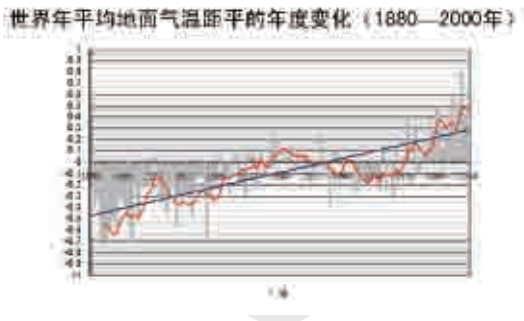
缓解资源压力：增加500kg粮食 → 耕地外流1亩地

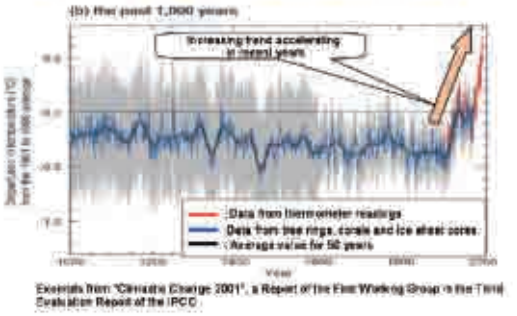
经济上的合理性：200亿kg粮食 → 150~200亿元

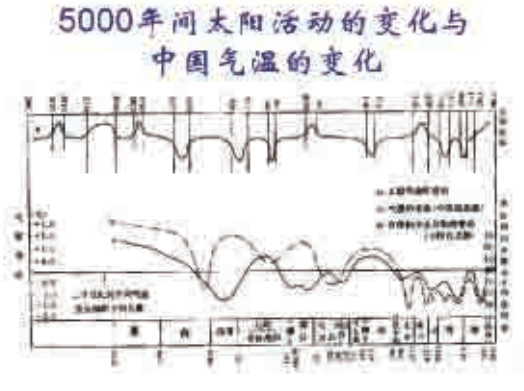
欢迎批评指正！

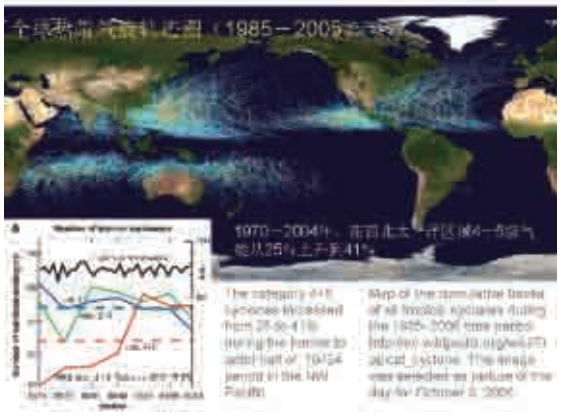
气候变化背景下水灾害的演变趋向与应对方略

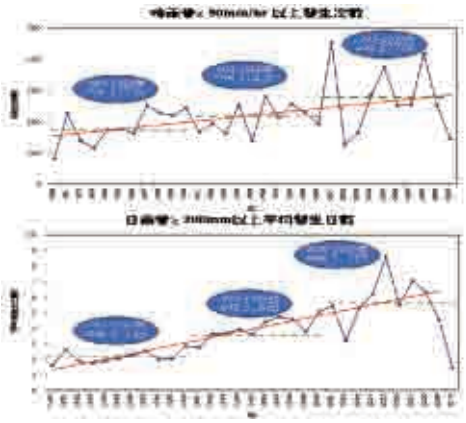
中国水利水电科学研究院
程晓陶







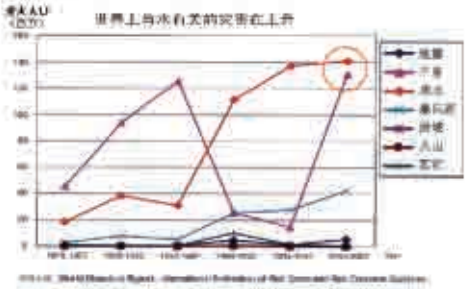




台湾降雨强度增强的记录

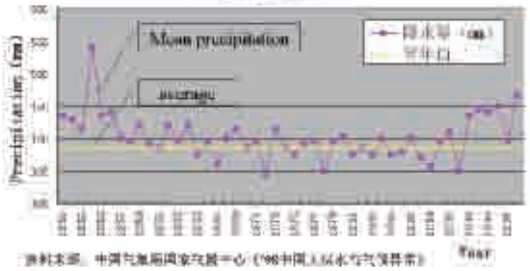
2 水灾害的演变趋向

• 20世纪90年代后期以来，世界进入了一个水旱灾害频发并重的阶段。



气候波动是水灾损失增长的自然原因

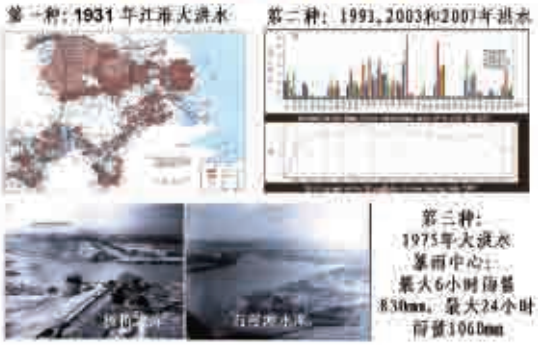
全国（336站）6—8月平均降水量变化趋势图（1951-1998）



气候变化影响评价结论和适应性措施研究流程图
——以淮河重点平原洼地治理项目为例

淮河典型历史大洪水的分类

第一种：1931年江淮大洪水　　第二种：1991、2003和2007年洪水

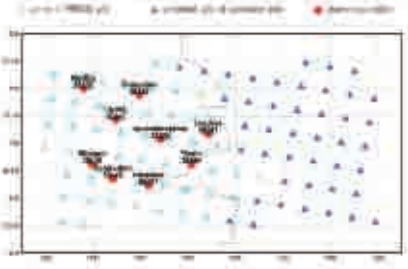


第三种：
1975年大洪水
暴雨中心：
最大6小时降雨
830mm，最大24小时
降雨1060mm

中英科技合作太湖流域未来洪水风险情景分析技术研究

第二工作单元：气候变化情景研究

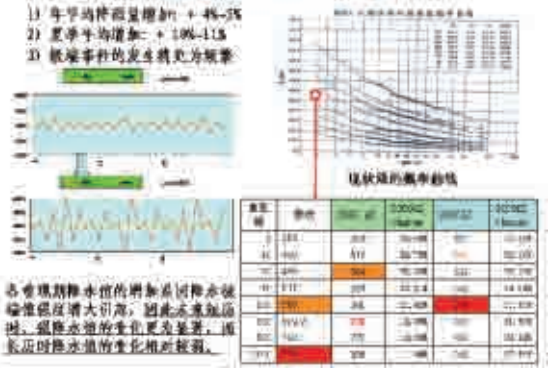
——验证了区域气候模式系统PRECIS对太湖流域气候的模拟能力，可为太湖流域未来洪水风险的情景分析提供气候变化的边界条件



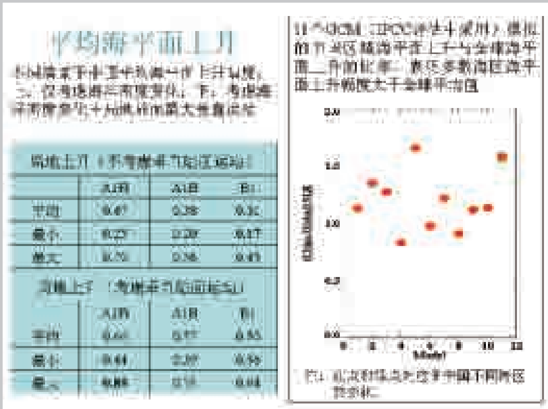
太湖流域及其邻海域内的气象观测站点（红色实心圆点）和PRECIS模式网格中心点

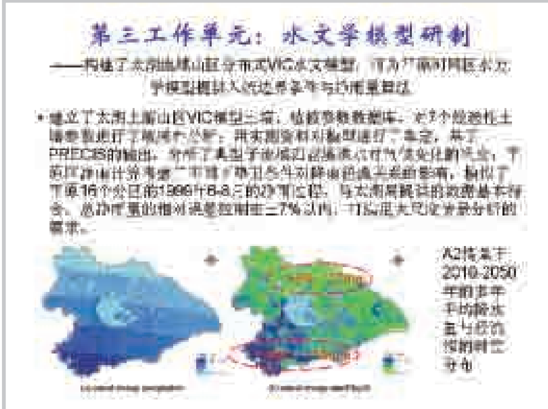
气候变化的分析结果

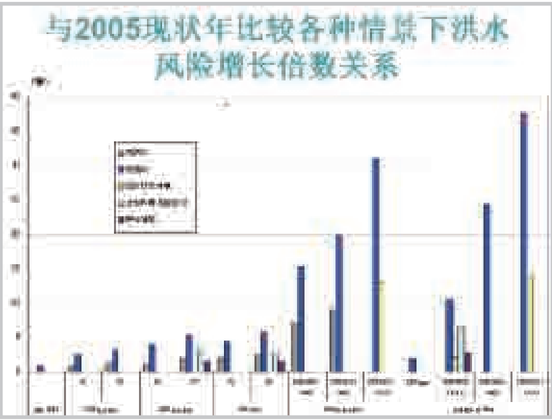
1）年平均降雨量增加 + 4%-5%
2）夏季平均增加 + 10%-11%
3）极端事件的发生将更为频繁

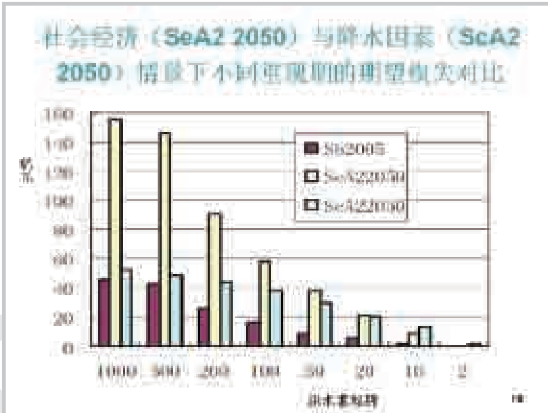


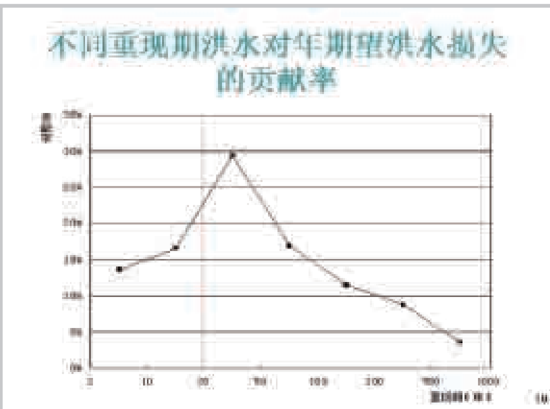
各重现期降水值的增加表明降水极端值强度增大明显，因此未来极端洪、涝降水值的变化更为显著，而长历时降水值变化相对较弱。

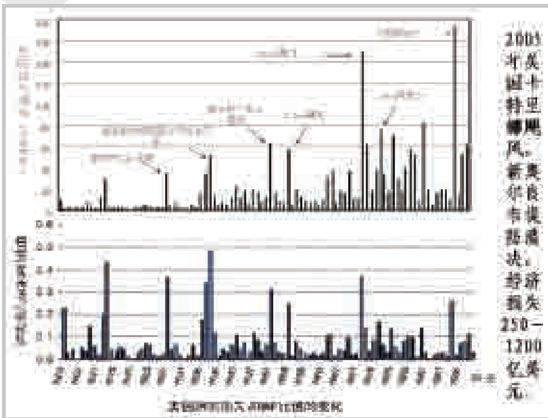

平均海平面上升

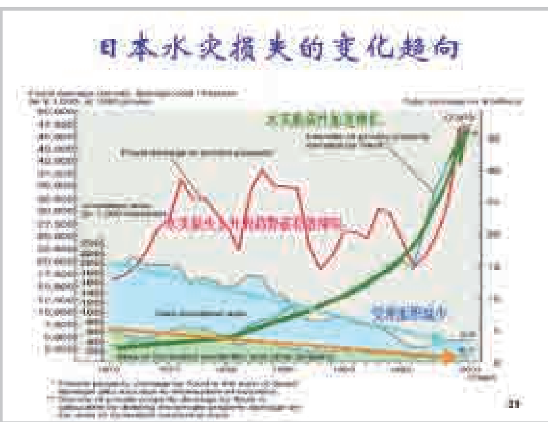

第三工作单元：水文学模型研制
A2情景下
2010-2050
年的多年
平均降水
量与农作
物的时空
分布

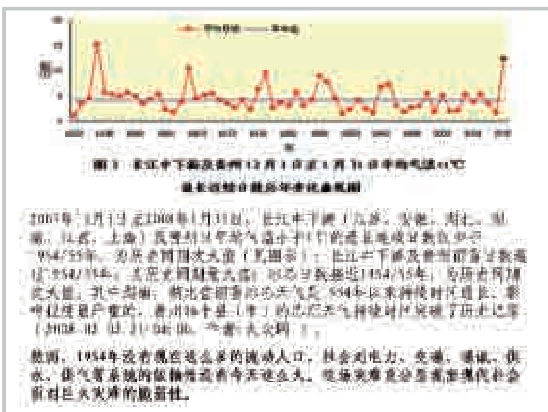

与2005现状年比较各种情景下洪水
风险增长倍数关系


社会经济（SeA2 2050）与降水因素（ScA2
2050）情景下不同重现期的期望损失对比
160
140
120
100
80
60
40
20
0
1000
500
200
100
50
20
10
2


不同重现期洪水对年期望洪水损失
的贡献率

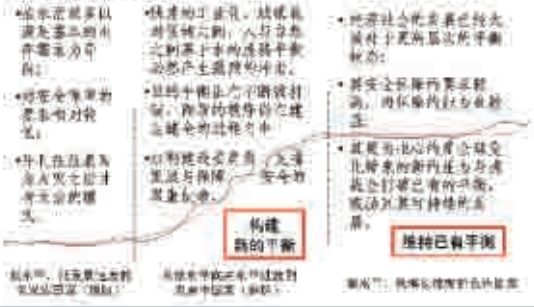

2005
年美
国卡
特里
娜飓
风，
新奥
尔良
市堤
防溃
决，
经济
损失
250—
1200
亿美
元。


日本水灾损失的变化趋向



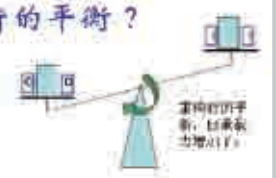
3 探讨适宜的应对方略

经济社会发展在不同阶段，决策影响与防灾能力有所不同，需要采取不同的防灾减灾战略。



如何重构新的平衡？

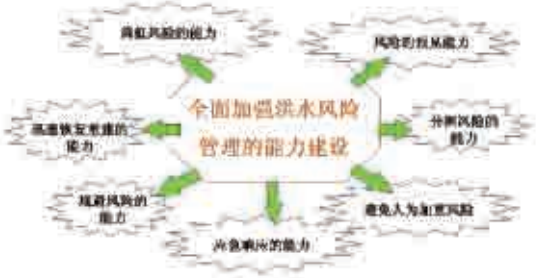
- 标准适度，布局合理，安全可靠，维护良好，调度运用科学的水利工程体系，是重构区域之间、人与自然之间基于水的新的平衡的基本手段。
- 符合科学规律，有利于整体与长远的工程措施并非地方能自觉接受的一种模式，需要国家——
  - 以法制手段强制实施，
  - 以行政手段推动落实，
  - 以经济手段补偿诱导，
  - 以科技手段大力支持。



一个成功的案例

- 水利改革成败的关键在于能否对立面积极互动，把握适度的运作机制。

全面增强应对洪水风险的能力



主要结论

- 在气候变化背景下，水灾害的极端事件有可能变得更为频繁。
- 在气候变化与经济社会快速发展的双重作用下，水灾害的风险将呈现持续增长的态势。迫需采取综合性的防灾减灾手段。
- 在新形势下，只有通过改革才能推动水利的健康发展。而其成败的关键在于能否行成覆盖全区、有自主活力、能良性互动、可持续发展的运作机制。

谢谢大家！

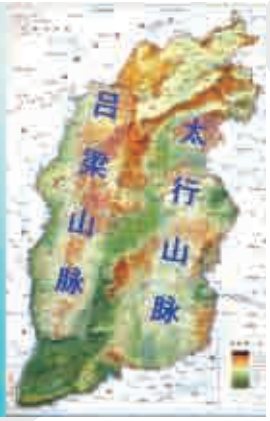
- 联系电话：010-68781693
- 电子邮件：chengxt@iwhr.com

实施兴水战略 建设山西大水网
积极应对极端气候变化的水安全保障

山西省水利厅　　潘军峰

近年来，受全球极端性气候变化的影响，我国水资源时空分布不均的问题更加明显，局部地区的强降雨、高温干旱等极端天气灾害出现的频率和强度显著上升。在山西，干旱是最主要的自然灾害，特殊的地理环境和气候条件，造成了山西降水量相对较少，水资源严重短缺。

省境东侧太行山凸起，地面高程从二、三百米突增至八百多米，对太平洋的暖湿气流起到了屏障和阻隔作用，致使太行山以西降雨量骤减。省境西侧黄土丘陵区比黄河高出二三百米，地高水低且沟壑纵横，河水沿境而过，一般难以利用。



在省境内，除中间汾河流域外，从东西两侧分水岭开始均为外向型河流，山高坡陡，水流湍急，一场洪水一般只有几个小时，一带而过，破坏力强，利用率低，对地下水的入渗补给也较小，河水多外流于周边省份。

在山西历史上发生的多次毁灭性灾害和社会动荡都因旱灾所致。中国近代史上的十大灾荒中，就有4次发生在山西及周边省份。如清光绪初年（1876—1878年）的北方大旱，全省人口从1643万人减少到1074万人，减少的人口数量占到总人口的1/3。

光绪年间遭遇大旱的山西灾民

20世纪80年代以来，山西全省性的干旱发生频率越来越高，近10年中就有7年出现大旱和局部大旱。

山西西部吕梁地区1997年—2000年连续四年大旱，大部分农田颗粒无收，致使51万人外流，80万人重新返贫。

历史证明，山西一旦发生全省范围的极端干旱，出现严重的水危机，将会对经济社会发展产生重大影响。

由于山西是全国的能源基地，输出电力占北京市用电量的1/4，出省煤炭占全国省际调运量的70%，26个省市的火电厂依靠山西的动力煤，因此，兴水治旱，确保水安全不仅事关山西转型跨越发展，也事关国家能源安全。

2005年以前山西面临的主要水问题：

一是水源控制性工程滞后，供水能力不足。2005年全省水库可调蓄水量仅有6亿立方米，不到河川径流量的1/14。由于缺乏调蓄汛期来水的水库工程，导致占全年来水70%以上的汛期来水大部分放弃。

二是由于地表水利用条件差，经济社会用水总量的2/3为地下水，导致地下水超采严重，2005年全省地下水开采量达40亿立方米，年超采量7亿立方米，水井的深度也愈来愈深，引发了一系列生态环境问题。

三是采煤对水资源造成严重破坏。

对山西的水问题，中国政府高度重视。胡锦涛主席2005年7月在山西考察工作时指出，要坚持开源与节流相结合、节约优先的原则，促进水资源的合理开发、节约使用、高效利用和有效保护。温家宝总理2006年3月在山西考察时指出："山西最大的制约因素是水，要研究长期解决水资源匮乏的治本之策，把水利建设摆在经济社会发展十分重要的地位"。

今年4月2日至4日，温家宝总理再次视察山西时，对全面加强水利建设又一次做出了明确指示，提出了具体要求。

国家水利部对解决山西的水问题也给予了全力支持。2006年至2007年，水利部先后四次听取山西水利专题汇报，并在北京召集全国水利方面的院士、专家为山西水利会诊把脉。

汪恕诚同志在水利部和全国人大工作期间多次亲临山西指导工作

陈雷部长最近两个月三次到山西指导水利工作

水利部与山西省人民政府联合批复的《山西省特大干旱年应急水源规划》，为山西省实施应急水源工程建设提供了规划依据。

今年3月27日，水利部与山西省人民政府签订的《加快水利改革发展和水生态修复保护、促进山西资源型经济转型发展合作备忘录》，再次为山西水利事业发展注入了新的活力，提供了强有力的支持。

在水利部的精心指导下，山西省委、省政府于2007年3月，在深入调研和科学论证的基础上，做出了加强水利建设、实施兴水战略的重大决策。

实施兴水战略的总体思路是：通过建设一批应急水源工程，在丰水年和正常年份，主要使用地表水，有效涵养地下水，使地下水储量逐步得以恢复；在特殊干旱年份，如果地表水供给不足，由地下水予以补充。同时，通过加大节约用水力度，有效减少了水资源的利用总量。

按照这一思路，2006年以来，山西规划了总投资140亿元的35项应急水源工程。到2010年底，一批水源工程相继投入运行。

“十五”末“十一五”末全省水库蓄水量对比图

加上除险加固的百座病险水库，正常年份地表水供给能力增加了15亿立方米，同时可补充2～3亿立方米的地下水，而用水总量一直控制在63亿立方米左右。这就为减少地下水用量奠定了基础。全省地下水用量已由“十五”期间的40亿立方米减少到了35亿立方米。全省地下水已开始出现回升。

随着35项应急水源工程相继建成并投入运行，地下水得到有效控制和涵养之后，我省面临的主要水问题将由“十一五”时期的拦蓄不足转为水资源配置能力不足和保证程度不高的问题。通俗地讲，就是如何把费很大劲儿蓄起来、拦起来、提上来的地表水、黄河水送到最缺水的地方，并且能够具有较高的保证程度，能够在特大干旱发生情况下发挥稳定全局的供水保障作用。

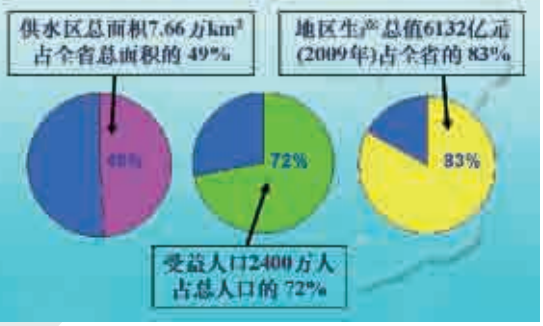
今年年初，中央一号文件出台了加快水利改革发展的决定，全国水利进入了一个快速发展的新时期。

按照中央一号文件精神，结合山西“十二五”转型跨越发展的目标任务，山西省委、省政府决定，在35项应急水源工程基本建成，百座病险水库除险加固后，全面启动以“两纵十横、六河连通”为构架的大水网建设。

今年4月8日，山西省委、省政府召开了全省动员大会，大水网建设全面启动。

山西大水网建设的总体思路：以保障转型跨越和山西经济社会可持续发展用水需求为首要任务，以纵贯我省南北的黄河北干流和汾河两条天然河道为主线，以建设覆盖全省六大盆地和主要经济中心区的十大骨干供水体系（十横）为骨架，并通过连通工程建设，将黄河、汾河、沁河、桑干河、滹沱河、涑河这六大河流及各河流上的大中型水库相连通，形成“两纵十横、六河连通，纵贯南北、横跨东西，多源互补、保障应急、丰枯调剂、促进发展”的山西大水网。

山西大水网供水区覆盖六大盆地、11个中心城市、70个县（市、区）。



到2015年骨干水网基本建成后，全省包括引黄水在内的地表水供水量达到61亿立方米，其中境内地表水供水量37亿立方米，提引黄河水24亿立方米；地下水供水量将由目前的35亿立方米压减到25亿立方米，全省年总供水量将达到86亿立方米。

“十二五”末山西省供水结构示意图

大水网建设主要是两大功能：

一是将蓄起来的水和黄河干流的水配置到需要水的区域；

二是河库连接后，提高各区域特别是城市和经济中心区用水的保证率，尤其是特大干旱年份用水的保证率。

大水网解决的问题归根结底是水资源的空间分布不均的问题，大水网是解决经济社会发达区域用水需求较大、水量少和山区水量大、用水少这一矛盾的手段。

由于占我省总面积20%的平川区集中了83%的GDP和72%的人口，在这一有限的地域，本地水资源已没有潜力，水生态环境急剧恶化，要实现可持续发展，建设大水网对以山区为主的我省尤为必要。

大水网建设是今后5-10年山西水利工作的核心和重点，也是根据山西省情、水情提出的应对极端气候变化的主要对策。

“两纵十横”中的两纵和六横是以黄河水为主要水源，由于流经山西的黄河干流径流量主要来自青海、甘肃等上游区，多数情况下与山西不属于同一个气象系统，山西发生特大干旱时这部分供水量基本上是有保证的。

此外，山西大水网的建成，使我们可以利用东西两山和中部盆地区的丰枯不同频率的特点，着力提高抵御局部性干旱的能力。

更为重要的是，由于在平常年份和丰水年份通过有效涵养地下水源，建立了一定的战略后备储量，在发生特大干旱情况时可以动用35亿立方米左右的地下水供水量。

综合以上分析，大水网建成以后，我省特大干旱年份的应急供水能力可以达到65亿立方米左右，可保障全省人民生活和关系国计民生的经济用水需求。

各位领导、各位专家，女士们、先生们，应对极端气候变化、保障水安全是全人类的共同责任。作为中国内陆省份的山西，在水利部的有力指导下，在水资源配置、节约、保护等一系列领域中，加强与有关国际组织和国家的交流与合作，希望通过我们的共同努力，为应对全球极端气候变化，保障山西乃至中国水安全和世界的水安全做出新的更大贡献！

水资源综合管理在贵阳市的实践初探

贵阳市水利局　　郑勇

摘要：本文介绍正在实施的亚洲开发银行贷款贵阳市水资源综合管理项目情况及体会。
关键词：水资源综合管理

1、贵阳市水资源基本情况

1.1贵阳市概况

贵阳市为贵州省省会，市城面积8034km^2，地处东经106°07′~107°17′、北纬26°11′～27°22′，下辖6区3县1市。2006年人口354.5万人，全市GDP为602.86亿元。贵阳市矿产资源丰富，以铝、磷、煤等为最；生物资源丰富，中药材品质优良；旅游资源丰富，民族风情浓郁；气候凉爽宜人，森林覆盖率高，有“森林之城、避暑胜地”美誉。

1.2贵阳市水资源状况

1.2.1贵阳市属亚热带季风湿润气候区，年平均气温15℃左右，多年均降水量1095mm。全市地处长江流域和珠江流域分水岭地带，位于云贵高原东斜坡第二阶梯面台地。全市共有流域面积大于20km^{2}或河长大于10 km的河流98条，多年平均水资源总量45.15亿m^3,人均水资源占有量为1274m^3/人,已逼近1100 m^3/人缺水线，是我国南方岩溶地区典型的缺水城市。

1.2.2全市水资源的主要特点：（1）水资源总量不足，人均水资源占有量低；（2）时空分布严重不均，季节性缺水严重；（3）水污染尚未有效遏制，面源污染呈加重趋势；（4）受岩溶地貌影响，开发利用难度大，投资高；（5）周边水资源丰富，后备资源充足。

1.2.3全市水利资源开发利用和管理存在的主要问题：（1）城市供水水源不足，用水矛盾突出；（2）农村供水设施不足，用水水平低；（3）城乡防洪能力不足，一旦发生特大洪灾损失惨重；（4）水资源保护力度不够，污水处理率低；（5）节水措施力度不够，综合利用率低；（6）生态环境用水不足，水环境尚有恶化可能；（7）水资源开

发利用难度大，投资不足；（8）水资源配置不合理，急需优化用水结构；（9）水市场尚未建立，水价机制尚未形成；（10）水资源管理体制混乱，政出多门现象严重。

2、水资源综合管理初步实践

2.1水资源综合管理概念及引进

2.1.1水资源综合管理概念:按照都柏林原则和全球水伙伴（GWP）的定义：“ 水资源综合管理是以公平的方式，在不损害重要生态系统可持续的条件下，促进水、土及相关资源的协调开发和管理，以使经济和社会财富最大化的过程。 ”水资源综合管理是社会各界和用水公众广泛参与水资源开发、利用、节约、保护等各项工作，充分体现公平的原则，统筹安排生活、生产和生态用水，全面协调供用水关系，采用法律、行政、经济、技术、工程等综合措施对水资源进行全面管理工作。水资源综合管理是目前全球水资源管理新的模式和趋势，特别要加强公众和市场对水资源的管理能力，实现水资源的社会共享。

2.1.2概念的引进：20世纪80年代末贵阳市经历前所未有的干旱，城市实行了紧急限水；90年代中期又受百年罕见洪涝灾害，兴利除害、统筹兼顾的治水思路得以贯彻；随着经济发展、生活水平提高，全市上下对治理城区南明河的要求迫切，2001年至2004年开展对南明河综合治理工程，初步实现“ 水变清、岸变绿、景变美 ”的治理目标，综合治理概念的引进实现上下游、水体与岸边、工程与生态治理多方位系统的治理，成为有效示范；2004年为解决全市经济快速发展，预期未来的缺水问题，着眼全市可持续发展战略，在考虑解决以解决资源性、工程性、水质性缺水为目标，采取工程性措施和非工程性政策、经济、管理等措施，基本解决贵阳市水资源紧缺问题，引进了水资源综合管理概念，确定以亚行贷款项目贵阳市水资源综合管理项目为载体，逐步实现水资源综合管理。

2.1.3贵阳市水资源综合管理项目概况：建设内容包括城乡供水、水利灌溉、灌区改造、雨水集蓄利用 “ 三小工程 ”、农村饮水、水土流失治理等方面。该项目以促进城乡发展、解决工农业用水和生态环境治理为核心，工程方案以蓄为主，合理配置全市有限的水资源，统筹城乡水利建设，实现水资源可持续利用。通过该项目的实施，满足全市相当时期内的需水要求。具体的建设内容为：（一）城市供水。 新建乌当区鱼洞峡水库等3处供水工程；（二）县乡供水。 新建清镇市席关水库、修文县金龙水库、开阳县毛竹林水库、乌当区新桃水库等43座小型水库；（三）灌区改造。 对清镇市、修文县、息

烽县、开阳县、乌当区等区、市、县7个重点灌区进行改造；（四）雨水集蓄利用。新建雨水集蓄利用“三小”工程10.6万处；（五）水土保持。实施以小流域为单元的重点水源地的水土流失综合治理800平方公里。

通过以上项目的实施，全市水库新增蓄水库容0.86亿m^3，雨水集蓄工程新增库容343万m^3，供水规模新增1.22亿m^3，日新增供水43.5万m^3，新增灌溉面积16.04万亩，改善灌溉面积16.5万亩，旱地浇灌13.7万亩，解决乡镇供水及农村人饮近27万人，800平方公里重点水源地水土流失得到综合治理。通过项目实施，建立一套符合贵阳市实际的水资源综合管理体制。

该项目计划投资24亿元，其中申请亚行贷款1.5亿美元(折合人民币12亿元左右)，国内配套人民币12亿元。项目于2004年底列入亚洲开发银行贷款备选项目，2006年完成亚行技术援助，2007年5月通过贷款评估，2007年6月国家发改委正式批准了项目立项，预计年内亚行批准该项目的实施。

3、水资源综合管理实施的几点思考与体会

3.1水资源综合管理势在必行。

针对贵阳市水资源特点和存在主要问题，其产生的根源故有自然的因素更有人为的因素，对水资源作为人类发展赖以生存的物质和国民经济社会发展重要战略物资的再认识是不断深化的，兼顾社会公众之需、统筹有限的水资源开发利用、优化配置合理利用、保护优先节约先行的水资源综合管理是解决日益紧缺和严竣现实必由之路。运用系统的、流域的管理思路统筹上下游、左右岸以及城乡、工农业、生活生态等用水，以需求管理、定额管理为先导的节水型社会建设，以保护资源的公共利益为基础，以公众参予的利益最大化原则，水资源才能满足社会经济的发展和人民生活的需要，才能实现可持续发展。

3.2水资源综合管理引进已初显成效

贵阳市水资源开发利用存在的问题之一就是投入不足，零敲碎打不成系统；受地形地貌影响没有大型控制性工程建设条件。引进水资源综合管理后，考虑统筹城乡供水，按流域规划集成。例如在一条小流域，在源头重点考虑水土保持综合治理，为解决山高水低群众居住和耕地分散问题布设小山塘、小水池（窖），在适当位置兴建小型水库为城镇供水、灌溉等，通过灌区改造节约用水提高水的利用效益，节约的水用于城镇发展

和工业用水，通过污水处理改造水环境，这样形成系统的治理模式也形成具有一定规模的项目内容，多条小流域的汇集形成了今天亚行项目的主要内容，该项目有65个子项目工程点达10万之众，这个项目的构想就得益水资源综合管理概念引进，也得到众多国际专家和国内专家的首肯，当然也得到亚行的支持和帮助。在项目的可研和亚行的技术援助中，这一思想得到公众和有关部门的认同和参予，通过技术援助和亚行专家的帮助，项目执行单位在信息获取、分析工具、机构加强能力建设等得到加强和提高，综合管理意识得以深入等等，都是实施亚行项目所取得的。

3.3亚行项目实施任重道远

贵阳市实施亚行水资源综合管理项目，其目标一是解决全市水利基础设施不足问题，二是解决水资源管理体制已不适应城市发展之需问题。具体来说就是“三个一点”：一是引进一点资金，二是引进一点制度，三是培养一点人才。从三年的前期准备看，培养一批本土的人才已经初步显现出来，一批具有与国际接轨的项目执行、管理、技术人才正在成长；在引进制度上，亚行项目管理模式、管理理念、管理方式已逐步为我所用，渐为消化吸收，促进了项目实施单位在理念、方法、模式的转变。但由于目前项目仍在前期准备，预计年内谈判和实施，所执行中的困难和问题仍等待着我们，我们有信心和决心把项目实施好，通过水资源综合管理实现贵阳市水资源的可持续发展。

在中国应对极端气候战略圆桌会议的总结讲话

全球水伙伴中国委员会常务副主席　　董哲仁

女士们、先生们：

按照会议议程，中国应对极端气候战略高级圆桌会议马上就要闭幕了。现在，请允许我对会议作一个简短的小结。

在这次会议上，水利部陈雷部长、环境保护部吴晓青副部长和中国气象局许小峰副局长做了主旨演讲。中国人民政治协商会议全国委员会副主席张梅颖女士等五位嘉宾先后致辞。有7位代表分别作了特邀专家报告。与会代表展开了热烈的讨论，发表了很好的意见，会议取得了丰硕的成果。

本次会议主题鲜明并具有以下特点：

第一个特点是体现了多部门多层次参与。这次会议邀请了全国政协、以及国务院法制办、国家发改委、水利部、环保部、中国气象局等6个国家部委局，联合国驻华机构、欧盟及有关国家驻华使馆、国际非政府组织、地方政府、科研机构、高等院校、民间团体、企业界共70多个部门130多位代表参与讨论，具有广泛的代表性。

第二个特点是这次会议是开放的，我们建立了一个交流对话的平台。这次会议发言内容广泛，富有新意，既有战略性问题讨论，也有科学问题的探讨，为各级政府和有关部门提供了可供选择的建议。这种由决策者、非政府组织、企业界、专家学者共同参加的高级圆桌会议，采用开放、互动的方式，平等协商，建言献策，充分体现了伙伴合作关系，达到了预期的效果。

这次会议提供了许多重要理念和观点，提出了许多有益的咨询建议。我试图简单归纳如下：

应对极端气候是全球性的问题，无论是发达国家还是发展中国家，都应该共同面对。

我国应对极端气候形势严峻，已经成为制约我国社会经济可持续发展的主要因素之一。随着工业化、城镇化深入发展，增强防灾减灾能力要求越来越迫切，强化水资源节约保护工作越来越繁重。

应对极端气候，防御水旱灾害，是一项关系国家长治久安、人民安居乐业、人与自然和谐发展的紧迫而重大的战略任务，必须从战略高度上重视，加强立法保障，加强机制、体制的改革，制定和实施涵盖政治、经济、社会的综合应对政策措施。

应对极端气候涉及多部门多行业，需要形成政府相关部门、相关行业的协调机制，只有水利、农业、气象、环保、能源、建设、卫生、国土、民政等多部门的合作，才能减轻由极端气候带来的水旱灾害，切实保障我国的防洪安全、供水安全、粮食安全、生态安全和能源安全。

应对极端气候需要进一步扩大社会公众参与。保证广大群众对于气候变化状况的知情权、参与权、表达权、监督权。政府在决策过程中，需要广泛听取专家和公众的意见，实现科学、民主决策。

应对极端气候需要进一步加强科学研究。气候变化影响时空尺度大，关系错综复杂，具有很大的不确定性。通过跨学科合作研究，通过国际合作深刻理解和认识气候变化的科学问题，探索自然规律，力图把握人类活动与气候变化的关系，需要通过加强科学研究和监测系统建设，为政府决策提供支持。

以上只是对于会议的初步归纳。会后，全球水伙伴（中国）秘书处将整理一份会议情况报告，分送有关政府部门、参会代表、新闻媒体等单位。

最后，我代表会议的主办方，再次感谢会议各支持单位的合作，感谢各位代表的热情参与和支持。

谢谢大家！

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Speech at the High-level Roundtable on Strategy of Extreme Climate Adaptation in China

Zhang Meiying,
Vice Chairperson, the China People's Political Consultative Conference (CPPCC)

Distinguished guests, ladies and gentlemen,
Good morning!

It is my 3rd time to be present at the High-level Roundtable meetings organized by the Global Water Partnership (GWP) China. In this beautiful spring, I really feel warm to get together with the old and new friends here to talk about the water issues in China. Please allow me, on behalf of the CPPCC, to extend my congratulations to the opening of this meeting and give my warmest welcome to the friends from all over the world.

The extreme climates and the consequent issues on water security are the major challenges faced by the whole world with an impact on the survival and development of human beings. There are highly related with the economic and social development as well as human future to well deal with the problems. However, owing to some reasons, all the countries of the world are hard to reach an effective agreement of immediate actions. As green house gas emission is growing day by day, the global climate could be extremer in the future. China, as one of the victims of extreme climates, is going to be confronted with more serious challenges, especially on water resource which is most fragile in front of climate disasters. In recent years, affected by extreme climate, water resources in China are unevenly distributed in time and space thus being more fragile. At present, water resources per capita in China are less than 700 m^3, which is much less than the water-shortage warning line recognized by the world. In 2010, the natural disasters produced by the extreme climates have been seen all over China, with some regions suffering from more frequent and stronger extreme climate disasters like heavy rainfall, high temperature and drought, strong typhoon, and especially flood and drought disasters which are more and more unpredictable.

As the Doctrine of the Mean of the Book of Rites says, preparedness ensures success and unpreparedness spells failure; better preparation ensures the good talking; doing things with better there will be no difficulties and set-backs when well-prepared before doing things; and better planning escapes mistakes and regret. 90% of the scientists of the world recognize that it is human beings that lead to the present global climate conditions. Today, we have to change the thoughts and ways against extreme climate and disasters that we used to have. We have to be well prepared before the disasters happen. In fact, since our technologies and economic conditions are not developed enough to completely prevent and stop disasters, we have to co-exist with them in a long time.

Therefore, we have to pay more attention to the dealing of disasters, including them into the overall plan on sustainable economic and social development and learning to well manage disasters.
China, as a responsible developing country, attaches great importance to the extreme climates and water security issue that has resulted from it. The Document <Decision on speeding up the reform and development in water sector> issued by the Central Government in early 2011 pointed out that water is the source of all lives and the basis of production and ecology, and producing benefits and reducing disasters from water are great issues for the national stability and prosperity. The Document emphasized that the annual average investment to water projects in the next 10 years should be doubled compared with that of 2010, which meant that 400 billion RMB should be used for water projects construction each year. These measures will greatly promote the development in water sector and ensure water security.

China has to take climate change adaptation and extraordinary flood and drought disasters prevention as a part of national security strategy. Firstly, the change of economic development mode shall be accelerated, and the policies and measures on lowering the climate change shall be well promoted according to the requirements of the Scientific Development Concept. The bearing capacity of water resources and economic development should be well coordinated and the consideration should be taken not only to the present but also to the future, and a series of policies and actions should be adapted to the controlling and reduction of green house gas emission and the reduction of the extreme climate disasters produced by the human activities focused on development of the low-carbon economy, optimization of energy structure and strengthening of environment protection .
Secondly, the weak points on flood and drought disasters prevention should be improved to promote the capacities of adapting to extreme climates and ensure water security. The capabilities against extreme climates and flood and drought disasters should especially be strengthened so that the sustainable economic and social development can be guaranteed by sustainable water resource utilization.

As an old Chinese saying goes that if the lips are gone, the teeth will be exposed to the cold. We have to be aware that disaster is not bordered, and no country can deal with it alone. It is the common responsibility to fight against extreme climates and ensure water security, and the impact of disasters can only be reduced at last by the unity, cooperation and mutual support of all the people in the world. The High-level Roundtable meeting today is the platform on which the experts and academicians from all over the world to communicate and learn from experiences on how to deal with the extreme climates. We are convinced that, with the common efforts and cooperation among all countries, departments, sector and the whole society, the progresses will be made on dealing with extreme climates and the sustainable water resources utilization will be realized.

Ladies and gentlemen, I hereby wish full success of the High-level roundtable meeting and wish you a pleasant time in Beijing.
Thank you very much!

Speech at the High-level Roundtable Meeting on Strategy of Extreme Climate Adaptation in China

Edgar Cua
Deputy Director General, East Asia Department Asian Development Bank

Distinguished Guests, Ladies and Gentlemen, Good Morning.

I feel privileged to be here today to address this High-level Roundtable Meeting on Extreme Climate Adaptation Strategy in the People's Republic of China (PRC). On behalf of the Asian Development Bank (ADB), I would like to thank the Global Water Partnership China (GWP China) and the Office of the State Flood Control and Drought Relief Headquarters for organizing this forum and to extend a warm welcome to all participants from the different ministries, research institutes, universities, and other members of civil society.. We are indeed pleased to be here and to co-sponsor this important event.

Introduction

Today we will talk about a subject that has increasingly become one of the greatest threats to all of humanity: ***climate change.***

I would like to focus on how climate change has significantly affected ecosystem services and the need for mankind to strengthen ecosystem management in response to such threats
Climate change has increased the frequency and intensity of climate-related disasters such as floods, fires, and droughts, and has caused ecosystem degradation. This in turn reduces the resilience of ecosystems and human societies against the impacts of climate change and the increased risk of disasters. Ecosystem degradation primarily affects the carbon sequestration ability of the natural systems, which may gradually turn these systems from carbon sinks to sources, thus exacerbating the downward spiral. I will discuss three examples in the PRC to demonstrate this vicious cycle of climate change, ecosystem degradation and increasing risk of climate-related disasters.

First is the issue on widespread desertification. Desertification, aggravated by climate change, is worsening the already difficult farming and livestock raising conditions in several regions of the PRC. A vast area of about 3 million square kilometers, stretching from the Tian Shan Mountains in the west to the eastern edges of the Gobi Desert, is at risk from desertification and land degradation, directly affecting about 100 million people. In the PRC, 27% of land area has suffered from some forms of desertification, exacerbating sandstorms that have hit at least 16 provinces, creating

considerable social, economic, and ecological difficulties. Climate change is not the only cause of desertification, but it is becoming an increasing threat to agricultural productivity and food security. Persistent drought, inappropriate agricultural expansion, overgrazing, and indiscriminate use of ground water continue to strain this already dry region. Climate change adds to the urgency of efforts to improve existing land practices.

Second is the rising sea level and marine ecosystem degradation. The rate of sea level rise along the PRC's coastline has been slightly higher than the global average, thereby contributing to flooding, coastal erosion, and seawater intrusion. More frequent typhoons and storm surges are also aggravating the hazards induced by these impacts. Heavily populated coastal areas, such as the Pearl River Delta, and the cities of Shanghai, Tianjin and Haikou are affected. Some marine ecosystems such as coastal wetlands, mangroves, and coral reefs are experiencing degradation and biodiversity loss. This has significantly reduced the resilience of marine ecosystems and human societies against the impacts of sea level rise and the increased risk of disasters.

Lastly, ecosystem degradation process has reduced the capacity of the ecosystem to buffer the impacts of climate change. Hence, ecosystem degradation increases the vulnerability of natural and human systems to the impacts of disasters such as floods, landslides, and droughts. In 2010, southwestern PRC experienced its worst drought in decades, affecting more than 50 million people. In the same year, the drought was followed by torrential rains, causing widespread flooding and landslides, affecting 70 million people in several provinces, and resulting in numerous mortalities and crop damages. Climate change, particularly rising temperatures that affect the water cycle, is considered to be responsible for the increased frequency and intensity of these extreme events, which impact all sectors from energy to agriculture, and lead to public health threats and economic losses.

The Government's Response: Giving Ecological Security Equal Importance

Against this backdrop, it is heartening to note that the PRC has recognized the importance of ecological security. On January 31, 2011, the PRC's Central Committee and State Council did what few other countries have the political or economic capacity to do. In its "Number One Paper," an annual policy paper that details the central government's top policy priority, the PRC government committed to double its annual investment in the water sector, specifically water conservation (three red lines). The government committed to invest RMB4 trillion ($608 billion) during the next decade. These large-scale investments reveal the urgency to reverse the country's environmental damage, expedite priority investments, and secure its food production.

The policy paper explicitly gave ecological security equal importance along with economic and national security. Minister of Water Resources Chen Lei was widely quoted as saying that it was the first time such an important party document had given singular importance to the water sector by raising it to the strategic level of the economic and national security. The government is encouraging more investment and more private sector participation in the water sector.

To some, the heightened policy focus on water was not a surprise, given the country's devastating year in 2010 when widespread droughts, floods, and mudslides hit a wide population base, affecting the environment, and further straining a growing food deficit. The policy paper specifically calls for comprehensive flood protection and drought management plans to be in place by 2020. Reducing consumption in all sectors through water pricing will also be encouraged.

Asian Development Bank in Action: ***Promoting Climate-Resilient Development***

In response to the global impact of climate change, we, at ADB, have been promoting climate-resilient development in our developing member countries in the Asia and Pacific region. Climate change is being mainstreamed into our operations. Apart from financial assistance, ADB works to strengthen good governance and policies in support of climate change adaptation. Capacity building is integrated at many levels, from assisting government ministries in crafting climate-supportive policies to helping country stakeholders better understand climate science and good practices required to properly respond to country-specific needs.

In 2010, ADB completed several studies and strategies on critical water issues in the PRC that are addressed in the 2011 Number One Paper. Two of these studies are national in scope. The national drought management strategy studied historical and geographic trends of drought incidents and government responses. The study found that the country's management system is "stuck" in a reactive mode. The guidelines for drought management strictly follow that of flood management, which limits responses until after an emergency has been declared. The National Flood Management Strategy came to similar conclusions as the drought study—greater risk assessment, monitoring, and an early warning system would greatly reduce response times and costs incurred from unnecessary losses, damages, and rebuilding.

ADB also provides policy and technical guidance to address climate change and variability issues in agriculture, infrastructure, transport, health, water, and other sectors. Our water sector initiatives are innovative, and are designed to cope with the impacts of climate change by reducing water losses and applying integrated water resources management to improve the resilience of communities and economies to climate change.

Promoting integrated river basin development and strengthening the resilience of urban water services to adverse impacts are major components of ADB's approach to adaptation in the water sector. In agriculture, ADB will monitor trends, build on its experiences in water management and irrigation, and support conservation and water-saving technologies to improve sector and agricultural resilience.

Sharing of the Chinese version of the ADB-NDRC recent publication:
Payments for Ecological Services and Eco-compensation: Practices and Innovations in the PRC

In a world where climate change is resulting in more unpredictable weather patterns, sea level rise, and more frequent and extreme storms, the regulating services provided by ecosystems are critical for climate change adaptation and disaster risk reduction. Examples of these services include climate and water regulation, protection from natural hazards such as floods and avalanches, water and air purification, carbon sequestration, and disease and pest regulation.

However, economic instruments related to ecological conservation are not fully in place, leading to an unequal distribution of ecological and economic benefits between protectors and beneficiaries. As a result, natural ecosystems continue to be degraded, or lost, at an alarming rate. Indeed, many have argued that the failure of society to compensate for conserving the environmental services is a key contributing factor to the rapid and environmentally damaging changes in the ecosystem that are taking place in the PRC, in particular, and the world, in general.

Payments for ecological services (PES) have thus become increasingly important policy instruments internationally to creating incentives for sustainable ecosystem service provision, addressing livelihood issues for rural poor, providing sustainable financing for protected areas, and promoting climate-resilient development. I am glad to inform you that ADB and the National Development and Reform Commission (NDRC) have successfully produced a knowledge product, entitled Payments for Ecological Services and Eco-compensation: Practices and Innovations in the PRC.

Today, we are very pleased to share with you the Chinese version which became available only yesterday. My colleagues, Dr. Qingfeng Zhang, one of the principal authors, and Yoshiaki Kobayashi will later discuss ecosystem services and climate change adaptation based on the findings of this publication.

Conclusion

Distinguished guests, ladies and gentlemen, while the PRC has shown strong commitment to climate change adaptation and disaster risk reduction, we observed that national policies and local actions still lack an integrated approach to address the downward spiral of climate change impacts, ecosystem degradation and increased climate-related disasters. Government support is urgently needed for the systematic integration of ecosystem management into climate change adaptation and disaster reduction policy frameworks and practices. It is also strongly recommended that adequate financial incentives, like eco-compensation or market-based payments for ecological services, as well as technological and knowledge resources are put in place for integrating ecosystem management in the climate change and disaster risk reduction portfolio.

Today's forum offers an unprecedented opportunity for cooperation among high-level policymakers and scientific communities to act on the combined threats of climate change, disasters, and continuous ecosystem degradation. I am confident that through open and frank exchanges, we will be able to foster closer links between ecosystem management, climate change adaptation, and disaster

risk reduction communities.

Let me again express my sincere gratitude to the Global Water Partnership China (GWP China) and the Office of the State Flood Control and Drought Relief Headquarters for coordinating and organizing this workshop. I am looking forward to productive discussions on how to best design an ecosystem-based climate change adaptation strategy.

Thank you very much.

Speech at the High Level Roundtable on Strategy of Extreme Climate Adaptation in China

Mme. Gillian Mellsop, Resident Representative, UNICEF China

Dear Chairman,

Ladies and Gentlemen,

It is a great pleasure for me to attend this high-level event when I am new in China.

I am glad to see how Chinese government is determined in encountering climate change, especially which the endorsement of the No. 1 Paper of the Central Committee of the Communist Party of China and the State Council for 2011 mainly focuses on the security of water security.

As we all know, the consequence of climate change is rising of temperature. Though climate change can have positive impact, such as increasing crop production and timber supply and reducing demand on energy for heating in middle and high latitude regions, the society has to face challenges of negative impacts, which are much larger than the benefit it may bring to us. Among the consequences the extreme climates created by climate change are notorious. Last year's severe drought in southern China, the flood in northern Xinjiang and this year's severe drought in northern China are best examples of these extremities.

Children, UNICEF's core constituency, are the most vulnerable victims of conflict caused by these possible changes in the following aspects: food security and malnutrition; water shortage, diarrhea and other waterborne diseases; malaria and other vector-borne diseases, death and illnesses from use of biomass fuels indoor; and impacts from the breakdown of economic and social structures.

All our work is targeting on realizing children's rights and their sound development. UNICEF has been supporting the Government of China's efforts to provide safe drinking water by building sector capacities, encouraging community participation in management of rural water supply, by identifying emerging issues, such as arsenic poisoning in groundwater, by supporting the development of appropriate standards, and by conducting research for policy development.

Now UNICEF is actively involving in climate change activities in various means. With support from Spanish MDG Achievement Fund, UNICEF is partnering with the Ministry of Water Resources in China to implement a project called "Managing the Effect of Climate Change through Monitoring

Groundwater" to fill the gap in understanding the relationship between climate change and groundwater quality and quantity. UNICEF is also very active in responding to natural disasters by taking a leading role in providing water and sanitation relief among UN agencies through cooperation with Chinese government agencies, especially provision of water and sanitation for schools. We are now working together with Ministry of Water Resources for piloting and promoting Water Safety Plan as a measure for improving water quality and reducing risks of contamination, and building capacity in developing contingency planning for water supply in emergencies. All these initiatives aim to ensure sustainable water supply with full consideration of water quality and risks posed by climate change.

Meanwhile, climate change is one of UNICEF's strategic areas with Children as a "communication agent". We are also working with related government counterparts for integrating climate change contents into our school water and environment project. It aims to educate school children to adopt low carbon life style and to prepare themselves and their communities in preventing disasters and adapting to climate change. There is long way to go in climate change mitigation and adoption. Children, our future, our hope, must be the heart of all our work.

Dear chairman and friends, taking this opportunity, on behalf of the UNICEF, I would like to express my sincere thanks to you and GWP in taking the leadership for organizing this conference. It provides a platform for representatives from different sectors to sit together to discuss the serious topics.

We are sincerely looking forward to further cooperation with you.

I wish you great success at this conference.

Thank you.

Speech at the High-level Roundtable on Strategy of Extreme Climate Change Adaptation

Zhu Chunquan, Chief Supervisor of World Wide Fund (Beijing)

Distinguished Vice Chairperson Zhang Meiying, Minister of Water Resources Chen Lei, Chairman of GWP China and former Minister of Water Resources Wang Shucheng, dear guests, ladies and gentlemen,
Good morning!

Today, the senior roundtable conference is open in Beijing with the organization of GWP China, ADB and the Office of State Flood Control and Drought Relief Headquarters. Following the theme of Chinese Anti-extreme Climate Strategy as well as the thought of people and water harmony, the conference invites the decision-makers, researchers and executors from the fields related with water resource protection and application to provide advices and suggestions for safeguarding national ecological safety. I hereby, on behalf of WWF, would like to extend my cordial greeting to the conference as well as my friends and experts at home and abroad.

In recent years, global warming, sea level rising, extreme climate and climate disaster have been occurring one after another, which not only affect natural ecological system and human survival, but also influence world economic development and social progress. Climate change has grown into a global problem. As WWF pointed out in 2009 in the Yangtze River Basin Climate Change Vulnerability and Adaptation Report, the materials of 147 meteorological stations in the Yangtze River basin showed that the annual average temperature of the basin in the 1990's was 0.33℃ higher than the average value from 1961 to 1990, and the difference even rose to 0.71℃ from 2001 to 2005. In the past several decades when climate was getting warmer, flood disasters occurred more and more frequently in the Yangtze River basin, and the situation might be worsened in the future featured by extremely serious flood, snow or draught. The Report also analyzed the effects of climate change on forest, marsh, water resource, grassland, agricultural land and river delta, finding out that marsh was most easily affected by climate change, and climate change worsen global marsh fragmentation. Water temperature rising and water level decreasing had threatened ecological diversification of marshes, which would be more fragile in China owing to climate change.

According to the researches at home and abroad, marsh plays a key role in climate change adaption. As a natural fresh water storage center, marsh stores over 96% usable fresh water resources of the world. It is named the kidney of the earth, indicating that it is provided with strong pollution degradation and water purification capability. It is indispensible for maintaining water environment

with diversified creatures. Marsh is the buffer to minimize natural disaster risks. It is provided with important functions of flood control, storm, erosion and draught prevention as well as climate control, so that it is strategically unique for establishing disaster prevention system, safeguarding national ecological security and countering extreme climate. Marsh is also called the gene center, which reserves a lot of unique genes of instinct wide animals and plants, creating ecological diversification of the world. Marsh, with strong ecological functions, is able to improve the adaption and resilience of global ecological system against extreme climate change. To sum up, marsh is an important natural resource and ecological support system for human survival and development.

Therefore, in order to promote sustainable development of Chinese economy and ecological environment, I hereby propose to:

Promote marsh ecological system protection with comprehensive basin management, and safeguard ecological security by the whole society after adapting to climate change. It is one of important strategic measures for buffering and adapting to climate change to maintain marsh ecological system healthy, which is also significant for water source maintenance, water purification, basin ecological security protection, and sustainable economic and social development promotion. WWF has established the marsh conservation network of the Yangtze River in 2007, which has covered the whole basin from the middle and lower reaches of the River within 3 years. There have been 102 members, covering an area of 1.85 million hectares, which make great contributions to ecological security maintenance of the Yangtze River. In the past, marsh protection won wide attentions from the departments on water resources, forest, energy and transportation owing to its complicated interest relations. Today, we are inspired by the success of the marsh protection network of the Yangtze River basin that, the managers, decision-makers and executors are able to adopt a kind of more comprehensive method to work out effective and acceptable management measures on ecological system protection and resource application only through promoting trans-department management mode and conversation transparency principles, so that various interest relations can be well handled and the functions of ecological system can take effect for a long time. In the future, we hope to accelerate the inclusion of marsh protection thought and actions into the national strategic plans of anti-climate change, water resource management, water pollution prevention and national functional area division.

My dear friends, ladies and gentlemen,
Let's work hand in hand to establish a harmonious order under the guidance of the Scientific Outlook of Development as well as the 12th Five Year Plan, and fight for safeguarding national ecological security, countering global climate change and extreme climate disasters, maintaining the service function of natural ecological system, and improving human welfare and living.

I hereby wish the conference fully successful! Thank you!

Speech at the High-level Roundtable on Strategy of Extreme Climate Adaptation in China

Khalid Mohtadullah, Senior Advisor of GWP

Excellency Madam Zhang Meiyng, Vice Chairperson of CPPCC, Honorable Minister Chen Lei, Honorable Mr Wang Shusheng, Chairman GWP China, distinguished speakers, ladies and gentlemen, it gives me great pleasure to be here this morning representing GWP HQs, and particularly to convey warm greeting from Chair GWP, its Executive secretary. As for myself, it is always home coming for me when I am in your great country, and I wish it to stay like that forever.

I wish to congratulate GWP China to have organized this important event in partnership with ADB and Office of State Flood Control and Drought Relief Headquarters at a time when extreme events are increasingly threatening human life and economic infrastructure as has been pointed out by all the speakers before me.

Recent foods in China and Pakistan remind us of the seriousness of this issue. In Pakistan's case 20 million people were affected during the last flood season and caused infrastructure damage in excess of USD 10 Billion. This has caused a very serious setback to our economy which was already reeling under adverse security environment prevailing in the region.

I am happy to tell you that GWP is very actively engaged in sharing of knowledge relating to climate change and emphasizing at all global forums the urgency of taking actions, particularly with respect to water resources where its impact is most felt globally, regionally and locally.

In this regard I would like to point out that very recently GWP China has translated GWP TEC document No 14 into Chinese. This needs to be read by all stakeholders at all levels to get a good understanding of this phenomenon and use this knowledge in the development of abatement and adaptation strategies.

The way this event has been organized in partnership mode is one good way of getting stakeholders together to discuss issues and make recommendations for further action by decision makers in China. GWP HQs therefore offers its full support to GWP China and its partners in these efforts.

GWP believes that climate change impacts are most seriously reflected in the various aspects of water resources, and what makes it even more difficult is the fact that there as yet no exact science is available to deal with it, and in the absence of that, we strongly suggest that the best way to ensure

sound adaptation is to have to have a sound strategy for water resources management. This alone will be able to provide the required resilience to be able to absorb climate shock from severe events mentioned by most speakers this morning.

China has made great progress as mentioned by Minister Chen Lei, and this needs to be recognized for many countries in the region to see and learn from:

1. It has been able to substantially raise water utilization efficiency within the framework of harmonious coexistence between man and nature
2. It has met safe drinking water supply targets six years ahead of schedule required under the MDGs
3. It has made enormous investments in water infrastructure that has enabled it to successfully respond to disaster events.
4. It has achieved major water savings in agriculture with increased production. It is creditable to see that China with 6% of the world's water, 9% of the world's arable land, feeds 22% of the world's population.
5. It has substantially strengthened protection of environment by effective legislation and regulatory framework
6. Most of all it has made lot of progress in emphasizing green and renewable energy (hydro, wind and solar), which now is said to be contributing almost 35% of energy supply in the country.

While a lot more needs to done, yet its actions like these that give countries the required resilience to cope with extreme events associated with climate change.

We in GWP stand together with GWP China and its partners to take further steps in better understanding of the phenomenon of global climate change and developing skills and policies that will give greater handle to deal with climate change issues.

Once again on behalf of Chair GWP, its Executive Secretary and myself, I wish this meeting great success.
Thank you,

Enhance Water Security and Adapt to Global Climate Change

---Keynote speech at the High-Level Roundtable Meeting on Strategy of Extreme Climate Adaptation in China

H. E. Mr. Chen Lei

Minister of Water Resources, P. R. China

Your Excellency Madame Zhang Meiying, Vice Chairperson of CPPCC
Your Honorable Mr. Wang Shucheng, Chair of GWP China,
Distinguished guests,
Ladies and gentlemen,

It is my great pleasure to attend the High-Level Roundtable Meeting on Strategy of Extreme Climate Adaptation, which is co-sponsored by Global Water Partnership China, Asian Development Bank and Office of State Flood Control and Drought Relief Headquarters. First of all, on behalf of Ministry of Water Resources, I would like to extend my warm congratulations on the convening of this meeting. I would also like to express my heartfelt thanks to the United Nation agencies, international organizations and financing institutions as well as governments of relevant countries and people of all walks of life who have devoted their long-term care and support to the development of water sector of China.

Climate change has become a major challenge faced by all the countries, exerting profound impact on human survival and development. As a developing country with a dense population and fast economic development, China has such basic characteristics on water as the insufficiency in availability, uneven distribution in time and space and the mismatch between water resources capacity and the production layout. In recent years, affected by global climate change, the extreme climates increasingly occur in China. The unexpected, unusual and unforeseeable flood and drought disasters take place frequently. Besides, the extraordinary rainstorm in some areas, the extreme high temperature and extraordinary typhoons exhibit a tendency of unexpected, frequent and prolonged occurrence. A tendency of more water in the south and less in the north has emerged. The observed runoff of the major rivers has been reduced. In the north, water scarcity is getting worse as drought affected areas in major agricultural areas are expanding along with the earlier advent of spring weather, and pests appearing more frequently and earlier than before, resulting in an unstable agricultural production.

A series of ecological problems have appeared, such as the shrinking of glacier and frozen earth areas, the drying-up of many rivers in northern part of China, withering or disappearance of some lakes, decrease of reservoir water storage, loss of functions of some wetlands, and increasing

pollution in water bodies; the coastal erosion caused by sea level rise, salt water intrusion, saline and alkaline of farmland, sea water intrusion in estuary area etc. Therefore, in order to cope with extreme climates, it is a crucial topic for China to solve on concentrating on flood and drought disaster prevention, ensuring water security and realization of sustainable water resources utilization in the process of building up a well-off society in an all round way and promotion and speeding up of the modernization.

The Chinese Government attaches high importance to the issue of global climate change and takes the resource conservation and environment protection as the basic national policy. In order to promote the better coordination between economic and social development with population, resources and environment, the measures of promoting recycled economy, extending low-carbon technology and developing low-carbon and renewable energy such as hydropower, solar energy, wind power have been taken up.

Before the UN Copenhagen climate change conference in 2009, the Chinese Government made a commitment, i.e. by the year 2020, the emission of carbon dioxide per GDP will be 40%-45% lower than that in 2005; the non-fossil fuel consumption in disposable energy will account for about 15% of the primary energy consumption; the forest coverage will increase by 40 million hectare over that in year 2005; and the forest storage volume will increase by 1.3 billion cubic meters over that in year 2005.

In the outline of the 12th Five-Year (2011-2015) Plan, specific requirement is made on speeding up the transformation of economic development pattern to adapt to the global climate change. Water resources are obviously the key area under great impact of global climate change. Therefore, water infrastructure construction will be the basis for coping with climate change and in particularly the extreme climate events. The No.1 Document "Decision on Accelerating the Reform and Development in Water Sector" released by the Central Government of China in 2011 gives priority to water as the basic infrastructure of the country and highlights the role of disaster prevention and reduction in coping with climate change, placing a strong emphasis on water resources safety for the national security.

During the period of 12th Five-Year Plan, we will insist on the principle of putting emphasis on both reduction and adaptation, integration of development and conservation, construction and management, scientific innovation and new system creation, government guidance and public participation, and on effective implementation of policies of the Central Government, strengthening basic water infrastructures and flood control and drought relief system and water resources conservation, protection and management system, enhancing capacity of emergency management for flood and drought and furthering up campaign of reform and development in water sector, so as to upgrade capacity of coping with climate change and provide guarantee for a long-term, stable and fast economic development and realization of well-off society in China.

Firstly, improve the flood prevention system. Considering the outstanding problems raised by severe flood and drought in recent years, priority will be given to the harness of medium-sized and small rivers and major tributaries of big rivers, the strengthening of small hazardous reservoirs, prevention of mountain flood and repairing of aged water gates, so as to lower the annual average direct economic losses caused by flood disasters to less than 0.7% of the total GDP in the 12th Five-Year Plan period.

Secondly, speed up the construction of farmland infrastructures. The supplementary facility building and water conservation works rehabilitation will be completed for 70% of the large irrigation systems and 50% of the backbone schemes of the major irrigation districts realizing a net increase of effected irrigation area of about 2.6 million hectare and a newly increase of 3.3 million hectare of high efficient water-saving irrigated areas. The construction of small waterworks on farmland in the selected counties will be speeded up by building "the five small water projects" of cellar, pond, dam, pump and canal, putting emphasis on end canal system construction in water-saving facilities rehabilitation and completion of on-farm supplementary facilities of irrigation districts so as to solve the problem of "the-last-one-km" farmland irrigation.

Thirdly, promote the building of water-saving society in an all-round way. The implementation of most strict water management system will be taken as a strategic measure for the building of water-saving society by drawing the "three red lines" for controlling water development and utilization, water use efficiency and pollutants-bearing capacity of water function zones and improving the implementation of such systems as charging for water resources utilization, water resources assessment, water abstraction permit system and specifying responsibility of water resources management and performance evaluation. Water use per 10,000 yuan of GDP will be reduced to below 140 cubic meters; water use per 10,000 yuan of industrial-added value will be lower than 80 cubic meters; water use coefficient of irrigation will be increased to 0.53.

Fourthly, enhance largely the water-supply capacity for urban and rural areas. The construction of drinking water safety projects for rural areas will be promoted to solve the problem of unsafe drinking water in rural areas. The construction of South-North Water Diversion project will be accelerated for building the strategic water resources allocation structure as "three vertical and four horizontal water systems, water transferring from south to north and balancing water needs for east and west" so as to improve the water resources regulation by strengthening connection of water systems of rivers, lakes and reservoirs. Advanced technologies for sea water desalination, use of recycled water and rainwater storage will be encouraged. The newly increased water supply capacity will reach to about 40 billion cubic meters and the annual average direct economic losses caused by drought disaster in the percentage of GDP in the same period will be lower than 1.1%.

Fifthly, strengthen work on water and soil conservation and ecosystem protection. The key national water and soil conservation projects will be constructed; the prevention of erosion in main protection

area and mountain disaster affected areas will be promoted; and the control of slope farmland cultivation and restoration of ecologically fragile river system and areas will be strengthened. The water energy development under the condition of protecting ecology and farmers' interests will be accelerated; the hydropower development in rural areas will be promoted; the newly increased installed capacity of hydropower in rural areas in the next five years will be 5 million kilowatts; the newly increased annual power generation will be 21.5 billion kilowatt-hours; and the annual reduction of carbon oxygen will be 18 million tons.

Sixthly, further reserve the water resources strategically. Plan for emergency in securing water safety in particular period should be worked out in line with the local conditions by adopting multiple measures for emergency water supply. In water-shortage river basins like the Hai river and the Liao river where more groundwater are used, total groundwater excavation will be put under strict control; deeper aquifer exploitation will be banned; water diversion through South-North Water Diversion Project will replenish abstraction of groundwater for recovering aquifer and increasing reserve strategically. In Northwest regions, the focuses are places on protection and conservation of water sources, construction of backbone water structures for enhancing water storage capacity in river basins, and relief measures for encountering with drought disaster. In water-rich areas of the southwest, the focuses are placed on water sources and supplementary facilities construction, improvement of water regulation in river basins and provision of emergency water source in extreme drought condition by fully use of groundwater storage.

Seventhly, enhance the capacity of dealing with emergency for flood control and drought relief. Non-structural measures of flood control shall be strengthened by consolidating administrative responsibility system, improving hydrological monitoring system and flood control commanding system, setting up an emergency system that covers all areas and regions including townships and villages and all population, building rescue teams combined by professionals and participation of the public for flood control and drought relief; building up material reserve for flood control and drought relief; and enhancing emergency management level.

Eighthly, carry out actively the international cooperation and exchanges. We have actively participated in international cooperation and exchanges in the field of scientific studies on coping with climate change. Since 1990s, we have C participated in the conferences and working group meetings of the IPCC. We have cooperated with the UNDP on Project of Studies on Impact of Climate Change in China and Vulnerability Assessment; and with UNICEF and UNESCO respectively on Projects of Study on Climate Change Impact on Underground Water Resources in China and Water Resources in Yellow River Basin . Various types of exchanges and cooperation have also been conducted with the scientific and research institutions of U.K., Canada, Switzerland and other countries. The International Center on Small Hydropower in Hangzhou has initiated the program of "lighting Africa" through small hydropower development with other organizations, a clean energy development mechanism with small hydropower and cooperation project in terms of

design of small hydropower stations and export of machinery and equipment, aiming at helping developing countries in Africa to develop clean energy and slow down the pace of climate change. In the future, we shall continue to promote the international exchanges and cooperation with both governments and private sector, learn advanced experiences and good practices from different countries, and make efforts to alleviate impact of climate change on China's water resources.

Ladies and gentlemen, it is the common responsibility of the human society to adapt to the extreme climate, prevent flood and drought disasters in a scientific manner and guarantee the water security. China is ready to strengthen exchanges and cooperation with international organizations and countries around the world in addressing the challenges of climate change, make greater contribution to sustainable water resources utilization, promote long-term and steady economic development and build a harmonious and stable society.

Finally, I wish this meeting a great success!
Thank you.

Strengthening Environment Protection and Well Handling Climate Change

——*Keynote Speech at the High-level Roundtable on Strategy of Extreme Climate Adaptation in China*

Wu Xiaoqing,Vice Minister, Ministry of Environment Protection of P.R.C.

Distinguished Mme Zhang Meiying, Vice Chairperson of CPPCC, Mr.Chen Lei,Minister, Ministry of water Resources and Mr. Wang Shucheng, Chair of GWP China,
Dear guests, ladies and gentlemen,

Good morning!

I am honored to take part in the High-level Roundtable on Strategy of Extreme Climate Adaptation in China, which is co-organized by GWP China, ADB and the Office of State Flood Control and Drought Relief Headquarters. Firstly, I, on behalf of the Ministry of Environment Protection of P.R.C., would like to extend my warm congratulation to the opening of the conference. Meanwhile, I would like to take this opportunity to communicate with all of you on environmental protection strengthening and climate change Adaptation of the Chinese Government.

As we all know, the global climate change has become a major threat faced by all the countries. It has greatly affected world's energy security, ecological security, food security, water security and human health as well. It has been a key consensus for the world to handle climate change and solve conventional environmental pollution through changing traditional high-carbon development mode and looking for green and low-carbon development road.

According to the researches, climate change is to some extent closely related to the environmental pollution and ecological deterioration. As far as the source is concerned, conventional air pollutants and green house gas are mainly produced by fossil fuel. As for the material nature, except for carbon dioxide which is one of the 6 green house gases according to the Kyoto Protocol, the other five gases are all under the pollutant control. Concerning the policy, the environmental protection measures in favor of pollutant emission reduction are for the same target compared with the requirements of climate change adaptation. Regarding the control measures, energy efficiency promotion and structural adjustment are the main measures for the coordinated control of climate change and environmental protection.

The Ministry of Environment Protection, as a member of the National Leading Committee on

Climate Change, has been always attaching great importance to the climate change adaptation, making great efforts on strengthening environmental protection and promoting low-carbon development.

Firstly, promoting the coordinated control over pollutants and carbon dioxide through pollutant emission reduction.

In recent years, environmental protection departments at each level have been strengthening environmental monitoring and adopting three measures including the management emission reduction, structural emission reduction and engineering emission reduction. Breakthroughs have been realized on pollutant emission reduction. For instance, chemical oxygen demand and sulfur dioxide emission have been reduced by 12.45% and 14.29% respectively until the end of 2010 compared with that of 2005, which means that the emission target of sulfur dioxide and chemical oxygen demand target are realized one year earlier and half a year earlier respectively as indicated in the 11th Five- Year(2006-2010) Plan . As a result, the total emission amount of conventional pollutants is reduced, and the green house gas emission amount from social and economic activities is also reduced. According to the case study on Panzhihua area, Sichuan Province, 1 ton sulfur dioxide emission equals to about 38 tons oxygen dioxide emission during the 11th Five- Year Plan period. In addition, the Ministry of Environment Protection is also leading the work on fulfilling the target set in Montreal Protocol. China has realized the target to get rid of CFC in advance at the end of 2009, which means that about 400 million tons of carbon dioxide emission has been reduced, making active contributions against the climate warming.

Secondly, promoting industrial structure adjustment through strengthening environmental effect evaluation.

In recent years, the environmental departments at each level have been strengthening their environmental effect evaluation work, and strictly implementing the policies, standards and measures on cycling economy and cleaner production. Since 2006, the Ministry of Environment has rejected 813 environmental evaluation documents or applications which are simple and repeated energy-costing, over-capacity and disqualified, which involves about 2900 billion RMB. During the 11th Five Year Plan, taking full advantages of the reversed transmission of the pressure for easing monetary condition for pollution emission reduction, China shut down many small thermal power plants with the capacity of over 70 million KW, which completed the task of 50 million KW one year and a half earlier, got rid of backward capacity of 0.11 billion tons of iron-smelting, 68.60 million tons of steel-smelting, 0.33 billion tons of cement, 93 million tons of coke, 7.2 million tons of paper- making, 1.8 million tons of alcohol, 0.3 million tons of monosodium glutamate, and 38 million weight cases of glass. As a result, environmental pollution and ecological damage are prevented from the origins, and low-carbon transformation of economic structure and industrial plan is thus finished.

Thirdly, reducing green house gas emission through CDM.

The Center of Environmental Certification (CEC) of the Ministry of Environment Protection is the

first operation entity with the official authority from the UN Executive Board (EB) for CDM. Under the support of the related departments, the environmental departments have been developing CDM programs and implementing CDM consulting services in many areas including chemical industry, wind power, landfill gas recycling, waste industrial energy and biomass. Until the end of 2010, over 96 million tons of carbon dioxide has been reduced with the certification of the EB, which is 36% of the total reduction amount in China and 19% of that in the world. China has made substantial contributions to the adaptation of global climate change.

Fourthly, leading green-type consumption through low-carbon product certification.
The basic task of building an environmental-friendly society is to establish a sustainable production and consumption mode, and form an energy-conservative and environment-protective industrial structure, growth mode and consumption mode. China environmental labeling is the key tool to promote sustainable consumption. In recent years, the Ministry of Environment Protection has issued 71 environmental labeling standards, with over 30,000 types of products of over 1,600 enterprises being issued with the labeling, and over 100 billion RMB annual output value of environmental labeling product groups formed. The labeling has been a key reference for selection of green products in China. From 2009, on the basis of China's Environmental Labeling, the Ministry of Environment started the related works on low-carbon product authentication. The CEC has signed cooperation memos with GTZ and BSI. Low-carbon product certification, on one hand, is to help producers and sellers to better spread the information on climate protection of low-carbon product and provide some judgment reference for consumers; and, on the other hand, is to lead and encourage the enterprises to develop low-carbon products and technologies to promote the formation of low-carbon production mode and consumption mode. Until Nov., 2010, four Chinese environmental labeling low-carbon product standards, including household refrigerating appliances, household laundry appliances, digital multi-function copier device and digital stencil duplicator, with over 100 different types of products of 11 enterprises qualifying the authentication.

Fifthly, strengthening capability building for climate change adaptation through scientific researches. The environmental protection departments have undertaken profound researches on some key areas including green- house gas statistics and monitoring, low-carbon technology and low-carbon development mode, with great achievements realized. For instance, research on carbon dioxide emission assessment for industries in 2007 was undertaken during the first national pollution source survey, initially understanding the emission amount, strength and distribution of carbon dioxide in the industries like electricity, steel and iron, etc. As far as industrial distribution is concerned, thermal power industry contributes the highest carbon dioxide; as for emission strength, the developed areas in eastern regions provide the lowest strength; as for carbon dioxide source, the products of key industries like power and steel relatively recreate more. In addition, the researches on environmental tax, green trading and pollution rights trading were also started, with some achievements having been used in the formulation of Chinese environmental economic policies. Meanwhile, the environmental protection departments, taking advantage of their experiences

on pollutant monitoring, statistics and supervision, have made progresses in green- house gas monitoring. During the 11th Five- Year Plan period, green- house gas monitoring stations were established in 31 provincial capitals or municipalities, aiming at automatically supervising carbon dioxide and methane on line. For instance, 4 regional green- house gas monitoring stations were also set up in Wuyi Mountain of Fujian Province, Changdao of Shandong Province, etc. All of the stations above have been operated this year.

Ladies and gentlemen!

There is still a long way to go to deal with climate change. The Chinese government proposed in 2009 to reduce carbon dioxide emission amount per unit of GDP by 40%-50% until 2020 compared with that of 2005. According to the Outline of the 12th Five- Year Plan for National Economic and Social Development which was approved recently, non-fossil fuel should take 11.4% of primary energy consumption in 2015, with energy consumption per unit of GDP reduction by 16%, carbon dioxide reduction by 17%, sulfur dioxide and COD by 8%, NH3-N and NOX by 10%, forest area increase by 21.66%, stalking volume by 0.6 billion m3. All of the restrictive indexes are closely related with green- house gas emission control and climate change adaptation. In the future, the environmental protection departments at each level, under the guidance of the Scientific Development Concept as well as the overall plan for climate change adaptation of the country, are going to further strengthen environmental protection, develop green and low-carbon dioxide development road, and focus on the following aspects.

Firstly, keeping on reducing pollutants discharge.

We are going to cooperate with the departments concerned to strictly follow the policies on industries and the national plan of closing the backward facilities, accelerate the implementation of the key environmental protection projects, promote the establishment of urban waste water treatment plants and cleaner power plants, and strengthen the responsibility system on emission reduction work. Taking thermal power industry as the key, we are dedicated to greatly reducing air pollutant emission from the industries of steel and iron, nonferrous metal, cement and paper-making, further coordinate the control over energy-saving and emission reduction, and green- house gas, carry out the research on the shift from the single regional pollutant control to the combined control strategy, and enhance the capability on coordinating green- house emission and the main pollutants.

Secondly, enhancing key biological functional areas to get adapted to climate change.

We are going to greatly promote bio-diversification and national strategy and plan against the climate change, systematically evaluate the impact of climate change on Chinese key ecological systems, species and bio-diversification protection areas on the basis of main functional region and ecological functional region, and identify the ecological system and species particularly sensitive to the climate change. We are dedicated to strengthening researches on the impact of the extreme climates and human activity on species and ecological systems, accelerating the establishment of evaluation index system, researching the monitoring technologies for the effects of climate change on

bio-diversification, establishing the responding and monitoring system, enhancing the establishment of alarming system, developing the ecological compensation mechanism of bio-diversification protection area, and effectively promoting the capability of key ecological system adapting to the climate change.

Thirdly, forcefully carrying out work on low-carbon product certification. According to the national plan on climate change adaptation and to corresponding to the requirements of the demonstration programs on energy- saving, emission reduction and the low-carbon products economy, we are going to classify the current environmental labeling standards, singling out suitable products for low-carbon product certification and working out the corresponding low-carbon product certification standards and marketable low-carbon product certification. Meanwhile, we shall develop carbon footprint calculation tools suitable to the China's conditions, actively participate in the formulation of international low-carbon product standards and regulations, enhance the international competitiveness of the country's environmental labeling products, lead and encourage the enterprises to adopt the low-carbon product label based on the country's environmental labeling, promote the labeling to be a part of the governmental green- purchasing plan, and gradually extend it.

Fourthly, starting the work on the formulation and revision of the related standards of green- house gas.

At present, some indexes on green- house gas emission have been set in some of the country' s pollutant emission standards on coal gas and vehicles, etc., and some CP standards also include energy cost control ones. In the future, the environmental protection departments, while working out air pollutant emission standards for some key industries, are going to add corresponding green-house control index, will give full play to the key role of environmental protection standards on green- house emission control and low-carbon development promotion so as to provide technical support and insurance for the country's green- house gas emission management.

Fifthly, strengthening education and encouraging the public participation. Taking full advantage of the current environmental publicity and education network, we will carry out the publicity and education activities of the related knowledge on climate change, formulate education plans, improve information release system, and give full play to the leading role of the government. We shall raise the low-carbon awareness of the public through holding various training and publicity activities, encouraging public participation, and form a favorable atmosphere for climate change adaptation and low-carbon industry development.

Sixthly, strengthening international exchanges and cooperation.

We shall actively take part in international cooperation, learn from foreign countries which have advanced experience and design thoughts on systems , strengthen the exchanges on environmental standards, low-carbon product certification and green trading, and promote he capability on fulfilling international environmental provisions and preventing the environmental risks. Through joint

researches and new low-carbon technology promotion, we shall promote the technical transfers in favor of climate change adaptation, energy-saving and emission reduction and low-carbon development, and accelerate the application and industrialization of technical results.

Ladies and gentlemen!

It is not only the need of accelerating the economic development mode transfer and sustainable development, but also the need of growing into a great responsible country and make contributions to the international climate change adaptation efforts to strengthen the environmental protection and well handle the climate change issues. GWP China, ADB and the Office of the State Flood Control and Drought Relief Headquarters have made a lot of effective efforts on promoting the climate change adaptation, with the regional coordination and cooperation system having been an important concept on handling extreme climates and ensuring ecological security. Let's work hand in hand to strengthen cooperation and carry out the international environmental exchanges and cooperation more widely, exploring the way favorable for climate change adaptation in order to make even greater contributions to the establishment of a harmonious world and the progress of human civilization.

Finally I wish the conference a great success!
Thank you!

Well Dealing with Extreme Climates in China to Contribute to World Climate Protection

—— *Keynote Speech at the high-level Roundtable on Strategy of Extreme Climate Adaptation in China*

Xu Xiaofeng, Vice Administrator, China Meteorological Administration

Distinguished Vice Chairperson Zhang Meiying,
Dear guests, Ladies and Gentlemen:
Good morning!

First, I, on behalf of China Meteorological Administration, one of the supporters to this conference, would like to extend my warm congratulations to the opening of the conference, and my heartfelt thanks to the organizers who made great efforts for the conference.

With the rapid development of economy and society, climate change has emerged as one of the most serious challenges for human beings, and it has been a common mission for the world to deal with it scientifically. China, as a country with complicated climate conditions, fragile ecological environment and frequent natural disasters, is easily affected by climate change. Affected by global warming, China has been suffering from frequent and sudden extreme climates events. However, it requests for the joint decision-making by the relevant departments and the public participation to deal with climate change and prevent it from influencing people's life and sustainable economic development. Today, the conference with the theme of the extreme climate adaptation strategy will help promote the public awareness and understanding on climate change and extreme climates, and facilitate the departments and industries concerned to carry out more effective work on extreme climate adaptation.

Based on the current science and the understanding to the nature, it is still hard to say that all extreme climate events result from the global warming, but it is confirmed that extreme climate events are getting more and more frequent just like the global warming. In some areas, the disasters that did not occur in the history occurred and happened once in several decades or about a hundred years were seen several times a year from which we could see these relate to the global warming.

With more and more studies carried out on climate, climate change and the relationship between human activities and the climate change, the understanding on these by the mankind deepens. People may still have doubts on the impact of their activities on global warming, but the effect of global warming on human's survival, production and living is obvious. To deal with the global climate

change, on one hand, we have to take actions immediately following the laws of science to relieve the effect of human activity on climate; on the other hand, we have to adopt the scientific measures to minimize the impact of extreme climates on economic and social development and human's living, and try our best to get adapted to the changed climate which is still changing. Therefore, the Chinese government has put climate change adaption capability building to an important strategic position in the 12th Five- Year Plan period.

I would like to share my opinions with all of you from two aspects.
Firstly, extreme climate is a serious challenge for the sustainable development in China.

Under the background of global climate change featured by global warming, the extreme climate events have been occurring more and more frequently in China.
Global climate changes in the past 100 years had damaged some important systems including thermohaline current of the north Atlantic, sea ice melting in the Arctic, glacier and ice cap of Greenland shrinking, ice shelf collapsing, Amazon rain forest damaged, long period drought in west Africa, Asian monsoon weakening, and sea and atmospheric circulation mode changed, etc. What' s worse is that the damages to the systems above will lead to more frequent extreme climate events which will bring out even extreme meteorological disasters, and thus greater threats to the economic and social development as well as the people's living. In the past 20 years, the extreme climate events were featured with: (1) increasing high temperatures in summer. The days over 35□ were increasing and much higher than the annual average temperature. (2) increasing regional droughts. Droughts had been the most frequent natural disasters in the past 50 years, and were still increasing. In northern China, droughts were seen in 8 years, bringing out highest losses since 1986. In 2006, serious high temperatures and droughts which should be seen once in a hundred years occurred in Sichuan Province and Chongqing, and heaviest droughts in the history happened in 2009 and 2010 respectively in southeast China, which all caused great damages to the production and the local people's living. (3) growing heavy rainfalls. In the past 20 years, floods were seen most frequently in the Yangtze River and the Yellow River basins after the 1950's, causing annual average direct economic losses of over 125 billion RMB. In the recent 5 years, the extreme climate events that were never seen in the history occurring frequently. In 2007, the typhoon Saomai which happened once in 50 years landed in Zhejiang Province, and a large regional flood which was never seen after 1954 hit the Huai River basin. In 2008, southern China was greatly affected by low temperature and snow which were also seldom seen in the history. In 2009, southern Taiwan was attacked by the most serious flood which was never seen in recent 50 years. In 2010, southern China and south of the Yangtze River were hit by 14 heavy rainfalls successively, and a series of heavy mud-rock flows greatly damaged the living of the people in Zhouqu of Gansu Province and in Guanling of Guizhou Province, and the breaching of Changkai dyke in Jiangxi Province. I have to remind you that the mud-rock flow in Zhouqu of Gansu Province is the largest one in that area since the founding of the People's Republic of China in 1949. A few days ago, Guangdong Province was greatly affected by the sudden rainstorm, gale and hail in Apr. 17th, killing 17 people.

Extreme climates have brought out serious damages to the economic and social development. China's frequent extreme climate events, while causing great losses to the people, greatly affected agriculture, water resource and natural ecological system. Drought, flood, high temperature and frost affected the output of agricultural products as well as cropping patterns and the planning. What's worse is that the meteorological disasters also led to serious insect disasters, which further increased production cost and investment. Extreme climate events also caused the uneven occurrence of droughts and floods. Since 1950, the runoff of the 6 largest rivers in China was reduced owing to droughts which resulted with dry-ups of some rivers in north China and the ground water reduced as well. Meanwhile, flood disasters occurred in some regions, especially in the basins of the Yangtze River, Yellow River, Pearl River, Songhua River, Huai River and Taihu Lake, where several large floods happened since 1990, causing serious losses and unbalance of water resource supply and demand. Climate change and extreme climate events also caused different effect on ecological systems. In the past 50 years, the glacier area in most regions of China shrank by over 10%, especially since the 1990's when the glacier shrinking grew rapidly. As a result, the runoff of inland rivers increased sharply. The ice lakes might also break. The area of frozen earth in Tibet withdrew by 4-5m, the distribution of certain forest types also moved northward, and inland lakes and marshes accelerated its shrinking too. At present, the economic development is more and more restricted by environment, and ecological civilization building is calling for new demands. There is still a long way to go to deal with various natural disasters including extreme climate events. China is still restricted by many elements including serious economic structural contradictions, lower efficiency of energy and resource using and high pressure on green house gas emission control.

Secondly, actively adapting to extreme climates and strengthening the capability of sustainable development.

From the aspect of background and mechanism of the occurrence, the extreme climate events are closely related to the global climate change. Therefore, the scientifically understanding of the global climate change is important to the adaptation of extreme climate events. There are different opinions on climate change and its causes, but we cannot neglect the importance and emergency of solving extreme climate events; we cannot deny the difficulty to deal with climate change; and we cannot weaken our determination and action against climate change. Adaptation to extreme climates is also close linked to the national disaster prevention capacity. Therefore, we have to establish and improve our national disaster prevention system and strengthen our overall capacity on disaster prevention.

The same attention should be paid to the slowing down of an adaptation to climate change. Slowing down is long-term and difficult while adaptation is more realistic and urgent. Adapting to extreme climates shall be put at the core of the national efforts on climate change adaptation, and the extreme climate events prevention shall also be put at the core of the national disaster prevention programme. We shall enhance climate change adaptation and disaster prevention and reduction capacity through saving energy, optimizing energy structure, strengthening ecological protection and construction with economic development at the core, and transform economic growth mode supported by scientific progress. Meanwhile, we should recognize that the appropriate counter- measures against

climate change are beneficial to the fulfillment of the Scientific Concept of Development as well as the sustainable development of economy and society. So, I would like to share you with my following suggestions:

Firstly, strengthening scientific innovation on adaptation to climate change and extreme climates. Since global climate change and its impact are of uncertainty and attract global concern , , we have to pay more attention to the scientific innovation, strengthen the observation, analysis, prediction, evaluation and research on climate change and extreme climate events in China. Meanwhile, we have to carry out research on the possible impact and its adaptation measures of global climate change on agricultural production, food security , ecological security, disease prevention, public health and security, water resources protection and water security. Disaster prevention standards should also be set up for the industries easily affected by climate change, feasibility rectification system should be established for key projects or programs, laws and regulations should be formulated for the natural disasters prevention, and people's living places and key strategic facilities should be set up far away from the areas witnessing frequent natural disasters or fragile to climate change.

Secondly, strengthening cooperation on adaptation to climate change and extreme climates. The relevant departments from different regions of all countries should work together to deal with climate change. Trans-regional disaster prevention and adaptation system shall be established. Multiple cooperation mechanism shall also be set up to greatly improve the prevention system establishment against extreme events and disaster-affected regions. New ways and means against climate change between countries and regions should be explored. The cooperation should be started on extreme meteorological disaster monitoring, warning and evaluation, disaster risk management and coordination, regional disaster monitoring network and information- sharing, aiming at promoting comprehensive anti-disaster capability. We should also strengthen information- and resources-sharing among different sectors to promote the efforts on anti-extreme climate disasters, aiming at making contributions to the protection of global environment and human sustainable development.

Thirdly, improving monitoring, warning and evaluation capability on extreme climates. We should strengthen meteorological disaster monitoring and warning capacity building for the flood and drought prevention areas in the middle-size and small river basins as well as frequently-occurred geological disaster areas, especially for typhoon, flood, drought, slide, mud-rock flow and high temperature. We should also improve evaluation work on overall impact of climate change over the large river basins, scientifically develop and use cloud water resources and strengthen the protection and utilization of groundwater resources. More attention should be paid to the evaluation of climate and disaster risk in the economic development and urban and rural construction. The scientific planning and designing of fundamental facilities and large projects should be strengthened, aiming at consolidating engineering basis against climate change and its risks.

Fourthly, improving capacity for extreme climate adaptation. We should establish and improve the systems and mechanisms against extreme climate disasters, improve plans for emergency, starting

mechanism and disaster warning mechanisms against extreme meteorological disasters, perfect the disaster prevention mechanisms among departments and regions and strengthen the organization and implementation capacity for adapting to extreme climates.

Fifthly, increasing social awareness on extreme climate adaptation. Addressing the extreme climate disasters needs the common actions of the whole society. We have to give full play to the resources of the society to well organize the education on climate change adaptation and disaster prevention, aiming at better understanding the causes and laws of extreme climate disasters as well as disaster prevention measures. The meteorological service information network of key areas shall be established and improved; the warning mechanism shall be set up for rural areas, special groups and key sites, aiming at minimizing the effects of natural disaster and climate change.

Ladies and gentlemen,

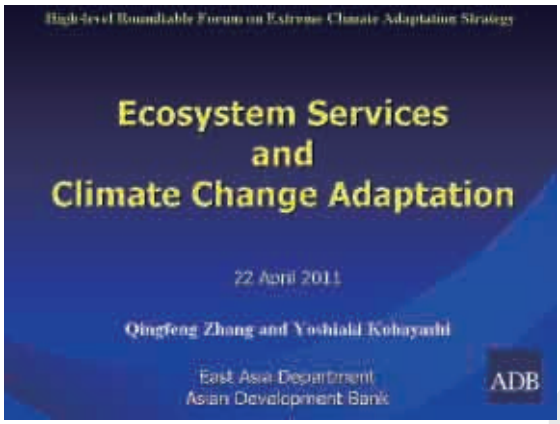
China Meteorological Administration, as a fundamental scientific department against climate change in China, is provided with sound basis on monitoring, inspecting, predicting and alarming of meteorological disaster and climate change, and scientific research, business and services and the evaluation on impact of climate change. Therefore, a meteorological comprehensive detection system is initially formed combined with land-based, sky-based and space-based facilities. China meteorological Administration has started the feasibility study demonstration work including survey and evaluation division of climate resources, meteorological disaster risk evaluation, and evaluation on climate change on 8 regions and 11 key river basins. China Meteorological Administration has been promoting the establishment of emergency management organizational system, attaching great importance to the education of meteorological disaster prevention as well as the role played by science in disaster prevention, and promoting the comprehensive capability building against climate change. In addition, together with the Ministry of Science and Technology and the Chinese Academy of Sciences, the National Assessment Report on Climate Change (□) has been worked in which evaluation is made on extreme climate events. China Meteorological Administration is now cooperating with IPCC to work out the National Assessment Report on Climate Change (V), and just submitted the proposal ed the of China on the Special Report on Managing Extreme events and Disaster Risk and Promoting Climate Change Adaption. We, as requested by the Central Government and the State Council, will be dedicated to cooperating with each department to play a better role in disaster prevention and climate change adaptation work, providing more scientific support and climatic services for the society and industries, and making new contributions to the establishment of an energy-conservation and environment-friendly society and the promotion of ecological civilization.

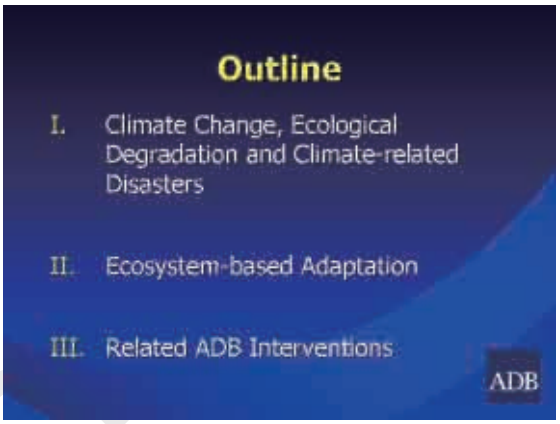
I hereby wish the conference a great success!

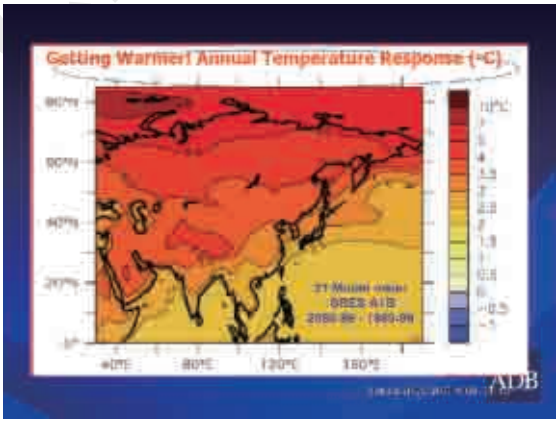
Thank you!

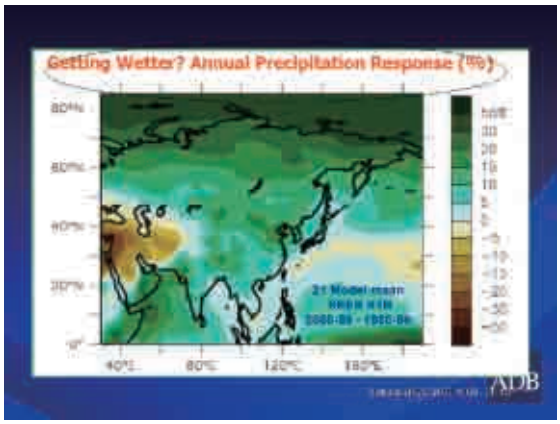
Ecosystem Services and Climate Change Adaptation

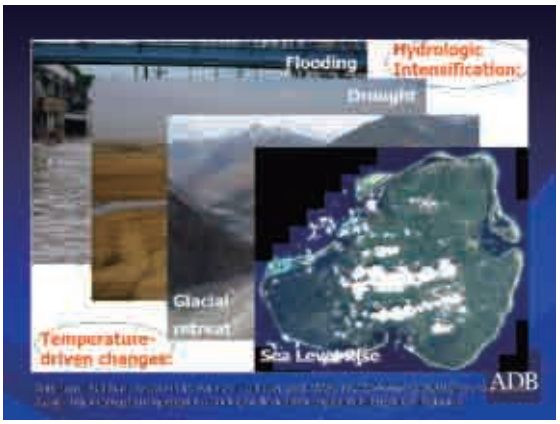
Qingfeng Zhang and Yoshiaki Kobayashi,
East Asia Department
Asian Development Bank

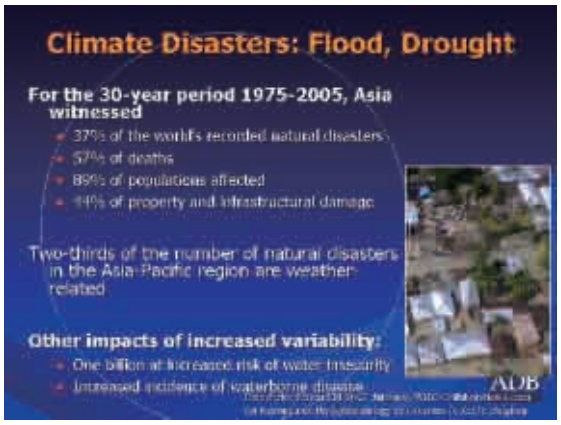


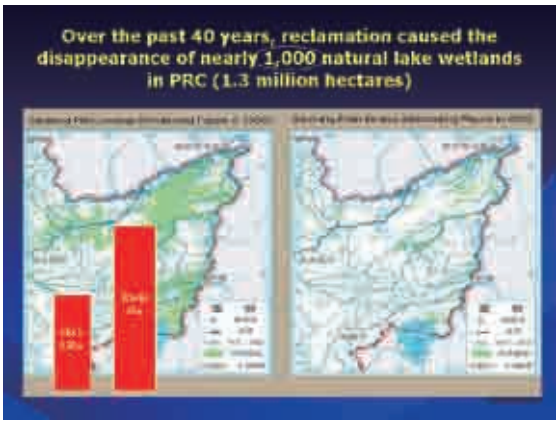


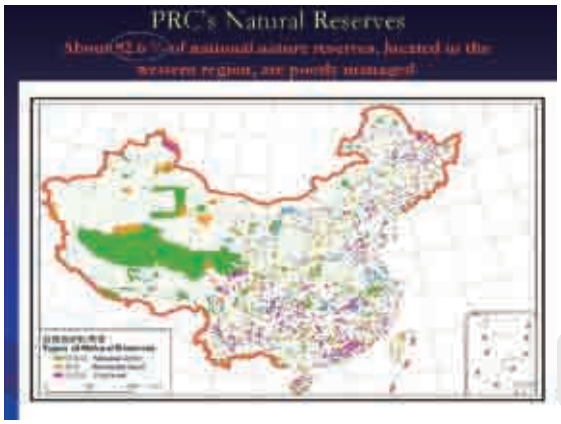


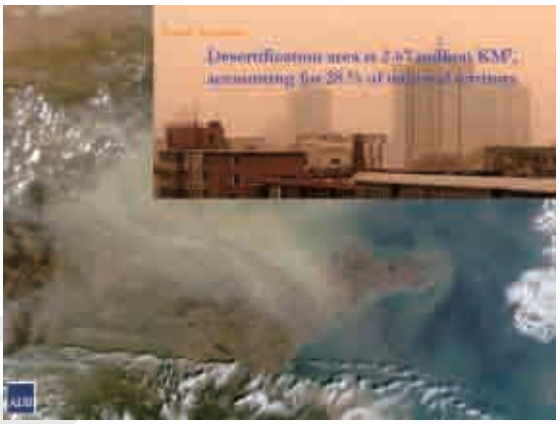





Climate Disasters: Flood, Drought
For the 30-year period 1975-2005, Asia witnessed
37% of the world's recorded natural disasters
57% of deaths
89% of populations affected
44% of property and infrastructural damage
Two-thirds of the number of natural disasters in the Asia-Pacific region are weather related
Other impacts of increased variability:
One billion at increased risk of water insecurity
Increased incidence of waterborne disease
ADB


Over the past 40 years, reclamation caused the disappearance of nearly 1,000 natural lake wetlands in PRC (1.3 million hectares)


PRC's Natural Reserves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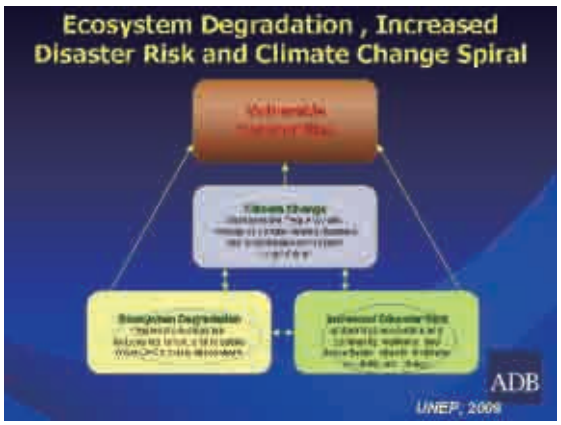
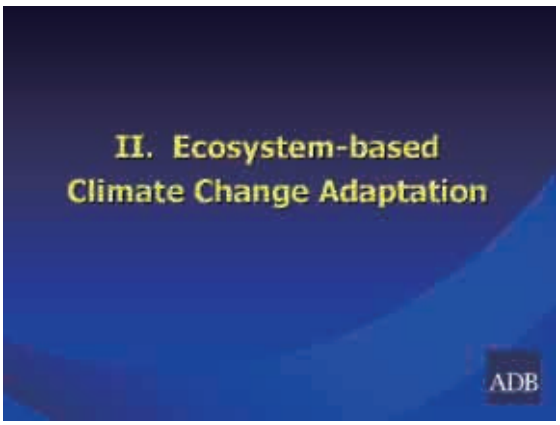
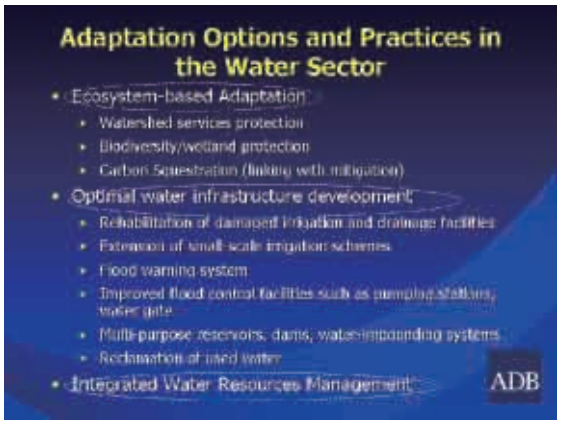
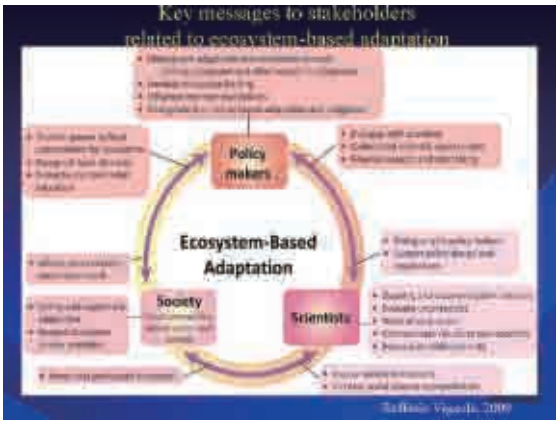
eutrophication

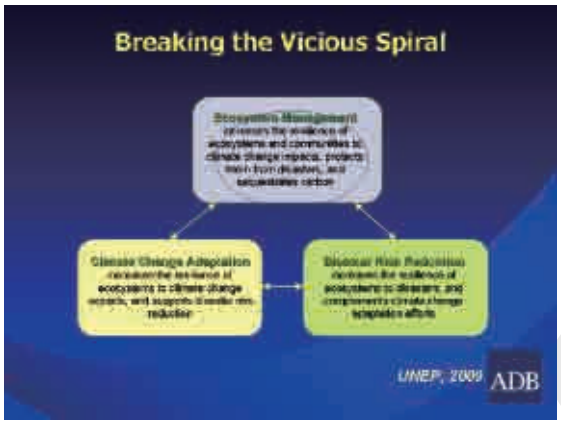

North and northeast: Increased water scarcity
Northwest: Desertification (higher evaporation)
Coastal regions: Typhoons, storm surge and long term inundation
MONGOLIA
BEIJING
Tibetan Plateau: Change in river flows / melting glaciers
Southern China: Increase in flood frequency and magnitude
ADB
Liu Erda, 2008

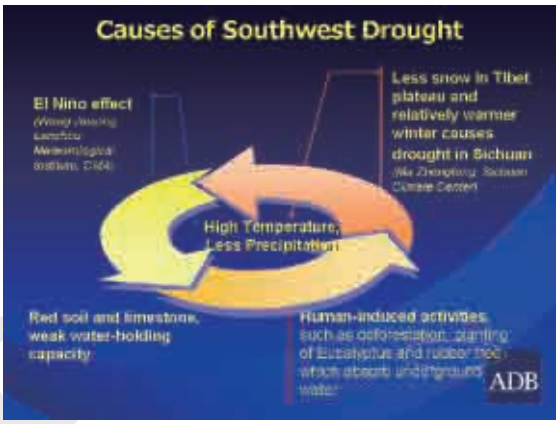

Ecosystem Degradation , Increased Disaster Risk and Climate Change Spiral
ADB
UNEP, 2009

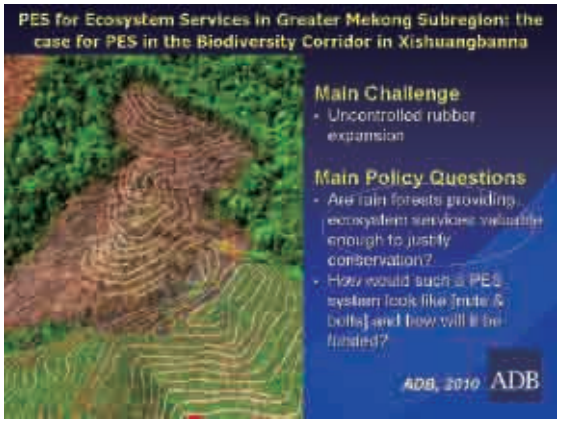

II. Ecosystem-based Climate Change Adaptation
ADB


Adaptation Options and Practices in the Water Sector
• Ecosystem-based Adaptation
  ▸ Watershed services protection
  ▸ Biodiversity/wetland protection
  ▸ Carbon Sequestration (linking with mitigation)
• Optimal water infrastructure development
  ▸ Rehabilitation of damaged irrigation and drainage facilities
  ▸ Extension of small-scale irrigation schemes
  ▸ Flood warning system
  ▸ Improved flood control facilities such as pumping stations, water gate
  ▸ Multi-purpose reservoirs, dams, water-impounding systems
  ▸ Reclamation of used water
• Integrated Water Resources Management
ADB

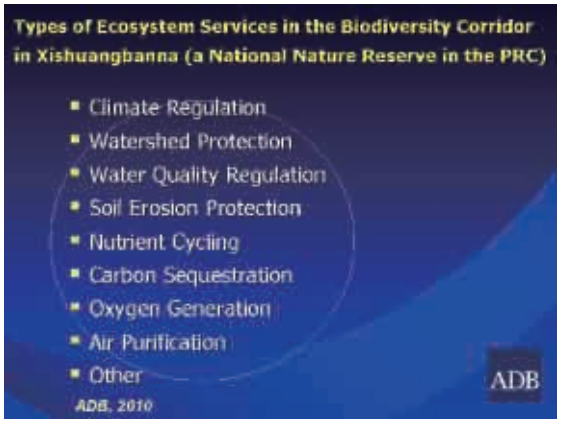

Key messages to stakeholders related to ecosystem-based adaptation
Policy makers
Ecosystem-Based Adaptation
Society
Scientists

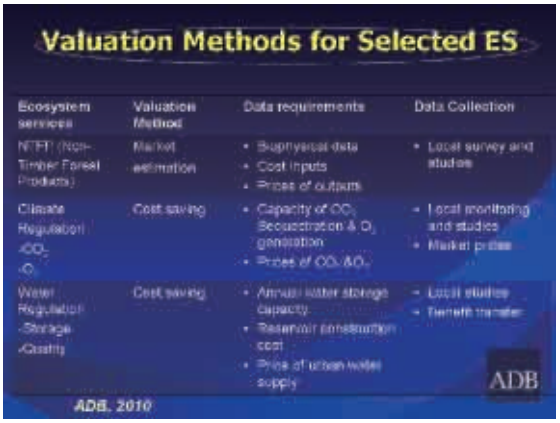

Breaking the Vicious Spiral
UNEP, 2009
ADB


Causes of Southwest Drought
El Nino effect
Less snow in Tibet plateau and relatively warmer winter causes drought in Sichuan
High Temperature, Less Precipitation
Red soil and limestone, weak water-holding capacity
Human-induced activities, such as deforestation, planting of Eucalyptus and rubber tree which absorb underground water
ADB


PES for Ecosystem Services in Greater Mekong Subregion: the case for PES in the Biodiversity Corridor in Xishuangbanna
Main Challenge
• Uncontrolled rubber expansion
Main Policy Questions
• Are rain forests providing ecosystem services valuable enough to justify conservation?
• How would such a PES system look like [nuts & bolts] and how will it be funded?
ADB, 2010
ADB


PES for Ecosystem Services in Greater Mekong Subregion: the case for PES in the Biodiversity Corridor in Xishuangbanna
Q1: What is the value of ecosystem services in Xishuangbanna BCI Pilot Site?
Q2: Which development pattern is sustainable? "Business as usual" or "conservation with development"?
Q3: How to secure and capture the value of ecosystem services? (Policy implications)
ADB, 2010


Types of Ecosystem Services in the Biodiversity Corridor in Xishuangbanna (a National Nature Reserve in the PRC)
• Climate Regulation
• Watershed Protection
• Water Quality Regulation
• Soil Erosion Protection
• Nutrient Cycling
• Carbon Sequestration
• Oxygen Generation
• Air Purification
• Other
ADB, 2010
ADB


Valuation Methods for Selected ES
Ecosystem services
Valuation Method
Data requirements
Data Collection
NTFP (Non-Timber Forest Products)
Market estimation
• Biophysical data
• Cost inputs
• Prices of outputs
• Local survey and studies
Climate Regulation
-CO2
-O2
Cost saving
• Capacity of CO2 Sequestration & O2 generation
• Prices of CO2 &O2
• Local monitoring and studies
• Market prices
Water Regulation
-Storage
-Quality
Cost saving
• Annual water storage capacity
• Reservoir construction cost
• Price of urban water supply
• Local studies
• Benefit transfer
ADB, 2010
ADB

Valuation Methods for Selected ES (Cont.)

Ecosystem services	Valuation Method	Data requirements	Data Collection
Soil erosion prevention	Damage Cost	• Erosivity • Cost of sediment removal	• Local studies • Benefit transfer
Nutrient Cycling	Cost saving	• Erosivity • N,P,K contents in ecosystem soil • Price of fertilizers • Ratio of pure N,P,K to N,P,K contained fertilizer	• Local studies • Benefit transfer
Air purification	Damage Cost	• Capacity of pollutants absorption • Treatment cost	• Local studies • Benefit transfer

ADB, 2010

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Summary of VES

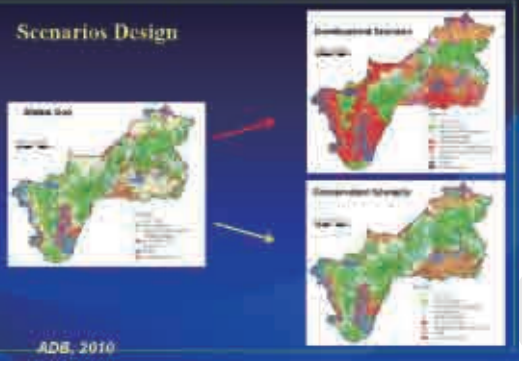
Ecosystem Services	Mengjin-Shengyang (135,932 ha)	Nananhe-Mangan (28,981 ha)	Total value ($million)	Unit Value (US$/ha/yr)
1. NPP	0.0	0.0	1.0	-
2. Carbon Sequestration	301	59	360	2,185
3. Oxygen Generation	100	25	125	835
4. Watershed Protection (Storage/Quality)	74	15	89	580
5. Water Quality Regulation	100	20	120	1,133
6. Soil Erosion Protection	30	9	39	294
7. Nutrient Cycling	140	36	176	1,104
8. Air Purification	100	24	124	912
Total	962	208	1,162	7,047

ADB, 2010

ADB

Scenario Analysis

Scenarios Design



ADB, 2010

PES Case Study: Findings and Policy Implications

1. What is the value of ecosystem services?

Over $1 billion annually, $7,047 per ha per year

2. Which development option?

Conservation scenario preserves the value with improvement, while development scenario incurs huge loss.

3. Policy implications

The value should be well considered into decision-making in land use, forest management, and BCI Corridor development.

(i) Incentives for forest conservation, restoration, and watershed protection

(ii) Disincentives for uncontrolled expansion of rubber and forest conversion on marginal soil and steep slopes.

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PES Policy Implications

1. It is imperative to have a sound PES policy as an overarching national framework but with practical applicability in the provinces/locally
2. The PES policy framework must be flexible to allow for various types/models of PES and across sectors
3. PES schemes must be closely related to market mechanisms (demand and supply for ecosystem services) in order to be sustainable
4. PES schemes must be based on "fair" compensation and market price; dictated pricing is rarely an incentive
5. In order to work as an incentive, payments should be in cash and directly channeled to grass root levels into revolving funds managed and controlled by beneficiaries
6. Verification and performance based rewards/sanctions must be in place.

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III. Related ADB Interventions

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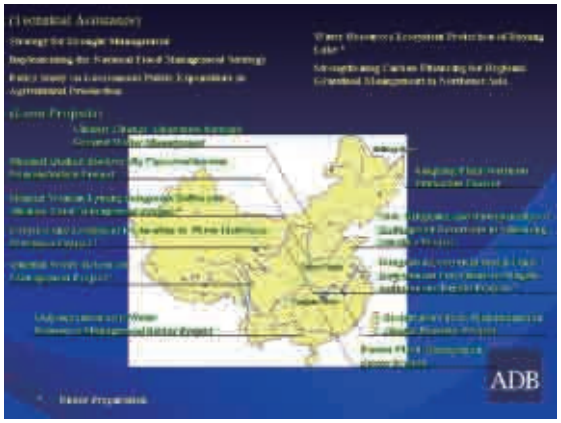

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A few other related ADB interventions in the PRC...

- **More Financing Mechanism:** Water Financing Partnership Framework; Climate Change Financing Partnership Framework; COM
- **More Investment Projects:**
  - River Basin Management (e.g., Sanjiang, Chao Lake, Hai River, etc.)
  - Wetland Management (e.g., Baiyangdian, Yanching, Jiazhou, etc.)
  - Urban Water Supply and Treatment (e.g., Nanjing, Wuhan, etc.)
  - Water saving Irrigation (e.g., Qinghai, Guizhou, CAD, etc.)
  - Flood Prevention and Reservoir Rehabilitation (e.g., Hunan, Shanxi, etc.)
- **More Policy Studies and Policy Dialogues:**
  - Economics of Climate Change in Northeast Asia
  - National Strategy for Drought Management
  - National Strategy for Flood Management
  - Payment for Ecological Services
  - National Disaster Management
  - Agriculture Public Expenditure Review

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Wetland Rehabilitation: Sanjiang Plain

- **Issues:**
  - The largest area of wetlands in the PRC: 108,300 km²
  - Considerable loss of wetlands due to major focus for agricultural development
  - Increasing pollution from upstream coal and gold mines and non-point pollution
  - Water flow more and more controlled by engineering works including reservoirs, drainage, and diversions
  - Competing water use between economic development and ecological conservation
- **Sanjiang Wetland Protection Program**
  - 5 year program of $56.38 million started in 2007
  - Protect the natural resources of wetlands and watersheds (biodiversity, water, and forests) from continued threats
  - Promote sustainable use of natural resources through integrated conservation planning
  - Improve the well-being of local communities

ADB

PES Mechanism to Protect Biodiversity in Sanjiang Project

- **Sellers:** farmers and communities in Sanjiang plain
- **Buyers:** Global Environmental Facility (GEF) and local government
- **Services:** conversion from farmland to wetland, and related conservation activities
- **Performance measures:** Project Performance Monitoring System
- **PES mechanism:** Project agreement among GEF, ADB, and local government

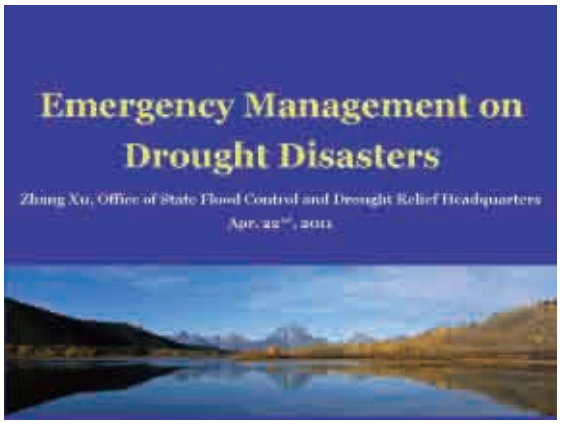
ADB

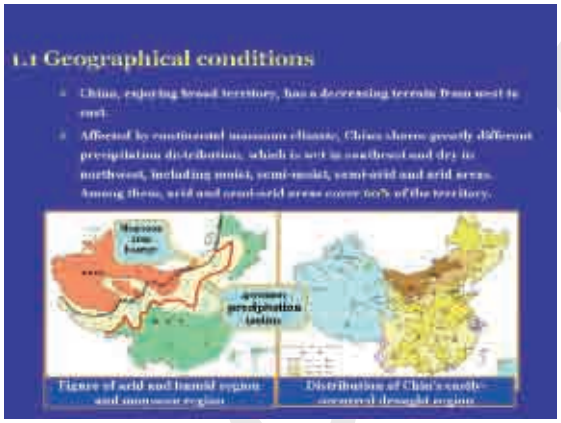
Thank you!

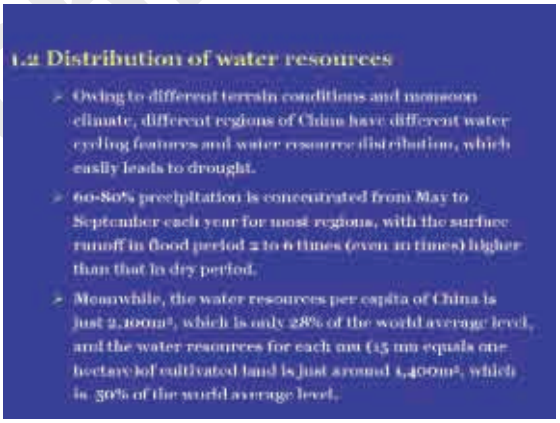
ADB

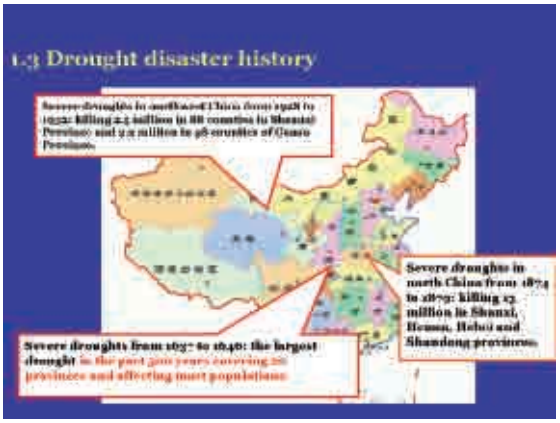
Emergency Management on Drought Disasters

Zhang Xu, Office of State Flood Control and Drought Relief Headquarters







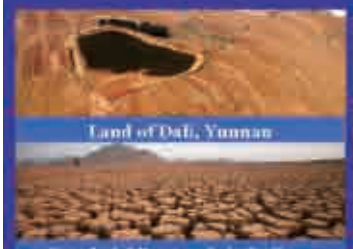


1.3 Drought disaster history

- Since the establishment of the People's Republic of China(P.R.C.)in 1949, a water supply insurance system has been established initially through large-scale water resources projects construction, which greatly enhanced the anti-drought capacity of the country. However, the construction was still greatly lagged behind, and drought disasters happened frequently and repeatedly.
- The national severe drought in 2000 affected 0.808 billion mu of land, leading to nearly 60 billion kg food losses, 37.7 million people and 630 cities and towns in 18 provinces in shortage of water.
- In 2009, a severe drought in north China affected 153 million mu of land, which was 35% of the total land affected by drought in China.
- In 2010, a big drought happened in 5 provinces of southwest China, affecting 121 million mu of land and 10.88 million people.

1.3 Drought disaster history

- The great drought of 5 provinces of southwest China in 2010



Land of Dali, Yunnan

Degchaizi Reservoir in Luliang County, Yunnan

Sugar canes in Yuxi, Yunnan

Headlines

I . About Chinese draught disaster

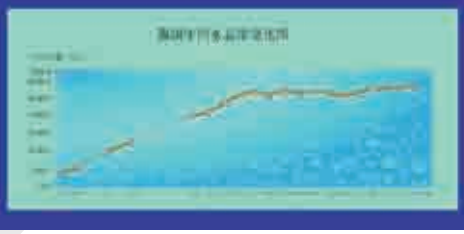
II . Achievements on emergency management on draught disaster

III. Draught disaster development trend and challenges

IV. Counter-measures against draught emergency management

2.1 Water resources distribution capacity increased greatly

- Since the establishment of the P.R.C., China has built 870,000 reservoirs and 4.6 million projects for water storage and supply, which are able to supply over 730 million m3 of water and the basic urban and rural water demand in medium drought years.



2.2 Agricultural irrigation capacity greatly enhanced

- 0.414 irrigation areas over 10,000 mu were established, and over 20 million small agricultural water projects were set up. At present, through finishing necessary water conservation project reforms for large irrigation areas, the effective irrigation area of China has grown from 240 million mu to 890 million mu, which was 20% of the world's total irrigation areas.

2.3 Rural water supply greatly improved

- 3.15 million water supply projects were built, which were able to provide water for 272 million farmers and 223 million farmers were provided with safe drinking water . The history of severe shortage of water in rural areas of China has gone forever.

2.4 Anti-drought water control capacity strengthened

- To deal with consistent and large-scale drought disasters, the Chinese government, through strengthening water project construction and water amount management and control, has greatly enhanced its trans-river basin and trans-province emergency control and management capacity.
- China has successfully undertook the emergency water diversions of Water Diversion from the Yellow River to Tianjin, Water Diversion from the Yellow River to Hebei Province, emergency water control of the Yangtze River, Jialing River, Xiang River and Gan River, water amount control of Pearl River, Water Diversion from the Yangtze River to the Tai Lake, Water Diversion from Yuecheng Reservoir to Saimaqilan, ecological emergency water control of Nansi Lake and emergency water control of Zhalong Wetland, which effectively insured the water supply and agricultural water supply demand of many important cities like Tianjin, Shanxi and others in the Pearl River Delta and along the Yangtze River, and safeguarded social stability and regional ecological environment.

2.5 Anti-drought emergency insurance capacity strengthened

- At present, anti-drought service teams have been established in 2,144 counties and 11,733 towns. In 2011, the Central Government of China invested 5.6 billion RMB for 800 counties' anti-drought service teams and anti-drought emergency materials storage in some key drought areas, which greatly enhanced anti-drought emergency insurance capacity.

Anti-drought service teams

2.6 Anti-drought laws and regulations worked out

- In recent years, Chinese government has formulated and issued a series of laws and regulations including the Anti-drought Regulations of P.R.C., National Emergency Plan on Flood and Drought Prevention and the outlines of emergency anti-drought plan.
- The local governments, according to the laws and regulations of the country, have formulated supporting laws and regulations, which then consist of the anti-drought legal system and provide guarantees for the regularization and legalization of China's anti-drought mission.

2.7 Drought monitoring and warning capacity increased

- To meet the anti-drought demands, the local governments of China have established over 2,300 soil moisture monitoring stations, and set up drought information collection stations in 2,379 counties and cities easily affected by droughts.
- The meteorological and agricultural departments, according to different demands, have also started related work.
- The drought information collected by the stations, combined with the other information on precipitation, reservoir storage capacity, river water, ground water and historical drought database, have played an important role in anti-drought decision-making.

2.8 Basic drought researches achieving great progress

- Organizing and starting a lot of basic work researches on emergency drought management;
- Working out the Anti-drought Strategy Research of China;
- Issuing Drought Level Standard, Guidance on Anti-drought Plan Formulation, Guidance on Anti-drought Regulation Formulation and Outlines on Trans-basin and Trans-regional Water Emergency Control Plan;
- Starting the researches on drought frequency, characteristic value, drought area division, risk evaluation, anti-drought capacity evaluation, etc.

Headlines

I. About Chinese drought disaster

II. Achievements on emergency management on drought disaster

III. Drought disaster development trend and challenges

IV. Counter-measures against drought emergency management

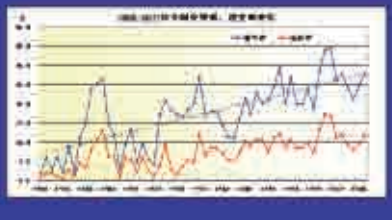
3.1 Drought development

With the development of global climate change and human activities, the unbalance of water resources distribution is getting more and more serious, with extreme drought events happening more frequently, increasing frequency of China's drought disasters, and more losses.

- More frequent drought disasters
- Larger disaster affected area
- Longer duration
- More serious disaster losses
- Higher anti-drought difficulties

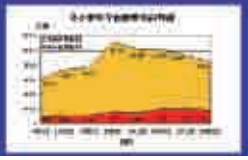
3.1.1 More frequent drought disasters

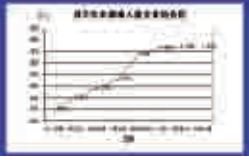
- From 1950 to 2010, heavy and heavier droughts happens in 24 years (39%), among which 11 occur from 1990 to 2010 (52%), namely, severe or extremely severe droughts happen once every two years.



3.1.2 Larger disaster-affected areas

- Drought used to occur in north China, especially northwest China, where water was in shortage.
- In recent years, droughts have been expanding to the south and east China, where it is usually rainy.
- Meanwhile, droughts have expanded the influence from traditionally agriculture to industry, urban life and ecological system, with water disputes and over-exploitation more and more serious.





3.1.3 Longer duration

- In recent years, droughts have been occurring in longer and longer time, even year after year.
- Large droughts happened in 2000 and 2003 successively, and trans-seasonal disasters occurred from the summer of 2006 to the spring of 2007 in Sichuan Province and Chongqing Municipality.
- Trans-winter and spring drought hit the winter wheat areas of north China from Oct. 2008 to Dec. 2009, a huge drought attacked 5 provinces of southwest China from Sep. 2009 to May 2010, and trans-winter and spring drought also occurred in north China in 2011, leading to great influence and losses.
- All above indicate that droughts are occurring more and more durably.

3.1.4 More serious disaster losses

- The economic losses by drought covers food production, economic crops, forestry, fishing, urban industry, hydropower, shipping, etc.
- The disaster-affected agricultural land areas were used from 50 million mu in the 1950's to 210 million mu after 2000, with corresponding food losses from 3.55 million tons to 31.90 million tons after 2000.
- From 1990 to 2008, the annual average economic losses caused by droughts reached about 1531.0 billion RMB, which was 1.2% of the total GDP of the year.

3.1.5 More anti-drought difficulties

- Water resources development degree has been extremely high in China, especially in north China. For instance, the degree is 70% around the Yellow River basin, and 90% around the Hai River basin. As a result, it is harder and harder to solve water inefficiency through fully developing the water resources potential of the areas and optimizing water resource control.

3.2 Challenges for emergency drought management

- The water supply and demand contradiction is more serious. It is estimated that the annual water shortage shall be about 60 million m3 in 2030 from 30 billion m3 at present.
- Anti-drought infrastructure construction is still weak. The present irrigation infrastructure is still not satisfied, and water resources projects are not with high standards, leading to low efficiency irrigation.
- Anti-drought regulation and planning system is needs further improvement. At present, more than half of the total provinces still have not issued their anti-drought laws or regulations, and the anti-drought plans which have been issued are not satisfied and operative.

3.2 Challenges for emergency drought management

- Drought monitoring and warning system and measures are not advanced. At present, most provinces still have not adopted the advanced technologies on drought information collection, transmission and analysis, with backward capacities on drought monitoring and evaluation.
- Anti-drought insurance is not perfect. Most of the anti-drought service teams are confronted with the problems of backward equipment, inefficient human resources, weak technologies, short of anti-drought materials and less investment.

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4 Strengthening counter-measures against drought emergency management

- China has to pay more attention to the following aspects on emergency drought management at present and in the near future:
- Firstly, further fulfilling anti-drought responsibilities.
- Secondly, further strengthening risk management.
- Thirdly, comprehensively strengthening integrated anti-drought capacity.
- Fourthly, comprehensively enhancing anti-drought technologies.

4.1 Further fulfilling anti-drought responsibilities

- Establishing and improving the anti-drought responsibility system; strengthening the responsibility awareness of each level of anti-drought commands, establishing related monitoring system, including emergency drought management into the performance evaluation of leaders at each level so that a united, coordinated and common anti-drought mechanism can be formed, guaranteeing highly efficient and orderly anti-drought work.

4.2 Further strengthening risk management

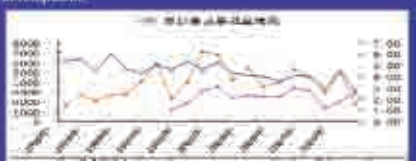
- Through the establishment of anti-drought planning system, the overall plans for each level, the special plan and emergency water control plan shall be worked out, the drought disaster insurance reviewing will be made for the key basins and regions, basic researches on drought disaster risk shall be enhanced, the drought risk map shall be worked out, anti-drought shall be transferred to a more comprehensive direction, crisis management shall be transformed into risk management, and the national anti-drought capability can thus be promoted.

4.3 Comprehensively strengthening integrated anti-drought capacity

Comprehensively strengthening integrated anti-drought capacity through working out the National Anti-drought Plan

4.3.1 Developing the anti-drought function of water resources projects

- Comprehensively strengthening the establishment of urban and rural water resources infrastructure, and the central over basin and regional water resources distribution projects, giving full play to the anti-drought function of current water resources projects system, and enhancing the capability of water resource to social and economic development.



4.3 Comprehensively strengthening integrated anti-drought capacity

4.3.2 Establishing and improving anti-drought emergency reserved water source project system

- Establishing various anti-drought emergency reserved water source projects, utilizing and integrating various anti-drought resources, scientifically controlling anti-drought water demand, comprehensively enhancing anti-drought emergency water supply capacity, insuring water supply safety in dry period, minimizing food and economic losses caused by drought.

Anti-drought emergency water source project in mountainous area of Guizhou

4.3 Comprehensively strengthening integrated anti-drought capacity

4.3.3 Establishing drought monitoring and warning system and anti-drought control system

- Accelerating the establishment of drought monitoring network, establishing drought monitoring and warning system, realizing real-time drought monitoring, drought information service and drought analysis evaluation, having in-time and effective drought warning, strengthening anti-drought control system establishment and enhancing anti-drought decision-making and controlling capacity.

Drought monitoring station

4.3 Comprehensively strengthening integrated anti-drought capacity

4.3.4 Improving anti-drought management service system

- Establishing and improving anti-drought organizations and systems, accelerating and promoting anti-drought laws and regulations system building, improving anti-drought planning system, and strengthening basic researches on anti-drought and training of anti-drought technologies.
- Strengthening the investment to fundamental anti-drought service teams, and further enhancing the capacity of nationwide water supply and irrigation during dry period.
- Establishing central and provincial anti-drought materials storage houses, and improving anti-drought materials storage system.

4.4 Comprehensively enhancing anti-drought scientific and technical level

- Organizing and starting researches on drought warning index system, drought evaluation system, drought rule and drought effect mechanism, and the promotion and application of new anti-drought technologies, materials, equipment and tools.
- Through strengthening international exchanges and cooperation, fully taking advantages from abroad, promoting China's anti-drought science and technology, and realizing scientific anti-drought and active-drought prevention.

Climate Change & Low-carbon Development

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CREIA

Climate Change
&Low-carbon Development

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Energy Research Institute of National Development and Reform Commission
Chinese Renewable Energy Industries Association (CREIA)
Apr. 22nd, 2010
Beijing, China

Outlines

- Climate change and low-carbon development
- Energy and climate change
- Challenges for Chinese low-carbon development
- Development in the future

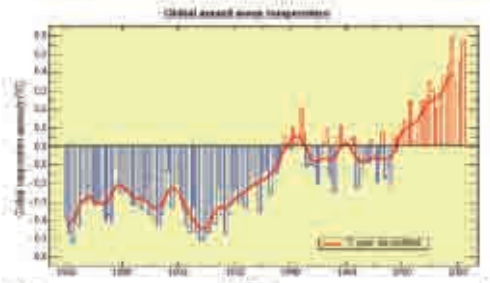
Low-carbon development --nature of climate change

Climate change has been a political truth but a question in science. However, low-carbon development has been a truth without doubt.

Climate change phenomenon

- The European scientists proposed that carbon dioxide and other gases might lead to green house effect in the 18th century.
- Green house effect has been demonstrated by many scientists since mid-20th century.
- The world transferred climate change to a political issue from just a science issue in 1979 when the first World Climate Change Conference was held.
- The UN started IPCC from the 1990's which finished 4 climate change evaluations and issued evaluation reports.
- According to the 4th evaluation report of IPCC, over 90% of the evidences showed that climate was changing and aroused by human activities.

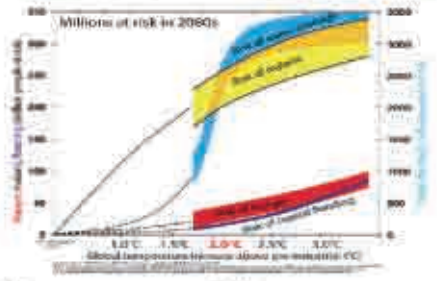
Historical development trend of climate change



Climate change phenomenon

- The 4th Evaluation report of IPCC concluded that:
  - climate change has brought about great influence in the world;
  - a great lot of data had demonstrated that climate change was aroused by human activities;
  - Dealing with climate change had been the most difficult challenge for us;
  - promoting international process for climate change adaptation had been the top priority of the General Secretary of UN.
- The conclusions were made by over 2,500 scientists from over 130 countries.

Probable price of climate change



Nature of climate change

No word can cover the nature of environmental capacity.

Nature of climate change

- There are three authoritative reports on climate change
  - Stern Review: ordered by the British Government;
  - An Inconvenient Truth by former U.S. Vice President Al Gore;
  - The 4th Evaluation Report by IPCC.
- They all concluded that:
  - Climate change had been a fact;
  - Smaller price would be paid to anti-climate change rather than to anti-climate change;
  - Smaller price would be paid to earlier anti-climate change effort rather than later effort.
- The 2009 Nobel Peace Prize was issued to Gore and IPCC.
- Combination of scientists and politicians
  - The expectations of politicians were disconnected by the scientists;
  - The conclusions of scientists were recognized by the politicians.
- Nature
  - Politicians took actions according to the conclusions of the scientists
    - Debilitating maximum right
    - Eroding environmental security space

What did we see in Copenhagen ?

The Copenhagen Conference is a watershed. China shall not keep silent, for U.S., EU, China and G77 have consisted of a new pattern on climate change negotiation.

Looking back into the basic rules regulating world development

- The UN Charter
  - The UN Charter fixed national territory principle and laws and each country had to abide by the decision no matter it was rational or not. Without the approval of the UN, no country was allowed to interfere into territorial completion of another one.
  - However, the Charter has been challenged by some rules including Kosovo and South Ossetia.
  - Today, it is not possible to have large-scale territory re-division.
- GATT
  - It resulting developed into WTO, which fixed market-oriented economy as the only acceptable economic development mode with free-trade regulations.
  - Though many countries have dispute on GATT and WTO, most countries take them as the pattern in international trading disputes and use the reference into WTO as the model for a mature market-oriented economy.
  - WTO and its related regulations guarantee powerful or enterprise competition and development of the world economy with the current rules of market-oriented economy.
- UNFCCC
  - Common but different responsibilities are global climate change.
- The former two rules are forceful, and the latter one asks for voluntary participations. However, the latter one will be forceful one day.
  - UNFCCC is a weak rule which has not been forceful yet.

Change of dominant climate change mechanisms

- Leadership alternation
  - U.S. was the dominator of climate change from 1990 to 2009, which was represented by UNFCCC in 1992 and the Kyoto Protocol in 1997. However, the refusal to sign the Kyoto Protocol of George Bush Administration reiterated that U.S. abandoned its domination on climate change.
  - EU replaced U.S. to dominate climate change from 2000 to 2009, featured by Kyoto Protocol taking effect, cleaner development mechanism fulfilled, and Bali Roadmap being worked out.
  - Multiple nation mechanism was formed in Copenhagen.
- Negotiation mode
  - The discussion mechanism of one country, one vote.
  - The Copenhagen Conference broke the mechanism.
  - Few countries started fighting for discourse right on climate change.
- The Copenhagen Conference in Dec. 2009 was a watershed.
  - A new pattern on climate change was formed by U.S., EU, China and G77.
  - China should no longer be silent, but dominant on climate change.

No winner in Copenhagen

- EU was embarrassed, anger and then beyond redemption, indicating the lacking of integrity, endurance and flexibility, which derailed EU's marginalization;
- U.S. kept being full of itself, which was the root for the failure in Copenhagen;
- China gained advantage from both sides, but its kindness brought out low results, so it must be blamed;
- G77 was not unified, so it was hard to be a decisive force.
- So, there is no winner in Copenhagen.

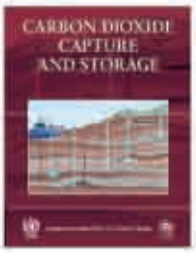
Root of failure in Copenhagen

- **The world economy is still in depression.**
- **The U.S. is not ready.**
- **China's activeness impacted the attitude of EU and some developing countries, leading to that**
  - India, Brazil, Japan and U.S. issued their immature stands;
  - EU was impatient, and hence made waste.
- **The root reason is that climate change does not damage the fundamental and central interests of each country.**
- **Denmark is too small to coordinate such a great disagreement of the world, so it is impossible to realize a Hans Christian Andersen fairy tale in Copenhagen.**
- **Mexico maybe still not able to solve the problem in 2010.**
- **In fact, no one is ready, and such a result might be a good one.**

Business Opportunities in Climate Change Issues

Though the Copenhagen Conference failed to reach restrictive agreements, the participants of the presidents, ministers and representatives of the parties demonstrated strong political determination to combat climate change and control the temperature increase by less than 2℃ based on the real sustainable development. In order to realize the target, global emission must be reduced greatly and global emission peak must be realized as soon as possible. Therefore, low-carbon economy has been indispensable.

Business opportunities in climate changes--low-carbon economy



Connotation of low-carbon economy

China's commitment in Copenhagen

- China is going to further include an climate change adaptation into economic and social development plan, and continue to adopt forceful measures.
  - Firstly, strengthening energy saving and promoting energy efficiency, aiming at reducing the carbon dioxide emission of unitary GDP by 40-50% in 2020 compared with that in 2005.
  - Secondly, greatly developing renewable energy and nuclear energy, aiming at growing the proportion of non-fossil energy to primary energy consumption to about 15% in 2020.
  - Thirdly, greatly strengthening forest carbon sink, aiming at growing the forest area by 40 million hectares in 2020, and the stalking volume by 1.3 billion m3 compared with that in 2005.
  - Fourthly, greatly developing green economy, actively developing low-carbon economy and cycling economy, researching and promoting climate-friendly technologies.

Low-carbon economy is the technical selection of ecological civilization.

Difficulties after Copenhagen Conference

Case the global temperature rises by 2℃ in 2050, the highest emission of global green house gas shall be 13.6 billion tons, and the lowest emission shall be 10.5 billion tons, which will be a dilemma then.

EU in extreme confusion

- North Europe in extreme disappointment;
- Germany no longer leading climate change adaptation,
- British climate change adaptation policy unclear owing to government alternation;
- South Europe involved in the financial crisis;
- East Europe still waiting and seeing.

U.S. government challenged by various elements

- Climate change adaptation is the unique counter for President Obama's administration.
- The brains of the Republican Party of U.S. still believe that green house gas emission reduction will greatly affect the economic interests of the U.S.
- Climate change is said to be dead among top class of the U.S. society.
- Generally speaking, the Americans have still not reached consensus on climate change.

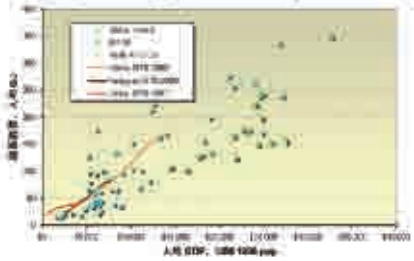
Stands of other countries

- Affected by U.S., the attitudes of Canada, Australia and Japan are still not clear.
- G77 is separated.
  - AOSIS felt they were deceived.
  - BASIC members were with their own axe to grind.
- Russia is still waiting and seeing.
- China is blessed with good luck all along.
- Therefore, though an initial agreement was reached in Cancun, the prospect is still not clear in Durban.

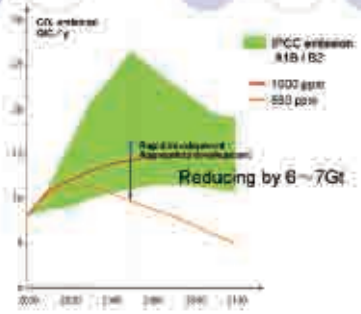
Energy and climate change

Energy, while supporting economic growth, brings out green house effect, which makes people hard to choose.

Growth, development and energy demand



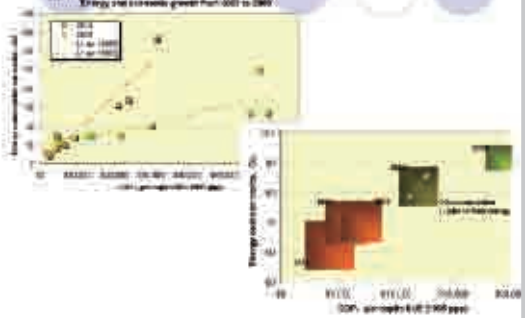
Realizing acceptable and stable carbon dioxide emission



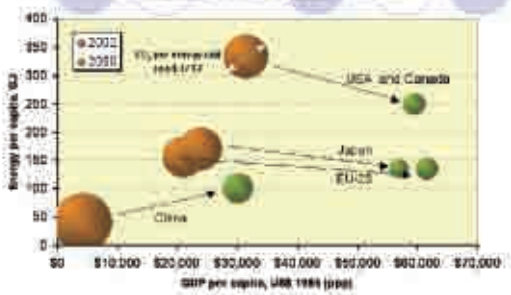
Kaya Identity

- Population — population
- Living standard — GDP per capita
- Energy using strength (efficiency) — energy of per GDP
- Carbon emission strength (energy resources) — CO_2 emission for each unit of energy

Management of economic growth, energy and carbon emission amount

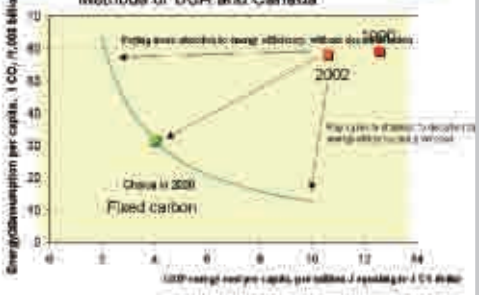


Statistics from regional aspect



Energy utility efficiency and de-carbonization

Methods of USA and Canada



Difficulties for low-carbon development in China

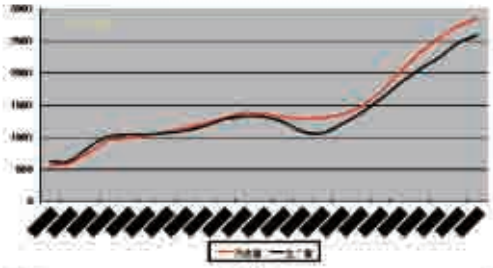
Energy saving and emission reduction will never be realized with the prerequisite of development-priority

Supply insufficiency will perplex China for a long time

- **Consistent national economy and population growth**
  - Average GDP growth rate of 9% since reform and opening-up
    - Double digits growth rate in recent years
  - 15 million population growth every year
    - equaling to the population of Japan in every 8 years, the population of France in every 4 years, and the population of Australia in every once a year
- **Unsmooth economic transformation**
  - High-speed development mode leading to increasing energy demand
  - Energy cost of unitary GDP maintaining high
- Technical progress unable to catch the rapid growth of total energy cost
  - Energy cost reduced of unitary GDP and energy cost growing consistently
  - Energy cost for unitary power generation and steel production not able to meet the growth of total energy cost

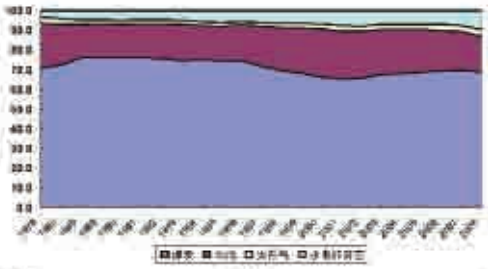
Historical review of energy consumption in China

—China has been following the self-sufficiency energy policy, with the self-sufficiency rate over 90%

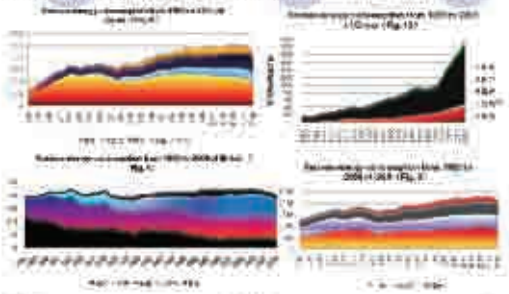


Reform of energy consumption structure

—Reform of energy consumption structure is passive, which is dominated by the growth of petroleum import and hydropower development.



Energy consumption structure comparison between China and the other main countries

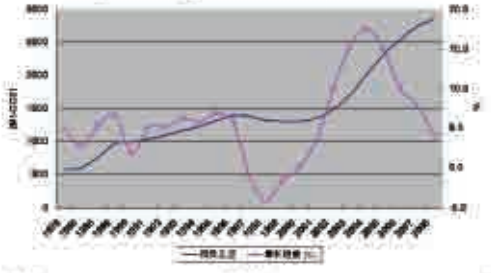


Proportion of natural gas power generation of developing countries

- India 31%
- Vietnam 37%
- Thailand 77%
- Philippians 70%
- China nearly 0%

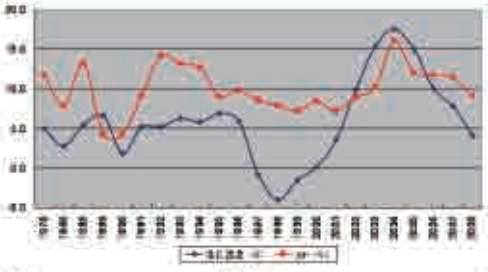
Gross consumption and growth speed

—Gross consumption growing consistently year after year, with minus growth in 3 years

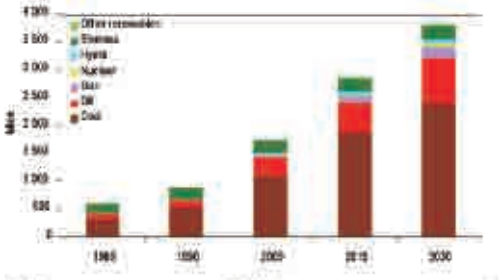


Energy and GDP growth

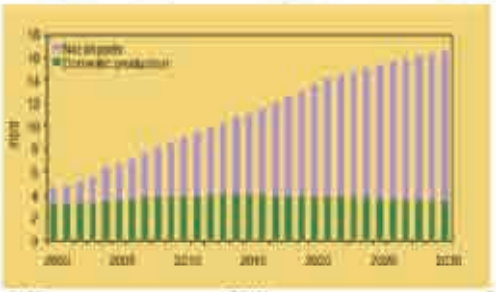
—From 2003 to 2005, the energy growth of China ever surpassed GDP growth, but GDP growth was higher than energy growth in most years



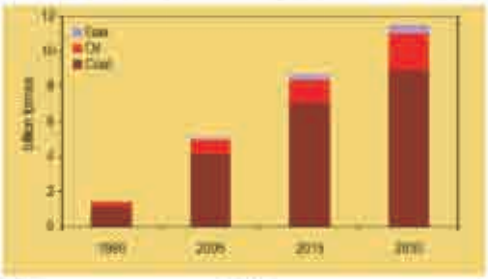
IEA's judgment on China's energy demand



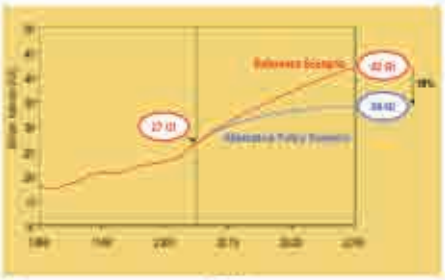
IEA's judgment on Chinese petroleum demand and import



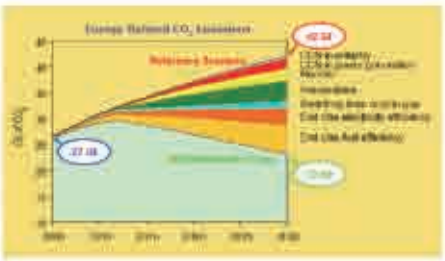
IEA's evaluation on China's green house gas emission



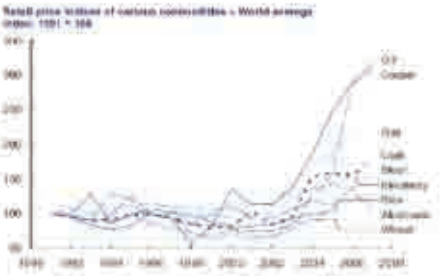
Estimation on global green house gas emission related with energy



The expectation of the Ball Roadmap to green house gas emission related with energy



The key is that China has lost the opportunity of using low-price resources development.



Development in the future

- Is heavy chemical industry the way-out ?
  - Only 500 million tons of steel and 1 billion tons of cement is produced by the world before 2000.
  - Now, China produces 700 million tons of steel and 1.5 billion tons of cement a year. Why ?
  - We always asked ourselves, what could we develop without heavy chemical industry ?
  - Do we really have to choose without heavy chemical industry ?
- Who is our example?
  - Not USA;
  - Not South Korea and Japan
  - Not southern Europe Province mode and Beijing Pioneer mode;
  - Is South America and South Europe our example?
- Thinking that Chinese exported shoes were burned in Spain, we should ask ourselves that is export-oriented economy ended ?
  - Where is our way-out ?

The traditional mode is still repeated.

- After the economic crisis, China's economy reached the fastest growth rate of 8.7%, but the price was extremely high
  - Over 3.2 billion tons of coal, which was 40% of the world's total
  - 960 million kw installed capacity of power generation units, with the newly-added capacity accounting for 70% of the world's total
    - 20 million kw of newly added hydro power, which is 80% of the world's total
    - 18 million kw newly added wind power, which is 81% of the world's total
    - 18 million newly added vehicles, which is the highest in the world.
- Improvements are expected to be achieved in the 12th Five-Year Plan
  - Transferring economic growth mode;
  - Transferring from speed to quality;
  - Quality is more difficult than speed.

Learning to do subtraction rather than addition

- As far as energy is concerned, do we have to follow the way of the western countries ?
  - Can we realize the living standard of developed countries with 1 kw per capita, with Italy and British with 1.3 kw per capita?
  - Is 3t per capita coal able to ensure better life?
- From the aspect of transportation,
  - is public transportation our best choice ?
- From the aspect of residential houses,
  - are Hong Kong and Japan our examples?
- From the aspect of living attitude,
  - is the optimism and leisure of south Europeans, Southern Americans and Africans our examples?

Where shall changes start?

- As far as energy is concerned, do we have to follow the way of the western countries ?
  - Can we realize the living standard of developed countries with 1 kw per capita, with Italy and British with 1.3 kw per capita?
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Our thoughts today are still that in the 20th century.

Rapid growing population

Limited resources

Climate change and ecological crisis
- Extreme disasters
- Geological disasters

So, changes have to be made
- Not only USA,
- but also China and the whole world but to realize low-carbon and sustainable development

New energy is not the only element for low-carbon economy.

- Low-carbon energy industry
  - solar energy, wind energy and nuclear energy
  - China's GE and Siemens
  - New-energy vehicle is not a new energy, but also a new manufacturing industry
- Advanced manufacturing
  - Advanced manufacturing is the base of industrial civilization and other emerging industries, and the prerequisite of China from a manufacturing country to a creation country.
  - We need a series of research teams and enterprises on manufacturing and materials, such as Foundries, United Technologies and Novozymes
- Quality agricultural industry
  - Not only hybrid rice, but also the unique products like Holland tulip and phalaenopsis.
  - Especially the companies like Monsanto

New energy is not the only element for low-carbon economy.

- Body-building environmental industry
  - It is an industry for promoting human living.
  - Chinese Pfizer and Johnson, etc.
- Creative cultural industry
  - It is an emerging industry in modern civilization
  - Hollywood, cartoon and even luxuries are cultural products. Vacheron Constantin is not only a brand of watch, and LV is also not only a brand of bag.
- Financial innovation industry
  - Financial service industry is the support to emerging industrial development
  - Innovation is indispensible to world financial center.

Mechanism, system and technical innovation

- Systematic innovation
  - Monopoly enterprises and market environment
  - Coordinated development between central and local governments
- Mechanism innovation
  - Market environment
  - International resources
- Technical innovation
  - Largest difficulty

Conclusion

- Why should China follow the road of low-carbon development ?
  - It is not only the prospect of national leaders, but also the objective demands of development.
  - According to USA study, we need 10 earths to meet the current demands of human beings. However, the truth is we have only one earth.
  - We have to change our development mode no matter that is climate change or not. Thanks to Bali Roadmap, no matter what agreement was reached in Copenhagen, Chinese people have understood that it is the only way to follow the low-carbon development.
  - Except for low-carbon development, we have no other choice.
  - We will have a new future and make largest contributions to the world if low-carbon development is insisted on.
- Follow your own judgment, believe in yourself.

Thank you

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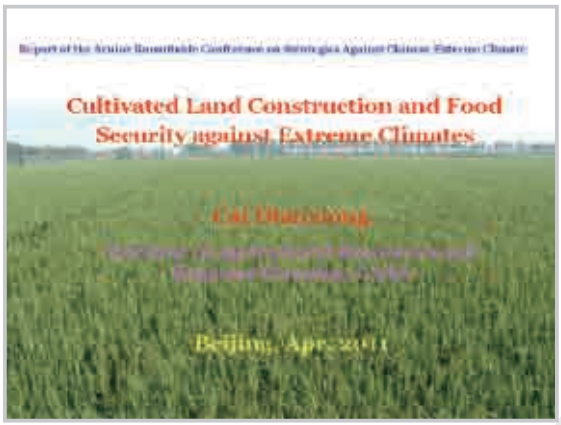
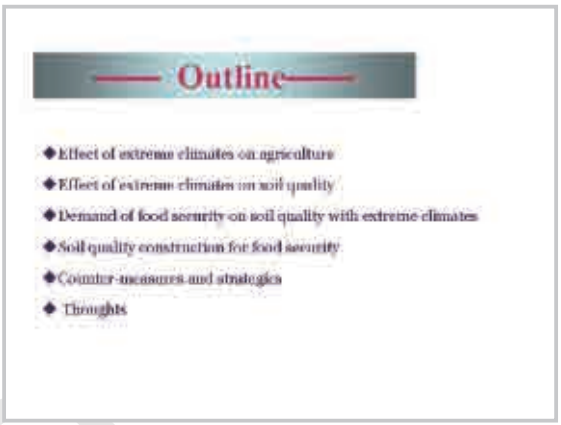
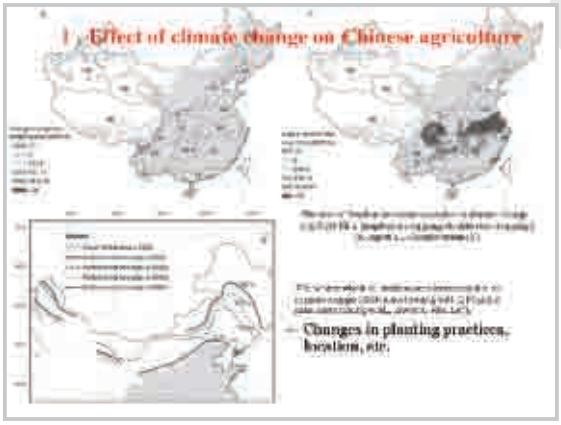
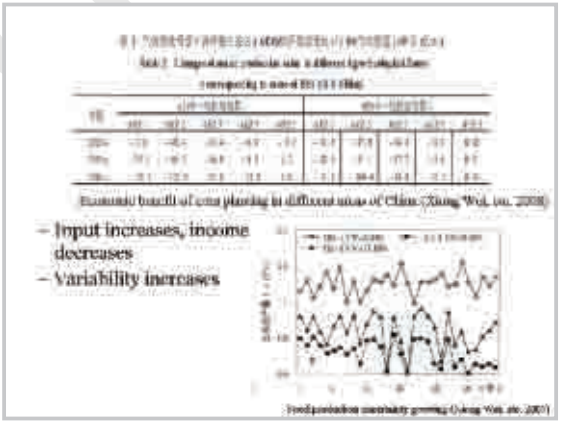
Discussion on Farmland Development and Food Security of China under Extreme Climatic Conditions

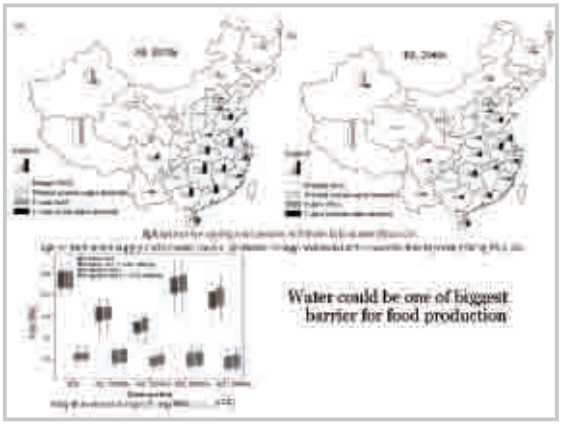
Cai Dianxiong
Institute of Agricultural Resources and Regional Planning, CAAS

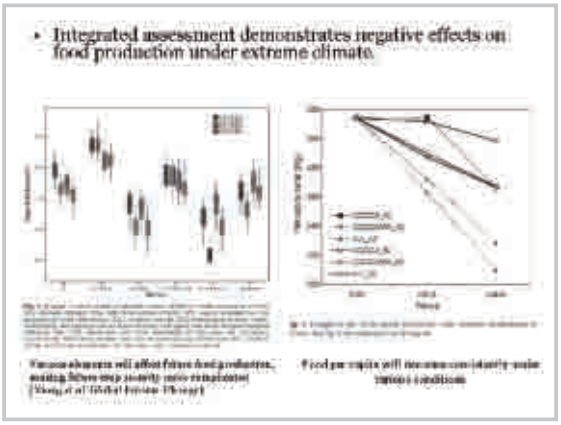




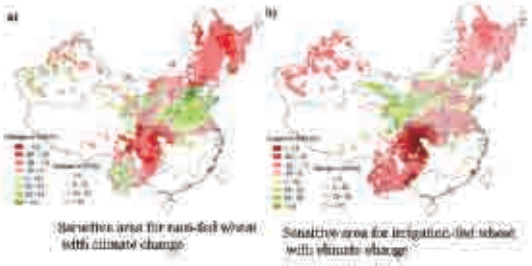








Larger regional variation exists which need regional specific adaptation strategies



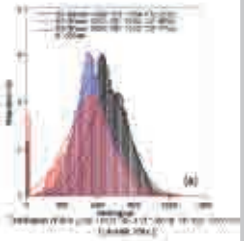
Sensitive area for rain-fed wheat with climate change

Sensitive area for irrigation-fed wheat with climate change

Results: Impacts of climate change on China's agriculture

- Agricultural meteorological disasters with climate change
  - The frequency and intensity of climate disaster increase

—Climate change will increase the frequency and strength of extreme climatic events. The frequency and strength of flood, drought and other disasters have been increasing in the latest 50 years.
—Researches say that extreme climatic events (flood, drought, extremely high temperature, low temperature disasters, etc.) are going to create higher effect on agricultural production, and 3% to 6% GDP will be lost at present, which will be higher.
—Due to the effect of climate change, the disasters associated with meteorological conditions change at the same time.
—According to the present research results, there are still disputes on whether current agricultural meteorological disaster increasing is caused by climate change.

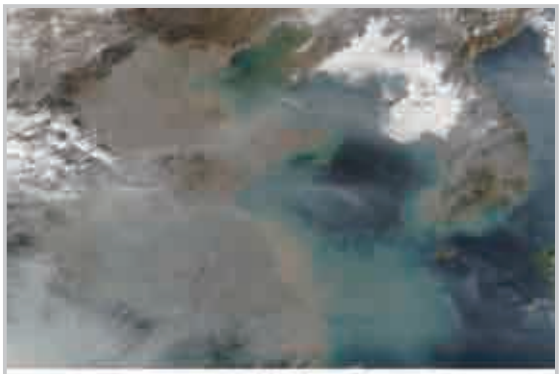


- What is the solution for food security and how ?

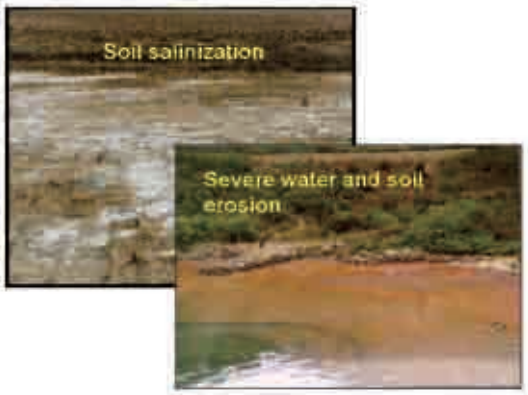
Improving cultivated land quality is the key element to counter extreme climates and guarantee food security.

Ⅰ. Effect of extreme climates on soil quality

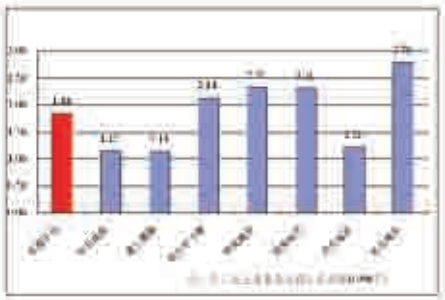
Effect on soil quality



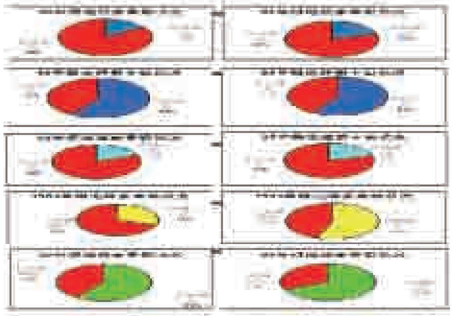
Water and soil nutrient losses, 2002



Sedimentation velocity and heavy metal combined pollution

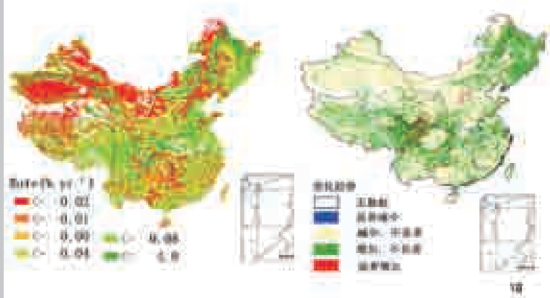


Appendix 1 Average content of organic matter in cultivated land of China

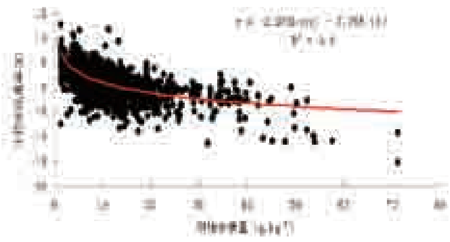


Appendix 1 Element deficiency change of Chinese cultivated land from 1985 to 1998

SOC changing rate and development

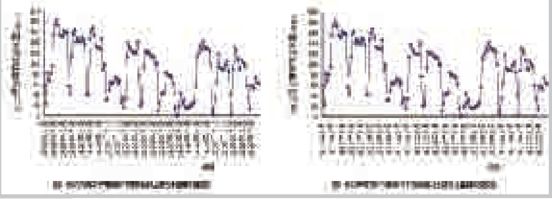


Organic carbon content in 20cm soil of China's agricultural land

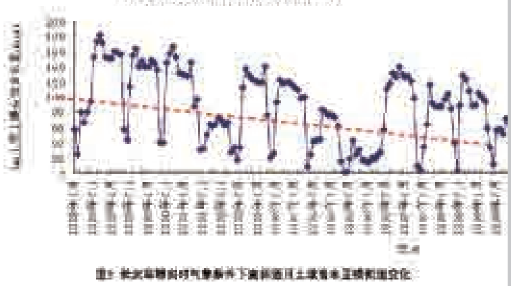


New features of China's cultivated land quality change with climate change

1. Fertilizer insufficiency: unbalance of organic fertilizer and chemical fertilizer
2. Serious water insufficiency: more and more serious water shortage (gross precipitation decreases, and drought occurs in each season)
   - Drought of deep soil layer in central and western Loess Plateau
   - The great leakage of ground water of north China
   - Seasonal drought in south China
3. Soil environmental worsening: common pollution from water, soil, gas and ecology.



Soil drought development of the Loess Plateau (highly productive cultivated land)



Appendix 4

Organic and chemical fertilizer investment for China's agricultural land

Year	Total (10,000 tons)	Organic (10,000 tons)	Chemical (10,000 tons)	Proportion of organic (%)
1949	443.8	443.4	0.4	99.9
1957	726	689	37	94.9
1965	974	798	176	81.9
1975	1710	1173	537	68.6
1980	2488	1218	1269	49.0
1985	3218	1442	1776	44.8
1990	4127	1537	2590	37.2
1995	5295	1701	3594	32.1
2000	6028	1882	4146	31.2

Grain stalk returning

	CO_2 loss of agricultural soil (Tg)	C return from grain stalk (Tg)	Grain stalk returning rate (%)
China	366	293	18
USA	812 2 times	884 3 times	90

Current status: [illegible]

Estimation: [illegible]

Problems and challenges

- Low-quality agricultural soil, and low capability of water and nutrient maintenance.

  [illegible]
- The total agricultural soil amount is low, with limited reserved resources.

  [illegible]
- The soil nutrient and fertilizer storage capability of agricultural land is low, with increasing difficulty on insurance.

  [illegible]
- The environmental problems of agricultural soil are worsening.

  [illegible]
- The infrastructure and water resources facilities are too old.

  [illegible]

Ⅲ. Demand of food security for soil quality

Basic situation of Chinese food security

- **Limited by soil quality, food supply and demand in China is in strain balance.**

Though food self-sufficiency is realized, the overall situation is not optimistic, with just 350-400kg per capita.

However, the annual shortage from 2000-2010 will grow to 30-50 billion tons.

- **Structural demand and supply contradiction (type, quality, etc.) is worsened.**
- **Regional production and supply capability is not balanced.**
- **Realization of producers' benefit—top prerequisite of food security**

Food planting area and output fluctuated in the past, with 15% and 12.4% reduction. 1 unit reduction of per unit area refers to 11.2% storage reduction and 9% food supply per capita.

- **Restrictions of international food and trading situation**

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- **Restrictions of international food and trading situation**

- Insufficient agricultural land—where is it from? How to deal with water insufficiency?

The area of cultivated land is decreasing. It is estimated that agricultural water insufficiency will grow to 300-50 billion m³ in the future 10-20 years.

- Source expanding?

over-exploitation of underground water, Inland Southern-North Water Diversion Project (200 billion m³), agricultural quotas?

- Low cultivated land quality——protective agriculture?

According to a lot of test results:

70% of the agricultural land is continuously with different fertilizers, 60% only 30-35% fertilizer efficiency; food output is limited to be increased; shall the protective cultivation be adopted without reducing the total amount of cultivated land?

➢**Cultivated land quality promotion and protection is indispensible.**

➢**Other accessory measures are needed for solving food security problems.**

Extreme climate

Ⅳ. Soil quality construction for anti-drought climate

Soil quality construction——It refers to all activities and processes on agricultural land and protection and development. Specifically speaking, it refers to that, under cultivation conditions, a series of protective and cultivative technical measures are adopted to realize the balance of soil fertilizer and water application, promote agricultural soil water and fertilizer application efficiency, ease the effect of extreme climate on agricultural soil productivity, and promote sustainable application of limited agricultural resources.

——**Construction nature:** Cultivating the quantity and quality of soil resources, adding scientific adjustment to realize sustainable soil application.

——**Connotation of cultivating:**

- Combining the protection and cultivation of basic agricultural soil resources
- Maintaining and improving the soil cultivation and self-adjustment capability of land's soil resources
- Preventing soil fertility decline and cultivation resource
- Construction of soil pollution prevention system

Thoughts

With the coordinated development of population, resource, social and economic development as the prerequisite, with the promotion of sustainability and efficiency of cultivated land resources as the core, the contradiction between agricultural soil living ecological and industrial soil shall be well treated, soil's climatic change and the thoughts of macro-control and micro-cultivation of soil resource shall be well implemented.

- Controlling promote cultivated land waste, reducing soil loss, and strictly fulfilling laws and acts of the management.
- Promoting soil quality, enhancing the capability of soil on water resource storage and nutrient balance.
- Optimizing agricultural soil fertilization, paying more attention to resource-regional application.
- Advancing agricultural soil quality construction, paying more attention to soil pollution treatment and prevention.
- Creating extreme climate and soil quality monitoring system, and establishing sustainable cultivation system.

Effective protection: sustainable land resource balance ——environment

Cultivation and application combination: taking sustainable development of cultivated land as the core——grasping thought

Optimal distribution: optimizing distribution and cultivation ——economy

Cultivation priority: soil control in priority——technical strategy

Ⅴ. Food security counter-measures on anti-extreme drought climate

——Greatly developing cultivation measures on agricultural soil

- Cultivation channel

Modern mode, traditional mode or combined mode

- Quality conservation

Combined quality construction

- Cultivation technology

Technical innovation, ex. organic and chemical fertilizer mixture

Bio- and eco-tech ex. : fallow cultivation technologies

Digital technology— ex., pollution prevention technology, intimate quality monitoring technology

——Giving full play to the role of education, policy and management

- Forming a good atmosphere of cultivation land protection.
- Encouraging the investment to anti-drought, water-saving and soil cultivation industries.
- Strengthening agricultural soil protection and quality promotion.
- System management.

——Actively processing pollution soil and developing cleaner production

Polluted agricultural land is important resource for Chinese agricultural soil—source opening

Improvement may lead to agricultural land pollution—resource saving

——Fulfilling optimal distribution of agricultural soil resources

- Optimizing agricultural soil distribution through protection and control
- Optimizing the distribution of agricultural, living, industrial and ecological land
- Balance of efficiency and sustainable cultivation

——Actively processing pollution soil and developing cleaner production

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@Crisis from consistent growth promotion driven by cost?

Main elements affecting stable food production

1. Quality element
2. Resource element
3. Structural element
4. Technical element
5. Social and economic element

Land recuperating and multiplying

@Main channels for China's stable food production with extreme climates

View 1: Food is the national economic basis, and cultivated land quality is the basis of food security.

View 2: Fertilizer promotion + cultivation management + water and fertilizer application + high productivity = output upgrading effect

View3: Environment + quality + resource + policy and regulation=food security

View4: Recuperation + fertilizer culturing = food coming from soil = consistent output growth

Fertilizing scientifically and well distributing organic and chemical fertilizer

- According to the observation of 32 long-term positioning tests, well distributing organic and chemical fertilizers, which increases the organic carbon content by 26% within 20 years; in this way, 1.8-5.4 million tons of carbon can be fixed annually in China.
- Organic fertilizer: fertilizer>1 application strategy
- Agricultural waste returned to the soil, which increases the proportion of organic waste returning to soil from 34% to about 68%.
- Promoting and applying organic fertilizer and green fertilizer

View 5: Double optimization strategy of food security and soil resource security

Solid foundation: expanding cultivated land production space to guaranteeing food production security and national security.

Important strategy: with the prerequisite of guaranteeing national food security, it is a good strategy to import more food.

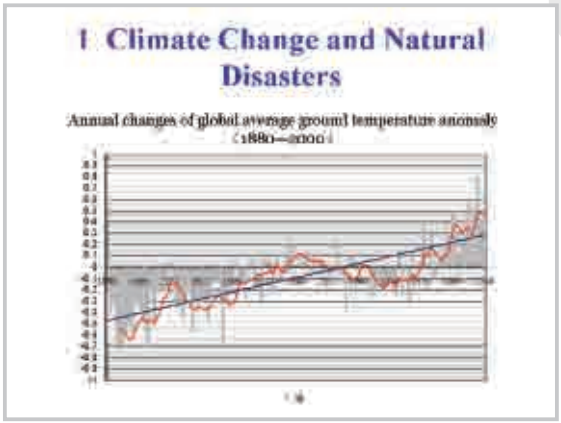
Relieving resource pressures importing 500kg food

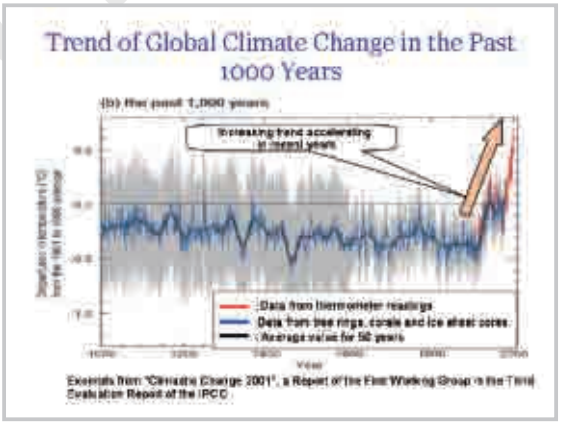
Economic rationality: 20 billion kg food 1[illegible]=20 billion RMB

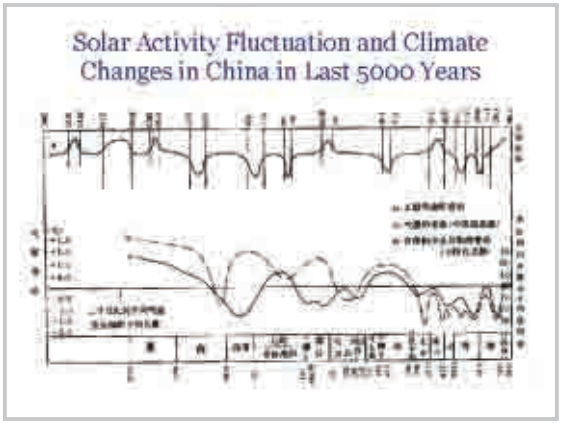
Thank you!

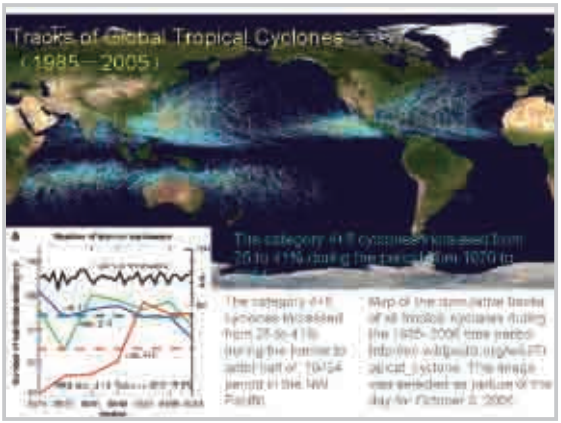
Evolution Trend and Adaptation Strategy of Water Disasters in the Context of Climate Change

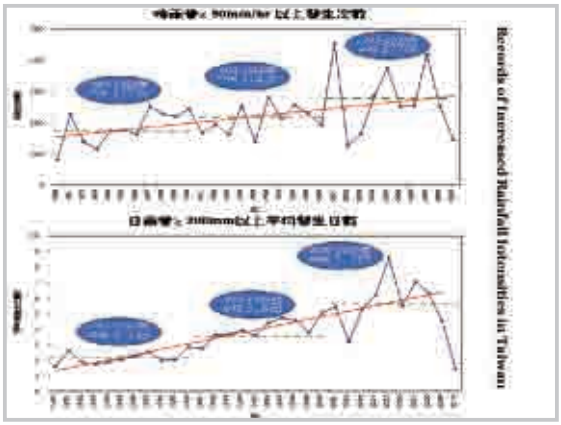
Cheng Xiaotao
China Institute of Water Resources and Hydropower Research

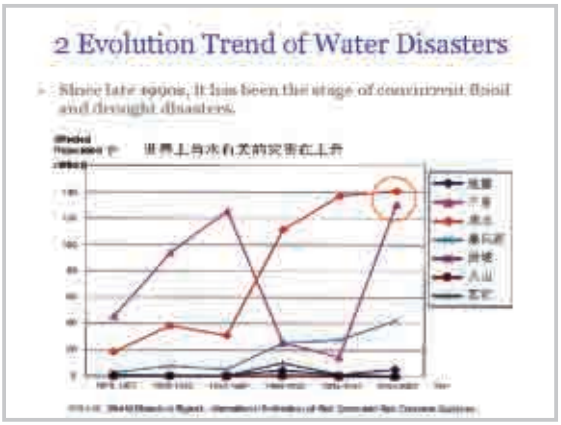


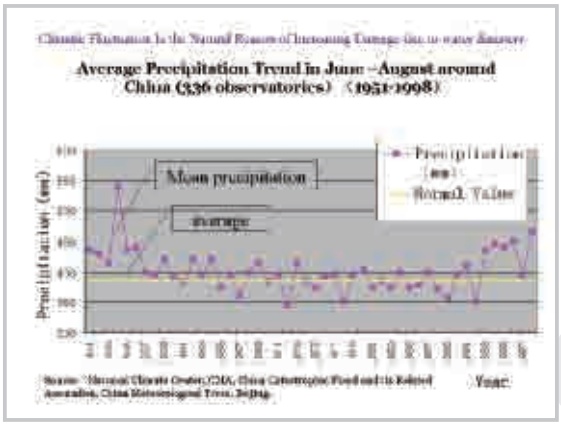


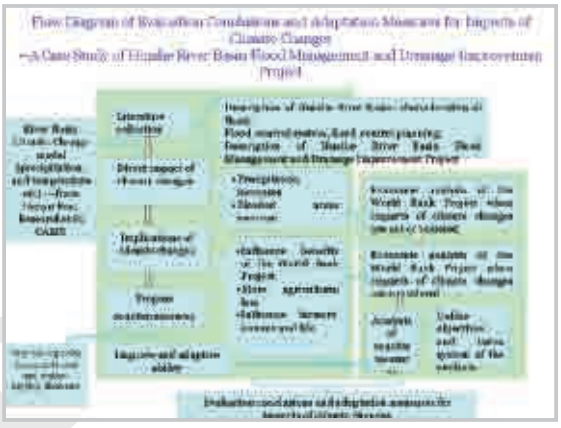


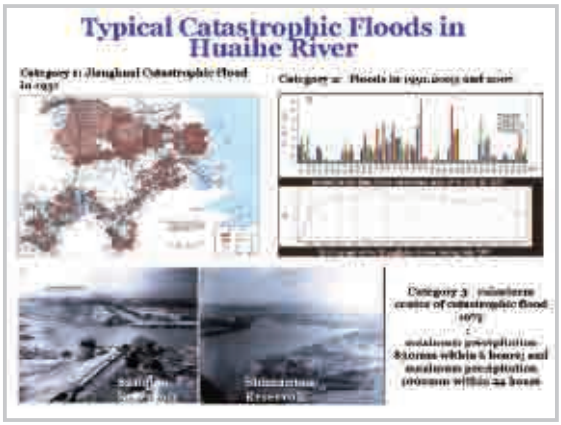


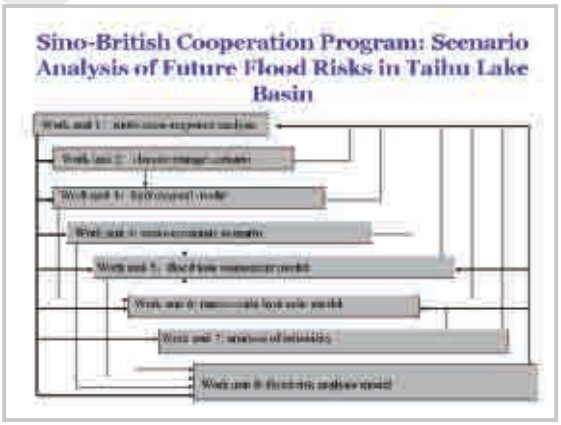

Records of Increased Rainfall Intensities in Taiwan

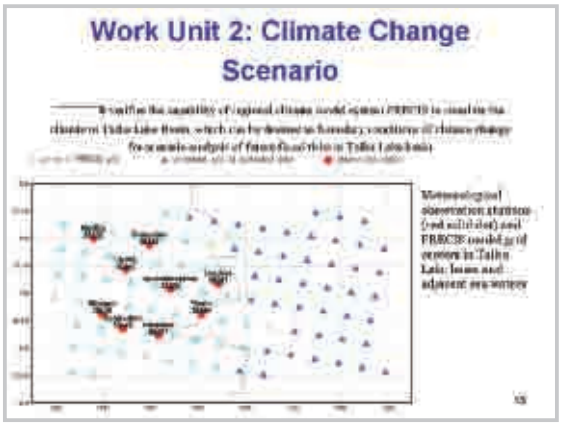

2 Evolution Trend of Water Disasters
Since late 1990s, it has been the stage of concurrent flood and drought disasters.

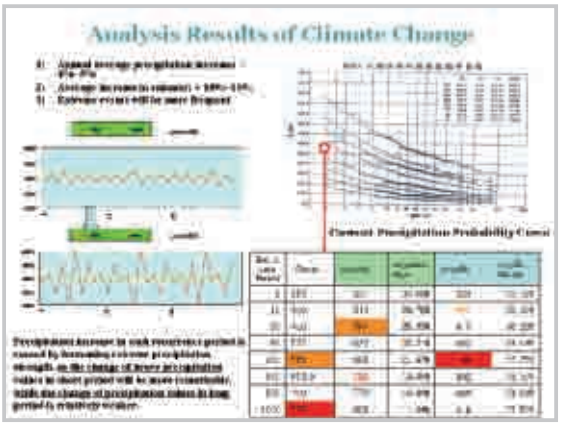

Climatic Fluctuation Is the Natural Reason of Increasing Damage Due to water Disaster
Average Precipitation Trend in June –August around China (336 observatories) (1951-1998)
Mean precipitation
Normal Value
Precipitation (mm)
Year:

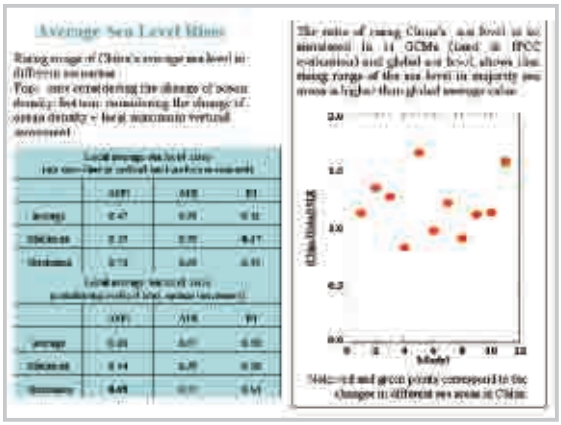

Flow Diagram of Evaluation Conclusions and Adaptation Measures for Impacts of Climate Changes
–A Case Study of Huaihe River Basin Flood Management and Drainage Improvement Project

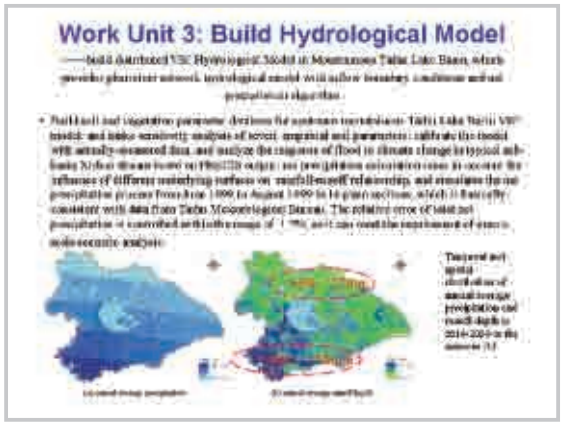

Typical Catastrophic Floods in Huaihe River

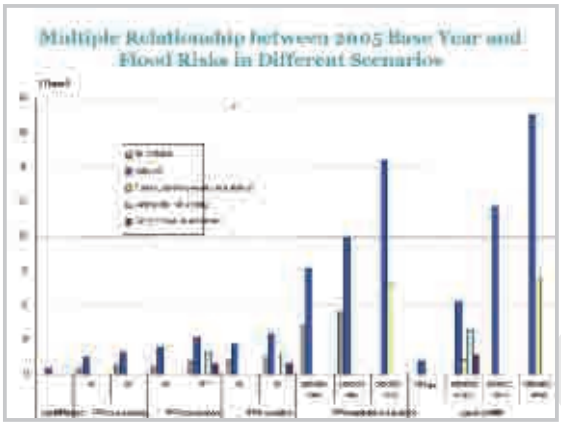

Sino-British Cooperation Program: Scenario Analysis of Future Flood Risks in Taihu Lake Basin

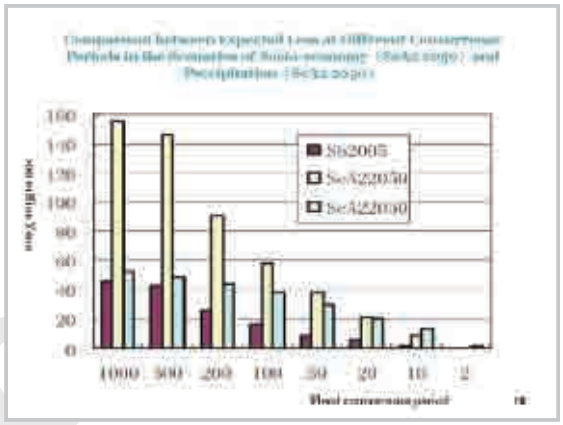

Work Unit 2: Climate Change Scenario


Analysis Results of Climate Change
Current Precipitation Probability Curve


Average Sea Level Rises


Work Unit 3: Build Hydrological Model


Multiple Relationship between 2005 Base Year and Flood Risks in Different Scenarios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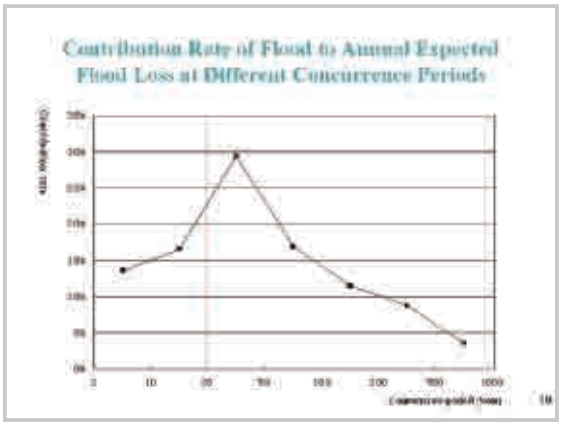
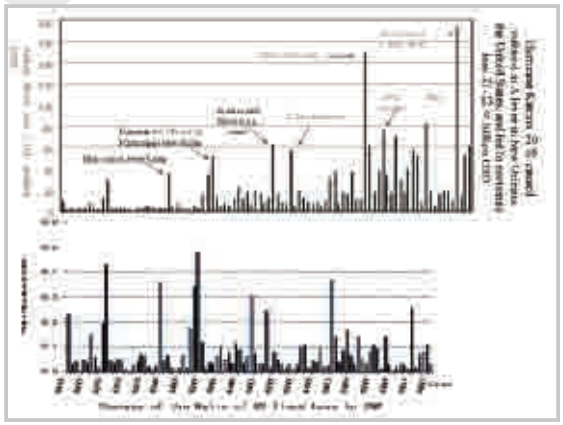
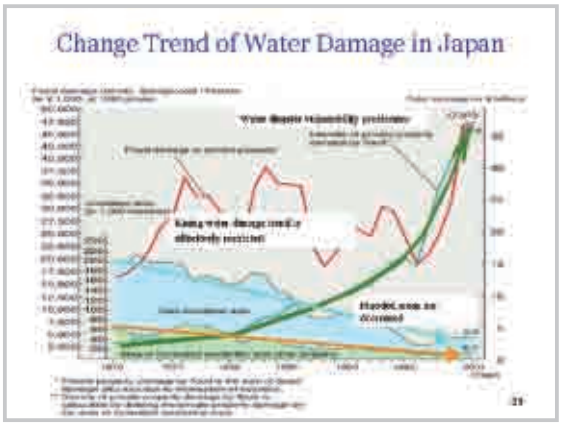
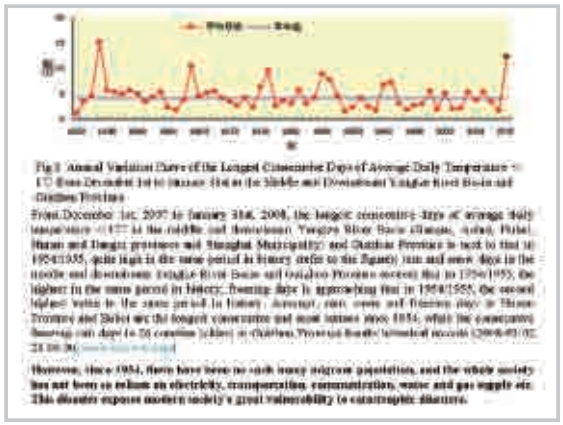
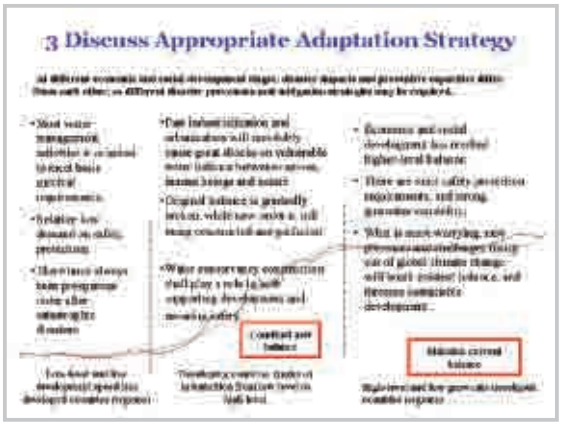
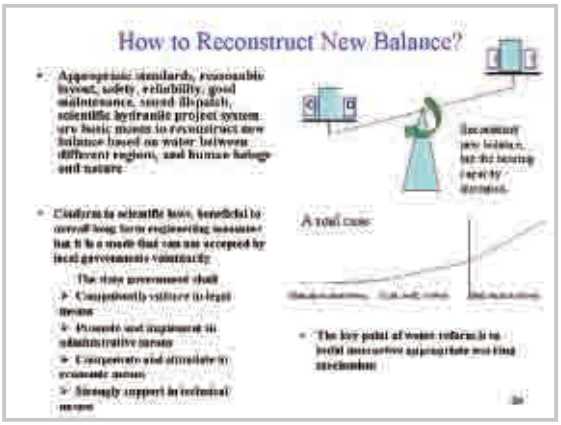

Contribution Rate of Flood to Annual Expected Flood Loss at Different Concurrence Periods

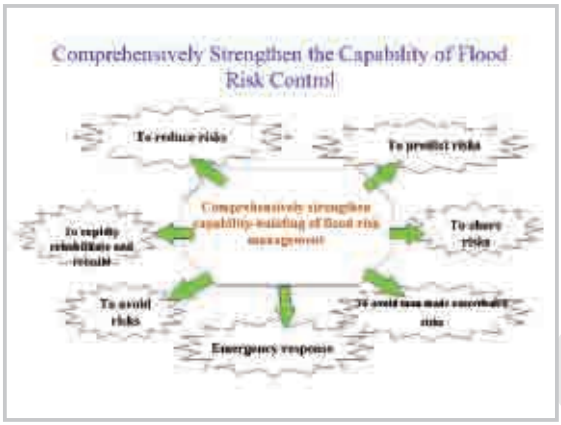



Change Trend of Water Damage in Japan









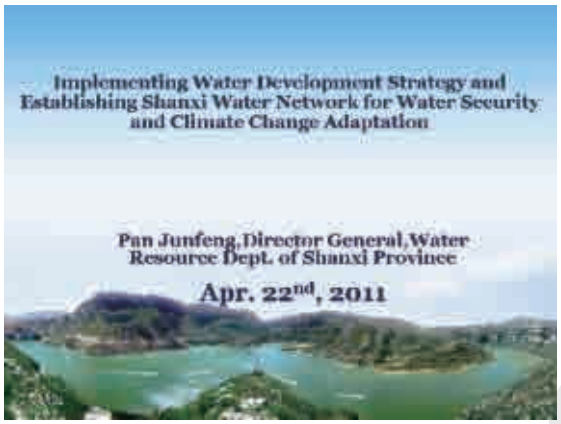
Main Conclusions

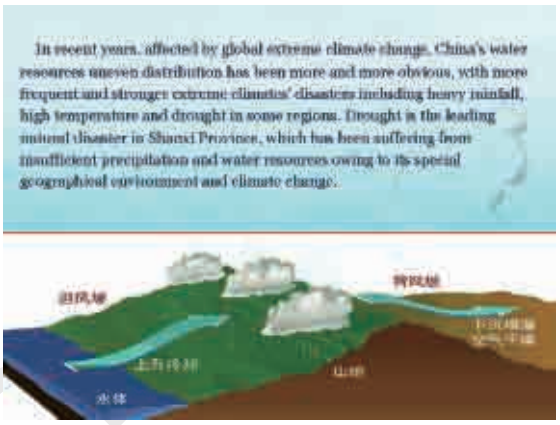
- In the context of climate changes, extreme water disaster events may become more and more frequent.
- Influenced by both climate changes and rapid economic and social development, water disaster risks will be increasing all the time, so it is necessary to adopt integrated measures to prevent and mitigate disasters.
- In the new context, it cannot promote healthy development of hydrology unless it is reformed. The key is to build an autonomous, interactive and sustainable working mechanism that covers all the regions.

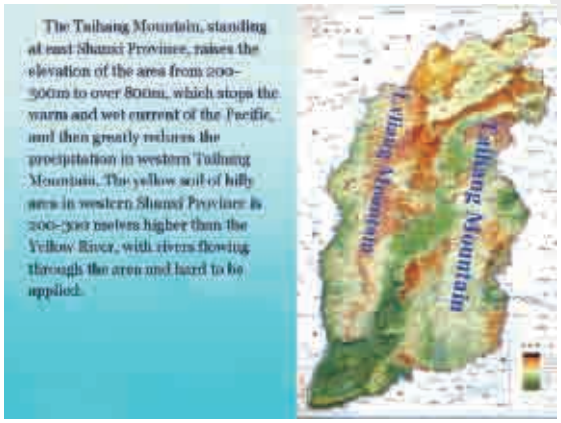
Thanks !

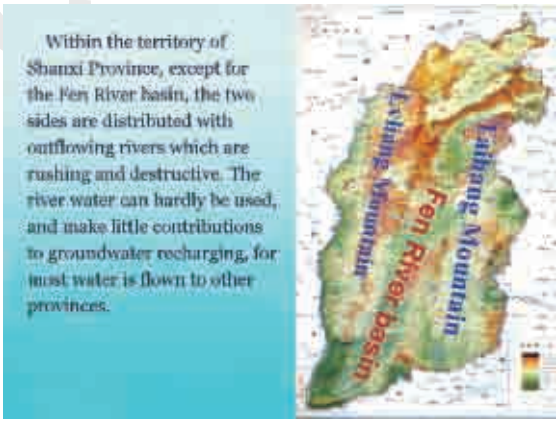
Implementing Water Development Strategy and Establishing Shanxi Water Network for Water Security and Climate Change Adaptation

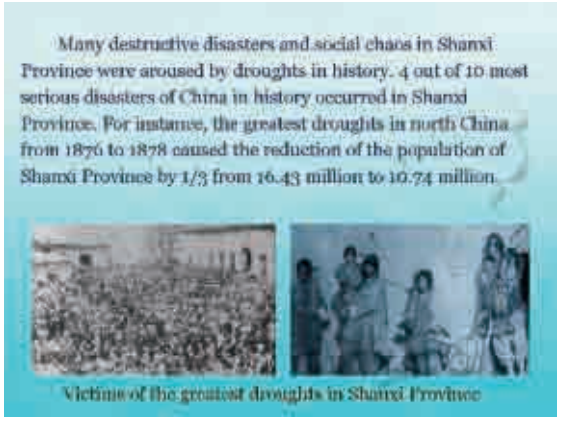
Pan Junfeng
Director General,Water Resource Dept. of Shanxi Province

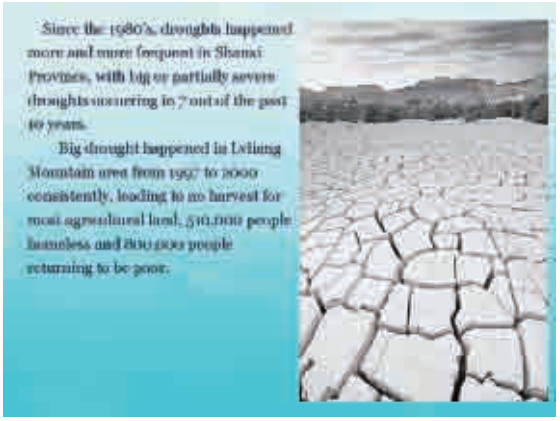












It has been proved to be true that serious water crisis will be aroused as long as there is extreme drought in the province, and thus the economy and society will be greatly affected.

Shanxi Province, as a national energy base, contributes 1/4 of Beijing's total power consumption, and 70% trans-provincial coal transportation of China, and provides coal for thermal power stations in 26 provinces or municipalities. As a result, water security is not only about Shanxi Province's development, but also the national energy security.

Main water problems for Shanxi Province before 2005:

Firstly, insufficient water supply due to the lacking of water resources-controlling projects

In 2005, there was only 600 million m³ of water in reservoirs controllable, which was 1/14 of river runoff. Due to the lacking of reservoir projects for flood control, over 70% of the water in flood season was abandoned.

Secondly, poor conditions for use of surface water

2/3 of total amount of water used for the economic and social development is from groundwater, leading to over exploitation of groundwater. As a result, 4 billion m³ of groundwater in Shanxi Province was exploited in 2005, with 700 million m³ of groundwater over-exploited, and the wells are getting deeper and deeper causing a series of ecological and environmental problems.

Thirdly, coal development greatly damages water resources.

The Chinese government has been attaching great importance to the solving of water problem in Shanxi Province. As President Hu Jintao pointed out when visiting the province in July, 2005 that water conservation must be insisted as the first principle, and water resources must be rationally developed, efficiently used and effectively protected. Premier Wen Jiabao also said when visiting the province in 2006 that the biggest element restricting Shanxi Province's development was water, therefore countermeasures must be worked out to solve the problem of water resources insufficiency, and water resources development must be put at an important position in the economic and social development.

In early April of this year, Premier Wen Jiabao once again visited Shanxi Province and requested that more efforts must be made on water resources development.

The Ministry of Water Resources also provides full support to the solving of water problems in Shanxi Province. Its relevant leaders listened for 4 times to the special reports on water resources issues of Shanxi Province from 2006 to 2007, and it organized the meeting attended by experts discussing the province's water problems in Beijing.

Mr. Wang Shucheng, as working in the Ministry of Water Resources and the CPPCC, visited Shanxi Province for many times, providing guidance on water work.

Water Minister Chen Lei has visited Shanxi for 3 times in recent 2 months to guide the water work.

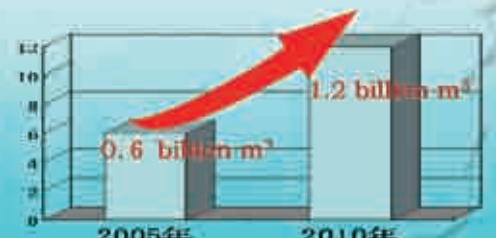
The Emergency Water Source Plan against Extreme Drought of Shanxi, approved by the Ministry of Water Resources and Shanxi Provincial Government, provides basis for planning work for the construction of emergency water source projects of the province.

On Mar. 2nd of 2011, the MOU on Accelerating Water Resource Reform & Development and Water Ecology Protection and Promoting the Transfer and Cooperation of Shanxi' Resource-oriented Economy signed between the Ministry of Water Resources and Shanxi Provincial People's Government, poured new energy into the development of Shanxi's water resource development and provided stronger supports.

Under the guidance of the Ministry of Water Resources, Shanxi Provincial government, based on profound investigation and scientific research, made the important decision on strengthening water resources development and implementing water development strategy in March, 2007.

The general thought on water development strategy will be: through establishing a series of emergency water source projects, using surface water and protecting groundwater in wet period, so that the storage of groundwater can be recovered gradually, supplementing surface water by groundwater in dry years, effectively reducing the total water consumption through saving water.

Following the droughts, Shanxi Province has invested 12 billion RMB in 35 emergency water source projects since 2006, and a series of water source projects have been put into use until the end of 2010.



Comparison of water storage of reservoirs in Shanxi at the end of The 10th and 11th Five-Year Plan periods

Added with new 200 of old reservoirs after reinforcement, the surface water supply in normal years has been increased by 1.5 billion m³, with 0.2~0.3 billion m³ groundwater supplement, and the total water supply maintained within 6.5 billion m³. Therefore, groundwater supply can be reduced by 0.5 billion m³ during the 10th Five-Year Plan from 4 billion m³ to 3.5 billion m³. And groundwater level starts to rise.

With the completion of the 35 emergency water source projects, the groundwater has been effectively controlled and protected, and the main water issue of Shanxi Province was turned into insufficient water resources distribution and low guarantee from insufficient storage capacity. Generally speaking, it is concerned with how to transfer the surface water and the water of the Yellow River through damming and lifting to the water-shortage areas so that water supply can be guaranteed at the extreme dry periods.

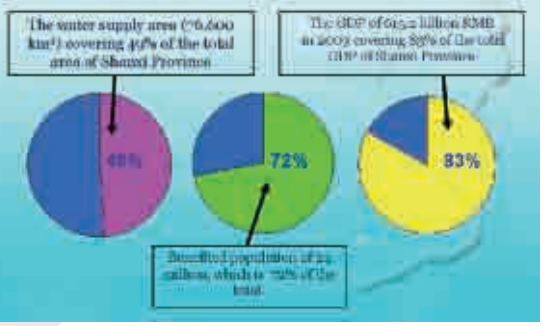
The No. 1 Document issued by China's Central Government on Accelerating Reform and Development in Water Sector symbolizes that China has entered into a new era of rapid development in water sector.

According to the Document, the Shanxi Provincial Government, combined with the target of economic development during the 12th Five-Year Plan, decided to start the big water network construction with the framework of "2 verticals, 10 horizontals and 6 rivers connection" after the completion of 25 emergency water source projects and old reservoirs reinforcement.

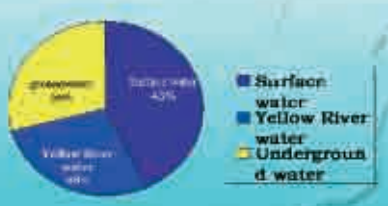
On Apr. 8th of 2011, Shanxi Provincial Government organized the meeting calling for the start of the big water network construction.

General thoughts on the big water network construction of Shanxi Province: In ensuring the water supply for the sustainable economic development as the top priority, with the trunk streams of the Yellow River and Fen River as the main lines, with the 10 leading water supply systems covering the 6 basins and main economic centers as the framework and connecting the Yellow, the Fen, the Qin, the Sanggan, the Zhang and Min rivers with the reservoirs on the rivers to form the big water network.

The water supply area of the big water network of Shanxi Province covers 6 basins, 11 central cities and 70 counties (cities or districts).



The total surface water supply will reach 6.1 billion m³ when the main water network completes in 2015 including 3.7 billion m³ of surface water supply and 2.4 billion m³ water diverted from the Yellow River and the groundwater supply will be reduced to 2.5 billion m³ from 3.5 billion m³, with the annual total water supply of 8.6 billion m³.



Water supply structure at the end of the 12th Five-Year Plan

The big water network shall have 2 functions:

Firstly, distributing water from reservoirs and the main stream of the Yellow River to the water-shortage areas;

Secondly, increasing the water supply guarantee rate of each region especially the urban and economic centers.

The establishment of the great water network is aimed at solving unbalanced distribution of water resources in economically developed counties and undeveloped regions.

Since 20% of the total area has produced 83% GDP and with 72% of the total population, the water ecology has been worsening greatly. Therefore, the establishment of the network is particularly important for sustainable development.

The construction of the big water network construction, as the key water resources works in the next 5 to 10 years of the province, is also the main extreme climate adaptation measures raised according to the local situation.

Water for the two verticals and 6 horizontals mainly comes from the Yellow River. Since water of the Yellow River in Shanxi Province mainly comes from Qinghai and Gansu provinces which have different climates, the water supply can be guaranteed even in extreme dry period.

In addition, the network also strengthen the capacity against partial drought through well coordinating the different frequencies of water richness and insufficiency between the central basin and the Taihang and Lvliang mountainous regions.

What's more, a stable groundwater reserve has been set up through effective groundwater conservation so that 9.5 billion m³ of groundwater can be used in extreme dry period.

To sum up, the emergency water supply will reach 6.5 billion m³ in extreme dry period, which is enough to insure the water demand both for domestic and economic uses.

Distinguished leaders and experts, ladies and gentlemen, it has been the common responsibility for human beings to handle extreme climates and ensure water security. Shanxi, as an interior province of China, under the guidance of the Ministry of Water Resources, has strengthened the exchanges and cooperation with related organizations and countries in the fields of water resources distribution, conservation and protection, hoping to make greater contributions to fight against global extreme climates and ensure water security of China and the world.

The Pracitce on Integrated Water Resources Management in Guiyang Minicipality

Zheng Yong
Deputy Director, Water Resources Bureau of Guiyang Municipality

1. Basic water resources situation of Guiyang City

1.1 About Guiyang City

Guiyang Municipality, the capital City of Guizhou Province, is located at 106°07′~107°17′and 26°11′~27°22′N, covering an area of 8,034km^2. It consists of 6 districts, 3 counties and 1 city. In 2006, the city was with a population of 3.545 million, with total GDP of 60.286 billion RMB. Guiyang Municipality is provided with rich resources of minerals like aluminum, phosphorous and coal, biological materials like best Chinese medical herbs, the touris spots featured by strong ethnic styles and vast forest which creates comfortable climate and it has named as “the city of forest”.

1.2 About water resources

1.2.1 Guiyang Municipality, located at the wet area of continental subtropical monsoon, shares an annual average temperature of 15℃ and annual average precipitation of 1,095mm. In the watershed area between the Yangtze River and Pearl River, and second-stair terrain of the eastern slide of Yunnan-Kweichow Plateau, Guiyang Municipality has 98 rivers with over 20km^2 of basin areas or over 10km of length, with the annual water resource of 4.515 billion m^3, water resources per capita of 1,274 m^3, which is close to the per capita water demand deadline of 1,100 m^3. Guiyang Municipality is a typical water- shortage city in karst area of southern China.

1.2.2 Main features of water resources: (1) the total amount of water resources is insufficient, with low water resources per capita; (2) water resources are unevenly distributed in space and time featured by severe seasonal water-shortage; (3) water pollution is not effectively controlled, with increasing surface pollution; (4) the water resources are difficult to be developed and used owing to the effect of karst features; (5) the surrounding areas are with rich water resources .

1.2.3 Main problems on water resources development and management: (1) the water sources for urban areas are insufficient which indicates the contradiction between water supply and demand; (2) the water supply facilities are insufficient in rural areas indicating the low water use level; (3) the flood control capacity is weak and serious losses will be caused as long as there is big flood;

(4) water resources are not well protected and waste water are less treated; (5) water conservation measures are not enough and comprehensive water use rate are low; (6) water for ecological environment is insufficient, and the water environment may be worsened; (7) water resources are hard to be developed and used and the investment are not enough; (8) the water resources are not rationally distributed and water use structure needs to be optimized; (9) water market and water pricing mechanism have not been established yet; (10) water resources management system is less well structured .

2. Practice on integrated water resources management

2.1 Concept of integrated water resources management

2.1.1 According to Dublin principle and GWP's definition, integrated water resources management(IWRM) aims to ensure the coordinated development and management of water, land and related resources by maximizing economic and social welfare in an equitable manner without compromising the sustainability of vital environmental systems. It asks for the public and water users to widely take part in water resources development, utilization, conservation and protection, fully embodies fareness, well coordinates water demands on domestic use, production and ecology, comprehensively balances water supply and demand and requests the legal, administrative, economic, technical and engineering measures for water resources management. It is a new approach and trend for global water resources management. The management of the public and market on water resources shall particularly be strengthened to share water resources by the whole society.

2.1.2 Introduction of the concept. Guiyang Municipality suffered from an unprecedented drought at the end of 1980's resulting with the emergency water supply limitation and again a serious of floods at the mid-1990's. Therefore, the approach of comprehensive water management was developed. With the development of economy and improvement of living standard of the people, it was urgent to harness Nanming River in rural areas of Guiyang Municipality which was then started being treated from 2001 to 2004, initially realizing the target of having clean water, green river banks and beautiful scenery. The introduction of method of integrated management realized the multiple and systematic treatment from the river's upper reaches to the lower reaches, from the water body to the banks and from engineering to ecological treatment approached. In 2004, aiming at realizing rapid economic development and sustainable development of Guiyang Municipality, the engineering measures and non-engineering measures such as policies, economy and management were adopted targeting at solving different types(resource, engineering and water quality) water-shortage problems in Guiyang Municipality. Therefore, the Programme on Integrated Water Resources Management of Guiyang Municipality funded by ADB is selected as t an example for IWRM practice.

2.1.3 Brief introduction on the Program: the Program includes the parts of establishment of urban and rural water supply facilities, agricultural irrigation, irrigation systems rehabilitation, rain-

water collection and storage, rural drinking water supply, water and soil erosion treatment. The Program, with the promotion of rural and urban development , industrial and agricultural water supply and environment management as the core, is dedicated to well distribute the limited local water resources , coordinate the development in water sector for rural and urban areas and realize the sustainable utilization of water resources. With the implementation of the Program, the water demand of the Municipality will be satisfied for quite long time. The construction includes: (1) urban water supply. 3 water- supply projects including Yudongxia Reservoir in Wudang District will be built; (2) county and townships water supply. 43 small reservoirs including Xiguan Reservoir in Qingzheng City, Jinlong Reservoir in Xiuwen County, Maozhulin Reservoir in Kaiyang County and Xintao Reservoir in Wudang District, etc. will be built; (3) irrigation systems rehabilitation. 7 key irrigation systems including those in Qingzheng City, Xiuwen County, Xifeng County, Kaiyang Countyand Wudang District, etc. will be built; (4) rain-water collection and storage . 106,000 projects for rain-water collection and storage are set up; (5) water and soil conservation. 800 km2 of water and soil erosion areas will be treated with the small river basins as the unit .

Through the implementation of the Programs , 86 million m^3 of storage capacity of reservoirs and 3.43 million m^3 of rain-water storage capacity and 0.122 billion m^3 of water supply capacity (435,000 m^3 of water supply capacity added per day) are added, 160,400 mu(15 mu equals 1 hectare) of irrigation area are increased, 165,000 mu of irrigation area improved, 137,000 mu of dry land irrigated, nearly 270,000 people in rural and urban areas provided with water and 800 km^2 of water and soil erosion areas in the key water sources regions treated comprehensively. Through the implementation of the Program, a set of comprehensive water resources management systems suitable for Guiyang is established.

The Program is planned to have investment of 2.4 billion RMB, including 0.15 billion dollar of loan from ADB and 1.2 billion RMB from home. The Program was included into the loan list of ADB at the end of 2004, with technical aid finished in 2006 and loan evaluation passed in May of 2007. In June of 2007, the National Development and Reform Commission approved the Program. It is estimated that the implementation of the Program is going to be completed within the year.

3. Thoughts on implementing integrated water resources management

3.1 Integrated water resource management is imperative.

The features and problems of water resources in Guiyang Municipality are caused by the nature and human beings as well. The understanding to water resources which is basic need for human beings and the national economic and social development has been deepened . It is the only way for solving water-shortage problem to coordinate the social and public water demand, well plan water resources development and utilization, optimize water use and protect and safe the water resources . Through using systematic and basin-based management approach to coordinate the water demands from upper reaches to lower reaches, from the left bank to right bank and from the industrial and

agricultural water demand to domestic water demand, water resources are able to satisfy the demands of the social and economic development and the people's life.

3.2 Implementation of integrated water resources management approach has taken effect.

Insufficient investment has always been one of the problems blocking the development and utilization of water resources in Guiyang. What's more, there are no large controlling water projects built due to the complicated terrain and geomorphologic conditions. After the introduction and implementation of the approach, urban and rural water supply shall be coordinated according to the river basins planning. Taking a small river basin as an example, water and soil conservation shall be the focus at water source, small pools or ponds shall be distributed for scattered people, and small reservoirs are built for urban water supply and irrigation. The water use efficiency will be raised through the irrigation systems' rehabilitation and water-saving. The saved water will be used for urban development and industrial production and the treated waste water will be used for environmental purposes, the treatment to the similar river basins form the main contents of the Program supported by ADB. The Program consists of 65 sub-programs with 100,000 project sites. The introduction and implementation of integrated water resources management approach is widely recognized and supported by the experts at home and abroad and ADB. During the stages of programme preparation and the implementation of ADB,s Technical Assistance project,this approach had also been understood and accepted by the public and relevant departments.With the support by the ADB and the assistance of the experts, the capabilities of the executing units of the Program have been strengthened .

3.3 There is still much to be done for the ADB-supported Program.

The objectives of this Program are to build more water infrastructures and study the water resources management mechanisms suitable to the urban development. To be specific, more funds and new systems will be introduced and human resources capacity built. At present, a number of native working staff including program managers, other managing staff and technical people have been trained and grown up, the new management mode, thoughts and experiences have been introduced through ADB and accepted and used which are helpful in promoting the changes of the concepts, approaches and modes for the Program-implementing agency . However, there are still some difficulties ahead. We are confident and determined to well complete the program to realize the sustainable development of water resources through integrated water resources management.

Concluding Remarks at the High-level Roundtable on Strategy of Extreme Climate Adaptation in China

Dong Zheren
Standing Vice Chair of GWP China

Ladies and gentlemen,

The High-level Roundtable on Extreme Climate Adaptation in China is now going to be over. Please allow me to make brief concluding remarks.

Mr. Chen Lei,the Minister of Water Resource , Mr. Wu Xiaoqing,the Vice Minister of Environmental Protection and Mr. Xu Xiaofeng, Vice Administrator of China Meteorological Administration made their keynote speeches at the conference. Mme. Zhang Meiying,Vice Chairperson,the Chinese People's Political Consultative Conference (CPPCC) followed by other 4 guests. 7 experts shared their presentations with the participants and all of you provided comments and suggestions for the conference. To sum up, the conference is a great success.

The conference has the following features:
Firstly, the participation by the participants from different departments and at different levels. The conference invited the CPPCC and 6 ministries including the Legislative Office of the State Council, National Development and Reform Committee(NDRC), Ministry of Water Resource, Ministry of Environment Protection and China Meteorological Administration, and over 130 representatives from over 70 units and organizations including the United Nations Offices to China, EU and its member countries' embassies to China, international NGOs, local governments, research institutions , universities, civil societies and enterprises.

Secondly, the openness. The conference is a platform for communication and dialogue. With the speeches of the extensive contents and with new ideas, the discussions on the strategic issues and with scientific analysis, the conference has provided optional recommendations for the governments at various levels and the concerned departments. The anticipated results have been achieved by this type of high-level roundtable with the participants including the decision-makers, representatives from NGOs and enterprises and the scholars through open and equal discussions, interactiveness and putting forward recommendations fully embodies the cooperative partnerships.

The key thoughts opinions and recommendations presented at the conference can be summarized as follows:

The extreme climates adaptation is a global issue which needs the common efforts from both the developed and developing counties.

China faces with serious extreme climate situation which is one of the major factors restraining the sustainable social and economic development. With the deepening of industrialization and urbanization, it has been more and more urgent to strengthen the capability of disaster prevention and the efforts on water resource conservation and protection.

The extreme climate adaptation and flood prevention are urgent and great strategic missions for the long-term stability and good governance of the country, happiness of its people and harmonious development of human and the nature. Therefore, we have to attach great importance to it strategically, strengthen legal framework and mechanism reform, and work out the comprehensive counter-measures covering the aspects of politics, economy and society.

The extreme climate adaptation involves many sectors requiring a coordination mechanism including the related governmental departments and industries. Through the cooperation of the departments on water resource, agriculture, meteorology, environmental protection, energy, construction, public health, national land and resources and civil affairs, can the flood and drought disasters brought by extreme climates be relieved, and can flood control security, water supply security, food security, ecological security and energy security be well guaranteed.

The extreme climate adaptation demands for further public participation. The public's rights of information, participation, expression of views and supervision on climate change should be ensured, and the governments shall listen to the opinions of the experts and the public while making decisions to realize the more scientific and democratic decision-making.

The extreme climate adaptation asks for further scientific researches. The impact of climate change relates very much with time and space and the complicated relationship thus having a high uncertainty. Through trans-disciplinary researches and international cooperation, the understanding to the climate change will be more scientific and the relationship between human activities and climate change can be well held. By strengthening the scientific research work and establishing monitoring systems, better supports can be provided for the government's decision-making.

These are just my preliminary summary remarks of the conference. An official report will be worked out by the Secretariat of GWP China to be sent to the government departments, participants and the media, etc.

At last, I, on behalf of the organizers of the conference, would like once again to extend my thanks to the supporting organizations and the efforts made by all the participants.

Thank you very much!

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