全球气候变化与中国水安全圆桌会议

材 料 汇 编

Proceedings of High - Level Roundtable on Global Climate Change and Water Security in China

全球水伙伴中国委员会
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前　言

气候变化是当今国际社会普遍关注的全球性问题。2009年12月7日至19日，《联合国气候变化框架公约》第15次缔约方会议暨《京都议定书》第5次缔约方会议在丹麦的哥本哈根市召开。会议以决定附加文件方式通过了“哥本哈根协议”。尽管这一协议不具有约束力，但它第一次明确认可2度温升上限，而且明确了可以预期的资金额度。哥本哈根会议的这一成果，将成为全球气候合作的坚实基础和新的起点。

中国政府高度重视气候变化问题，会议开幕前两周，中国政府承诺：到2020年单位国内生产总值二氧化碳排放比2005年下降40%-45%，非化石能源占一次能源消费的比重达到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，表现了中国作为负责任大国对世界的贡献。

气候变化一方面使近年来超强台风、城市特大暴雨、山洪灾害等极端灾害事件增多，给防洪安全带来严峻考验；另一方面又将影响水资源的供需关系，供需矛盾将更加突出，同时对水生态和水环境也造成影响。中国是一个人口众多、经济发展水平较低、能源结构以煤为主、应对气候变化能力相对较弱的发展中国家，随着城镇化、工业化进程的不断加快以及居民用能水平的不断提高，中国水安全在应对气候变化方面面临严峻挑战。

为推动我国适应气候变化，探讨建立更有效的区域合作与协调机制，寻找防灾减灾的共同策略，以减轻因气候变化引起的自然灾害影响；探讨以水资源的可持续利用促进经济社会的可持续发展，全力保障供水安全和生态安全；促进相关行业和部门的交流与合作，积极借鉴国外先进经验；在适应气候变化方面达成基本共识。2010年4月8日，在中国水利部和环境保护部的支持下，由全球水伙伴中国委员会和瑞士发展与合作署主办，大自然保护协会、联合国教科文组织北京办事处、联合国儿童基金会驻中国办事处、中国水利水电科学研究院和中国大坝协会等协办的全球气候变化与中国水安全高级圆桌会议在北京召开。会议由全国人大财经委员会副主任委员、水利部原部长、全球水伙伴中国委员会主席汪恕诚主持。

中国人民政治协商会议全国委员会副主席张梅颖出席会议并致辞，水利部部长陈雷，国务院参事、科学技术部原副部长刘燕华和环境保护部总工程师万本太作了主旨演讲。联合国驻华系统气候变化与环境工作组主席、联合国工业发展组织驻华代表爱德

席会议并致辞。亚洲开发银行气候变化高级专家丁大庸、中国水利部和联合国儿童基金会“气候变化对地下水影响”合作项目中方专家组组长高占义教授、中国工程院王浩院士、徐祥德院士和张建云院士等做了主题报告。

此是全球水伙伴（中国）为旨在促进跨行业、跨部门平等对话、交流合作而举办的第七次高级圆桌会议，会议设四个主要议题：节能减排与气候变化，气候变化对中国水资源的影响，气候变化与防洪安全、饮水安全、粮食安全和生态安全，应对气候变化与水资源综合管理等。参会人员在促进相关部门与行业进行通力合作，推动积极应对全球气候变化，保障中国水安全等方面进行了深入和热烈的讨论。

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112人到会。会后，多家中央媒体对会议进行了详细报导。

为使会议取得的成果在水资源综合管理领域中发挥更大作用，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

2010年6月

Preface

Climate change is the global issue concerned by the international community at present. From December 7 to 19, 2009, the 15th Conference of the Parties for the "United Nations Framework Convention on Climate Change" and the 5th Conference of the Parties for the "Kyoto Protocol" were held in Copenhagen, Denmark. The conferences adopted the "Copenhagen Accord" in the form of additional papers. Although this document does not have binding power, but it has been decided that the increase in global temperature should be below 2 degrees Celsius for the first time and the amount of funds that can be expected also clarified. This result of the Copenhagen conference has laid a solid foundation and presents a new starting point for the global cooperation toward climate change issues.

The Chinese Government attaches great importance to climate change issues. Two weeks before the opening session of the Copenhagen conference, the Chinese Government committed to reduce carbon dioxide emissions per unit of GDP by 40%-45% by 2020 compared with that in 2005, the non-fossil energy per unit of energy consumption is expected to be about 15%, the forest area and stalking volume will increase 40 million hectares and 1.3 billion cubic meters respectively compared with those in 2005. All these efforts represent China's contribution to the world as a responsible country.

As a result of climate changes, in recent years the extreme climate events such as extraordinary typhoons, rainstorms in urban areas and mountainous torrential flooding disasters have occurred increasingly which have brought great challenges to flood control on one hand; and on the other hand, it has intensified contradiction between the water supply and demand while also affecting water ecology and water environment. As a developing country with a large population, relatively low level of economic development and coal-dominated energy structure, China has a relatively weak capacity to address climate change. Along with the fast growth of urbanization and industrialization and more public demand for energy consumption, China's water security faces serious challenges as a result of climate change.

For the better adaptation of climate change in China, the High-Level Roundtable on Global Climate Change and Water Security in China, sponsored by Global Water Partnership China and Swiss Agency for Development and Cooperation, supported by China's Ministry

of Water Resources and Ministry of Environment Protection and co-sponsored by The Nature Conservancy, UNESCO Office Beijing, UNICEF Office for China, China Institute of Water Resources and Hydropower Research and Chinese national Committee on Large Dams, was held on April 8,2010 to discuss about the establishment of mechanisms for better cooperation and coordination between different regions to work out common strategy for disaster prevention and control to curb the influence of natural disasters due to climate change and about the sustainable utilization of water resources for the sustainable development of economy and society in order to achieve water supply safety and ecological security. It also aims to promote the exchanges and cooperation between various industries and sectors, learn the advanced experiences from other countries and achieve the common understanding on climate change adaptation.

The conference was chaired by Mr.Wang Shucheng, Vice Chairman of the NPC Financial and Economic Committee, the former minister of Ministry of Water Resources and the Chair of Global Water Partnership China.

Mme Zhang Meiying,Vice Chairperson of China People's Political Consultative Conference, attended the meeting and delivered a speech. Mr. Chen Lei, the Minister of Ministry of Water Resources, Mr. Liu Yanhua, the Consultant to the State Council and the former Vice Minister of Ministry of Science and Technology and Mr. Wan Bentai, the Chief Engineer of Ministry of Environment Protection gave keynote speeches. Mr. Edward Clarence-Smith, the Chair of UN Climate Change and Environment Working Group in China, Resident Representative of UN Industrial Development Organization in China, Mr. David McLoughlin, the Deputy Resident Representative of UNICEF China Office, Dr. Walter Meyer,the Councilor of Switzerland Embassy to China and Mr. Khalid Mohtadullah, the Senior Adviser of Global Water Partnership attended the meeting and delivered speeches. Mr. Tae Yong Jung, the Senior Expert on Climate Change of Asian Development Bank, Prof. Gao Zhanyi,the Team Leader, the Chinese Ministry of Water Resources and UNICEF cooperated project impact of climate change on groundwater" Mr. Wang Hao,Mr. Xu Xiangde and Mr. Zhang Jianyun,the academicians of China Academy of Engineering, also made presentations.

This is the seventh High-level Roundtable organized by Global Water Partnership China, aiming at promoting cross-sectoral and inter-departmental dialogues, exchanges and cooperation, with four main topics: energy conservation and climate change; impact of

climate change on water resources in China; relationship between climate change and flood control safety, drinking water safety, food safety and ecological security; climate change adaptation and integrated water resources management. Participants have had in-depth and warm discussions on aspects like the promotion of cooperation between the related departments and sectors, the addressing of global climate change issues and the protection of China's water security.

There are altogether 112 participants from the State Council's relevant ministries, the departments of Ministry of Water Resources, United Nations organizations' offices in China, over 10 other international organizations, research institutes, universities, enterprises and non-governmental organizations and media. After the conference, it was reported by several national media.

In order to have the conference results shared by others and contribute to the integrated water resources management, it is decided that Global Water Partnership China Secretariat edits and publishes this proceedings.

Due to the short time available and the limited ability, there are inevitably shortcomings and mistakes and they are subject to your correction.

Global Water Partnership China Secretariat

June 2010

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在全球气候变化与中国水安全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！

两年前的今天，我曾出席了“中国水与卫生高级圆桌会议”，两年后，我再次与来自五大州的新朋故友相聚一堂，感到格外高兴。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。

当前，全球变暖引起的极端气候已呈常态化趋势，使中国本已日益突出的水安全和固有的脆弱性进一步加剧。去年以来，我国西南降水丰沛的云南、贵州、广西、四川、重庆等省区，发生了秋、冬、春连旱。炎炎烈日灼烧着干裂的土地，赤地千里，超过6000万的受灾人口，相当于加拿大与澳大利亚两国人口总和，基本生活用水都面临着严重的困难。乡亲们男女老少昼夜跋涉上山寻找水的场面，令人触目惊心。有人惊呼：母亲河已经没有眼泪。

在西南持续大旱的同时，肆虐的沙尘暴又开始席卷我国北方地区。这场近年以来影响我国范围最广、强度最大的沙尘天气，波及到包括海峡对岸的台湾在内的我国17个省区市，以及临近的日本与韩国。20天前袭击北京的那场沙尘暴，以瞬间8级的狂风，从蒙古高原“搬运”了15万吨沙尘到北京，强浮尘天气使得北京的天空呈现出奇异的明黄色。

显然，气候异常变化的影响并不仅仅局限于中国。北半球中高纬度的寒潮和暴雪，不断刷新有气象记录以来的历史极值，而在南半球的澳大利亚，暴雨引发的洪水与泥石流，造成10万市民家中停电，交通瘫痪，经济损失高达数亿美元。

毫无疑义，全球气候变暖导致了许多灾难性的后果，生物多样性遭到破坏，1万7千

种生物濒临灭绝，地球生态正在逼近极限；冰川消退、永久冻土层融化、海平面上升、飓风、洪水、暴风雪、干旱及森林火灾等，使人类的生存环境面临着日益严峻的威胁；而极端气候事件带来的另一个直接后果是农业大幅度歉收，世界范围内对陆地、食物和水源的争夺有愈演愈烈之势，粮食安全成为大国博弈、地区冲突和一些国家政局持续动荡的导火索。

各位朋友，水是生命之源，它滋润着万物，孕育着生命和文明，古代人类的四大文明无一不是诞生在江河之滨；进入到工业时代和信息时代，水与人类的活动更是息息相关。然而，世界水资源的形势却不容乐观，淡水资源匮乏已危及地球的生命支持系统，全球有超过八亿人没有安全的饮用水源，每年有五万多亿吨水体被污染。如果有一天，地球母亲再无乳汁哺育我们，即便我们创造再多的财富，人类也不可能活得有尊严。从这个意义上说，水不仅作为资源，更是生命。

老子《道德经》上说，上善若水，水滋润万物而不与万物相争，它的行为最接近自然规律。人类也要遵循自然规律，要对大自然心存敬畏，与自然和谐相处，合理地开发、利用和分配水资源。如果人类不能善待自然，违背自然规律，那么带给人类福祉的水，本来与世无争的和谐之水，同样也可以成为战乱、饥饿和纷争的祸端。这不禁让我想起中国古代哲学家庄子的“相濡以沫”的典故，大意是说泉水干涸，暴露于陆地上的两条鱼，为了生存，相互以唾液润湿对方。面对来势凶猛的气候变化与水安全的重大挑战，人类也要发扬“相濡以沫”的大爱精神，因为经济全球化早已把各国的利益紧密地联系在一起，没有人能够置身局外而独善其身。

气候变化与水安全是全球性的难题，需要我们像全球共同应对金融危机一样同舟共济，拿出信心、诚意和勇气，采取一致的行动，以对话代替对抗，积极开展多领域的务实合作。我相信，人类文明发展到今天，我们有足够的良知、智慧、能力和机制，共同应对全球性的气候变化与水安全问题，以水资源的可持续利用，保障世界经济社会的可持续发展。让我们携起手来，积极探索人与自然和谐共生的生态文明之路，大力发展低碳经济，责无旁贷地承担起节能减排的国家责任，努力建设节水型社会，让自然生态得以平衡修复，让山川秀美、风调雨顺、江河安澜，让人类铸剑为犁、守望相助、共同呵护我们的地球家园。

问渠哪得清如许？为有源头活水来。共同的使命和信念把我们凝聚在一起，这次全

球气候变化与中国水安全的高级圆桌会议，不仅为我们提供了难得交流机会，更重要的是形成共识，重塑我们人类与气候、生态、环境和水和谐相处的信心。

最后，我衷心预祝这次研讨会圆满成功。

谢谢大家！

在全球气候变化与中国水安全高级圆桌会议上的致辞

联合国驻华系统气候变化与环境工作组主席、
联合国工业发展组织驻华代表

尊敬的各位来宾，

大家上午好！

首先请让我来介绍一下有关于水的开发和利用方面的情况。我们都知道，全球气候变化对各国的水资源都有很重要的影响。但是，这些影响还没有被完全理解，尤其是在气候敏感的领域。结合联合国气候变化的合作框架，我们已经组织开展了一项关于气候变化对黄河流域水资源的影响方面的调查活动，不仅仅是要了解现在的影响，而且要看到其未来的影响。也就是说，我们想象一下在未来有什么不同的影响。通过这项调查，将会总结出水评价的典型经验。

我们看到，有关地下水方面的事件也在不断增长，尤其在一些农村地区城镇化进程也都在加快。所有这些问题由于气候变化的原因而更加严重了。联合国项目框架也正在实时监控。我们的这个活动也正在开发一些模型，将进一步衡量气候变化对地下水的影响，评估地下水污染的影响。我们注意到地下水的开发利用问题，尤其是在一些干旱地区过度开发使用地下水，但是这种开发利用并没有很好地规划和进行严格的管理。联合国也做了一些具体项目，通过项目的实施去考虑在紧急状况下利用地下水进行供水的方案。

在北京，他们也希望可持续地开发、利用和管理地下水，并建成地下水库。

另外，联合国开展的工作是确保饮用水的安全，我们引进了一些非常先进的制度和水管理方法，这和中国政府第十一个五年计划中的有关目标也是一致的。

在中国，更好地保护水的意识还应该进一步提高。在2007年之后联合国已经开发了

一个项目，希望把世界上最好的实践经验引进到中国，也希望予以更多的推广、宣传和教育。现在，我们已经看到就此编写了很多教科书，希望能提供给中国的一些中学，而且把它融入到全国的教学课程之中。

女士们、先生们，以上是关于我们在中国开展的水资源有关活动的简单介绍。

最后，预祝这次会议取得圆满成功！

谢谢！

在全球气候变化与中国水安全高级圆桌会议上的致辞

尊敬的张梅颖主席， 尊敬的陈雷部长，各位来宾， 女士们，先生们：

气候变化是最近世界媒体和政界人士的“ 热门话题 ”。

当前影响中国南部的严重旱情和由于积雪融化造成的新疆洪水可能是气候变化对当地的天气模式变化影响的例子。气候变化可以使海平面上升，冰川萎缩，产生暴风雨、强降水和洪水，以及导致气温升高和干旱。

儿童是联合国儿童基金会的核心之所在 ，他们可能会受到气候变化造成的粮食短缺、水模式的转变和虫媒或其他疾病的影响，他们自己也会受到由于气候变化引起的环境变化的影响。这些问题存在于 广大的范围之内，并可能影响到家庭和社会和谐；影响到住户、地方和区域经济结构，影响到人口流动，甚至可能造成对国家主权问题的紧张局势。儿童是这些可能的变化引起的冲突中最脆弱的受害者。

目前，关于气候变化的研究，大多集中在大气、海洋和地球表面，很少有科学家在深入研究气候变化的更深刻影响，如关于地下水系统方面的研究。几乎没有人知道土壤、地表水、地下水在降雨的变化、温度、输水模式的影响下是如何变化的。

在西班牙千年发展目标成就基金的支持下，联合国儿童基金会正在与中国水利部与其他机构合作实施的“ 气候变化对地下水影响 ”的项目，以填补在理解气候变化与地下水水量和水质之间关系的空白。该项目与由同一机构支持的联合国教科文组织与水利部开展的气候变化对黄河流域地表水影响的活动互为补充。

虽然该项目在2008年年中才开始实施，但在联合国儿童基金会的支持下已经开始汇总调查成果。地下水变化的模型化工作已接近完成，并有望使中国可以预测地下水水位变化的趋势，并提供一个区域一级水资源综合管理工具。

另外，在本项目结束时，有望在这项工作的基础上可以向决策者提出有关地下水管理的政策性建议。

联合国儿童基金会也使用其他战略支持与气候变化有关的工作。例如，预计气候变化会增加自然灾害发生的频率和规模，联合国儿童基金会通过提供水和卫生设施十分积极地做出了反应。

联合国儿童基金会还在家庭和社区一级把儿童作为“沟通代理人”，并在去年12月举办的哥本哈根世界首脑会议上组织了儿童论坛。在我们的支持下，五名中国儿童参加了论坛，他们现在活跃在气候变化有关的公共活动当中。

主席先生、各位朋友：借此机会，我谨代表联合国儿童基金会，向你们和全球水伙伴组织这次会议表示衷心的感谢。它提供了一个平台，让我们互相交流和分享信息。这是一个很好的解决气候变化问题的机会。

保护我们生活的星球需要各个政府、组织和个人之间团结一致，并决心共同付出努力。

一个适合儿童的世界是一个我们能够生存的世界。据近代史料显示，由于生态系统的变化，中国北方已经有14个城市已经消失，中国20%的土地已变为沙漠，影响到四亿个生命，由于沙尘暴、地下水水位的变化则会影响到更多的人。气候变化问题现在已经加深了大家在全球范围内共同努力的紧迫性，地球上每个人的利益都是一致的，不论其贫富、种族或宗教信仰有何不同。因为我们都依赖于运行在全球范围内的生态系统，历史表明没有持续运行的生态系统的存在，我们的存在也会消失。我们必须接受这一挑战，并立即采取行动，后代的生存取决于今天我们所采取的行动，这就是我们的选择，也是地球的希望。

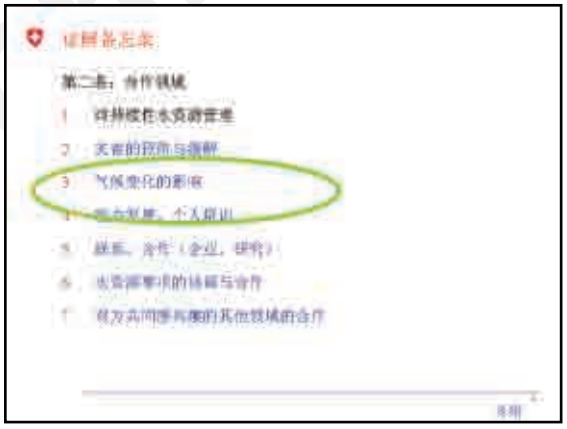
在这个意义上来说，我们真诚地期待着与您进一步的合作。

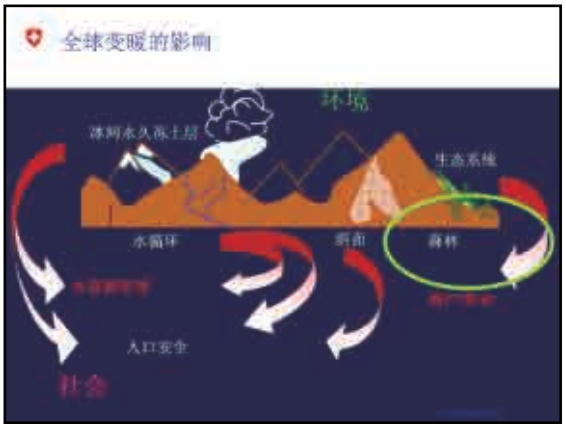
我祝愿本次会议取得圆满成功。

谢谢。

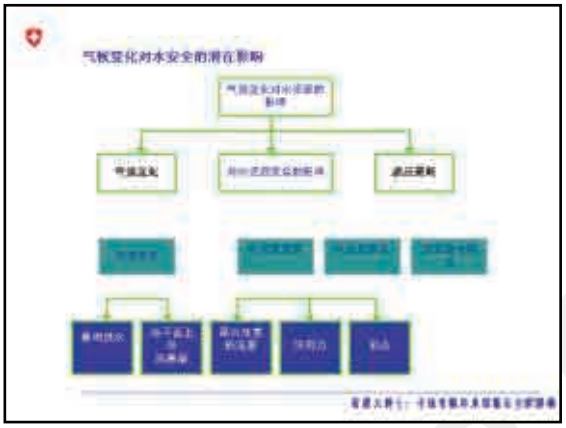
在全球气候变化与中国水安全高级圆桌会议上的致辞

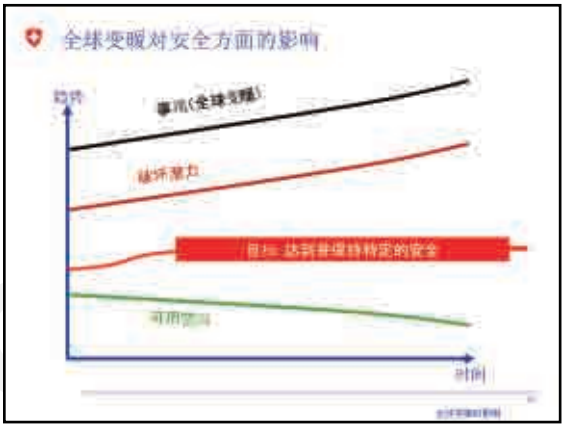
瑞士驻华使馆参赞　　孟葳

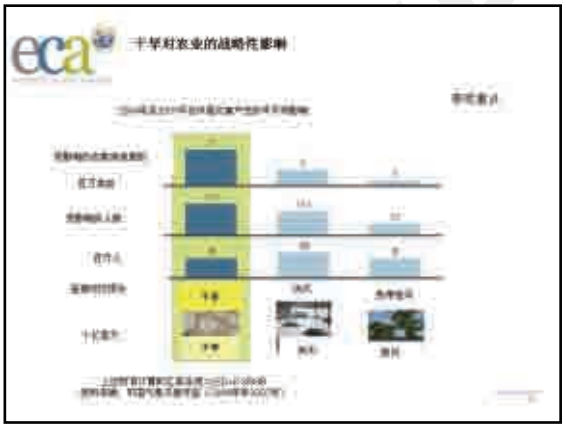


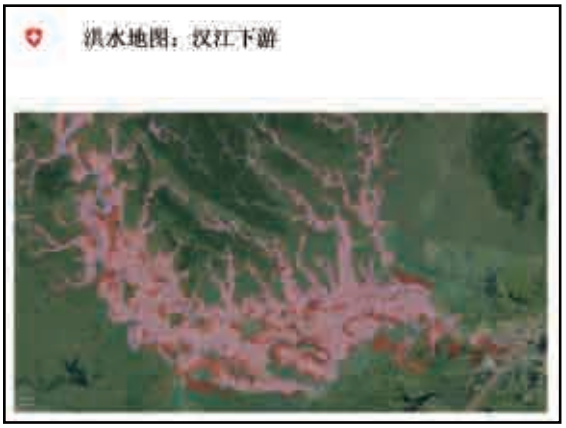

全球变暖的影响
环境
冰河永久冻土层
生态系统
水循环
表面
森林
人口安全
社会

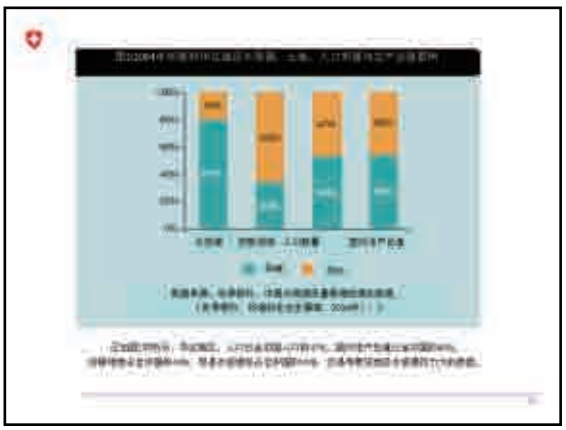

全球变暖对水管理的影响


气候变化对水安全的潜在影响


全球变暖对安全方面的影响
事件(全球变暖)
脆弱度
目标: 达到普遍特定的安全
可用资源
时间


eca
干旱对农业的战略性影响


洪水地图：汉江下游

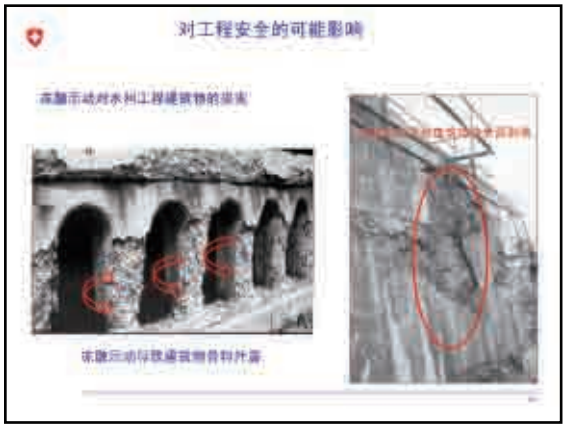



对供水安全的可能影响


对供水安全的可能影响

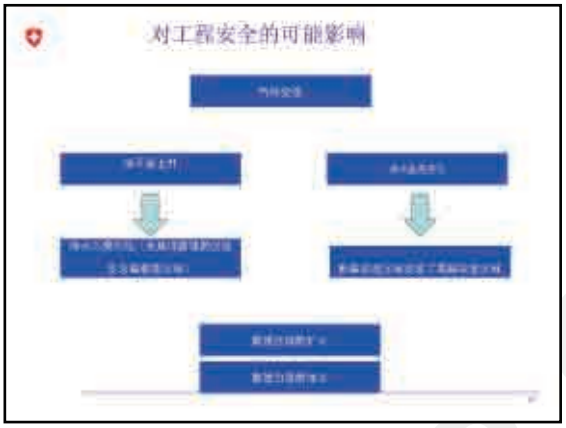

对供水安全的潜在影响

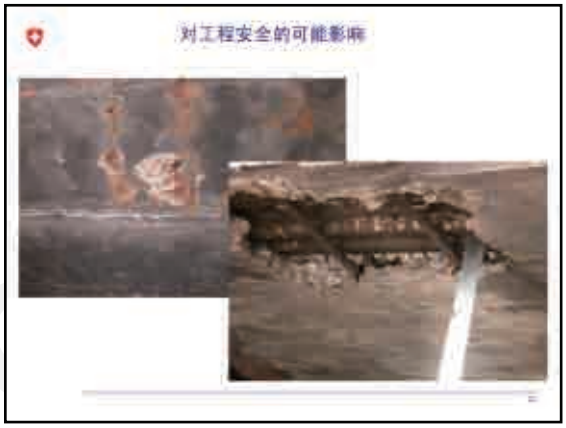

对工程安全的可能影响

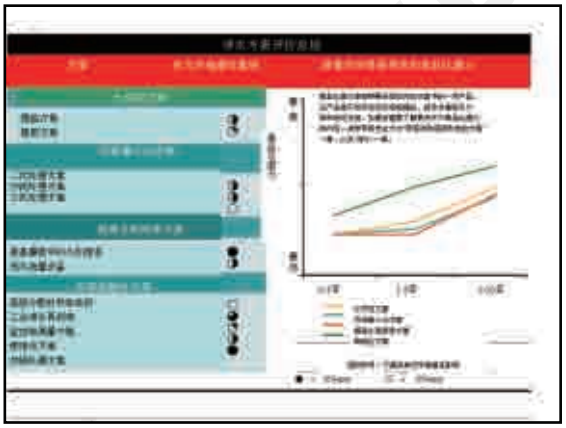

对工程安全的可能影响


对工程安全的可能影响


对工程安全的可能影响


对工程安全的可能影响


对工程安全的可能影响

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在全球气候变化与中国水安全高级圆桌会议上的致辞

全球水伙伴高级顾问　　卡里德·穆塔杜拉

尊敬的张梅颖女士、陈雷部长、汪恕诚主席，各位来宾，女士们，先生们：

能够代表全球水伙伴总部来出席《全球气候变化与中国水安全高级圆桌会议》并与各位共同探讨这方面与水有关的重要问题，我深感荣幸。

全球水伙伴中国委员会已经成立十年了。十年来，因其在水相关部门、机构和其他利益相关者之间有效地发挥了桥梁作用，成绩斐然，令人感佩。如今，全球水伙伴中国委员会作为中性平台，已经享有很高的声誉，也具备组织象今天这样高规格会议的能力。全球水伙伴中国委员会的分支机构---黄河水伙伴、福建水伙伴、河北水伙伴、陕西水伙伴和湖南水伙伴也在发挥各自的作用，推动着重要的利益相关者在一起进行对话，增强对重要水问题如节水和河、湖、灌区以及大城市的防污战略的认识。全球水伙伴中国委员会在工作方法上一直保持着综合性、参与性与能力建设为主的特点，它已经走过很长一段征程，但在保证中国水安全问题上还有更多的工作要去完成。

水利部部长陈雷先生、原部长汪恕诚先生和杨振怀先生一直在指导并大力支持全球水伙伴中国委员会的工作，使其在保证中国水安全工作上起着重要作用。基于此，全球水伙伴中国委员会也吸引了国内外知名组织的专家为其技术委员会工作。同样，董哲仁先生的工作责任是贯彻落实全球水伙伴中国委员会理事会制定的方针政策，成绩令人称赞。董先生在环境可持续发展领域的能力、建树和智慧使全球水伙伴中国委员会在关键时期保持着领先地位。很高兴，董先生能够一如既往地担任全球水伙伴中国委员会的领导工作。

由于气候变化的影响，中国水安全面临巨大挑战。当然，对于存在着水资源逐渐短缺、污染严重和分配不均问题的世界其他地区来说，也同样如此。为应对这一挑战，中国中央及地方各个水利相关部门需要共同制定政策，并保证政策的有效实施。为了这个需要，全球水伙伴中国委员会将在未来继续发挥自己的作用，组织相关人员、机构、省

级政府、流域机构和其他利益相关者，在政策制定和实施的过程中做好协同工作。

在此特别感谢瑞士政府与我们共同举办高级圆桌会议。希望此次合作有助于我们在未来建立紧密的伙伴合作关系。

全球水伙伴总部再次申明，将一如既往地支持中国委员会的工作。借此机会也向我们的所有利益相关者表示感谢，特别是感谢一直以来支持我们工作的水利部及其所属机构。相信若没有你们的帮助，我们这十年不会如此顺利和平坦。再次感谢尊敬的陈雷先生和与会的各位嘉宾，谢谢你们给予全球水伙伴中国委员会的鼓励和支持。希望我们能在将来取得更多的成绩，相信我们能够共同更好更有效地解决气候变化引起的水安全问题，这也是这次举办高规格的会议之目的所在。在此转达全球水伙伴秘书长的问候，预祝本次高级圆桌会议取得圆满成功。

谢谢。

积极应对全球气候变化 着力保障中国水安全

——全球气候变化与中国水安全高级圆桌会议主旨发言

水利部部长　陈雷

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和瑞士发展与合作署举办的“全球气候变化与中国水安全高级圆桌会议”。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、有关国际组织和国家政府、各界人士表示衷心的感谢！

全球气候变化深刻影响人类生存和发展，是各国共同面临的重大挑战。妥善应对气候变化，事关经济社会可持续发展，事关世界各国人民福祉。中国作为负责任的发展中国家，高度重视全球气候变化问题，在发展中国家中第一个制定了《应对气候变化国家方案》，出台了一系列应对气候变化的政策措施。去年，中国政府制定了2020年控制温室气体排放行动目标，提出到2020年，单位国内生产总值二氧化碳排放在1990至2005年下降46%的基础上，到2020年比2005年再下降40%~45%，非化石能源占一次能源消费比重达到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。这是中国根据自身国情采取的自主行动，是为全球应对气候变化做出的巨大努力。

水是全球气候变化最直接和最重要的影响领域。受全球气候变化影响，近年来中国水资源时空分布不均问题更加明显，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。2003年和2007年淮河两次发生流域性大洪水，2005年珠江流域发生1915年以来最大洪水。每年都有7～8个台风登陆，有些台风风力之强、降雨之大、影响之广历史罕见。干旱灾害呈现频次增加、范围扩大、过程延长、影响加重的态势。1997年至2000年北方大部分地区持续4年严重干旱，2006年至2007年重庆、四川发生百年不遇的夏秋冬春四季连旱，2009年中国连续发生4次大范围严重干旱，部分地区干旱持续时间之长、缺水程度

之重、波及范围之广、造成危害之大，都是历史上少见的。

去年入秋以来，中国西南地区云南、贵州、广西、重庆、四川等省（区、市）遭遇历史罕见的持续特大干旱，降水与多年同期相比偏少5~9成，主要江河来水量较多年同期偏少3~8成，特别是云南、广西和贵州的干旱已持续半年之久，一些地方旱情达到百年一遇，对人民生活、农业生产造成了严重影响。近期西南地区虽有一些降雨过程，但对缓解旱情的作用不明显，同时全国其他地区的旱象也开始露头。截至4月6日统计，全国耕地受旱面积807万公顷，全国因旱饮水困难人数达到2595万人，是多年同期的2倍多。

面对严峻旱情，中国政府高度重视，胡锦涛主席多次作出重要指示，要求加大工作力度，解决好旱区居民的饮水困难问题，努力减少灾害损失。温家宝总理亲赴广西、云南和贵州重旱区视察旱情，看望慰问灾区群众，强调决不能让一名群众没水喝。回良玉副总理深入云南检查指导抗旱工作，并主持召开国务院专题会议，研究部署抗旱和春耕生产工作。中央政府安排特大抗旱经费和综合抗旱资金12.15亿元，提前拨付农村饮水安全、小型农田水利建设等资金64亿元，支持西南旱区抗旱工作。各有关部门，地方各级政府和社会各界采取了一系列重要举措，紧急调拨资金、物资、人员，组织干部群众积极抗旱，做了大量卓有成效的工作。国家防总、水利部及时启动抗旱Ⅱ级应急响应，先后派出33个工作组和专家组赴西南重旱区和北方冬麦区协助指导抗旱工作，组织调集一大批水利专家和抗旱物资设备支援灾区抗旱，加强抗旱水源统一调度和人饮解困分类指导，采取水库供水、应急调水、打井取水、拉水送水等多种应急措施，全力以赴确保饮水安全，努力减少旱灾损失。

积极应对全球气候变化，切实保障中国水安全，是中国现代化建设过程中必须高度重视和着力解决的重大战略问题。当前和今后一个时期，我们将认真贯彻落实科学发展观，积极践行可持续发展治水思路，坚持减缓与适应并重的原则，加强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，从整体上增强水利应对气候变化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。

一是夯实城乡抗旱基础设施。这次西南大旱暴露出中国西南地区抗旱水源工程不足、水资源调蓄能力较低、水利基础设施建设相对滞后的问题。中国将在全力开展抗旱减灾工作的同时，加快编制全国和地方抗旱规划，启动西南五省水源工程规划和小型水

利设施建设规划编制工作；抓紧开工建设一批控制性骨干水利工程和中型水库等重点水源工程，提高水资源配置和调控能力；因地制宜兴建小水窖、小山塘等“五小水利”工程，加快山丘区雨水集蓄利用，提高山区蓄水供水能力；积极开发利用西南岩溶地区地下水资源，搞好应对特大干旱的战略水源储备；加强农田水利基础设施建设，完善农田灌排体系，提高农业抗御干旱能力。

二是完善防洪减灾工程体系。洪涝灾害始终是中华民族的心腹之患，必须进一步加快治理步伐，确保江河安澜。按照国务院批复的七大江河流域防洪规划，继续推进大江大河大湖及其重要支流治理，完善流域防洪减灾工程体系。加快重点蓄滞洪区安全建设，确保区内居民的防洪安全，实现洪水“分得进、蓄得住、退得出”。集中对洪涝灾害发生频繁、灾害损失严重的中小河流进行系统治理，逐步提高中小城镇和农村的防洪能力。全面开展山洪灾害防治工作，最大程度地减少山洪灾害造成的伤亡和损失。

三是提高防汛抗旱应急能力。加快推进国家防汛抗旱指挥系统二期工程建设，提高防汛抗旱现代化水平。抓好防洪减灾预案体系建设，进一步健全“防、抢、撤、救”各项预案，形成“纵向到底、横向到边”的预案体系，建立快速、高效、有序的应急响应机制。完善全国水文站网体系，加强雨情水情预测预报，建立旱情监测预警和决策支持系统，提高水旱灾害预报预警的超前性、准确性。加强防汛抗旱服务体系建设，完善专业防汛抗旱队伍、民防队伍和解放军、武警部队四位一体的防汛抗旱减灾机制，做好防汛抗旱物资储备，增强防汛抗旱应急保障能力。

四是全面加强水资源综合管理。把落实最严格的水资源管理制度作为促进经济发展方式转变的重要手段，抓紧建立和完善水资源开发利用、水功能区限制纳污、用水效率控制等指标体系，健全相关法律制度，切实强化取水许可、水资源论证、节水考核、入河排污口设置等方面的管理和执法监督，充分发挥水资源要素在转变经济发展方式中的基础性、约束性和导向性作用，遏制不合理用水需求，改善水生态环境，提高用水效率和效益，推动经济社会发展与水资源、水环境承载能力相协调。

五是优化水资源配置和调度。加快南水北调工程建设，构建我国“四横三纵、南北调配、东西互济”的水资源战略配置格局。继续发挥区域水资源配置工程作用，缓解局部地区严重缺水的状况。积极探索河湖水系连通，构建引得进、蓄得住、排得出、可调控的江河湖库水网体系，实现调水引流、多源互补、丰枯调剂、以清释污。加强水库群

联合调度，全面发挥水库的调蓄功能，保障生活、生产、生态用水需求。

六是大力推进节水型社会建设。建立以需水管理为核心、以水权水市场为基础的制度体系，形成有利于节水的体制机制，建立自律式发展模式，大力推行节约用水。在农业领域，把节水灌溉作为一项根本措施，加快大中型灌区和井灌区节水改造，因地制宜大力推广渠道防渗、管道输水、喷灌、滴灌、微灌等高效节水技术，发展旱作节水农业。在工业领域，优化调整区域产业布局，大力发展循环经济，重点抓好高耗水行业节水，严格实施建设项目节水“三同时”制度。在城市生活领域，加强供水和公共用水管理，加快城市供水管网改造，全面推广节水器具，大力提高公众节水意识。

女士们、先生们！应对全球气候变化、保障水安全是全人类的共同责任。中国愿意在防洪、抗旱和水资源配置、节约、保护等一系列领域中继续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，为应对全球气候变化，保障中国乃至世界的水安全做出新的更大贡献！

最后，预祝会议取得圆满成功！

强化水污染防治　保障水环境安全

——在全球气候变化与中国水安全高级圆桌会议上的讲话

环境保护部总工程师　　万本太

主席先生，女士们、先生们：

上午好！很高兴参加由全球水伙伴中国委员会、瑞士发展与合作署联合举办的“全球气候变化与中国水安全高级圆桌会议”。我受周生贤部长委托，代表中华人民共和国环境保护部对会议的召开表示热烈的祝贺！

众所周知，水安全状况与经济社会和人类生态系统的可持续发展紧密相关，水安全已成为国家安全的一个重要内容，与国防安全、经济安全、金融安全有着同等重要的战略地位。而水环境安全则是水安全的重要组成部分。如今，水环境安全已经成为制约中国经济、社会可持续发展的关键因素。今天，我就中国水环境安全面临的挑战，以及中国政府所做的努力和下一步对策，与在座的各界朋友进行交流和探讨。

一、中国水环境安全面临的挑战

中国水问题严重，水资源短缺、水环境恶化、水旱灾害频发等问题日益突出。近年来，由于全球气候变暖，水资源量及其时空分布发生变化，极端水旱灾事件频发，影响了水环境安全。同时，由于长期以来的粗放型增长方式，使得在经济高速增长的同时，付出了巨大的资源和环境代价，长期积累的矛盾尚未解决，新的环境问题又陆续出现。在这种情况下，如何做好水环境保护工作，是我们面临的严峻挑战。

水污染现状不容乐观。据有关研究全国水污染物排放总量远超过水环境容量，从根本上改善水环境质量任重道远。全国地表水国控断面中，劣Ⅴ类断面所占的比例超过了五分之一。湖泊水库富营养化问题日渐突出，部分湖库和河流水华现象频繁发生。

饮水安全仍然面临威胁。目前，中国饮用水水源地的环境管理仍比较薄弱。一些

城市没有备用水源，部分农村人口存在饮水不安全问题。少数地方地下水饮用水源铁、锰、硝酸盐等物质超标。

全球气候变化加剧了水环境的问题。全球变暖导致的干旱缺水，使河道断流、地下水超采、湿地减少、河床萎缩、土地荒漠化等一系列生态环境问题更加突出，流域水体污染严重的现状短期内难以得到根本改变。另外，气温升高之后，导致水体生物的生长与分布规律发生变化，容易产生新的水生态问题，比如富营养化加快问题。

二、中国在保护水环境安全方面所做的工作

水环境问题危害人民群众健康，影响社会稳定和生态环境安全，严重制约经济社会的可持续发展。加大水污染防治工作力度，努力改善水环境质量，提高水环境安全水平，是中国建设生态文明、实现经济社会又好又快发展，必须着力加以解决的重要课题。为此，中国政府开展了以下方面的工作：

水环境保护的基本制度逐步建立。新修订的《水污染防治法》已于2008年6月1日起实施。新的《水污染防治法》明确提出要保障饮用水安全，全面推行排污许可制度，确立超标违法原则和强制淘汰污染落后产能机制，还增加了水污染事故处置、污水集中处理设施监管、污染源自动监控设备等方面的规定，尤其加大了对违法行为的处罚力度。进一步理顺了水污染防治管理体制，完善了环境管理制度体系，明确了地方政府责任，为各级政府和有关部门全面推进水污染防治工作奠定了坚实的法律基础。

水污染物排放总量得到有效控制。国务院成立了以温家宝总理为组长的国家应对气候变化和节能减排工作领导小组，发布了《节能减排综合性工作方案》和《中国应对气候变化国家方案》，对包括减少主要水污染物排放总量在内的节能减排和应对气候变化工作进行了全面部署。从中央到地方，严格控制水污染物排放总量，加强水污染防治工作力度，加大产业结构调整、淘汰落后产能、提高环境准入门槛、实施清洁生产等各项政策措施正逐步发挥作用。“十一五”前四年累计单位国内生产总值能耗比2005年下降14.38%，化学需氧量排放量比2005年下降9.66%。

重点流域水污染防治取得突破。中国政府高度重视“三河三湖”（淮河、海河、辽河，太湖、巢湖、滇池）、松花江、三峡库区及其上游、南水北调水源地及沿线、黄河

小浪底库区及上游等重点流域污染防治工作，组织编制并实施了专项规划，提出了“让江河湖泊休养生息”的各项政策措施。“十一五”期间，各专项规划共安排治污项目2712个，总投资1600亿元。截至2008年底，已建成和在建项目1270个，占46.8%；在建项目785个，占28.9%。国家建立了全国环境保护部际联席会议制度，定期专题研究重点流域水污染防治工作，解决流域治污的重大问题。国务院办公厅印发了《重点流域水污染防治专项规划实施情况考核暂行办法》，重点流域省界断面水质考核制度全面建立，成为推动重点流域治污的关键抓手。近年来，对太湖、巢湖等九大重点湖库开展了生态安全评估与调查工作，提出相应的综合治理方案，力争做到一湖一策。

饮用水安全保障工作不断加强。国家制定并实施了《全国城市饮用水安全保障规划》，将水源地保护作为饮用水安全保障的核心任务。制定了《全国城市饮用水水源地环境保护规划》，明确了城市饮用水源环境保护的目标、原则、主要任务及保障措施。为了解决严重影响农民健康的水质问题，以及局部地区的严重缺水问题，实施了《全国农村饮水安全工程“十一五”规划》。相继开展了全国城镇和乡镇集中式饮用水源地基础环境状况调查工作，初步摸清了底数，首次明确了4002个城镇集中式饮用水水源和2.5万个乡镇集中式饮用水水源环境管理对象，提出了相应的保护对策。

环境执法与应急管理工作逐步强化。近年来，中国连续开展打击违法排污企业保障群众健康环保专项行动。2009年，全国出动执法人员242万余人次，检查企业 98万多家次，立案查处环境违法问题1万余件。印发了《关于加强环境应急管理工作的意见》，组建国家环境应急专家组，推进环境应急管理体系建设。各地制定各类环境应急预案3500多件，实行24小时应急值班制度，有效防范了水突发环境事件的发生。

三、中国水环境保护的目标、原则及对策

未来的五年乃至十年，是中国经济社会发展的战略机遇期，是全面建设小康社会奋斗目标承上启下的关键时期，也是注重改善民生、构建和谐社会、实现经济社会又好又快发展的重要时期。到2015年，主要水污染物排放要得到基本控制，水环境质量得到基本改善。到2020年，主要水污染物排放得到有效控制，水生态环境质量得到明显改善，水环境安全得到基本保障。

中国水环境保护的基本原则：遵循自然规律树立生态理念。要让江河湖泊休养生

息，充分发挥水生态系统的自我修复、自我更新的能力，以水环境容量和承载力为基础，统筹环境与经济关系，积极主动给江河湖泊以人文关怀，采取综合手段，提高水环境的生态服务功能，实现人水和谐。水质与水量统筹协调。严格执行主要水污染物排放总量控制制度和水资源管理制度，以流域为单元，水质、水量有机结合，跨部门、跨地区统筹协调，推进水环境、水资源的有效保护。点源与非点源统一控制。以污染减排为抓手，进一步深化点源污染治理工作，加强源头减量、过程控制和末端治理工作。重点湖泊要强化面源污染控制工程，航运发达的水域要对流动污染源进行严格的管理与治理。流域与近岸海域协同保护。统筹协调流域治理与近岸海域生态环境保护的关系，充分考虑近岸海域环境容量要求，不断加强流域和入海河流的水污染控制。

为了实现上述目标，按照以上原则，未来五到十年中国水环境安全将采取以下对策：

实施重点流域水环境保护战略，推进分区污染防治。坚持不懈地推进重点流域污染防治、湘江重金属水污染治理及重点城市河湖水生态修复试点工程。以流域水资源优化配置为基础，统筹实施流域、区域污染防治。针对全国及流域的水污染共性问题，对饮用水水源地保护、工业污染防控、城镇污水处理设施建设运营、面源污染控制等提出统一要求。针对重点流域污染特点，实施分区污染防治策略，分区确定规划任务和治污重点。

强化污染物排放总量控制，实行主要污染物减排。要着力推进结构减排、工程减排和管理减排，加大对造纸、酿造、印染、制革、医药、选矿以及各类化工等行业落后产能淘汰力度，推动各项减排重点工程按时、保质地建成并确保运行；加大环境执法力度，严厉打击环境违法行为，深入推进清洁生产，积极有序发展循环经济。

健全环境风险防范机制，加强饮用水水源地保护。要严格按照《水污染防治法》的规定，科学划分饮用水水源保护区，在保护区内实行严格的保护措施。整体提升饮用水安全保障水平。完善饮用水水源保护区分级管理制度，强化保护区内建设项目和人为活动的监督管理。不断提升饮用水水源环境质量监测能力，从饮水源头确保水质安全。建立完善城乡饮用水水源污染应急预警体系，防止发生危及群众饮水安全的水污染事故。

加快生态建设，保护水生态环境安全。要落实“让江河湖泊休养生息”的各项政策措施，按照预防为主、防治结合的方针，保障流域生态安全。要严格保护流域水系源头区陆地生态系统，尤其加强天然林保育。科学开展生态恢复，加大人工退耕还草、小流

域水土流失综合治理力度。在农村地区积极开展测土施肥技术、保护性耕作管理技术的典型示范和推广，减少水土流失和养分流失。因地制宜推行生态型农林牧模式，发展有特色的流域生态经济。

完善水生态环境保护投融资机制，以科技手段支撑水生态环境保护。要建立“政府引导、地方为主、市场运作、社会参与”的多元化投融资机制。要探索研究制定污染赔偿与生态补偿相结合的奖惩机制等。建立健全环境经济政策体系，利用财税、信贷、保险、贸易等多种手段促进水污染防治工作。加快水体污染防治科技支撑研究，抓紧“水体污染控制与治理”国家重大科技专项的实施工作，切实解决当前水污染防治工作中的重大科技问题。

女士们，先生们！

中国政府正在为实现保障国家水环境安全的目标而不懈努力。我们高度重视和不断加强水生态环境保护方面的国际合作。多年来，我们与联合国驻华机构、国际金融组织以及外国政府相关机构合作开展了一系列水生态环境系统管理与保护项目，得到了国际社会的关心与支持。在此，我谨代表中华人民共和国环境保护部，对支持中国的国际机构和有关国家表示衷心的感谢！

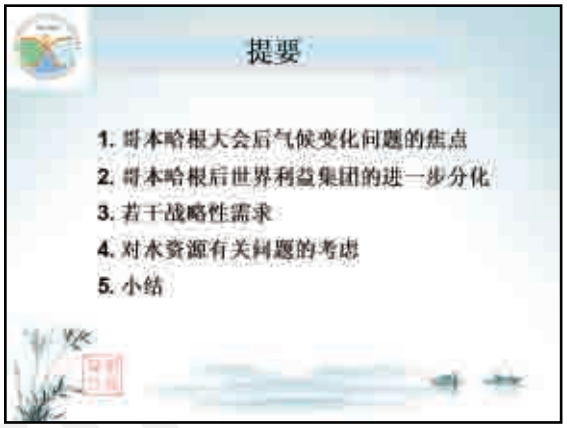
女士们、先生们！

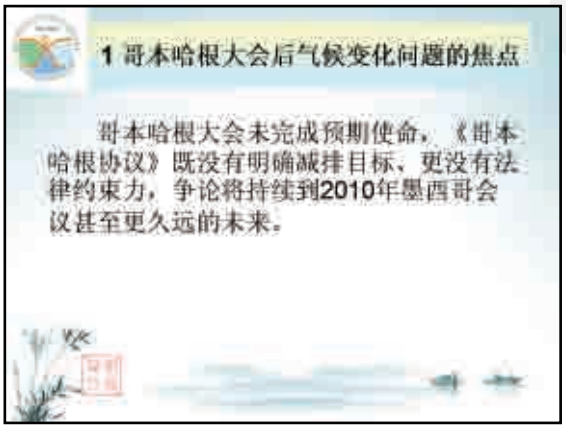
气候变化是当今国际社会普遍关注的全球性热点问题，全球水伙伴中国委员会以及瑞士发展与合作署在推动气候变化方面做了大量卓有成效的工作，所倡导的区域合作与协调机制已经成为推动适应气候变化、保障供水安全和生态安全的重要理念。我们坚信，通过各部门、各行业和全社会的共同努力和通力合作，水环境保护一定能够取得新进展！中国将把加强水环境保护、促进生态文明建设放在更加突出的位置，通过坚持不懈努力，切实改善水环境质量，保障水环境安全，更加广泛地开展国际环境合作与交流，积极参与应对气候变化等全球性环境问题的挑战，为全世界人民享有更加美好的明天、促进人类的文明进步做出新贡献。

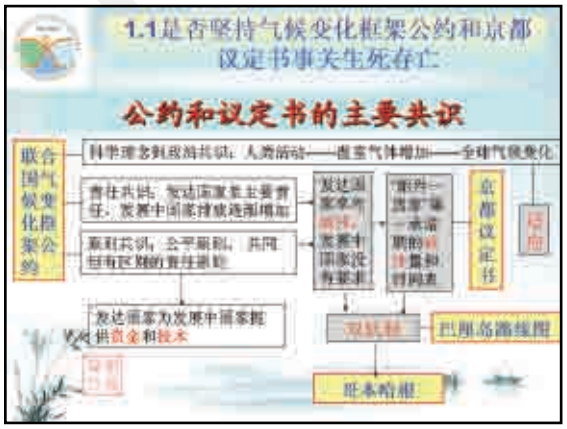
最后，预祝会议取得圆满成功！

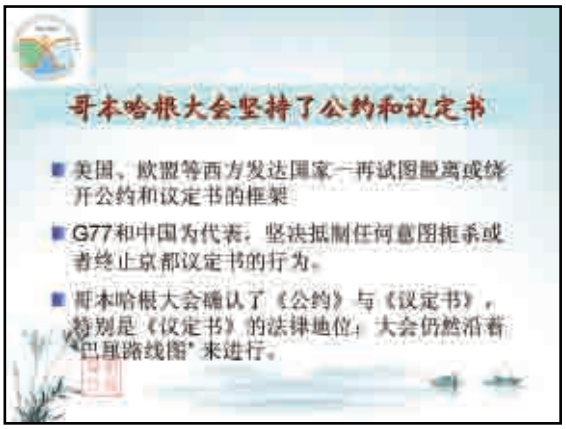
哥本哈根大会后的绿色经济与水资源

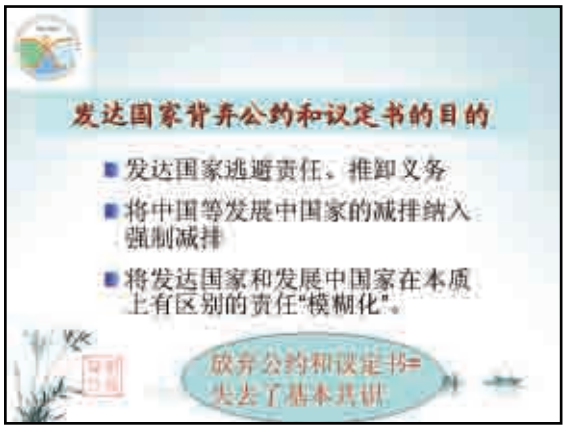
国务院参事、科学技术部原副部长　刘燕华











今后的国际谈判框架？

- 谈判单轨制还是双轨制（三轨制?）
- 中期目标与长期目标
- 减排或排放空间的分配方案如何体现公平和有区别的原则
- 如何坚持发达国家与发展中国家的区别
- 如何认识发展中国家内部所出现的区别
- 中国等自主减排是否接受强制性的目标，减排是否接受"三可"

1.2 2℃阈值是否与450ppm挂钩？

从科学结论到政治共识

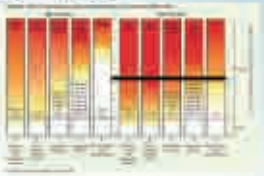
- 哥本哈根大会初步使2℃阈值从科学结论到政治共识，并作为全球减排努力的目标参考
- 450ppm将成为下个政治共识的目标，2℃是否与450ppm挂钩将成为下个科学争论的焦点。

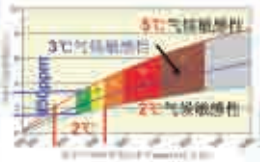
科学问题	成为政治共识的科学结论	国际行动
气候变暖面积	人类活动导致气候变暖（《公约》）	减排
气候变化影响	2℃阈值（哥本哈根）	减排努力的目标
升温2℃的温室气体浓度	450ppm?	2050年排放减半?

科学—道义—规则?

科学上的不确定性

- 2℃影响阈值是有不确定性的科学认识
  - 正面影响评估不够
  - 一些关键结论只有中等可信度





- 2℃——450ppm关系依赖于气候敏感性
  - 2℃→温室气体浓度是一个区间
  - 450ppm→升温也是对应一个区间

环境等无形资源分配

挂钩将规定总排放空间

- 2℃是否与450ppm挂钩表面上看是科学问题，但本质上是排放空间的问题。
- 与2℃阈值对应的温室气体浓度将决定全球未来的排放空间
- 2℃→450ppm挂钩是2050年排放减半目标的前提
- 2℃→450ppm挂钩后，将是有限排放权分配的争夺

固化世界贫富差距

发达国家的陷阱

2℃阈值 — 科学结论→政治共识

450ppm目标浓度

2050年全球减排50%（全球约八千亿吨CO_2排放空间） — 总排放空间

发达国家率先减排80%（获得44%排放权，15亿人） — 强制减排，优厚排放权

发展中国家2020年前无强制减排（只获得56%排放权，45亿人） — 排放量被规定，发展被限制

1.3 应对气候变化融资的来源和使用

哥本哈根大会关于资金和技术的成果

- 短期资金：发达国家承诺在2010~2012年向发展中国家提供300亿美元新的、额外的资金援助。
- 长期资金：发达国家同意到2020年，每年为发展中国家"筹集"1000亿美元，没有明确长期资金的具体来源及各个发达国家的分摊比例，最终可能成为空头支票。
- 在技术方面，《协议》同意成立"技术机制"来加速技术发展和转让，但未就"技术机制"的细节问题进行展开。

欠帐还是施舍?

融资问题的争论

项目	发展中国家	发达国家
性质	历史债，义务	否认历史债
前提条件	无附加条件	要求其他主要国家满足美国对透明度的要求
资金数量	"仍是不够的" 发达国家GDP的1%（中国观点	2010~2012年 承诺300亿美元 到2020年每年"筹集"1000亿美元
来源	市场靠不住	85%依靠市场机制。
资金管理	专项基金	IMF 和世界银行
资金分配使用	不能区别对待	"最脆弱国家"，中国等发展中大国无权使用

1.4 今后的碳市场

国际政策制造出的市场

- 《京都议定书》的三个灵活合作机制
  - 国际排放贸易机制ET
  - 联合履行机制JI
  - 清洁发展机制CDM
- 碳金融有可能成为未来重建国际货币体系和国际金融秩序的基础性因素

全球碳交易市场

- 交易标的
  - 一是二氧化碳排放配额，以及由此衍生出来的类似期权与期货的金融衍生品。
  - 二是相对复杂的减排项目。
- 交易规模
  - 2008年全球碳交易市值为1263.5亿美元，比2007年上升100．6%（IETA）
  - 2012年1500亿美元（世界银行）
  - 2020年3．5万亿美元，有望超过石油市场成为世界第一大市场（英国新能源财务公司）

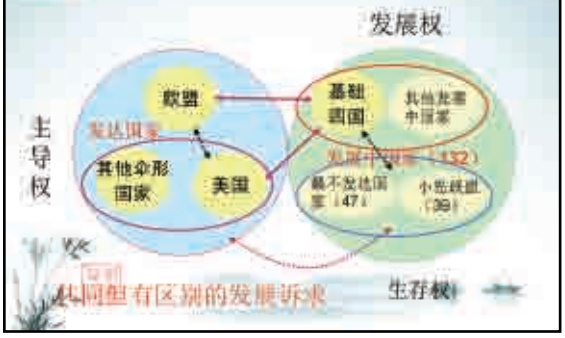
碳交易市场的价格

- 发达国家掌握了碳排放交易价格的话语权
  - 欧盟排放交易体系（EUETS）
  - 英国排放交易体系（ETG）
  - 美国芝加哥气候交易所（CCX）
  - 澳大利亚新南威尔士州温室气体减排体系（NSW）
- 中国不具备价格方面的话语权
  - 中国提供的碳减排量已占全球市场的30%以上
  - 大部份实为最终外企业，中国处于碳交易产业链的最低端
  - 国际市场上碳排放交易价格每吨17欧元左右，国内8-10欧元左右

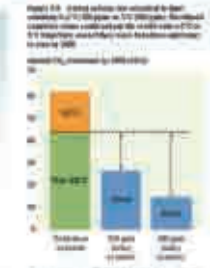
碳交易市场的话语权

- 碳交易限额、冲抵权限
- 碳捕捉和存储（CCS）技术带进清洁发展机制?
- 碳排放交易价格制定权
- 信用评级权
- 碳市场与碳融资

2 哥本哈根后世界利益集团的进一步分化



2.1 发达国家内部共识增大

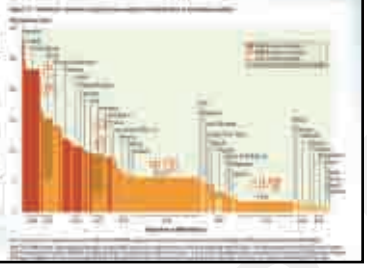


- 伞形国家对减排趋于积极与欧盟立场逐渐靠拢
  - 特别注重技术和总量—排放权交易体系
  - 特别注重清洁能源和低碳经济竞争力
  - **特别注重法律和碳关税。**
  - 对发展中新兴大国具体减排施压方面形成高度默契——只有发展中大国减排才能实现目标

- 分歧
  - 欧美之间政治主导权之争
  - 欧盟和美国减排承诺和减排路线的分歧依然存在
  - 欧盟内部就减排承诺的分歧日渐突出
  - 伞形国家可能重新集合

2.2 发展中国家内部分歧增大

- 共识
  - 坚持《京都议定书》和"巴厘路线图"
  - 西方应为提供资金和技术帮助
- 分化
  - 发展中国家内部的贫富的悬殊越来越大
  - 受气候变化影响各不相同；
  - 发展中大国快速增长的碳排放
  - 发达国家资金援助的诱惑，为有限的气候资金进行争夺



- 发展中国家内部的分化
  - 基础四国：自主减排，形成统一战线，成为发展中国家"抱团反击"的中坚力量
  - 非洲国家：虽然要求资金援助，被边缘化，仍会与发展中国家大方向保持一致。
  - 小岛国：要求资金和技术支持，要求发展中大国也加入减排行动。
  - 雨林联盟：率先提出要区别对待发展中国家，建议重视减少毁林和森林退化排放（**REDD**）。

2.3 中国被推到前台

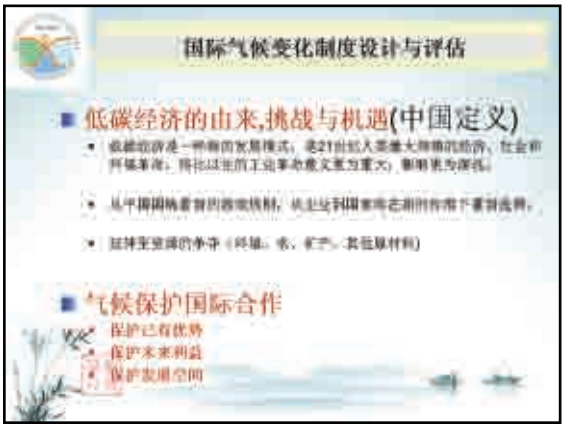
- 美国立场转变后，欧盟和美国Vs基础四国将成为新的焦点
- 小岛国和最不发达国家可能对基础四国施压
- 中国作为经济大国和排放大国被推到前台

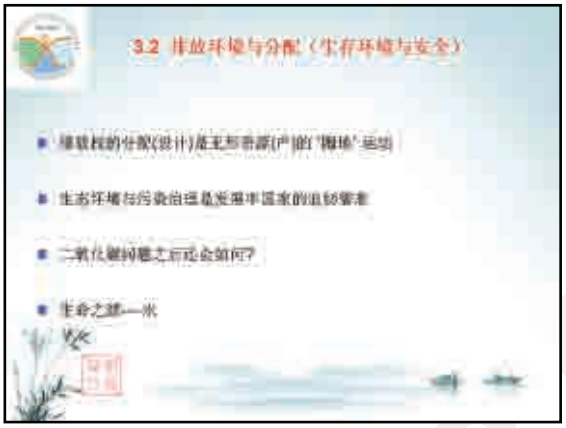
3 若干战略性需求

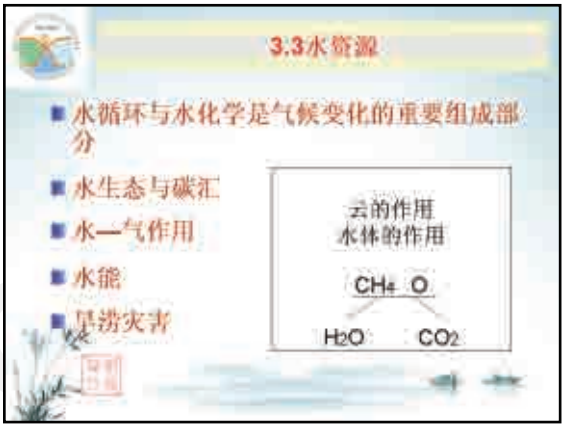
气候变化问题不仅是科学问题，已演变为事关国家经济安全和社会发展的国际政治和经济问题。

- 绿色经济发展与经济结构调整
- 保护环境与分配
- 水资源
- 技术优先领域

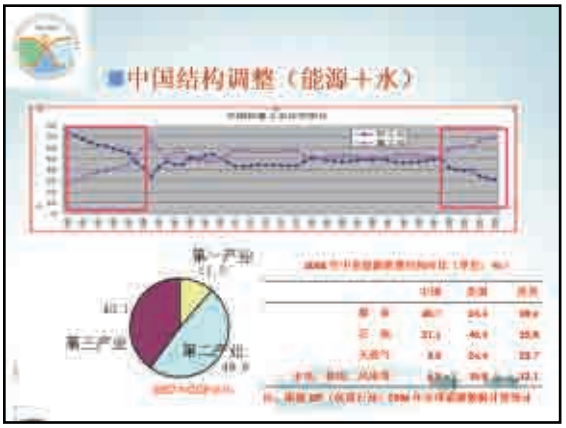

3.1 绿色发展问题
理性地看待气候变化问题
全球变暖
(水优先)

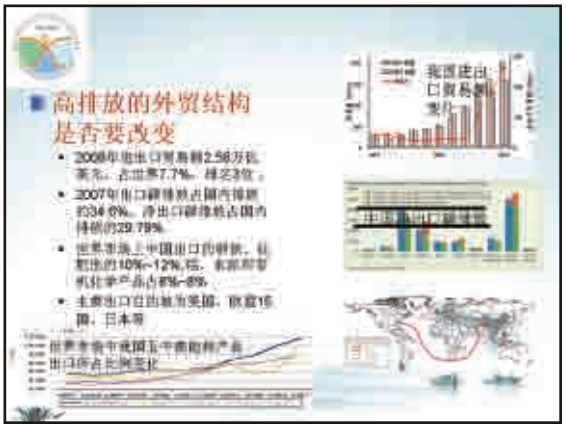

国际气候变化制度设计与评估
低碳经济的由来,挑战与机遇(中国定义)
气候保护国际合作
保护已有优势
保护未来利益
保护发展空间


3.2 排放环境与分配(生存环境与安全)

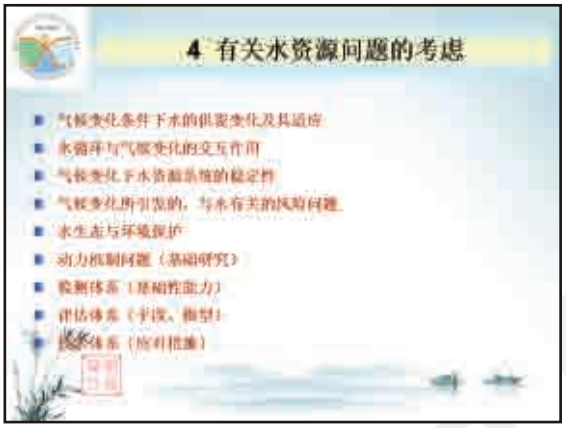

3.3水资源
水循环与水化学是气候变化的重要组成部分
水生态与碳汇
水—气作用
水能
暴涝灾害
云的作用
水体的作用
CH4 O
H2O CO2

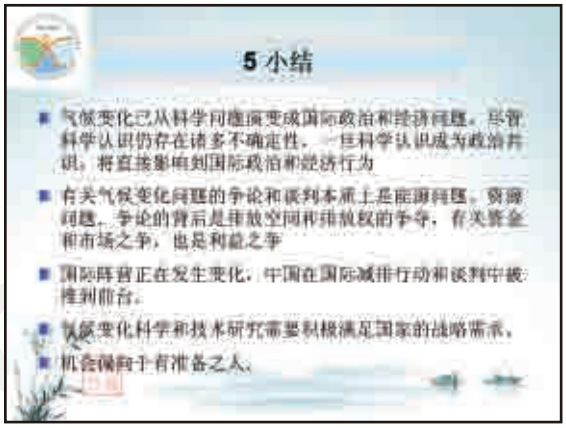

3.4 应对气候变化战略技术
2020单位GDP减排40%~45%的地区和行业路径
单位GDP水的消耗


中国结构调整(能源+水)
第一产业
第二产业
第三产业


高排放的外贸结构
是否要改变
2008年出口贸易额2.56万亿
美元，占世界7.7%，排名3位；
2007年出口碳排放占国内排放
的34.6%，净出口碳排放占国内
排放的29.79%
世界制造业中国出口的钢铁，铝
型出的10%~12%左，水泥和石
化产品占8%~9%
主要出口目的地为美国，欧盟15
国，日本等
我国进出口贸易额变化
世界主要年度国际中间和产品
出口所占比例变化


减排的技术和技
术经济创新
减排核查的标准
碳排放过程
中水的消耗？
技术创新基本概念模型

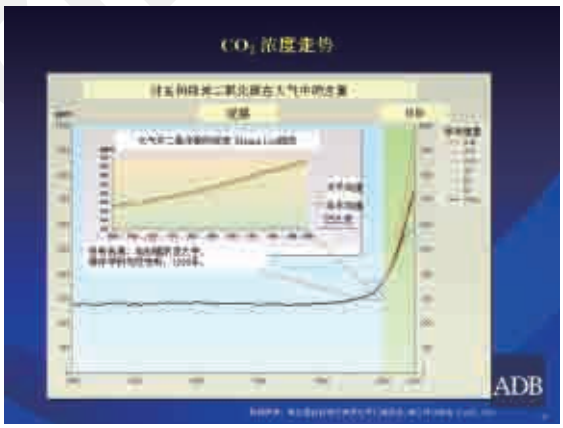

4 有关水资源问题的考虑
气候变化条件下水的供需变化及其适应
水循环与气候变化的交互作用
气候变化下水资源系统的稳定性
气候变化所引发的，与水有关的风险问题
水生态与环境保护
动力机制问题（基础研究）
监测体系（基础性能力）
评估体系（手段、模型）
[illegible]体系（应对措施）

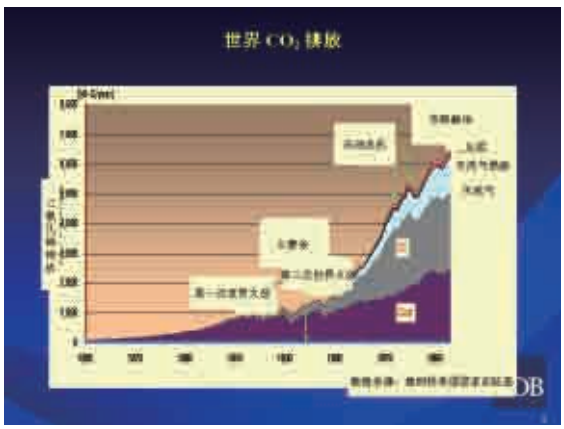

5 小结
气候变化已从科学问题演变成国际政治和经济问题。尽管科学认识仍存在诸多不确定性，一旦科学认识成为政治共识，将直接影响到国际政治和经济行为
有关气候变化问题的争论和谈判本质上是能源问题、资源问题。争论的背后是排放空间和排放权的争夺，有关资金和市场之争，也是利益之争
国际格局正在发生变化，中国在国际减排行动和谈判中被推到前台。
气候变化科学和技术研究需要积极满足国家的战略需求。
机会偏向于有准备之人。

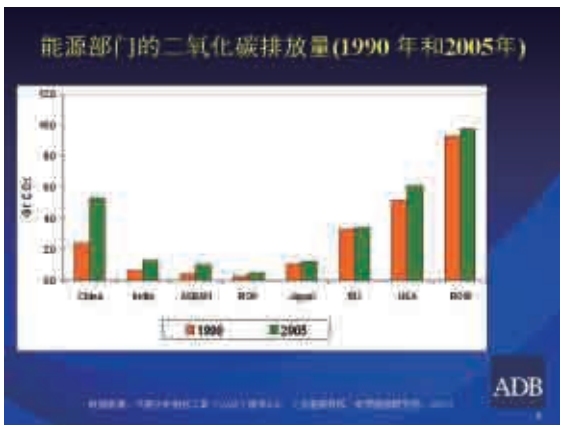

谢谢

气候变化经济学影响及应对策略

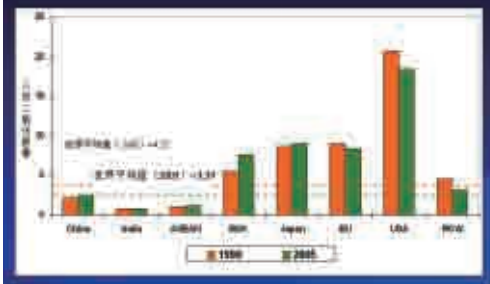
亚洲开发银行气候变化高级专家　　丁大庸





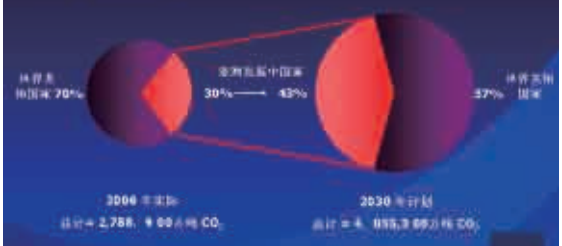


能源部门二氧化碳人均排放量 (1990 年和 2005年)



ADB

亚洲发展中国家的能源消费在全球二氧化碳排放量中占有的份额

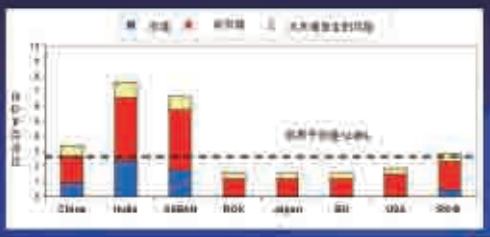


ADB

II. 气候变化经济学

ADB

到2100年的平均国内生产总值的损失（参考A2的情景）



ADB

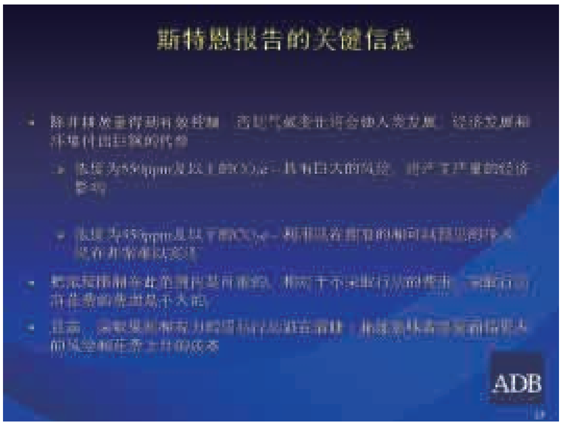
什么是气候变化经济学？

ADB

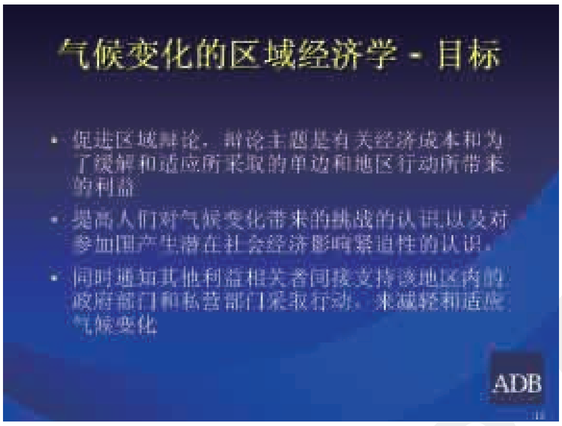
评估风险程度和相关费用的方法或途径

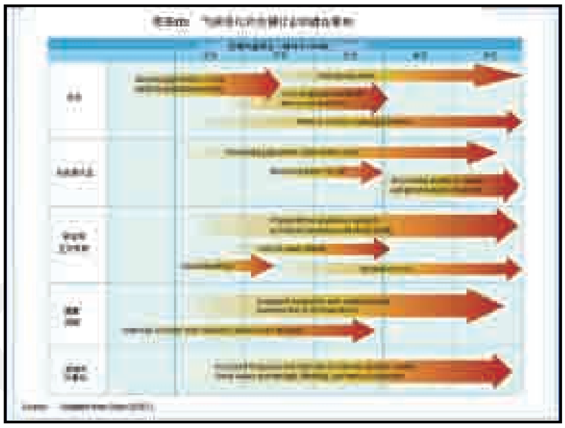
- 对于人类生活和环境有关的经济活动所产生的实际影响
- 综合评估模型的利用
- 比较边际减排成本曲线与涨的社会成本

ADB

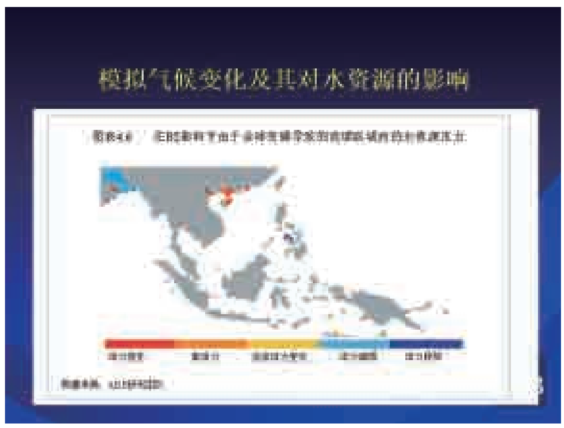

斯特恩报告的关键信息
ADB


III. 东南亚地区气候变化评价的主要结论和成果
ADB


气候变化的区域经济学 - 目标
促进区域辩论，辩论主题是有关经济成本和为了缓解和适应所采取的单边和地区行动所带来的利益
提高人们对气候变化带来的挑战的认识以及对参加国产生潜在社会经济影响紧迫性的认识。
同时通知其他利益相关者间接支持该地区内的政府部门和私营部门采取行动，来减轻和适应气候变化
ADB




区域气候变化对水资源的影响
温度升高
海平面上升


模拟气候变化及其对水资源的影响

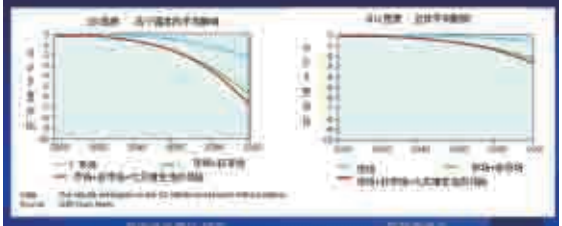
水利行业的适应性选择与实践

- 受损的灌溉和排水设施的修复
- 小规模灌溉方案的扩展
- 洪水预警系统
- 改进的洪水控制设施，如排水站，水闸门
- 多功能水库，水坝，蓄水系统
- 流域综合开发集水区
- 废水回收和改良
- 海水渗透厂

ADB

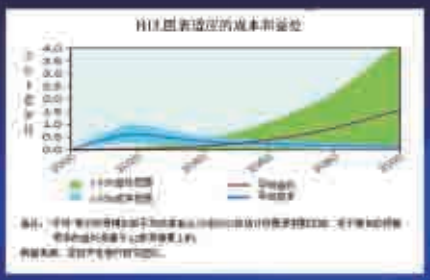
到2100年的平均国内生产总值的损失（A2参考方案）

SEA (4): 截至2100年国内生产总值为6.7%



ADB

适应国内生产总值经济学：东南亚的国内生产总值合计



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东南亚的政策内涵

- 对于增强的气候弹性的适应能力
- 对于低碳经济的缓解
- 资金支持，技术转让，国际区域间合作
- 加强政府政策协调
- 进行更多关于气候变化有关问题的研究
- 将经济危机转变为机会

ADB

对全球解决方案的需求

- 应对气候变化需要一个全球性解决方案，该方案是建立在共同的并且存在差异的责任感基础之上的
- 作为一个全球性的公共福利，应对气候变化需要全世界所有国家，包括发达国家和发展中国家，为寻求全球的解决方案而共同努力。
- 所以，一个有效的全球解决方案的重要组成部分包括从发达国家向发展中国家进行财政资源和专门技术知识的有序转让
- 要解决全球气候变化问题，离不开没有发展中国家的参与
- 国际社会已经同意按照已经路线图加紧努力以应对气候变化问题。

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亚洲开发银行在中华人民共和国境内进行的其他一些有关活动

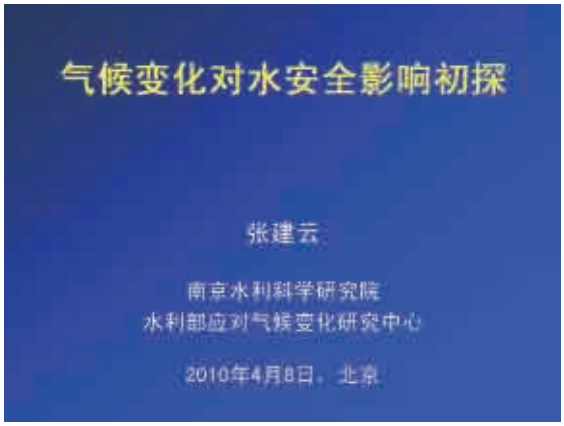
ADB

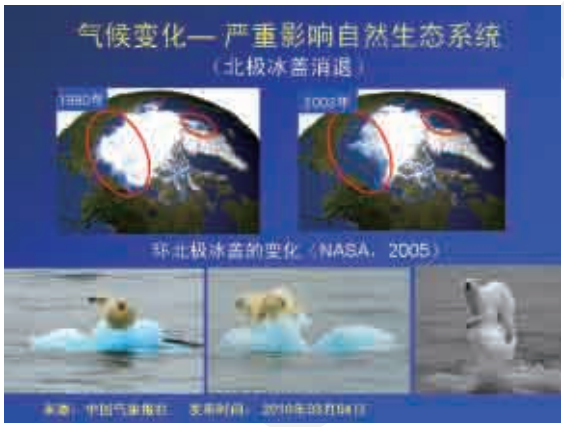
谢谢！

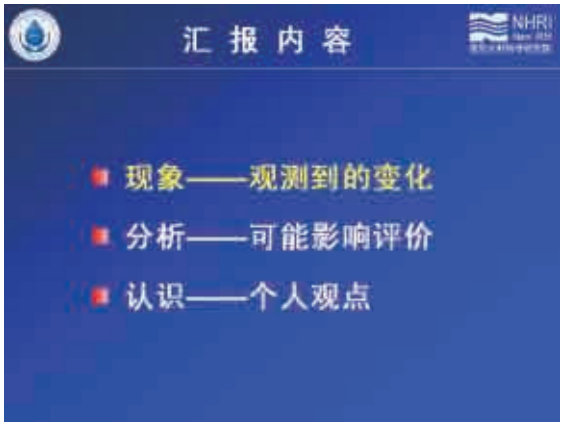
ADB

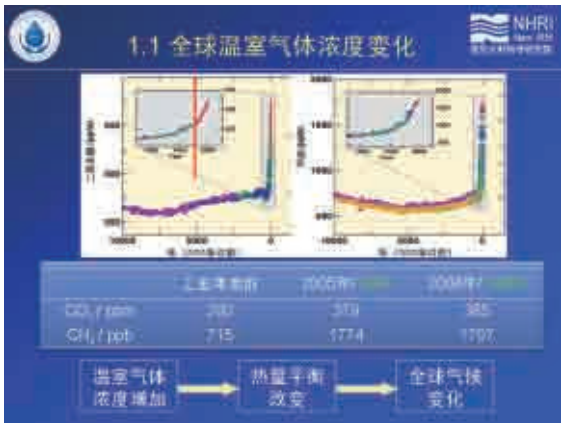
气候变化对水安全影响初探

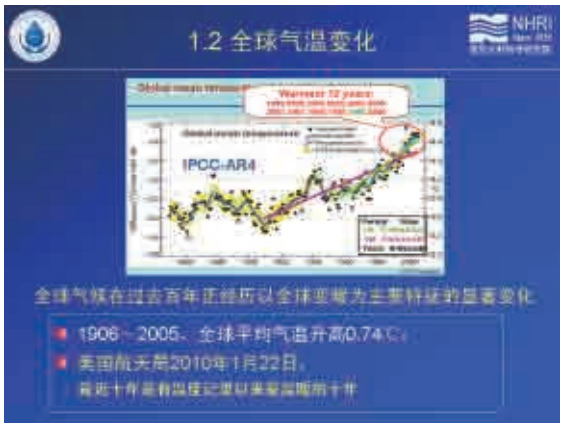
中国工程院院士、南京水利科学研究院院长、
水利部应对气候变化研究中心主任　　张建云

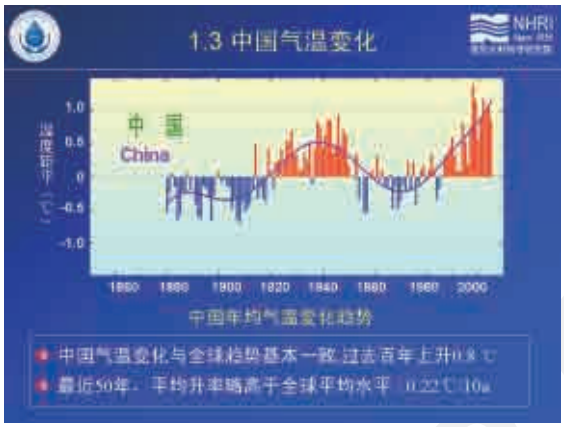


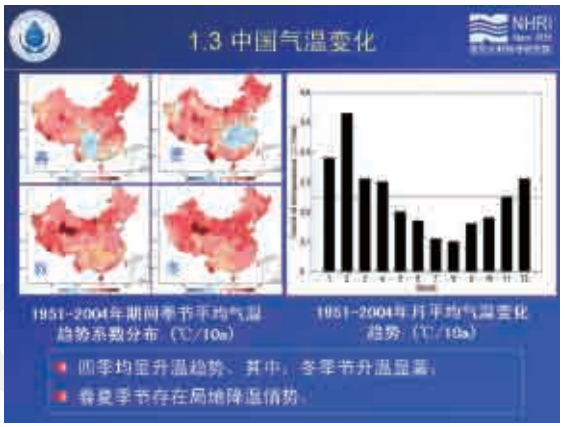


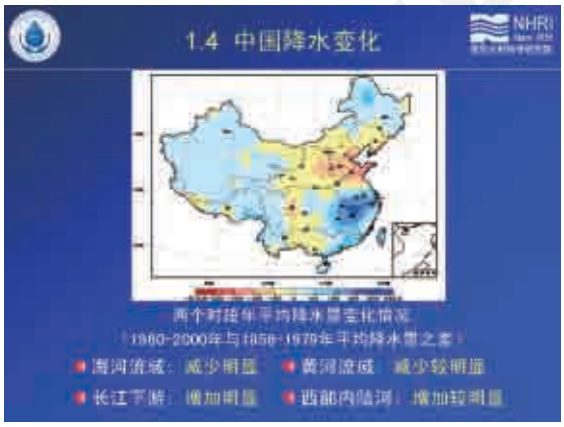



1.1 全球温室气体浓度变化
温室气体浓度增加
热量平衡改变
全球气候变化


1.2 全球气温变化
IPCC-AR4
1906～2005，全球平均气温升高0.74℃；
美国航天局2010年1月22日，

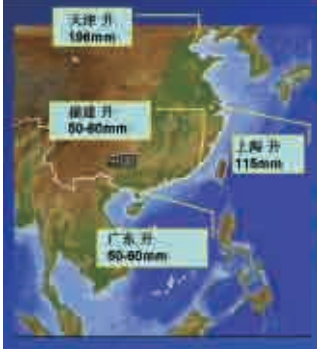

1.3 中国气温变化
中国
China
中国年均气温变化趋势
中国气温变化与全球趋势基本一致，过去百年上升0.8 ℃
最近50年，平均升率略高于全球平均水平 0.22℃/10a


1.3 中国气温变化
1951-2004年期间季节平均气温趋势系数分布（℃/10a）
1951-2004年月平均气温变化趋势（℃/10a）
四季均呈升温趋势，其中，冬季节升温显著；
春夏季节存在局地降温情势。


1.4 中国降水变化
两个时段年平均降水量变化情况
（1960-2000年与1956-1979年平均降水量之差）
海河流域：减少明显
黄河流域：减少较明显
长江下游：增加明显
西部内陆河：增加较明显


1.5 中国暴雨变化
1960年前后60min降雨量比值分布
极端强降水事件日数的变化趋势
区域性短历时暴雨强度有增加趋势
区域性极端强降水日数有增加趋势
陕西安塞，1998.7，1300mm/6-7h（调查）
广东惠江，2007.7，1188mm/24h（实测）

1.5 中国海平面变化



- 全球过去百年平均海平面每年上升1-2mm，中国近50年上升120mm
- 《2009年中国海平面公报》：2009年中国沿海海平面处于近30年高位，较常年（1975－1993年）高88毫米，比08年高80毫米，09年比07年上升14毫米。
- 近30年来，中国沿海海平面总体呈波动上升趋势，平均上升速率为2.6毫米/年，高于全球平均值。

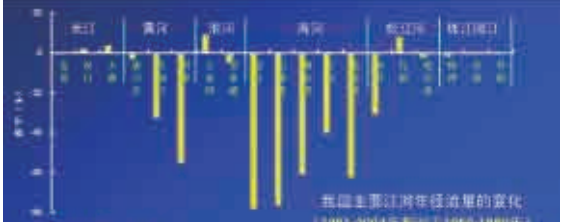
1.6 台风变化

强度	1970s	1980s	1990s	2000-2009
台风 12-13级	15	9	15	18
强台风 14-15级	0	2	2	4
超强台风 16级以上	0	0	0	1

强热带风暴发生频繁呈增加趋势

1970年以来我国登陆台风统计（登陆时最大风速统计）

1.7 河川径流变化



我国主要江河年径流量的变化
（1991-2004年相对于1956-1990年）

- 总体趋势：减少
- 显著减少趋势：海河、黄河、辽河
- 弱减少趋势：淮河、松辽河、珠江、长江
- 弱增加趋势：长江中下游、海河上游、闽江

1.7 河川径流变化

海河流域实测径流量的变化

水文站	平均流量(m³/s)			距平百分率(1991-2004)(%)	
	1955-2004	1980之前	1980之后	与1955-2004相比	与1980-1980相比
观台	31.3	48.9	10.8	-65.4	-77.9
石匣里	16.1	24.7	5.77	-64.2	-76.6
下会	8.61	11.2	6.88	-22.4	-40.1
张家坟	17.4	25.0	9.4	-45.9	-62.2

张建云等，我国主要江河近50年河川径流变化，水科学进展，2007（5）

1.7 河川径流变化

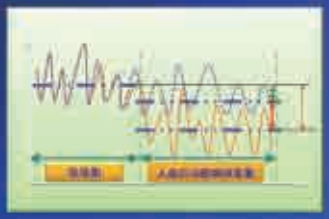
黄河流域实测径流量的变化

水文站	平均流量(m³/s)			距平百分率1991-2004(%)	
	1955-2004	1980之前	1980之后	与1955-2004相比	与1980-1980相比
潼关	827	938	617	-1.8	-34.2
花园口	1240	1460	979	-21.4	-32.9
利津	1020	1360	609	-40.5	-55.2

径流减少主要集中在中下游地区（气候变化影响30%左右，人类活动为主要原因）

张建云等，我国主要江河近50年河川径流变化，水科学进展，2007（5）

径流变化归因识别技术



1、基准期的确定方法(有序聚类法和M—K法等)

2、天然径流还原方法

1.8 干旱情况变化

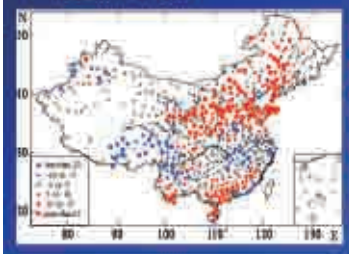
十大流域干旱面积长期变化趋势(1951-2007)

地区	干旱面积趋势（%/10a）
松花江流域	1.81
辽河流域	3.08
海河流域	4.28
黄河流域	0.59
淮河流域	1.46
长江流域	0.13
东南诸河流域	0.44
珠江流域	0.46
西南诸河流域	-0.69
西北诸河流域	0.18
全 国	0.94

斜体显示时间为通过0.05信度检验

1.8 干旱情况变化

干旱发生频率的变化



1979-2007年和1951-1978年年平均干旱日数之差

干旱频繁增大区域

- 辽河流域
- 海河流域
- 淮河流域北部
- 黄河流域大部
- 珠江流域大部

西南诸河干旱频率减少

1.8 干旱情况变化

建国以来，我国干旱灾害的严重程度不断加深。

与建国初相比，21世纪以来的平均受旱率、平均成灾率和粮食减产率分别是原来的2.3倍、4.3倍和2.6倍。

不同年代我国干旱灾害情况统计

年代	平均受旱率/%	平均成灾率/%	因旱粮食减产率/%
1949—1959	7.35	2.39	2.32
1960—1969	12.4	5.87	4.46
1970—1979	11.80	5.01	3.18
1980—1989	10.95	6.12	4.82
1990—1999	19.88	9.75	6.03
2000—2007	19.85	10.26	6.14

1.9 冰川雪盖变化

冰川大范围缩小，雪盖面积下降，永久性冻土退化

《中国冰川资源及其变化调查》项目（2007年）显示，与第一次冰川普查（上世纪80年代末）相比，面积缩小比例为7.4%

青海高原多年冻土面积的减少和冻土下界的升高，20世纪80年代与90年代相比，高原多年冻土下界分布高度上升约71米，季节性冻土厚度平均减小19cm。

祁连阿里卡里斯冰川

1.10 湖泊萎缩

20世纪50年代以来，全国有142个大于10km²的湖泊萎缩，总计面积减少9574km²，占萎缩前湖泊总面积的12%，蓄水量减少516亿m³，占湖泊总蓄水量的6.5%。

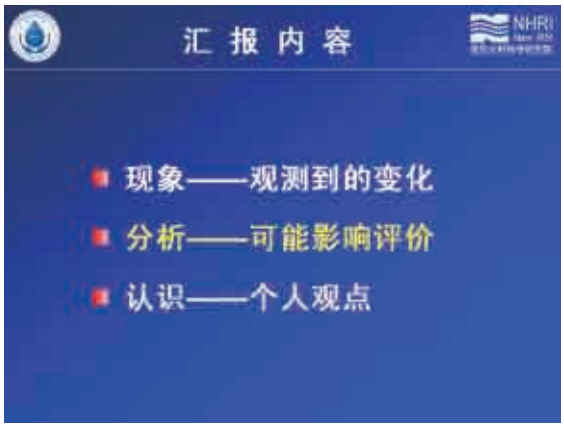
我国不同类型湖泊萎缩情况统计

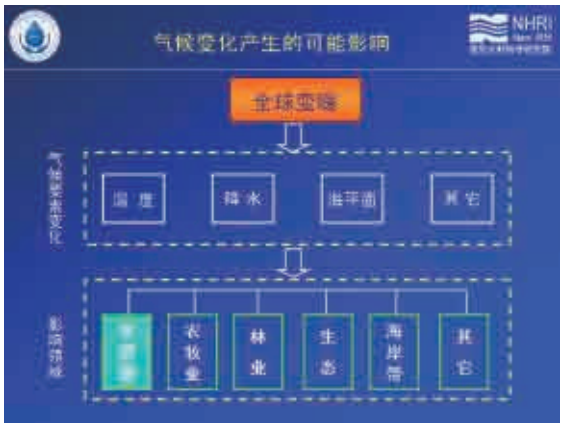
湖泊类型	湖泊数量		湖泊面积		湖泊蓄水量	
	湖泊数（个）	占总湖泊数（%）	面积减少（km²）	占总面积（%）	蓄水量减少（亿m³）	占总蓄水量（%）
淡水湖	105	46.8	1797	16.8	310.8	11.7
咸水湖	27	11.3	1178	4.3	108	4.1
盐湖	10	7.5	601	5.6	16	2.1
全国	142	23.8	9574	12.4	515.8	6.5

1.11 湿地退化

区域暖干化导致湿地资源减少，抗干扰能力减弱

生物多样性减少，濒危物种增加，自然退化加重


汇 报 内 容
现象——观测到的变化
分析——可能影响评价
认识——个人观点

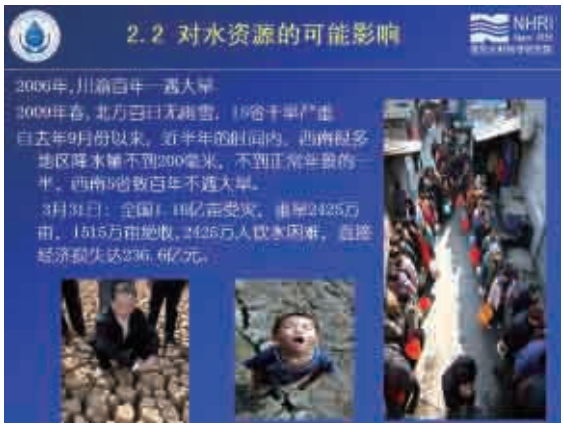

气候变化产生的可能影响
全球变暖
温 度
降 水
海平面
其 它
农牧业
林 业
生 态
海岸带
其 它


对水的影响
气候变化（水）
防洪
水资源
水工程
生态


2.1 对防洪安全的可能影响
全球变暖 空气温度升高 大气持水能力增加 降水机率增大、强度增强，暴雨发生机率加大
全球变暖 海平面上升（2007年国家评估报告：2100年中国沿海平面平均可能上升0.6-0.74m） 沿海及河口地区防洪形势更加严峻
全国平均降水量增加（国家应对方案：2020年，全国年平均降水量将增加2-3%，2050年增加5-7%），将增加洪涝灾害发生机率。
气候变化影响机理

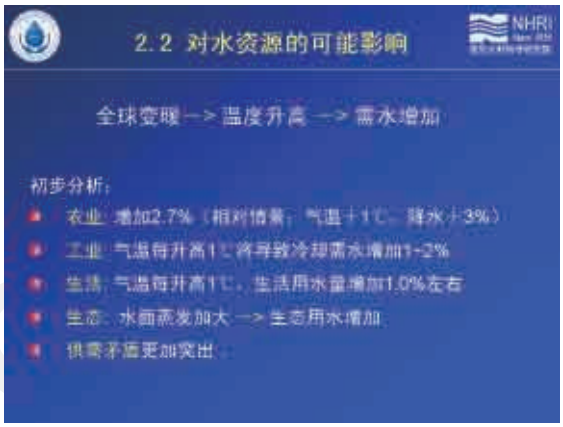

2.1 对防洪安全的可能影响
我国极端气候事件发生呈频率增加强度增大趋势
91江淮洪水
98长江、松花江、闽江洪水
2003、2005、2007淮河洪水
2005、2008西江洪水


2.2 对水资源的可能影响
全球变暖
地表潜热增加
蒸散发增强
高温热浪及干旱事件频次增加，范围扩大
气候变化加剧区域干旱


2.2 对水资源的可能影响
NHRI
2009年,川渝百年一遇大旱
2009年春,北方百日无雨雪,19省干旱严重
自去年9月份以来,近半年的时间内,西南部多地区降水量不到200毫米,不到正常年景的一半。西南5省数百年不遇大旱。
3月31日:全国1.18亿亩受灾,重旱2425万亩,1515万亩绝收,2426万人饮水困难,直接经济损失达236.6亿元。


2.2 对水资源的可能影响
NHRI
侧重经济发展(A2)情景的2050年水资源分布:北方缺水情势可能进一步加剧
我国洪涝干旱灾害发生机率可能增加
南涝北旱的格局可能不会有明显改变
随着社会经济的发展,北方缺水情势可能会进一步加剧


2.2 对水资源的可能影响
NHRI
农业灌溉用水量增加
气温升高
蒸散发增加
生长期变化
降水变化
作物需水变化
利用有效降水变化
灌溉需水变化


2.2 对水资源的可能影响
NHRI
全球变暖—>温度升高—>需水增加
初步分析:
农业:增加2.7%(相对情景:气温+1℃,降水-3%)
工业:气温每升高1℃将导致冷却需水增加1-2%
生活:气温每升高1℃,生活用水量增加1.0%左右
生态:水面蒸发加大—>生态用水增加
供需矛盾更加突出


2.2 对水资源的可能影响
NHRI
温度升高
水体富营养化
水质恶化
水质性缺水影响供水安全


2.3 对水工程安全的可能影响
NHRI
气候变化对工程安全的影响:
(1)中国气候区的变化,工程设计标准问题
(2)极端低温对水工材料特性的影响
(3)长历时干旱高温对工程安全的影响

2.3 对水工程安全的可能影响

就温度而言，全球变暖指全球范围内平均温度上升，同时温度变化幅度增加，发生低温寒流和高温热浪的可能性增加。

近几年，发生3次明显寒潮：

1，2004年到2005年冬季，我国出现了两次大范围寒潮过程，造成长时期的降温和严寒天气；

2、 2008年1月南方冰冻雨雪天气

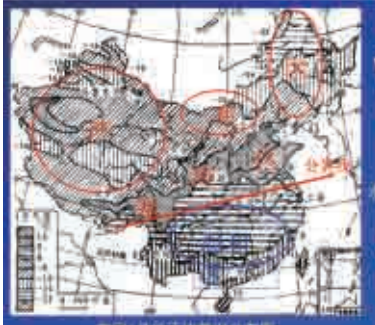
3，去冬今春华北等地寒潮暴雪天气

因此在全球变暖的大背景下，

年平均气温将继续升高

同时存在发生极端低温寒潮的可能性

2.3 对水工程安全的可能影响



水工建筑物抗冰冻设计规范
DL/T 5082-1998

严寒区：T<-10℃

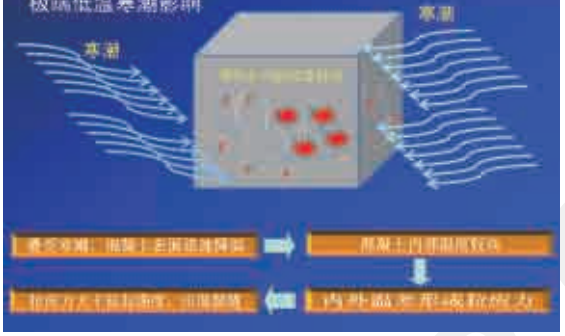
寒冷区：-10℃≤T≤-3℃

温和区：T>-3℃

修订？

2.3 对水工程安全的可能影响

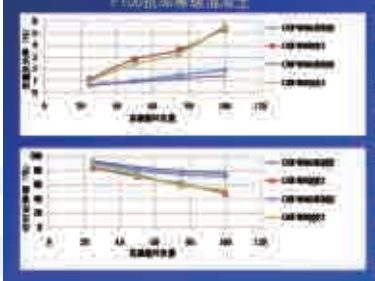
极端低温寒潮影响



2.3 对水工程安全的可能影响

水工混凝土的抗冻性能试验

F100抗冻等级混凝土



-35℃～6℃冻融循环下的抗冻性能：

C30水工混凝土，75次冻融循环后，质量损失率已达于5%，相对动弹性模量已下降至初始值的51%

C30水工混凝土，100次冻融循环后，质量损失率为6.8%，相对动弹性模量下降至初始值的53%

2.3 对水工程安全的可能影响

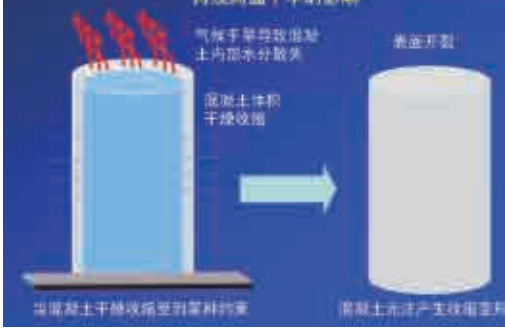
冻融对水工建筑物的破坏

冻融导致建筑物表面剥落

冻融导致建筑物骨料外露

2.3 对水工程安全的可能影响

持续高温干旱的影响

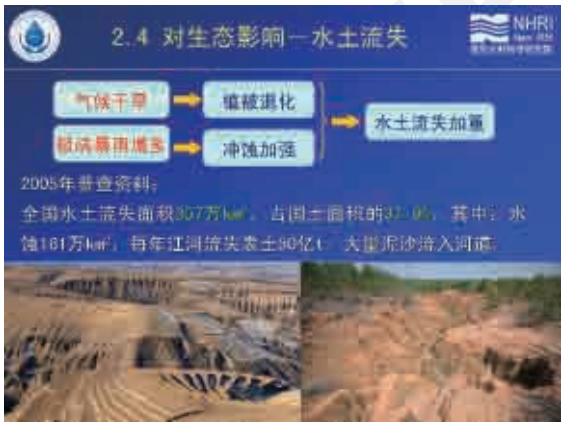



2.3 对水工程安全的可能影响
持续高温干旱对水工建筑物的影响
丰平混凝土双曲拱坝


2.3 对水工程安全的可能影响
海水腐蚀的影响
气候变暖
海平面上升
海水盐浓度变化
腐蚀区域面积扩大
腐蚀强度增加


2.3 对水工程安全的可能影响
钢筋混凝土腐蚀经济损失统计


2.4 对生态影响—水体污染
河流湖泊变暖，热力结构和水质变化，藻类和浮游生物增加
太湖2007年4月平均水温19.56℃，为25年来最高，为藻类暴发提供了适宜的条件


2.4 对生态影响—水土流失
气候干旱
植被退化
极端暴雨增多
冲蚀加强
水土流失加重
2005年普查资料：

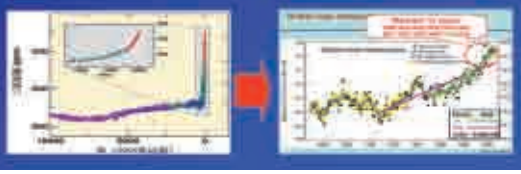

2.4 对生态影响—海岸带
气候变暖，海平面上升，入海径流量减少，台风、风暴潮强度增加，极端事件增多，对海岸带产生一系列影响
河口盐水入侵
海岸侵蚀
湿地萎缩和红树林减少
海洋生物和鱼类减少

汇报内容

- 现象——观测到的变化
- 分析——可能影响评价
- 认识——个人观点

几点认识

1. 大量的观测数据表明，全球气候正在发生以全球变暖为主要特征的变化；这种变化除了气候系统的本身自然周期变化外，人类活动排放的大量温室气体是气候变化的重要原因。



几点认识

2. 气候变化已经对水利、农业、林业、生态等自然领域和社会经济发展多方面产生了严重影响，未来这些可能进一步加剧。

水是气候变化影响最直接和最重要的领域之一，未来的规划和管理均需适当地考虑气候变化的影响；

几点认识

3. 低碳经济是以低能耗、低污染、低排放为基础的经济模式，是人类社会继农业文明、工业文明之后的又一次重大进步。

实质是能源高效利用、清洁能源开发、追求绿色GDP

核心是能源技术和减排技术创新、产业结构和制度创新以及人类生存发展观念的根本性转变

大背景是全球气候变暖对人类生存和发展的严峻挑战

发展低碳经济既是目标，也是手段，对我国当前的节能减排，转变经济发展方式，加快产业结构调整是一个很好的抓手。

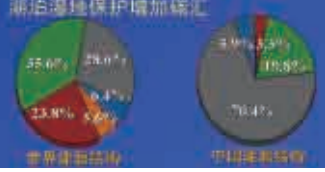
几点认识

水利应积极应对气候变化问题，在发展低碳经济中发挥作用

水能资源开发（今年水电装机将达2亿千瓦，2010年两会代表建议水电到2020年装机达到3.5亿千瓦，以满足非化石能源占比15%的要求）

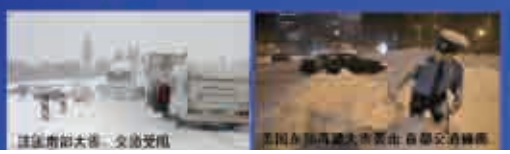
核能等清洁能源开发水资源保障（目前我国核电装机不到1000万千瓦，“积极发展核电”是中长期发展规划目标，2020年可能达7000-8000万千瓦）

加强水土保持、湖泊湿地保护增加碳汇

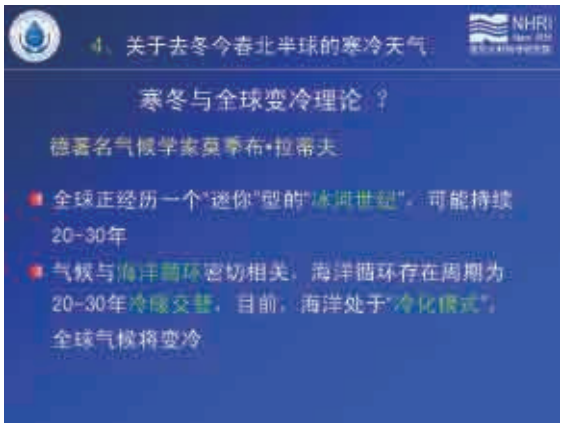


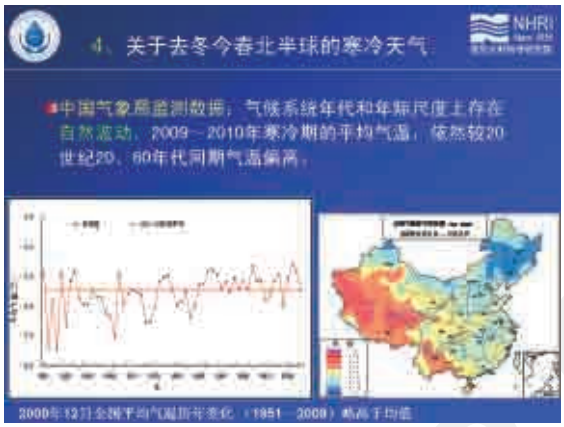
4. 关于去冬今春北半球的寒冷天气

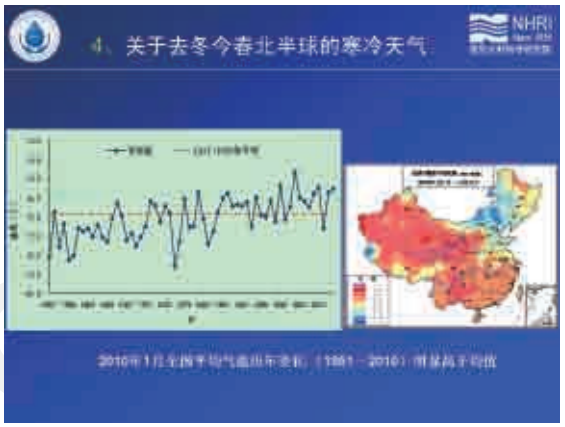
- 今冬北半球异常寒冷，创下多个近年之最
- 2009年12月19日至20日，美国东部普降暴雪，华盛顿地区的积雪深度达61厘米，创下1932年12月以来之最。
- 2009年12月中旬末，暴风雪横扫欧洲，部分地区积雪深度超过50厘米，历史罕见。
- 2010年1月4日，韩国首尔的积雪深度超过28厘米，为1937年有记录以来之最。

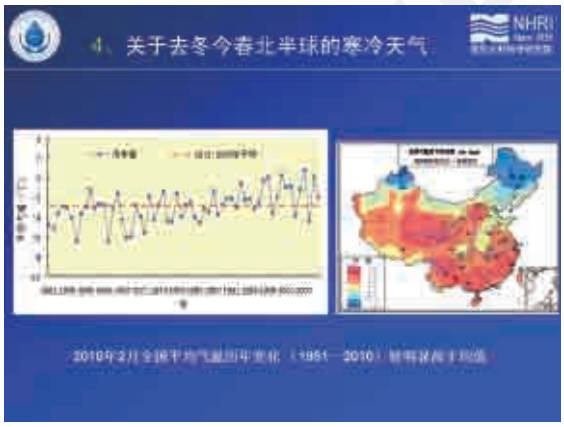


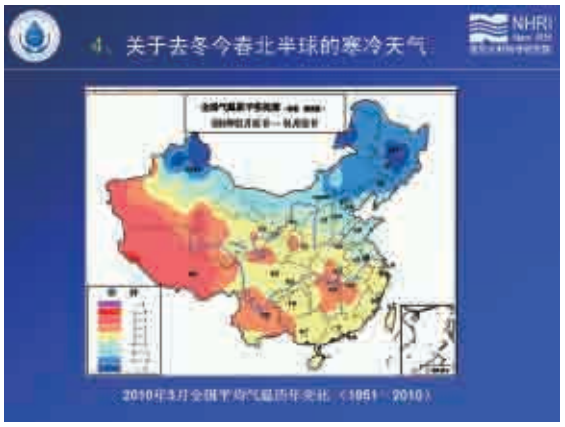

4、关于去冬今春北半球的寒冷天气
我国北方遭遇低温、暴雪
北京（2010.1.5,-15.5度）遭遇了1986年以来最冷的早晨和自1951年以来最大的降雪
新疆阿勒泰等地积雪深度不断刷新纪录，灾情严重
环渤海遭遇近30年最严重海冰灾害


4、关于去冬今春北半球的寒冷天气
寒冬与全球变冷理论？
德著名气候学家莫季布•拉蒂夫
全球正经历一个"迷你"型的"冰河世纪"，可能持续20-30年
气候与海洋循环密切相关，海洋循环存在周期为20-30年冷暖交替，目前，海洋处于"冷化模式"，全球气候将变冷


4、关于去冬今春北半球的寒冷天气
中国气象局监测数据：气候系统年代和年际尺度上存在自然波动，2009—2010年寒冷期的平均气温，依然较20世纪20、60年代同期气温偏高。


4、关于去冬今春北半球的寒冷天气


4、关于去冬今春北半球的寒冷天气


4、关于去冬今春北半球的寒冷天气

4、关于去冬今春北半球的寒冷天气

国家气候中心丁一汇院士：

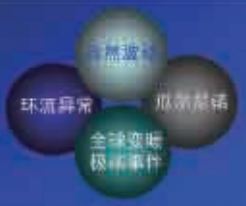
- "北极涛动"是导致今冬极端冷事件的主要原因。
- 从本世纪初开始，北极涛动的正位相开始逐步减弱，向负位相方向发展，即极地气压逐步升高，原本仅在极地附近绕西风带活动的极地冷空气开始向南垂延，致使极地寒流向南沿三条路径侵袭了北美东部（特别是北美的东南部）；北欧和西欧；东亚（特别是东北亚）。

4、关于去冬今春北半球的寒冷天气

世界气象组织副秘书长颜宏博士：

- 不应当把长期的全球变暖趋势和北半球近期出现的冬季严寒天气混为一谈，更不能认为这两者相悖。相反，这两者之间有内在联系。
- 短期的气候异常基本上是由自然因素造成的。而全球变暖趋势的驱动力是温室气体的增加。在此因素不变的情况下，全球变暖的总趋势不会有大变化。

4、关于去冬今春北半球的寒冷天气



目前从气候的自然波动、环流异常、厄尔尼诺等种种观测的事实和现象分析，认为本次严寒只是长期升温过程中的一个小插曲，是变暖大趋势上叠加的一个自然波动，全球气候变暖的大趋势并未发生大的改变。

几点认识

5、目前对气候变化的预测及影响评估具有较大不确定性，涉及多学科的交叉，在此领域我国话语权弱，应加强应对气候变化的基础研究。

最关心的问题：

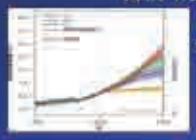
未来如何变？

有何影响？

如何适应和应对？

几点认识

目前研究存在4方面主要问题



问题1：未来情景预测有很大的不确定性

问题2：水资源变化未来的归因分析不够清晰

问题3：水资源影响评估缺乏水循环机理和适应过程应对机理耦合研究

问题4：应对措施缺乏技术机理和调控理论研究

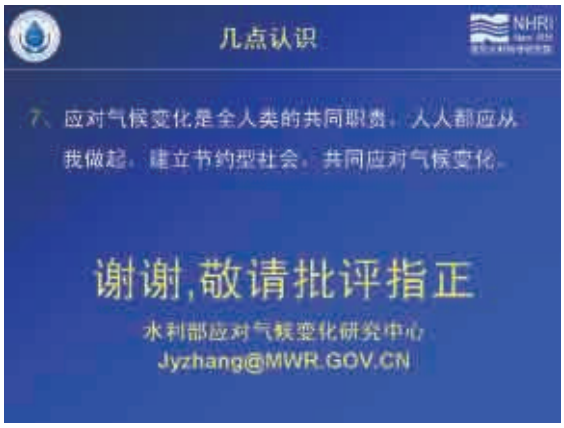
几点认识

6、关于2010年西南大旱

特点：是有气象资料以来，西南地区遭遇的最严重干旱，持续时间长，干旱面积大，影响程度重。

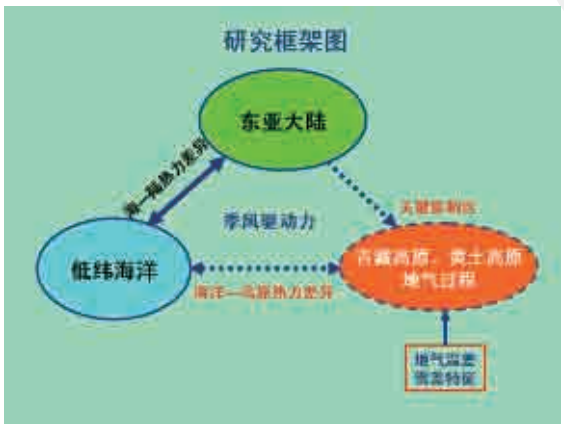
气象：自去年9月起，200多天降水少，整个西南地区降水比常年同期少了五成以上，尤其是云南和贵州两省，云南同时温度又异常高，200多天平均的情况较常年同期偏高2度，水分蒸发大，导致干旱严重。

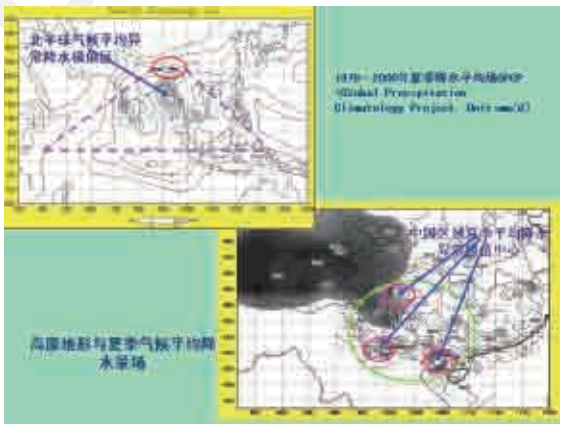
成因：降水要有冷暖气团交汇，特殊地理环境，西藏高原世界屋脊，水汽是来自屋脊的南麓从印度洋输送过来，这是重要的水汽输送带，而在过去的200多天里这条输送带比常年异常偏弱，水汽的输送非常少，从秋季到入冬以来整体冷空气活动偏弱，无法与西南暖湿气流交汇。

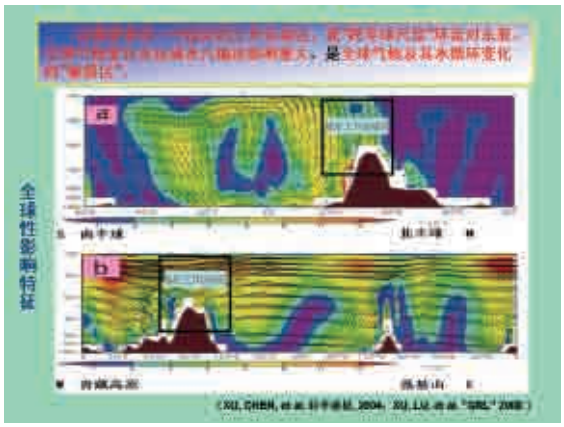

几点认识
NHRI
7、应对气候变化是全人类的共同职责，人人都应从我做起，建立节约型社会，共同应对气候变化。
谢谢,敬请批评指正
水利部应对气候变化研究中心
Jyzhang@MWR.GOV.CN

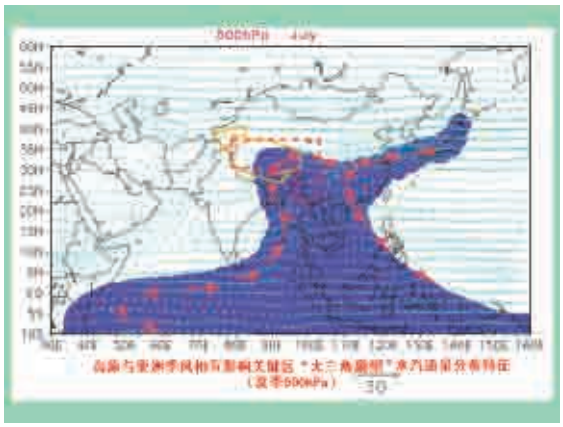
高原地气过程对中国区域水灾、水资源影响机制及观测系统应用研究

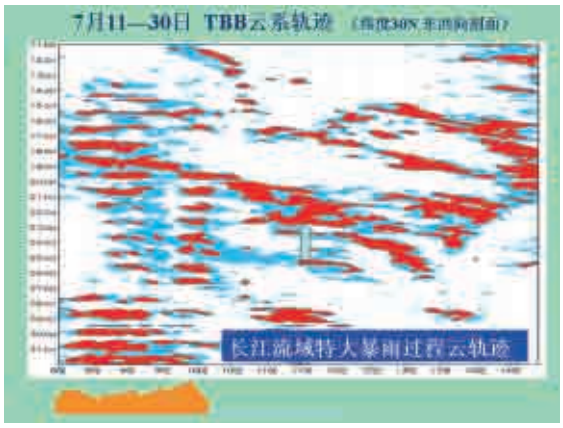
中国工程院院士　　徐祥德

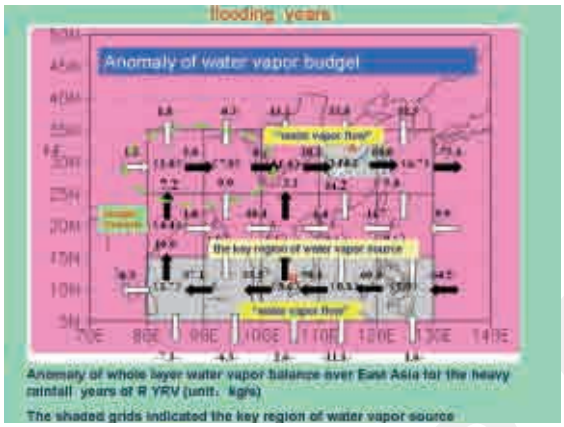


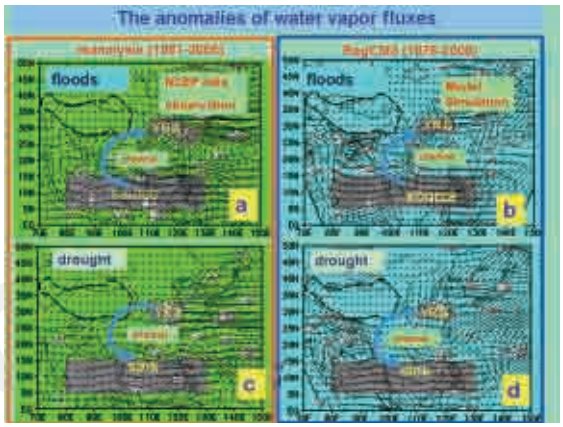


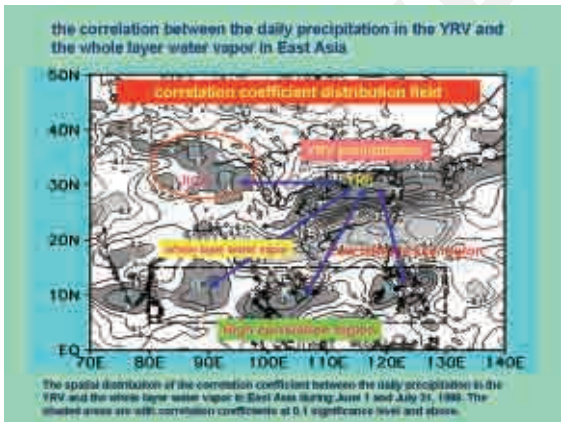


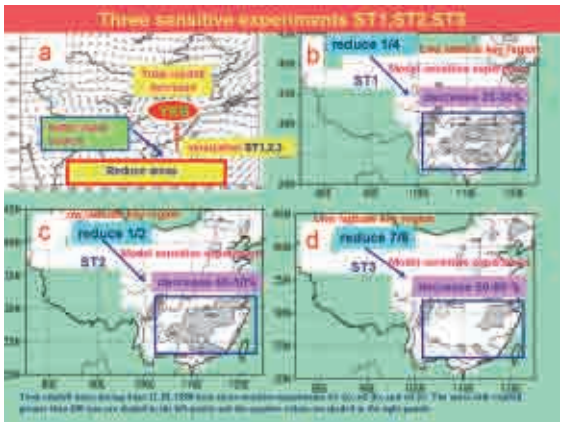


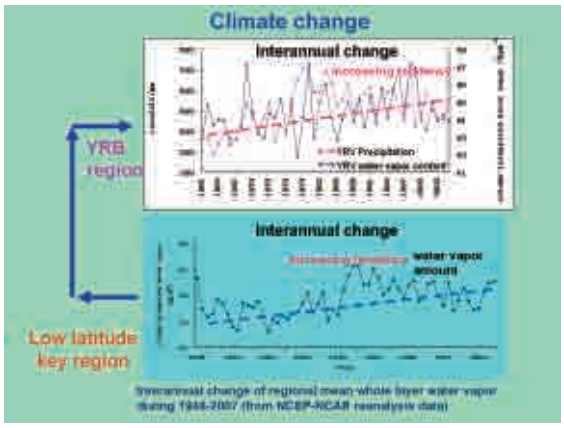

7月11—30日 TBB云系轨迹
长江流域特大暴雨过程云轨迹

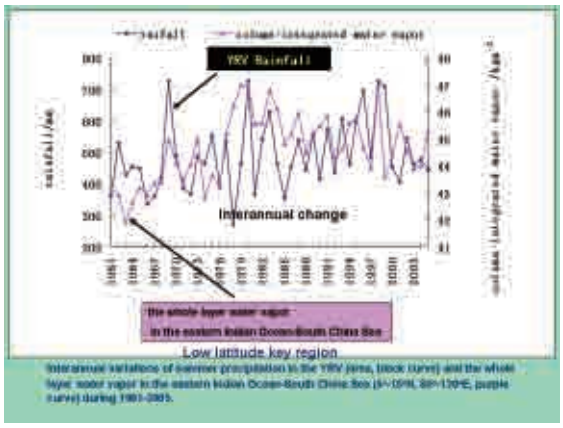

flooding years
Anomaly of water vapor budget
the key region of water vapor source
Anomaly of whole layer water vapor balance over East Asia for the heavy rainfall years at R YRV (unit: kg/s)
The shaded grids indicated the key region of water vapor source

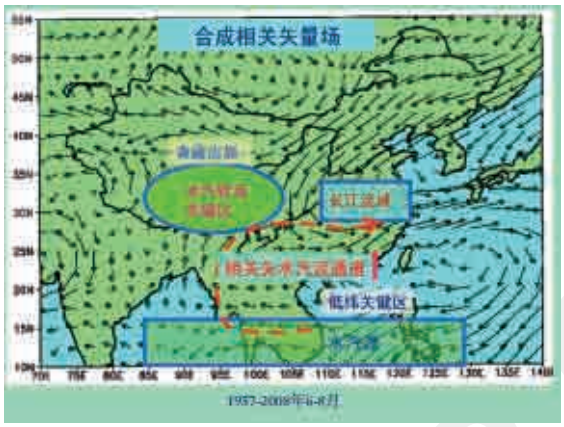

The anomalies of water vapor fluxes
floods
drought

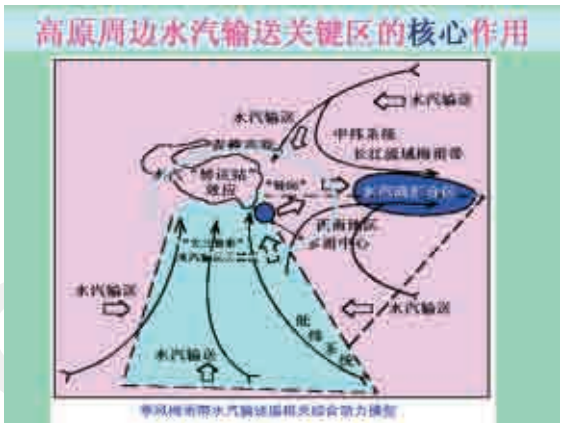

the correlation between the daily precipitation in the YRV and the whole layer water vapor in East Asia
correlation coefficient distribution field
high correlation region
The spatial distribution of the correlation coefficient between the daily precipitation in the YRV and the whole layer water vapor in East Asia during June 1 and July 31, 1998. The shaded areas are with correlation coefficients at 0.1 significance level and above.

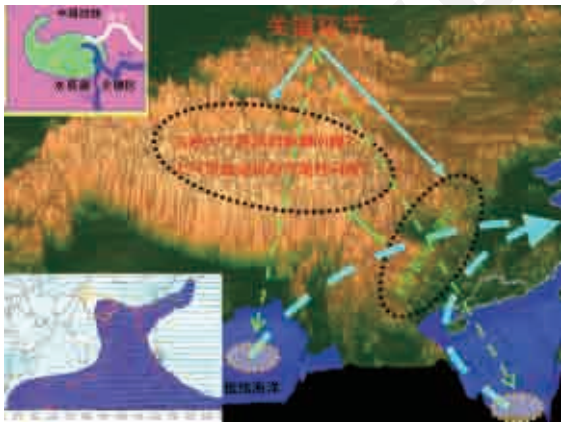

Three sensitive experiments ST1,ST2,ST3
reduce 1/4
ST1
reduce 1/2
ST2
reduce 7/8
ST3



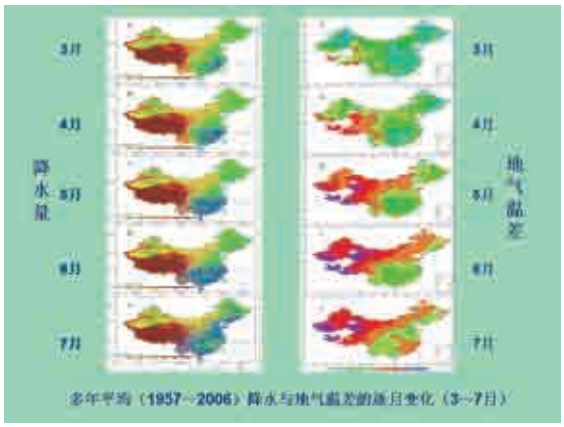




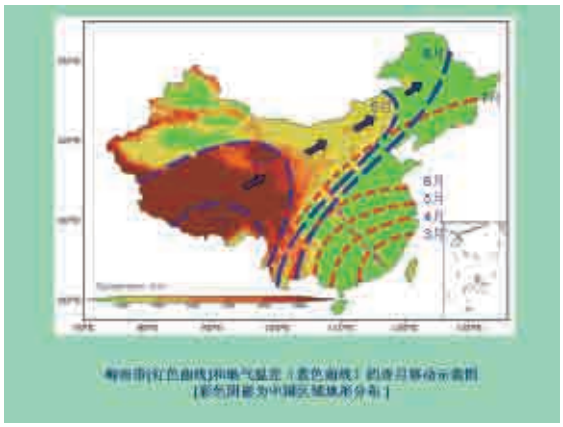




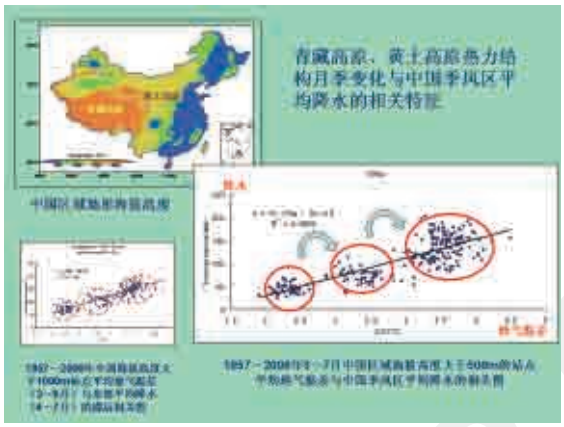
全球变化背景下
中国区域降水变化趋势的
区域性特征

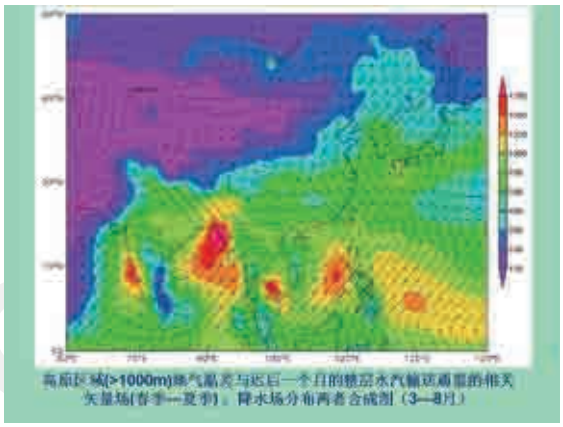


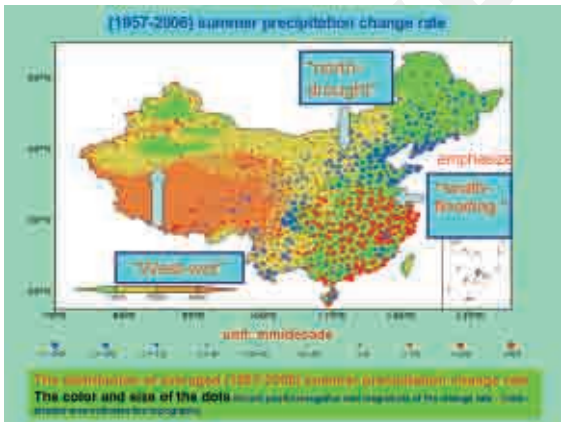
多年平均（1957~2006）降水与地气温差的逐月变化（3~7月）

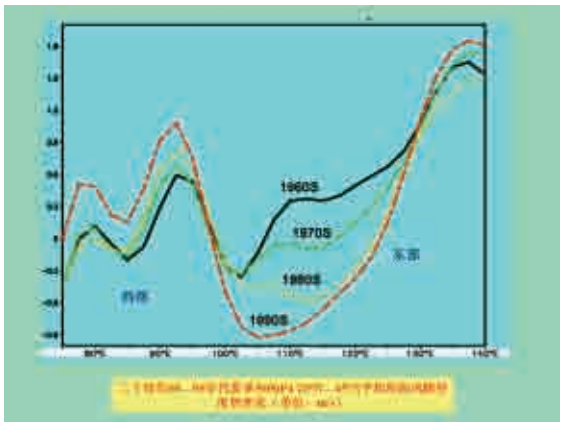


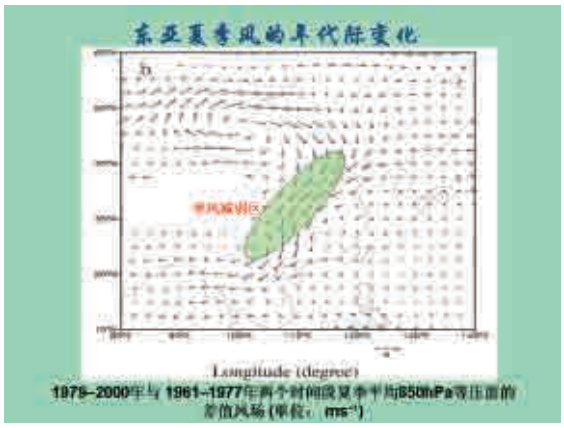
梅雨带(红色曲线)和地气温差（蓝色曲线）的逐月移动示意图
(彩色阴影为中国区域地形分布)




高原区域(>1000m)地气温差与近后一个月的整层水汽输送通量的相关矢量场(春季—夏季)，降水场分布两者合成图（3—8月）





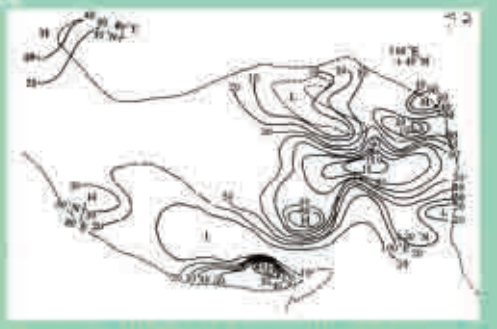


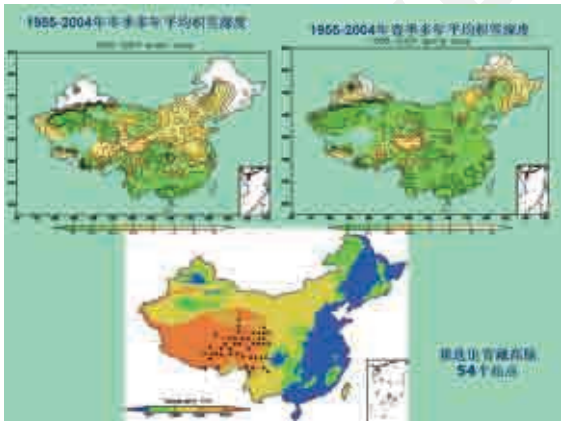
1979–2000年与1961–1977年两个时间段夏季平均850hPa等压面的差值风场(单位：ms^{-1})

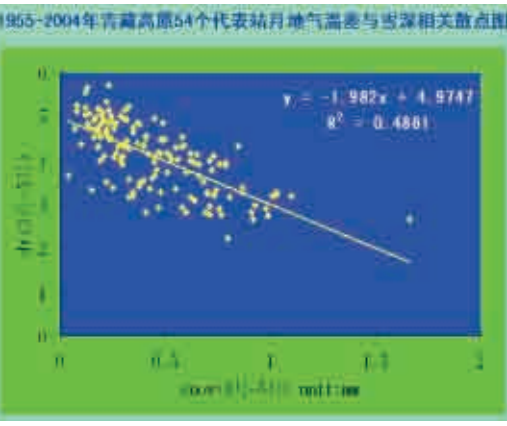

春季地气温差年际变化
（1957~2006）

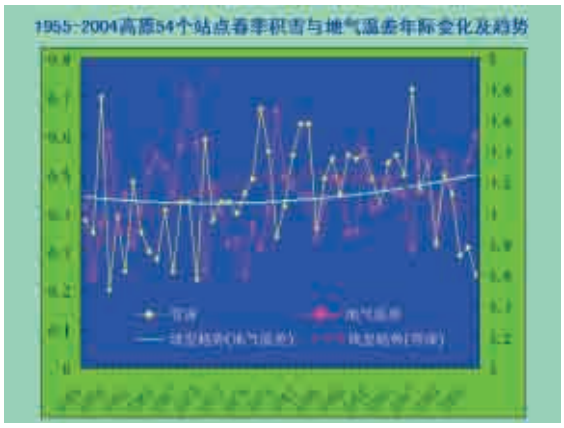
资料

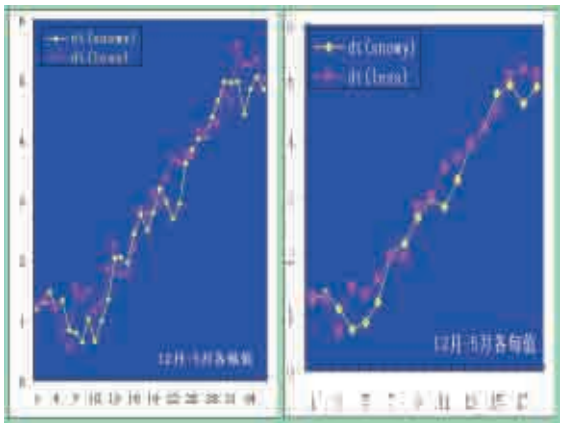
采用1955-2004年中国753个地面站地气温差、雪深资料，卫星遥感雪盖数据以及NCEP再分析资料，综合分析高原积雪"湿土壤"与大气互反馈效应对中国夏季风及其降水分布特征的影响问题。

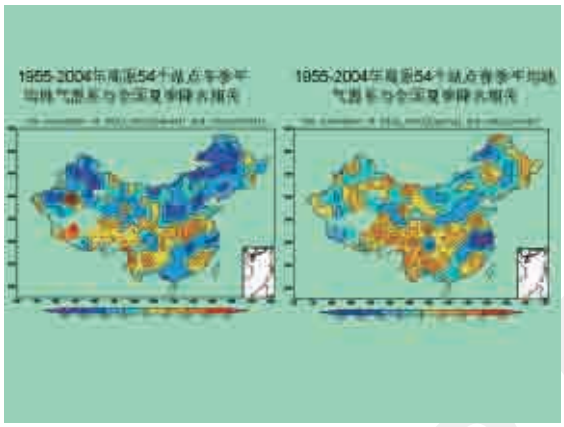

青藏高原10~4月多年平均积雪日数的分布

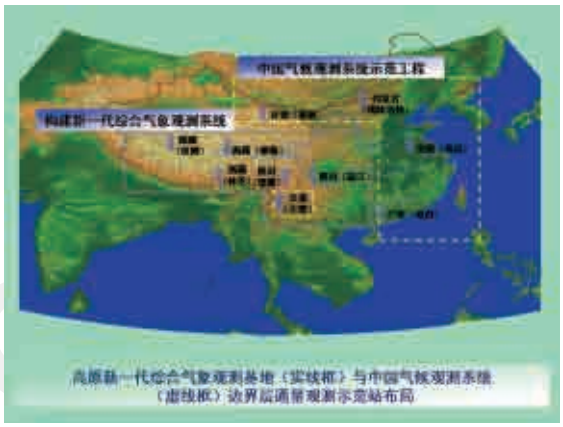








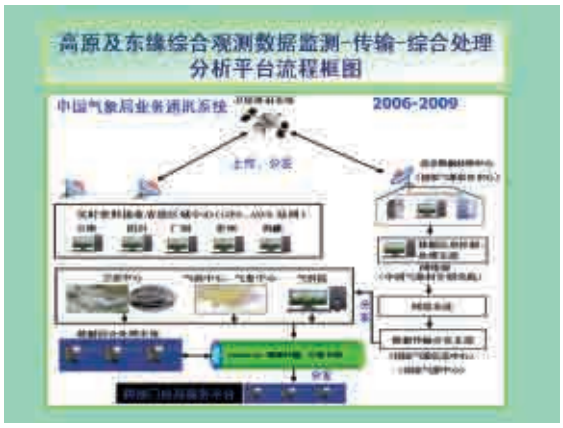


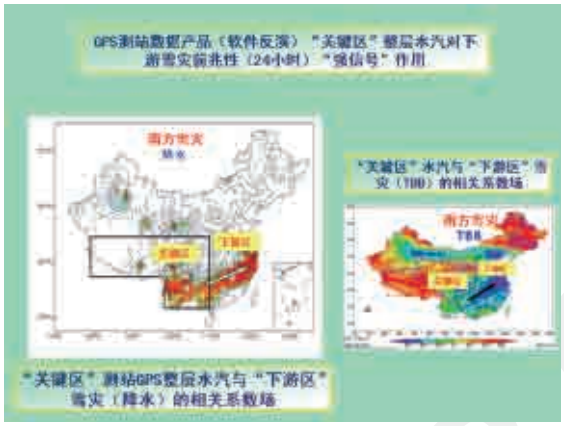


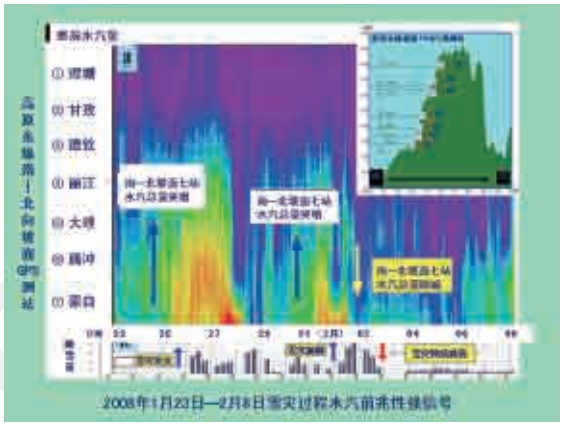
高原新一代综合气象观测基地（实线框）与中国气候观测系统
（虚线框）边界层通量观测示范站布局

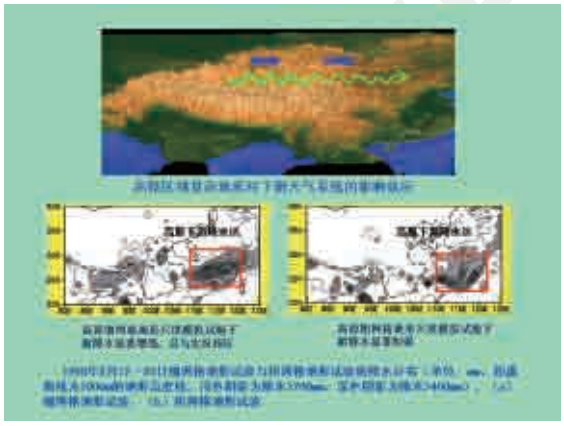
JICA青藏高原及东缘
观测系统设计及应用

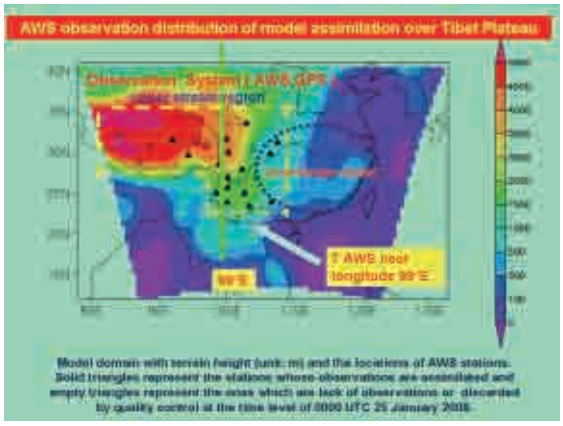

已建中国气候观测系统五个综合气象观测示范站边界层通量观测塔

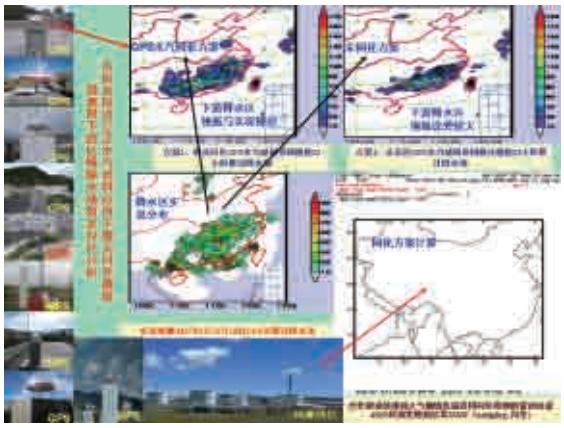

高原及东缘综合观测数据监测-传输-综合处理分析平台流程框图
2006-2009

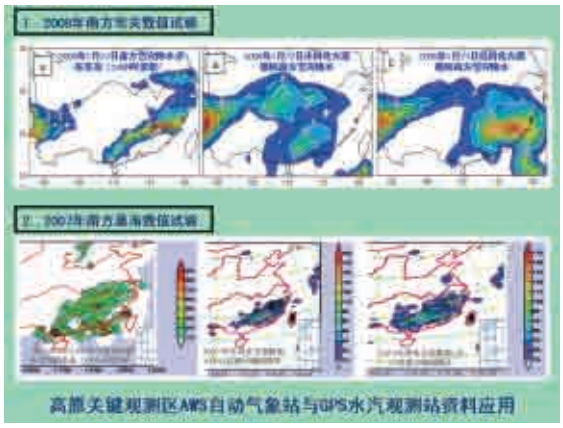

GPS测站数据产品（软件反演）“关键区”整层水汽对下游雪灾前兆性（24小时）“强信号”作用
“关键区”水汽与“下游区”雪灾（TBB）的相关系数场
“关键区”测站GPS整层水汽与“下游区”雪灾（降水）的相关系数场


高原东缘沿1北向坡面GPS测站
2008年1月23日—2月8日雪灾过程水汽前兆性强信号



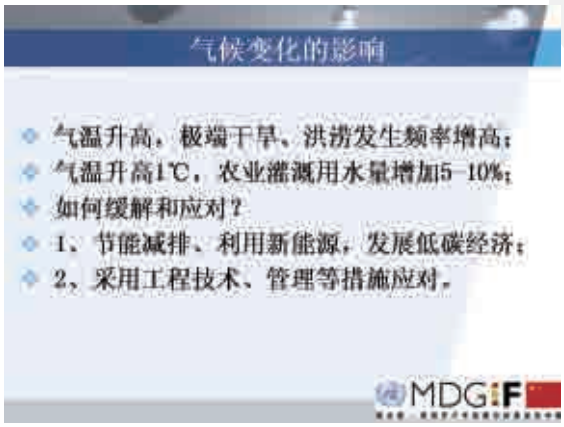

AWS observation distribution of model assimilation over Tibet Plateau
Observation System (AWS,GPS
data assimilation
7 AWS near longitude 99°E
Model domain with terrain height (unit: m) and the locations of AWS stations.
Solid triangles represent the stations whose observations are assimilated and
empty triangles represent the ones which we lack of observations or discarded
by quality control at the time level of 0000 UTC 25 January 2008.

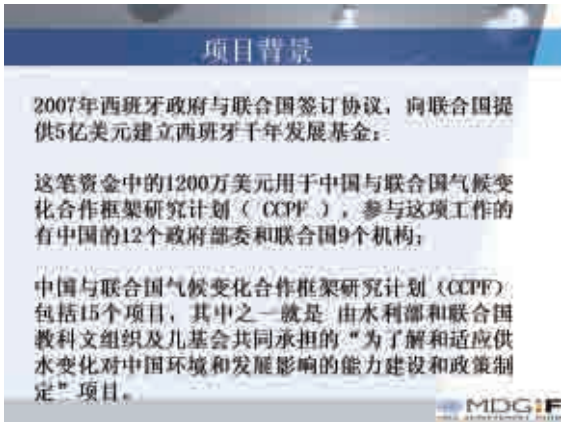


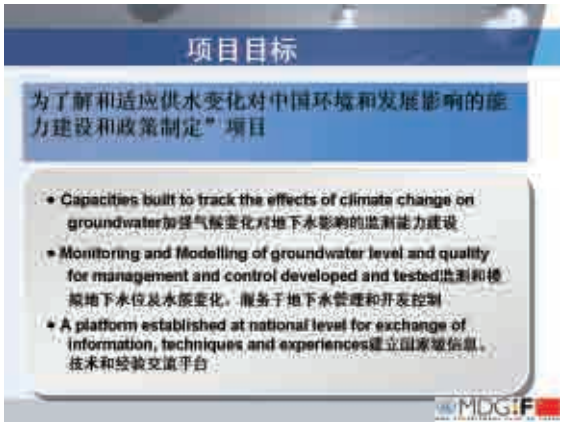


气候变化对地下水影响研究

水利部和联合国儿基会“气候变化对地下水影响”合作项目
中方专家组组长　　高占义



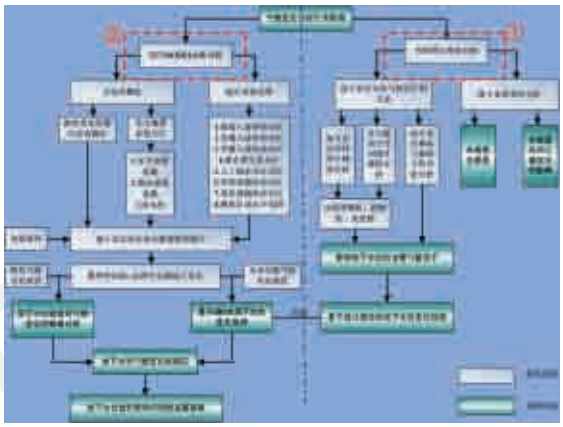


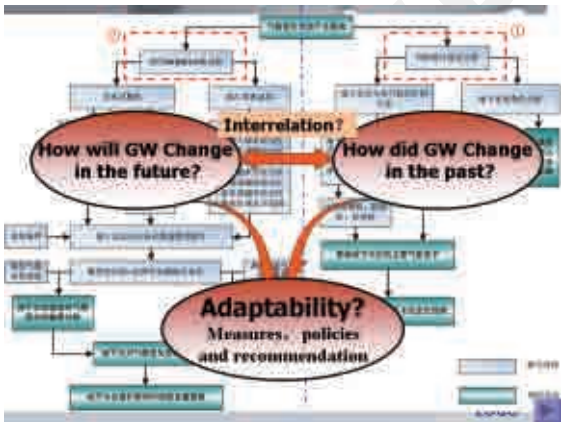



地下水监测能力建设
A
更新三个试点的地下水位监测设备

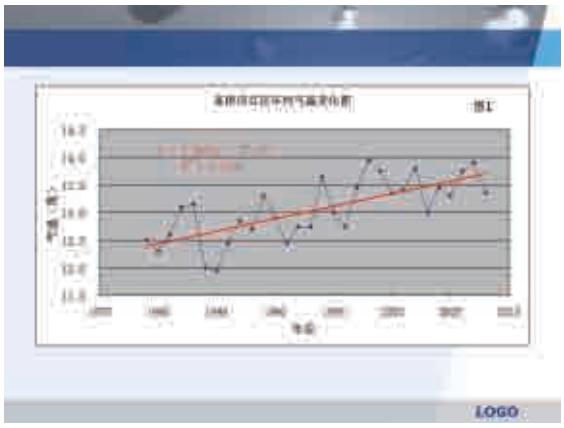

地下水监测能力建设
B
对三个试点的技术人员进行培训
Field technical training

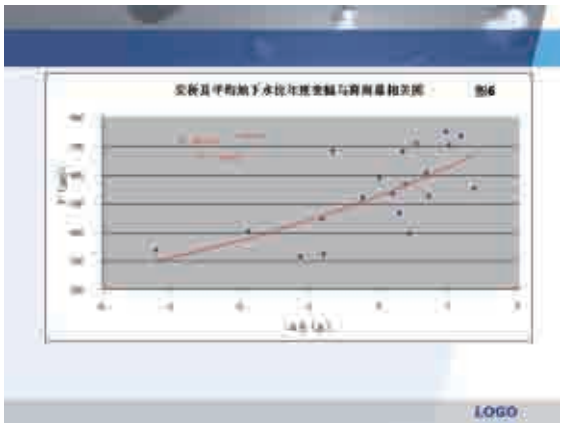

研究分析方法
IPCC SRES Scenarios + Climate(MIROC3.2) model
历史资料
Future Climate Change Scenarios in the pilot area
Groundwater Response to Climate Change in Future

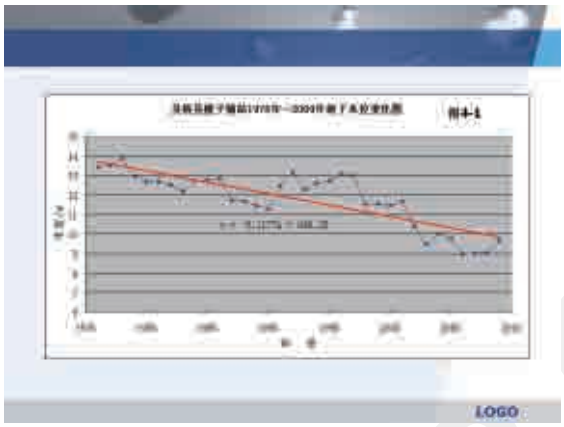


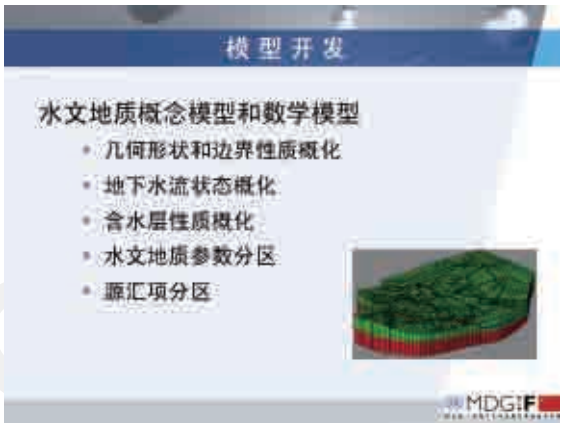

How will GW Change in the future?
Interrelation?
How did GW Change in the past?
Adaptability?
Measures, policies and recommendation

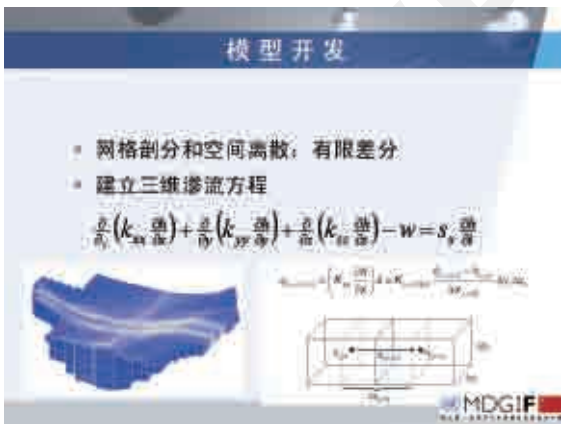

三个试验区情况
Cangzhou, Hebei: Typical region in northern China, groundwater overexplored
Weihai, Shandong: Serious seawater intrusion
山东威海，海水严重入侵
Xianyang, Shaanxi: Groundwater is a major water supply


LOGO


LOGO

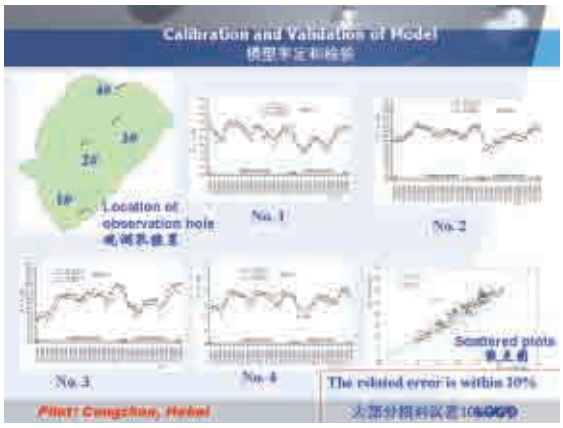

LOGO

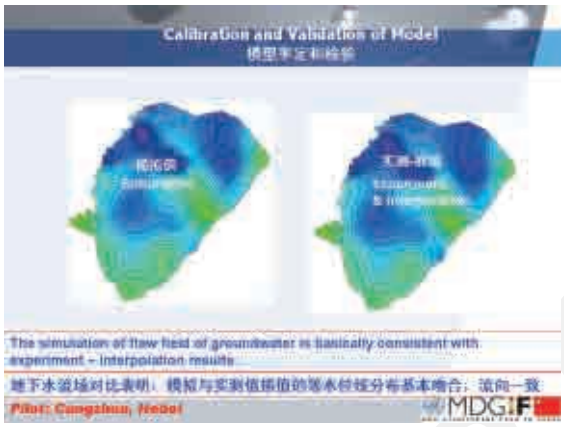

模型开发
水文地质概念模型和数学模型
几何形状和边界性质概化
地下水流状态概化
含水层性质概化
水文地质参数分区
源汇项分区
MDGIF

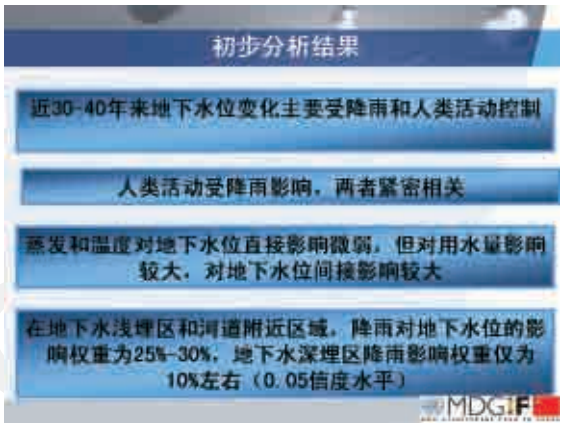

模型开发
网格剖分和空间离散：有限差分
建立三维渗流方程
MDGIF


时空离散
LOGO

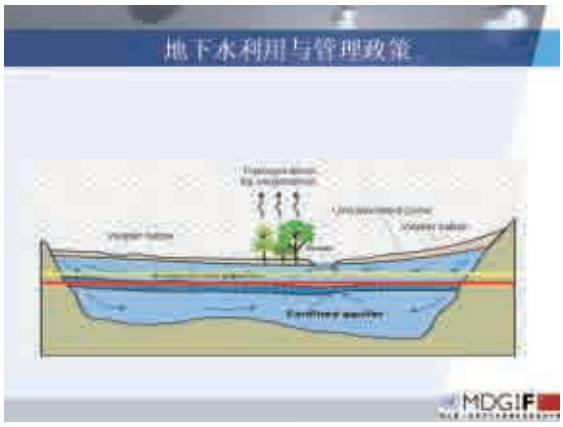

Partition of Source and Sink Terms
源汇项强度分区
Rainfall recharge
降雨补给
Trans-boundary discharge
Irrigation recharge
灌溉补给
Shallow groundwater evaporation
浅水蒸发
Artificial pumping
人工抽水
Pilot: Cangzhou, Hebei
MDGIF

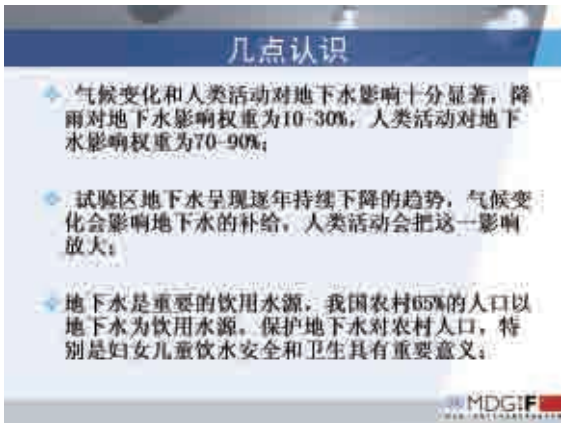

Calibration and Validation of Model
模型率定和检验
Location of observation hole
No. 1
No. 2
No. 3
No. 4
Scattered plots
The related error is within 10%
Pilot: Cangzhou, Hebei

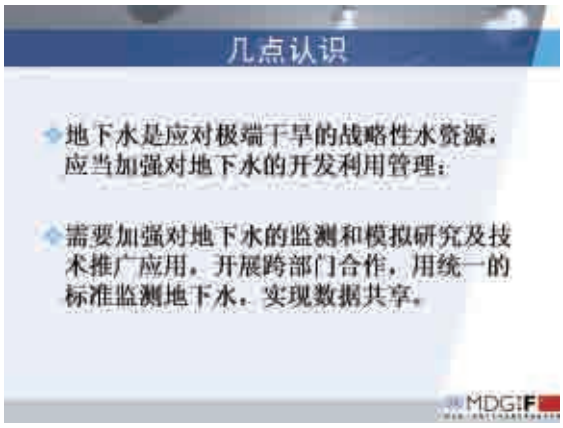

Calibration and Validation of Model
模型率定和检验
The simulation of flow field of groundwater is basically consistent with experiment – interpolation results
地下水流场对比表明，模拟与实测值插值的等水位线分布基本吻合，流向一致
Pilot: Cangzhou, Hebei
MDGIF


初步分析结果
近30-40年来地下水位变化主要受降雨和人类活动控制
人类活动受降雨影响，两者紧密相关
蒸发和温度对地下水位直接影响微弱，但对用水量影响较大，对地下水位间接影响较大
在地下水浅埋区和河道附近区域，降雨对地下水位的影响权重为25%-30%，地下水深埋区降雨影响权重仅为10%左右（0.05信度水平）
MDGIF


人类活动为气候变化对地下水影响起到了放大器的作用
潜水含水层
承压含水层
MDGIF


地下水利用与管理政策
MDGIF

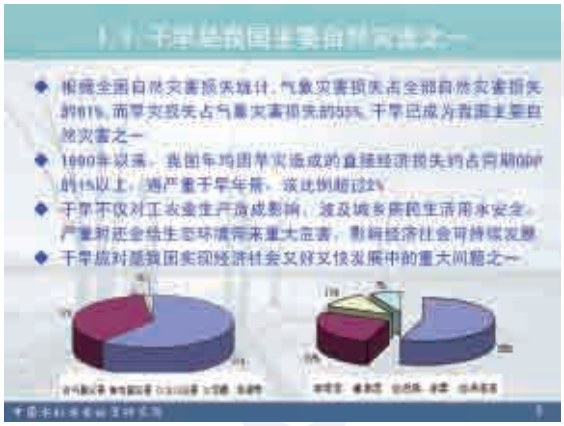

几点认识
气候变化和人类活动对地下水影响十分显著，降雨对地下水影响权重为10-30%，人类活动对地下水影响权重为70-90%；
试验区地下水呈现逐年持续下降的趋势，气候变化会影响地下水的补给，人类活动会把这一影响放大；
地下水是重要的饮用水源，我国农村65%的人口以地下水为饮用水源，保护地下水对农村人口，特别是妇女儿童饮水安全和卫生具有重要意义；
MDGIF

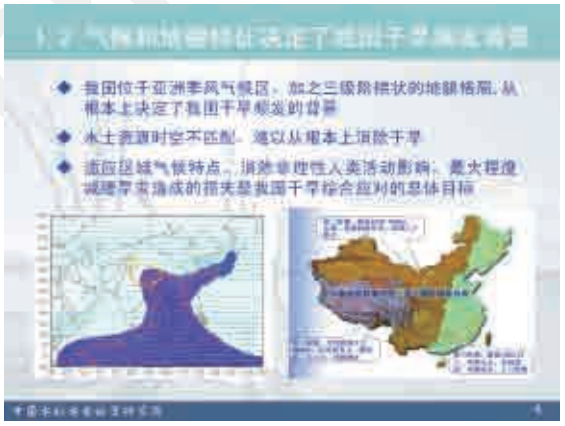

几点认识
地下水是应对极端干旱的战略性水资源，应当加强对地下水的开发利用管理；
需要加强对地下水的监测和模拟研究及技术推广应用，开展跨部门合作，用统一的标准监测地下水，实现数据共享。
MDGIF

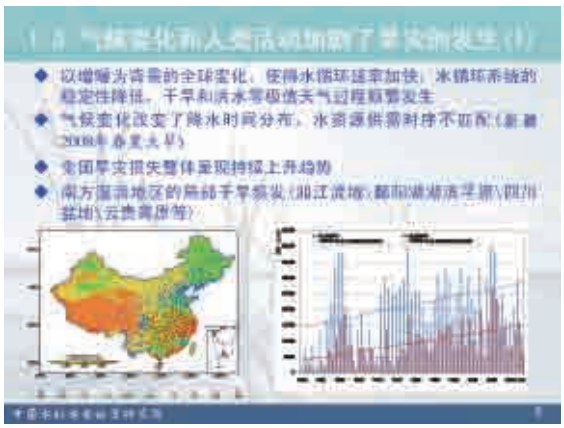

谢 谢！
MDGIF

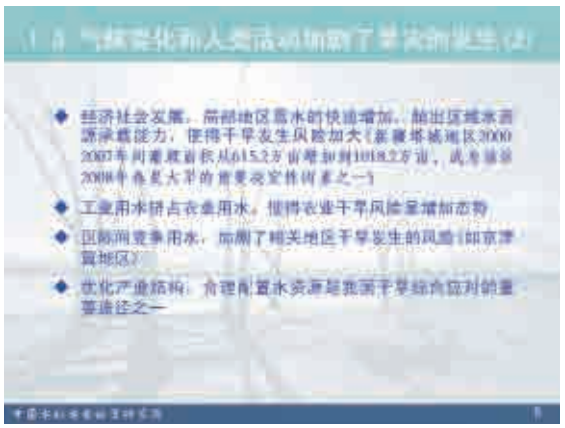
中国干旱综合应对的几点思考

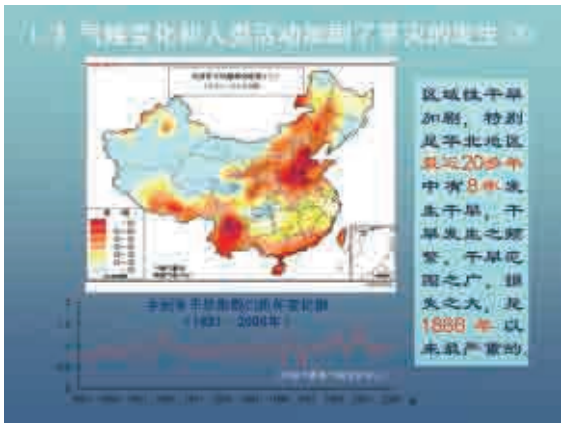
中国工程院院士　　王浩



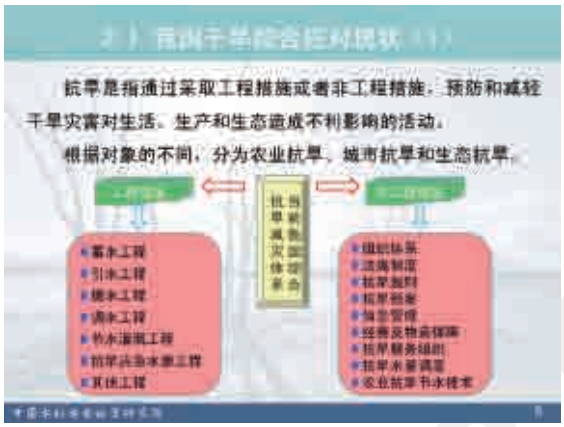







区域性干旱加剧，特别是华北地区最近20多年中有8年发生干旱，干旱发生之频繁，干旱范围之广，损失之大，是1888年以来最严重的。

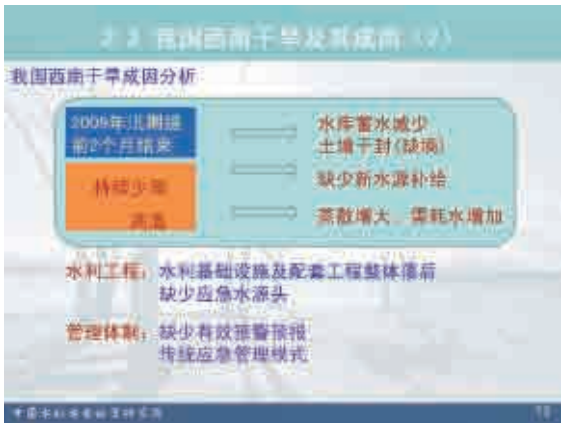

报告提纲
1
2
我国干旱综合应对现状及问题
3
我国干旱综合应对关键技术

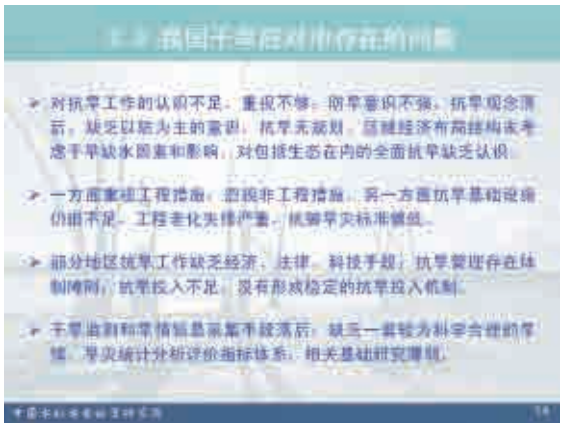

2.1 我国干旱综合应对现状（1）
抗旱是指通过采取工程措施或者非工程措施，预防和减轻干旱灾害对生活、生产和生态造成不利影响的活动。
根据对象的不同，分为农业抗旱、城市抗旱和生态抗旱。
抗旱减灾体系
蓄水工程
引水工程
提水工程
调水工程
节水灌溉工程
抗旱应急水源工程
其他工程
组织体系
法规制度
抗旱预案
抗旱档案
抗旱管理
经费及物资保障
抗旱服务组织
抗旱水量调度
农业抗旱节水技术

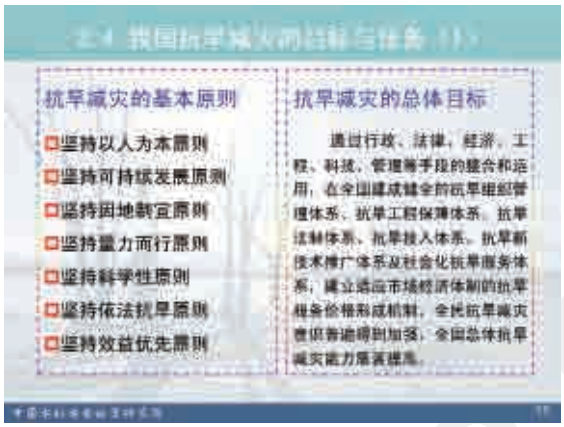

2.1 我国干旱综合应对现状（2）
水源工程
节水工程
抗旱减灾工程体系

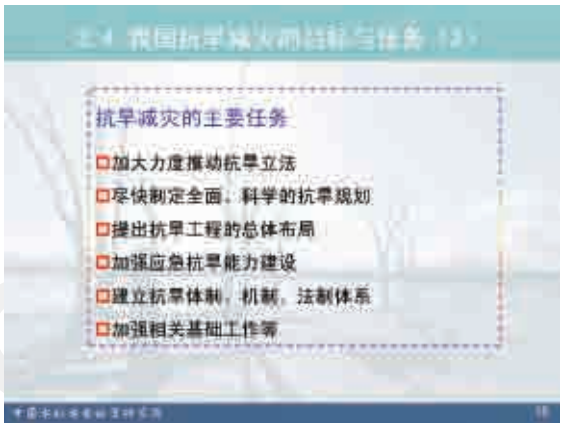

2.1 我国干旱综合应对现状（3）
抗旱减灾非工程体系


2.2 我国西南干旱发展态势（1）
截至3月17日15时统计，广西、重庆、四川、贵州、云南5省（自治区、直辖市）共5104.9万人受灾，饮水困难人口1609万人，饮水困难大牲畜1105.5万头；农作物受灾面积4348.6千公顷，其中绝收面积940.2千公顷；因灾直接经济损失190.2亿元。

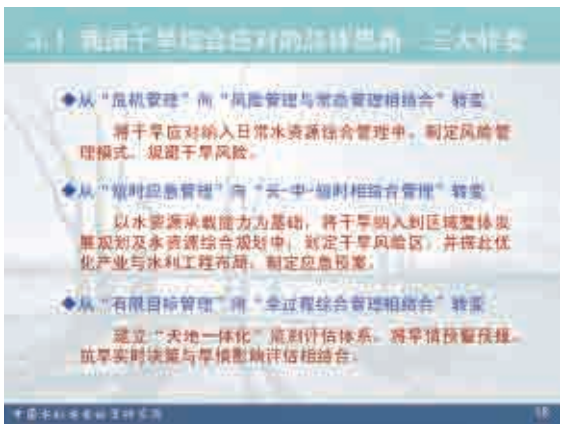

我国西南干旱成因分析
2009年北部湾前2个月降雨
持续少雨
水库蓄水减少
土壤干封(缺墒)
缺少新水源补给
蒸散增大，需耗水增加
水利工程：水利基础设施及配套工程整体薄弱
缺少应急水源头
管理体制：缺少有效预警预报
传统应急管理模式

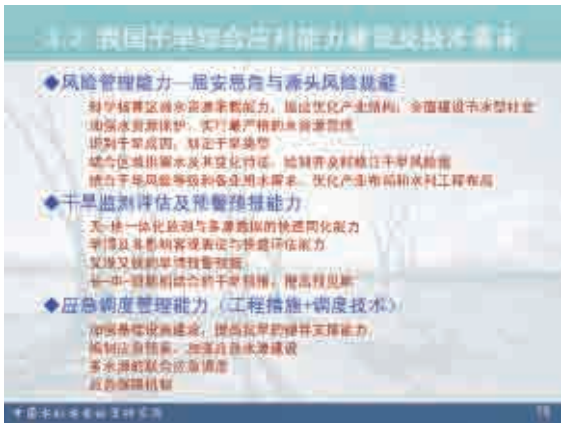

对抗旱工作的认识不足，重视不够，防旱意识不强，抗旱观念落后，缺乏以防为主的意识，抗旱无规划，区域经济布局缺乏考虑干旱缺水因素和影响，对包括生态在内的全面抗旱缺乏认识。
一方面重视工程措施，忽视非工程措施，另一方面抗旱基础设施仍相不足，工程老化失修严重，抗御旱灾标准偏低。
部分地区抗旱工作缺乏经济、法律、科技手段，抗旱管理存在体制障碍，抗旱投入不足，没有形成稳定的抗旱投入机制。
干旱监测和旱情信息采集不规范，缺乏一套较为科学合理的旱情、旱灾统计分析评价指标体系，相关基础研究薄弱。


抗旱减灾的基本原则
坚持以人为本原则
坚持可持续发展原则
坚持因地制宜原则
坚持量力而行原则
坚持科学性原则
坚持依法抗旱原则
坚持效益优先原则
抗旱减灾的总体目标
通过行政、法律、经济、工程、科技、管理等手段的整合和运用，在全国建成健全的抗旱组织管理体系、抗旱工程保障体系、抗旱法制体系、抗旱投入体系、抗旱新技术推广体系及社会化抗旱服务体系；建立适应市场经济体制的抗旱服务价格形成机制，全民抗旱减灾意识普遍得到加强，全国总体抗旱减灾能力显著提高。

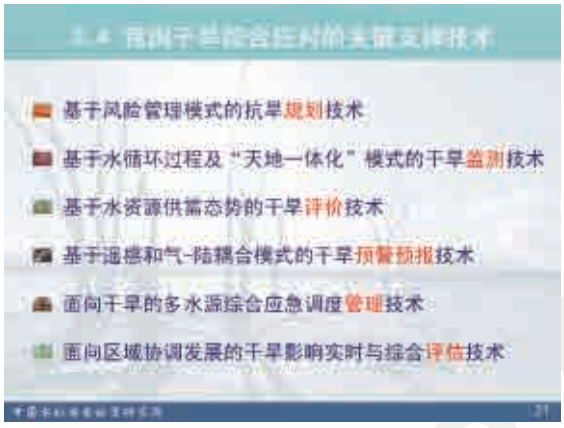

抗旱减灾的主要任务
加大力度推动抗旱立法
尽快制定全面、科学的抗旱规划
提出抗旱工程的总体布局
加强应急抗旱能力建设
建立抗旱体制、机制、法制体系
加强相关基础工作等

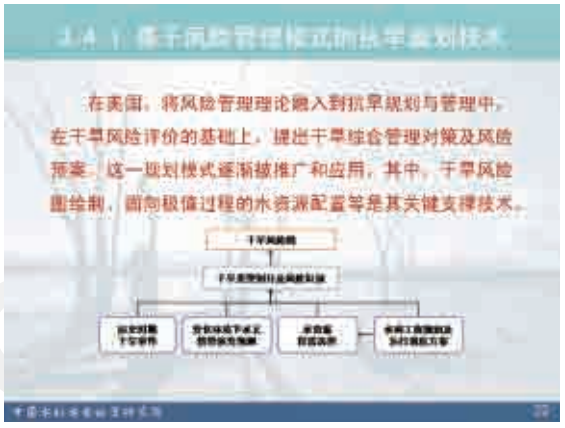

我国干旱综合应对关键技术


◆从“危机管理”向“风险管理与常态管理相结合”转变
将干旱应对纳入日常水资源综合管理中，制定风险管理模式，规避干旱风险。
◆从“临时应急管理”向“天-中-临时相结合管理”转变
以水资源承载能力为基础，将干旱纳入到区域整体发展规划及水资源综合规划中，制定干旱风险区，并调整优化产业与水利工程布局，制定应急预案。
◆从“有限目标管理”向“全过程综合管理相结合”转变
建立“天地一体化”监测评估体系，将旱情预警预报、抗旱实时决策与旱情影响评估相结合。


◆风险管理能力—最安息点与源头风险提醒
◆干旱监测评估及预警预报能力
◆应急调度管理能力（工程措施+调度技术）

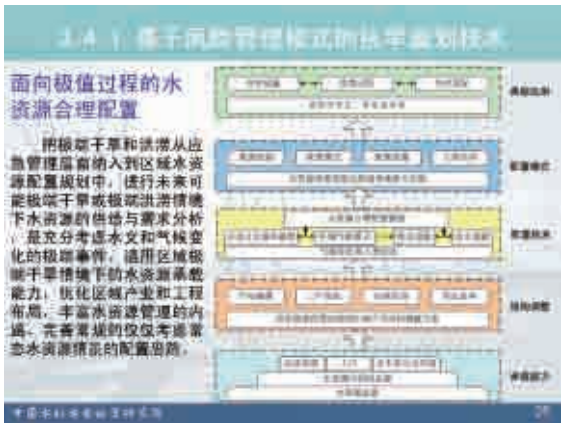

评估
管理
预警预报
评价
监测
规划
区域协调发展
干旱影响实时与综合评价
地表水
地下水
中水
再生水
应急水源
多水源综合应急调度
遥感
气-陆耦合模式
降水
蒸发
径流
水利工程特征
水资源供需态势
大气
地表
土壤
地下
水资源开发利用
遥感技术
地面监测技术
水循环过程
“天地一体化”监测
干旱风险图
面向极值过程的水资源配置
干旱应急调度与应急预案编制
风险管理模式


基于风险管理模式的抗旱规划技术
基于水循环过程及“天地一体化”模式的干旱监测技术
基于水资源供需态势的干旱评价技术
基于遥感和气-陆耦合模式的干旱预警预报技术
面向干旱的多水源综合应急调度管理技术
面向区域协调发展的干旱影响实时与综合评估技术

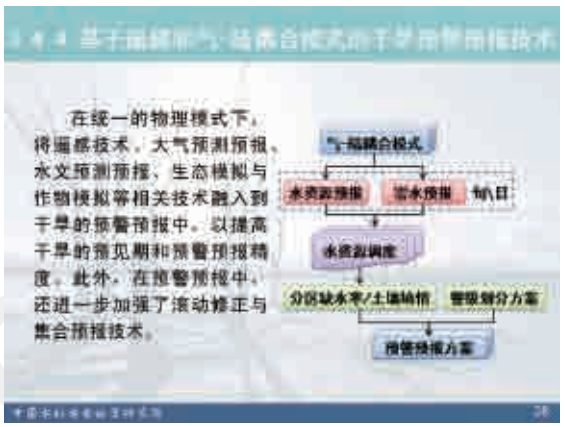

在美国，将风险管理理论融入到抗旱规划与管理中，在干旱风险评价的基础上，提出干旱综合管理对策及风险预案。这一规划模式逐渐被推广和应用，其中，干旱风险图绘制，面向极值过程的水资源配置等是其关键支撑技术。


干旱风险评价及风险分区的理论与技术体系
理论与技术体系
管理系统
应对方案

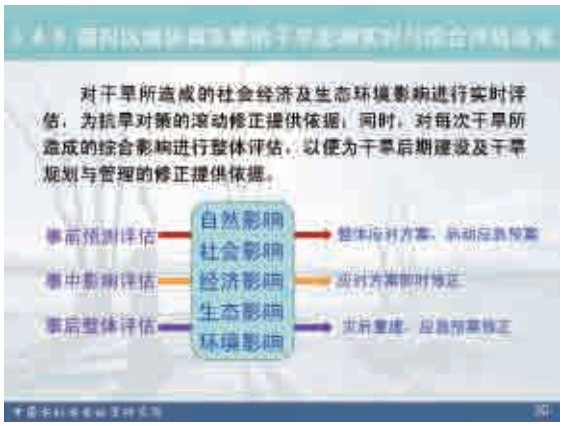

干旱风险评价及风险分区研究的经济、社会效益


面向极值过程的水资源合理配置


对水循环的大气过程、地表过程、土壤过程和地下过程以及水资源的开发利用状况进行综合监测。将遥感技术（包括卫星遥感、探空等）与地面监测技术相结合，进行干旱的“天-地一体化”监测。


在统一的物理模式下，将遥感技术、大气预测预报、水文预测预报、生态模拟与作物模拟等相关技术融入到干旱的预警预报中，以提高干旱的预见期和预警预报精度。此外，在预警预报中，还进一步加强了滚动修正与集合预报技术。


结合干旱预警预报及干旱影响，对地表水、地下水等常规水资源与中水、再生水等非常规水资源及应急水源进行综合调度，并提出综合性的保障措施。


对干旱所造成的社会经济及生态环境影响进行实时评估，为抗旱对策的滚动修正提供依据；同时，对每次干旱所造成的综合影响进行整体评估，以便为干旱后期建设及干旱规划与管理的修正提供依据。
事前预测评估
事中影响评估
事后整体评估
自然影响
社会影响
经济影响
生态影响
环境影响


THANKS.
敬请批评指正！

汪恕诚主席
在“全球气候变化与中国水安全高级圆桌会议”闭幕式上的总结发言

尊敬的各位来宾，女士们，先生们：

在与会各位来宾和专家的共同努力下，会议按照计划完成了预定的各项议程。我现在代表会议组委会，对会议做一简要总结。

会议的氛围非常好，大家虽然来自不同的行业，不同的领域，有着不同的经历，也可以说有不同的观点，但是大家都能够开诚布公地谈出自己的观点，畅所欲言，互相尊重，能够形成一种交流，这对我们进一步地研究气候变化背景下的中国水安全问题无疑是一种非常有益的方式。这种由决策者、管理者、非政府组织、企业界、专家学者共同参加的这次圆桌会议，采用开放、互动的方式，平等协商的气氛，充分体现了伙伴关系的一种新的会议模式，达到了预期的效果。不足之处是受时间限制，有些代表言犹未尽。

总结起来，我们可以认为，会议取得了丰硕的成果，主要成果可以归纳为以下四个方面。

第一、明确了保障水安全是应对全球气候变化的重要领域。论坛与会者充分讨论了气候变化的成因、气候变化趋势，及其对中国水资源的影响，提出了气候变化背景下的与水有关的中国防洪安全、饮水安全、粮食安全和生态安全等重大问题；分析了提高能源效率、发展可再生能源、低碳技术在减少温室气体排放方面的途径，探讨了采用水资源综合管理理念应对气候变化保障中国水安全等可能采取的适应体制、技术和措施。这些讨论充分表明了水是全球气候变化最直接和最重要的影响领域，只有正视现实，充分依靠体制创新、管理创新、科技创新和技术进步，才能够全面提升我国应对气候变化保障水安全的能力和水平。

第二、气候变化是全球性的问题。气候变化带来的环境问题，属于全球的环境问题。当然就需要大家共同来应对。无论是发达国家，还是发展中国家，都应该共同来解

决人类面临的重大问题。中国作为温室气体排放最大的国家，又是应对自然灾害能力比较薄弱的国家。因此中国更应该采取积极的态度，参与到这场全球性的挑战中间去。那么中国政府现在已经研究了很多战略上的一些目标，我们很快就要制定十二五规划。在十二五规划里边就要把中国政府面向全世界承诺的三项指标落实到具体工作当中去，这是当前最重要的一件事情。

第三，通过这次会议以后，增进了对中国水资源情况的理解和共识。中国水资源问题或者气候变化对中国经济发展的影响面临的困难是很大的。要应对这些挑战，付出的代价也是很多的。我们这次会议重点讨论的是水安全问题，是自然灾害发生以后、温室气体排放、地球的温度上升以后带来对水资源的变化。实际要减少二氧化碳排放对中国来讲，挑战是更加尖锐。中国政府承诺了2020年非化石能源要比一次能源消耗的15%。说起来这15%，算算帐谈何容易？中国现在70%是靠煤炭发电。非化石能源实际上是可再生能源加上核电，称为非化石能源。中国的核电才刚刚起步，现在还不到一千万千瓦，到2020年起码要达到五六千千瓦。水力发电我们发展很快的，已经到了两亿千瓦。但是真要满足15%的要求，水电怎么算下来新机装机容量一千一百千瓦，否则就完不成指标。中国风力发电现在按照每年百分之百的速度在发展，很快要超过美国成为世界上风电最多的国家。但是风力发电能够上网的现在只占70%，原因很简单，风电的不稳定性给调度带来很大困难。另外风电年利用小时数不到两千个小时。因此只能够解决一个火力发电的发电量。因为它的价格比较昂贵，上网电价五毛五。因此现在电网就不愿意吸收。这边火力发电在停机，这边要去吸收高电价的新能源，当然在经济政治上不愿意接受。我想一方面表达中国政府有这个决心来实现自己承诺的三项目标，从另一方面也让世界各国能够了解、能够理解中国达到这个目标是付出相当代价，而且是相当困难的。

第四、论坛提高了公众应对气候变化保障水安全意识。多家媒体对这次会议做了报道，媒体报道的信息，将有助于大众更好地了解气候变化带来的中国水安全问题、更好地了解应对气候变化保障水安全政策和行动，将有助于公众提高保护水资源、保护气候的意识。这将是会议的一个额外的收获和成果。

以上是我对本次会议做的简要总结。我们将在这个总结的基础上，将本次会议讨论的内容和成果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。

我们期待着本次会议的这些成果能够为推进应对气候变化保障中国水安全方面做出积极的贡献，能够为中国的水资源保护和气候保护起到推动作用。

女士们，先生们，

以上是我对这次会议做的很简要的总结，我们期待本次会议的成果，能够为推进应对气候变化，保障中国水安全问题做出积极贡献。能够对中国水资源保护和气候保护起到推动性作用。

谢谢大家！

会议文集

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Proceedings

Addresses:

Keynote Speeches:

Invited Reports:

Speech at the High-level Roundtable on Global Climate Change and Water Security in China

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

Distinguished guests, ladies and gentlemen:

Good morning!

Two years ago at the same day as today, I attended the "High- Level Roundtable on Water and Sanitation". Two years later, I come again together with my new and old friends from the world, I am very happy. Here, on behalf of the CPPCC, I express my sincere congratulations to the opening of this conference and a warm welcome for friends coming from afar.

Currently, extreme climates caused by global warming have shown a trend of normalization, making China's increasingly prominent water security and the inherent vulnerability exacerbated. Since last year, China's southwestern Yunnan, Guizhou, Guangxi, Sichuan and Chongqing provinces/ autonomous regions normally with much rainfall has been struck by drought continuously in autumn, winter and spring seasons. With such hot weather and dry lands of thousands of miles, over 60 million people were affected which is equivalent to the total populations of Canada and Australia. Their basic water need was facing serious difficulties. Men and women villagers went uphill day and night to find water. The scenes are shocking. Someone exclaimed: the Mother River has no tears.

When drought is continuing in the Southwest, sandstorms began to sweep in northern China. This was the most extensive and biggest sandstorm weather affecting our country in recent years, spreading to 17 provinces include Taiwan on the other side of the Strait, as well as neighboring countries of Japan and Korea. The sandstorm that struck Beijing 20 days ago "carried" 150,000 tons of dust to Beijing from the Mongolian Plateau with eight class wind, and the strong dust weather made Beijing's sky with strange bright yellow color.

Clearly speaking, the impact of climate change is not only shown in China. The cold and snowy weather in Northern Hemisphere high latitudes constantly refresh the meteorological records extreme value of the history, while in Australia in the Southern Hemisphere , heavy rain triggered floods and landslides caused electricity shut down for 10 million of residents and the traffic paralyzed with hundreds of millions dollars of economic losses.

Without doubt, global warming has led to many disastrous consequences, such as the destruction of biological diversity, 17,000 kinds of bion are to be extinguished , the Earth approaching ecological limits; melting glaciers, melting permafrost, sea levels rising, hurricanes, floods, storms, droughts and forest fires, making the living environment of mankind faced with increasingly serious threat; and another direct consequence caused by extreme climate events is the significant decrease in agricultural production ; the worldwide fight for land, food and water is getting worse, and the issue of food security is leading to a game between big powers , the regional conflicts and political turbulence in some countries.

Dear friends, water is the source of life and has bred life and civilization and all living things. And the 4 ancient civilizations of mankind were born in the river side without exception. Entering into the industrial and information age, water and human activities are more closely related. However, the world's water situation is not optimistic, and fresh water scarcity has threatened the Earth's life support systems; more than 800 million people worldwide are without safe drinking water, more than 5 trillion tons water is polluted per year. If one day, Mother Earth has no milk to care about us, even if we create more wealth, human beings can not live with dignity. In this sense, water is not only as a resource, but is life.

In ”The Moral", Laozi said” the highest good is like water”. Water breeds all living things but does not compete with anything and it behaves closest to the laws of nature. Humans should follow the laws of nature, feel reverence for nature, keep in harmony with nature and rationally develop, utilize and distribute water resources. If human beings can not be kind to nature and go contrary to the laws of nature, then the water that brings human with well-being and no interference to harmony can also lead to war and the scourge of hunger and strife. This reminds me of the ancient Chinese philosopher Chuang Tzu's allusion of "help and comfort each other in time of adversity or crisis" whose general meaning is that in a dried -up spring, in order to survive, two exposed fishes moistens each other with saliva. Facing ferocious climate change and water security challenges, human need to carry forward with the spirit of love, because economic globalization has long put the interests of all countries closely together, and no one can sit on the sidelines and keep immune.

Climate change and water security problem is global in nature, and we need to get into the same boat together like dealing with the global financial crisis, and have faith, sincerity and courage, by taking concerted action, replace confrontation with dialogue, and actively carry out more practical cooperation. I believe that with the development of human civilization to the present, we have enough conscience, wisdom, ability and mechanisms to jointly respond to global climate change and water security challenges, and with the sustainable use of water resources to ensure the sustainable economic and social development in the world. Let us join hands, and actively explore the natural harmony of man and ecological civilization, develop a low carbon economy, take on the responsibility of States to save energy and reduce emission, build water-saving society, let nature and ecology be restored, let the beautiful landscape, good weather and tranquil rivers re-appear so that

human farm pleasantly and commonly take care of our home planet with mutual help.

One may ask where we can get clear water. The answer is to find a better water source. The common mission and values unite us together, and this High-level Roundtable on Global Climate Change and Water Security in China not only provides us with valuable opportunities for exchanges, but more importantly, it will form consensus and reshape our confidence that human can live in harmony with climate, ecology, environment and water.

Finally, I sincerely wish the conference every success.

Thank you!

Speech at the High-level Roundtable on Global Climate Change and Water Security in China

Mr. Edward Clarence-Smith
Chair for UN Theme Group in China on Climate Change and Environment,
UNIDO Res. Rep. in China

Distinguished guests,

Good morning!

At the beginning of the address, please allow me to introduce the situations on water resources development and utilization. As we all know, global climate change has greatly impacted the water resources of each country. However, these impacts are not fully understood, especially in the fields sensitive to climate change. In conjunction with the cooperation framework with the UN on climate change, an investigation on climate change's impact on water resources of the Yellow River Basin has been organized by us to get to know not only the impact at present but also the impact in the future. In other words, let's just imagine what the different impact will happen in the future. This investigation is going to conclude with the typical experiences on water assessment.

As we all see, the conditions of groundwater are also getting worse especially in the rural areas where urbanization is accelerating. The fact is that all of the problems above are getting more serious due to climate change. Under the UN program framework, the real-time monitoring has been conducted, and some models developed to further measure the impact of climate change on groundwater and evaluate the influence of groundwater pollution. Groundwater over-exploitation has always occurred especially in some drought-stricken areas. No reasonable planning and strict management has been adopted. Therefore, the UN has developed some programs which give directions for groundwater supply under emergent situations.

In Beijing, groundwater is expected to be developed, utilized and managed sustainably. For instance, underground reservoirs are to be built.

In addition, since the UN programs are dedicated to insuring drinking water safety, and some very advanced systems and management on water resources have been introduced which also matches the objectives of the China's 11th Five-Year Plan.

As a matter of fact, China has to further promote its water protection awareness. The UN has developed a program since 2007 hoping that the best practicing experience could be introduced to China together with more publicizing and educations on water protection. We have worked out many textbooks based on the program. We sincerely hope they can be provided for the secondary schools in China and included into China's education system.

Ladies and Gentlemen, that's all for what we have done and what we are doing on water resources in China.

Finally I wish the meeting a success.

Thank you!

Speech at the High-level Roundtable on Global Climate Change and Water Security in China

Mr. David McLoughlin
Deputy Representative UNICEF Office for China

Dear Madam Zhang Meiying, Minister Chen Lei, Distinguished guests, Ladies and gentlemen,

Climate change is a recent “hot topic” in the world's media and in political circles.

The current severe drought affecting China's south, and the floods in Xinjiang due to melted snow may be examples of the impact of climate change on local weather patterns. Climate change may raise sea levels and shrink glaciers, produce storms and heavy precipitation and flooding, as well as causing rising temperatures and drought.

Children, UNICEF’s core constituency, may be affected by climate change due to food shortages, changes in the pattern of water and vector borne or other diseases, themselves due to changes in their environment caused by climate change. These problems maybe monumental in scope, and may impact family and social harmony; household, local and regional economic structures; population movements, and may even create tension on issues of national sovreignty. Children are the most vulnerable victims of conflict caused by these possible changes.

At the moment, most of the studies on climate change are focused on the atmosphere, oceans, and earth's surface; few scientists are studying the effects of climate change more deeply, such as on groundwater systems. Little is known about how soil, subsurface water, and deeper groundwater are responding to changes in rainfall, temperature and water transit patterns.

With support from the Spanish MDG Achievement Fund, UNICEF is partnering with the Ministry of Water Resources and other agencies 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. The project complements UNESCO’s activities with the MWR on climate change impact on surface water in Yellow River Basin, also with the support of the same donor.

Although the project only started in mid-2008, we are already collecting results from investigations conducted with UNICEF's support. The modeling of the groundwater changes is almost complete

and hopefully will allow China to forecast trends in groundwater levels and provide a tool for integrated water resource management at regional level.

It is also expected that a set of policy recommendations related to groundwater management will be put forward to decision makers by the end of the project, on the basis of this work.

UNICEF supports other work related to climate change using additional strategies. For example, climate change is predicted to increase the frequency and scale of natural disasters and UNICEF is very active in response to such events by taking a leading role in provision of water and sanitation relief.

UNICEF also uses children as "communication agents" at household and community level, and recently organized a Children's Forum during the Copenhagen World Summit last December. Five children from China attended the Forum with our support, and they are now active in public events related to climate change.

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 us to communicate each other and share information. It is a great opportunity for us all of us in tackling climate change issues.

To protect our living planet needs agreement among governments, among organisations and among individuals, along with determination and joint effort.

To have a world fit for children is one in which we are able to survive…recent history shows that 14 cities in Northern China has disappeared due to change in ecosystems….20% of the total land within China is now classed as dessert…effecting 400 million lives….and many more through sand storms, and water table changes, Climate change issues now have deepened the urgency for everyone globally to work together …the interest of everyone on earth is now the same…regardless of wealth, race, or religion,….for we all depend on functioning ecosystems on a planetary scale….for as history shows without the existence of functioning ecosystems our existence will disappear…we must accept this challenge and act immediately….for future generations survival is dependent on today's action by us….It is our choice….and the earth's hope.

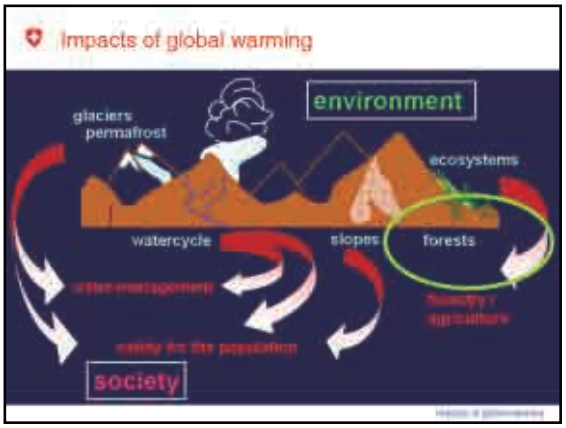
In this regard, we are sincerely looking forward to further cooperation with you.

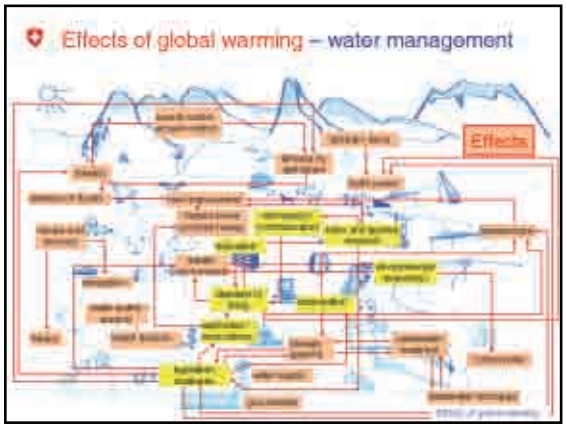
I wish you great success at this conference.

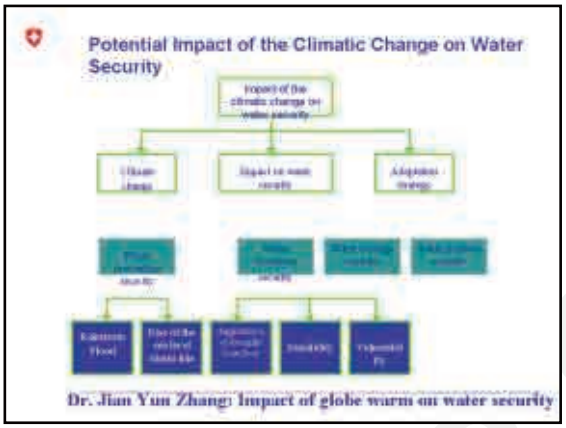
Thank you.

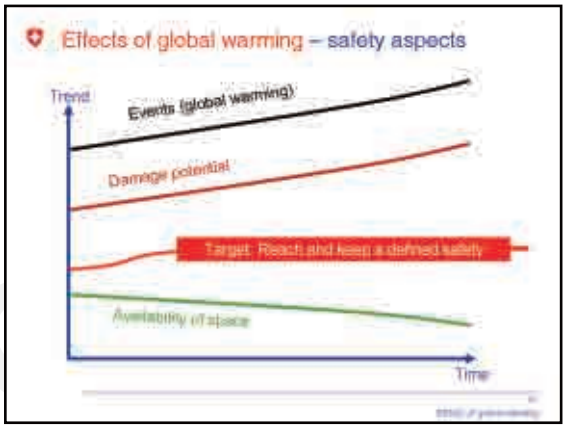
Speech at the High-level Roundtable on Global Climate Change and Water Security in China

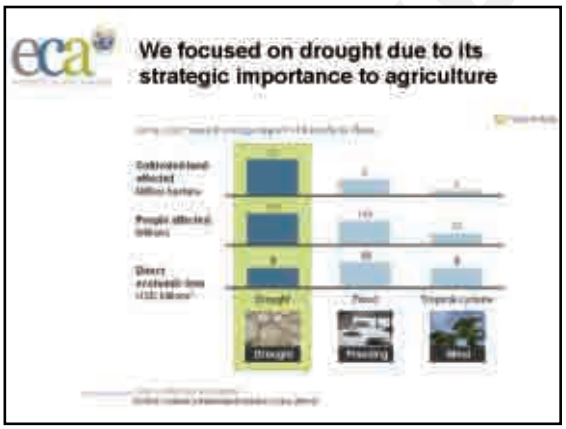
Mr. Walter Meyer
Councilor, Embassy of Switzerland to China

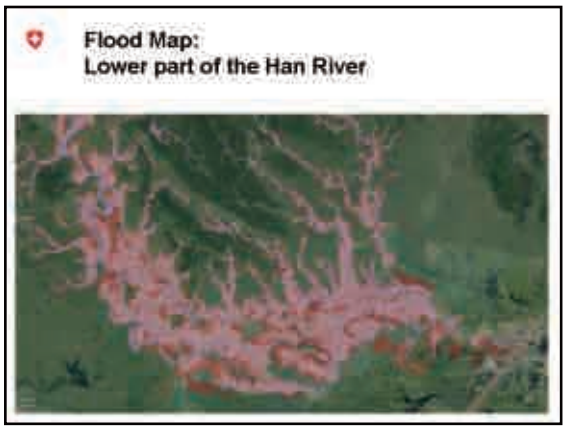

Impacts of global warming
environment
glaciers
permafrost
ecosystems
watercycle
slopes
forests
society


Effects of global warming – water management
Effects


Potential Impact of the Climatic Change on Water Security
Dr. Jian Yun Zhang: Impact of globe warm on water security


Effects of global warming – safety aspects
Trend
Events (global warming)
Damage potential
Target: Reach and keep a defined safety
Availability of space
Time


eca
We focused on drought due to its strategic importance to agriculture


Flood Map:
Lower part of the Han River

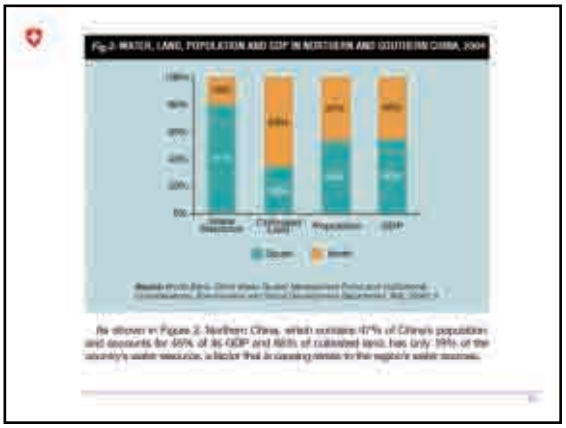
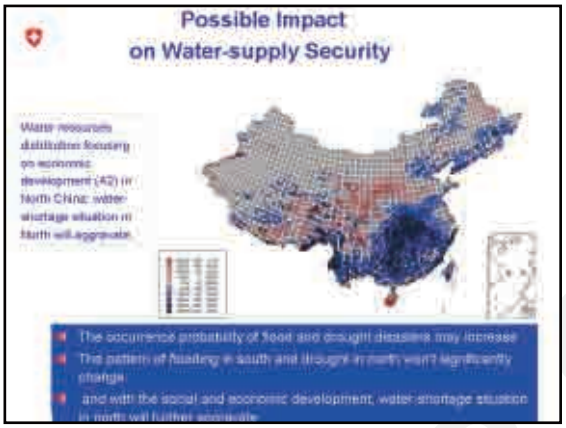
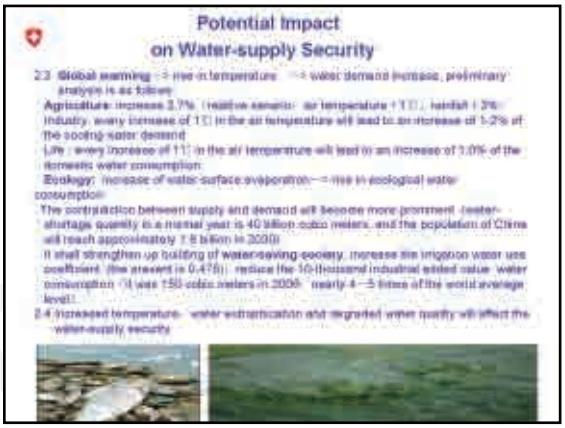
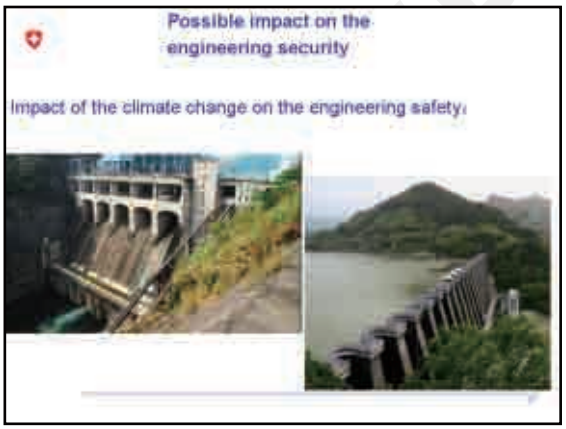


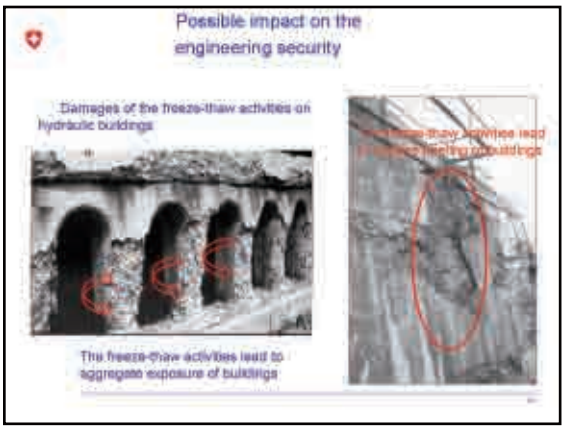
Fig.2 WATER, LAND, POPULATION AND GDP IN NORTHERN AND SOUTHERN CHINA, 2004
As shown in Figure 2, Northern China, which contains 47% of China's population and accounts for 45% of its GDP and 46% of cultivated land, has only 19% of the country's water resource, a factor that is causing stress in the region's water sources.


Possible impact
on the water-supply security
2.2 Global warming: → Increase of evapotranspiration ↑
frequency increase and range expansion of high temperature, hot wave and drought events
in 2000, Chongqing of Sichuan suffered from the once-in-a-century
in the spring of 2009 North China had been shortage of rain and snow for one hundred days, 15 provinces suffered from serious droughts, the nationwide area suffered from drought reached 130 million acres, 48% more than that in normal years, a population of 3.48 million was faced with the drinking water difficulty


Possible Impact
on Water-supply Security
Water resources distribution focusing on economic development (42) in North China; water-shortage situation in North will aggravate.
The occurrence probability of flood and drought disasters may increase
The pattern of flooding in south and drought in north won't significantly change
and with the social and economic development, water-shortage situation in north will further aggravate


Potential Impact
on Water-supply Security
2.3 Global warming → rise in temperature → water demand increase, preliminary analysis is as follows
Agriculture: increase 2.7% (relative scenario: air temperature +1℃, rainfall +3%)
Industry: every increase of 1℃ in the air temperature will lead to an increase of 1-2% of the cooling water demand
Life: every increase of 1℃ in the air temperature will lead to an increase of 1.0% of the domestic water consumption
Ecology: increase of water surface evaporation → rise in ecological water consumption
The contradiction between supply and demand will become more prominent (water-shortage quantity in a normal year is 40 billion cubic meters, and the population of China will reach approximately 1.6 billion in 2030)
It shall strengthen up building of water-saving society, increase the irrigation water use coefficient (the present is 0.475); reduce the 10-thousand industrial added value water consumption (it was 150 cubic meters in 2006, nearly 4—5 times of the world average level)
2.4 Increased temperature, water eutrophication and degraded water quality will affect the water-supply security


Possible impact on the
engineering security
Impact of the climate change on the engineering safety:


Possible impact on the
engineering security
Damages of the freeze-thaw activities on hydraulic buildings
The freeze-thaw activities lead to aggregate exposure of buildings

Possible impact on the engineering security

3.2 Impact of continuous high temperature and drought on hydraulic buildings

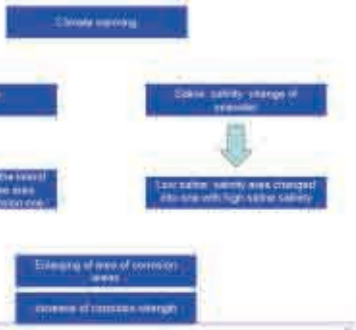
Doone dam of Fergie concrete

Possible impact on the engineering security

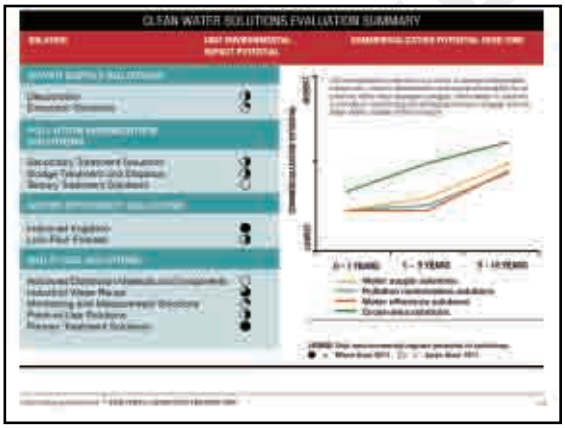
3.3 Global warming
Elevated seal level
Impact of the marine corrosion

Distribution schematic diagram of China's coastal harbore

Possible impact on the engineering security



Possible impact on the engineering security



Thanks for your attention

Celebrating 60 years of Switzerland - China diplomatic relations: 1950-2010
庆祝瑞中建交60周年 1950-2010

Speech at the High-level Roundtable on Global Climate Change and Water Security in China

Mr. Khalid Mohtadullah
Senior Advisor of GWP

Hon'ble Madam Zhang Meiying, Minister Chen lei, Chairman Wang Shu Sheng, Excellencies, Ladies and Gentlemen,

It's a great pleasure for me to be here representing the GWP headquarters, on this very auspicious occasion, where such distinguished participants are deliberating on a very important aspect of water, namely "Water Security and Climate Change in China"

GWP China is now 10 years old, and looks back on its achievements with pride and satisfaction, because it has very effectively served as a bridge between water related sectors, its institutions, and other important stakeholders. GWP's neutral platform is now highly respected and has the convening power to be able to assemble such a distinguished gathering as we see today. Its affiliated chapters in the Yelllow River, and in the provinces of Fujian, Hebei, Shaanxi and Hunan have in their own right contributed to the facilitation of a dialogue among key stakeholders for raising awareness about crucial issues in the water sector, such as water savings, pollution control strategies in lakes, rivers, irrigated areas and in the municipalities. Its approach has been one of integration, participation and capacity building. While GWP China has come long ways, it still has to do a lot more for achieving water security in China.

Minister Chen Lei, his predecessor Mr. Wang Shu Sheng, and his predecessor Mr. Yang Zhang Hui have contributed immensely in guiding and supporting GWP China to perform its role, and in so doing, has made GWP China become an important voice in the country's effort to achieve water security. Because of their unmatched support, GWP China has been able to attract competent nationally and internationally well known minds to serve its various advisory committees. Similarly, Mr. Dong Zheren's role in implementing policies set by GWP China Council has been extremely commendable. His competence, wisdom and eminence in the field of environmental sustainability gave GWP China the leadership it required in these strategic times. It is greatly desirable that he continues to serve GWP China with the same commitment as in the past.

The emerging impact of Climate change is going to make water security a serious challenge for China, and of course in many other parts of the world where water is fast becoming scarce, polluted

and unevenly distributed. To face this challenge in China, all water related sectors in the center and in the provinces will have to work together in developing strategies and ensuring its effective implementation. It is in this context that GWP China in the coming period will perform its role of bringing people , institutions, provincial governments, river basin authorities and other important stakeholders together, to attain synergies at all stages of policy development and implementation.

We are also very grateful to the Swiss government for their cooperation in organizing this HLRT, and hope that this important beginning will grow into a sound partnership in the future.

GWP HQs once again reaffirms its commitment to continue supporting GWP China, and wishes to take this opportunity of thanking all its stakeholders who have partnered with us – particularly the Ministry of Water Resources and its various institutions, without whose support in these ten years our common beneficial journey would not have been possible. Once again, a very big than you, Hon'ble Chen Lei and Excellencies present here, for your continued encouragement and support to GWP China. We now look forward to even greater successes in the future----we strongly believe that together we stand tall and better equipped to deal with issues of water security in the emerging climate change scenarios, and that in some ways also reflects the purpose of this high level meeting. I also wish to convey the best wishes of GWP Executive secretary for a very successful HLRT.

Thank You.

Actively Adapt to Global Climate Change and Strive to Ensure China's Water Security
-- Keynote speech at the High Level Roundtable Meeting on Global Climate Change and Water Security in China

Chen Lei, Minister of Water Resources of China

Distinguished guests,
Ladies and gentlemen,

It is my great pleasure to attend this High Level Roundtable Meeting on Global Climate Change and Water Security in China jointly held by Global Water Partnership (GWP) China and Swiss Agency for Development and Cooperation (SDC). On behalf of the Ministry of Water Resources of China, 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 UN agencies, international organizations, national governments and people from all walks of life who have devoted their long-term care and support to the development of water resources of China.

Global climate change is a major challenge faced by all the countries, exerting profound impact on human survival and development. Properly dealing with the climate change concerns not only the sustainability of socio-economic development but also the benefit of all the people. As a responsible developing country, China attaches great importance to global climate change. It is the first among the developing countries to formulate the National Plan of Climate Change Adaptation, promulgating series of adaptive policies and measures. Last year, Chinese government set up the action target of the green house gas emission control for 2020. According to this target, by the year 2020, China's CO2 emission will decrease by 40%~45% compared to 2005 which already witnessed a decrease of 46% based on the volume of 1990; the non-fossil fuel will have to account about 15% of the primary energy consumption; the forest coverage will increase by 40 million hectares over the year 2005; the forest storage volume will increase by 1.3 billion m3 over the year 2005. This voluntary action is based on China's national situation, showing the huge efforts China has made to deal with the global climate change.

Water is the most important area that is most directly affected by the global climate change. Due to this impact, the time and special distribution of water resources of China have become more uneven in recent years, extreme weather events like regional torrential rains, high temperature droughts as well as super typhoons becoming more and more frequent and strong, floods and droughts becoming

more sudden, anomalous and unpredictable. For instance, Huaihe River experienced two basin-wide floods in 2003 and 2007, while the year 2005 witnessed the biggest flood of Pearl river since 1915. Every year, there are about 7~8 landing typhoons with some of them showing the unprecedented power of wind, strength of rainfall and scope impact. Drought disasters show a momentum of higher frequency, larger scope, longer process and graver impact. A serious drought occurred in most part of the northern China lasting for 4 consecutive years from 1997 to 2000. Chongqing and Sichuan province were hit by the most disastrous drought over the past 100 years lasting for totally four seasons from the summer of 2006 to the spring of 2007. The year 2009 witnessed 4 large scale severe droughts in a row. Some were even seldom seen in the history considering its length of lasting, gravity of water scarcity, scope of impact and the seriousness of damage.

Entering the autumn of last year, southwestern China including Yunnan, Guizhou, Guangxi, Chonqing, Sichuan and some other provinces, regions and municipalities were stroke by a lasting drought seldom seen in history. The precipitation volume is 50% ~90% shorter with the income water of main rivers 30%~80% less than the annual average of the same period. In particular, the drought in Yunnan, Guangxi and Guizhou provinces have lasted for over half a year. Some places are even witnessing a one-hundred-year disaster, seriously affecting people's life as well as industrial and agricultural production. Although currently there are some rainfall processes in southwestern regions, their effect of drought alleviation is not very satisfactory. What's worse, the drought in other areas of China is showing up. According to the data of April 6th, the total area of drought affected farmland reached 8.07 million hectares, with 25.95 million people having difficulties in getting drinking water, which is twice as many as the past annual average of the same period.

Chinese government attaches great importance to the severe drought. President Hu Jintao has made important comments on many occasions, requiring stronger efforts to solve the people's drinking water difficulty and to reduce the disaster losses. Premier Wen Jiabao has visited Guangxi, Yunnan and Guizhou provinces for disaster investigation consoling convicted people. He stressed that there shall never be any person who has no drinking water. Vice Premier Hui Liangyu made an in-depth investigation in Yunnan province and guided the onsite alleviation. He also presided over the subject meeting of the State Council, studying and making deployment for drought alleviation and spring plowing and production. The central government allocated 0.155 billion RMB as a special fund for mega-drought, accompanying a comprehensive alleviation fund of 1 billion RMB. A sum of 6.4 billion RMB has also been appropriated ahead of time for rural drinking safety and small irrigation and drainage projects. Related departments, party committees and governments at all levels as well as peoples from all walks of life adopted a series of significant measures, urgently allocating capital, materials and staff, organizing the officials and the general public to fight against the disaster, bringing remarkable achievement. The State Flood Control and Drought Relief Headquarters and the Ministry of Water Resources of China timely initiated the Class II Emergency Plan, dispatching 33 working teams and expert teams to the southwestern areas and the northern winter wheat zone to help and guide the alleviation activities, devoting a great amount of experts and materials to the

convicted areas to help coordinate the unified alleviation water regulation and provide guidance for the different resolution of people's drinking water difficulty. Various kinds of emergency measures were adopted, including reservoir water supply, emergency water diversion, drilling wells and distance water fetching, to ensure the drinking water security and reduce the drought losses with our utmost efforts.

Actively adapting to the global climate change and ensuring China's water security is a significant strategic problem for China in the process of modernization requiring utmost efforts. For the current period and a certain period in the future, we must conscientiously implement the scientific outlook on development, positively practice the thought of managing water in a sustainable way, attach equal importance to mitigation and adaptation and strengthen the water infrastructure and flood control and drought systems. At the same time, we should strengthen the conservation, protection and management of water resources and improve the emergency management capacity of floods and droughts so that the water resources management could be comprehensively enabled to adapt to the global climate change and to fight against floods and droughts, realizing the sustainable utilization of water resources and ensuring the sustainable socio-economic development.

Firstly, build up the drought alleviating infrastructures in urban and rural areas. The current drought in southwestern China once again reveals the deficiency of water source projects, the insufficient capacity of water resource regulation and storage and the relative backwardness of water infrastructures. Therefore, while fully committed to the current drought alleviation, we will accelerate the compiling of the national and regional drought alleviation plan, staring the compiling of the water source project planning for the five provinces in southwestern China and the construction plan of small scale irrigation and drainage projects. Meanwhile, a number of controlling backbone projects and major water source projects like medium reservoirs will be initiated as soon as possible in order to improve our capacity in water resource deployment, regulation and management. Five kinds of small hydro projects like small cells and small mountain pools will be constructed based on the different situation of places to enhance the water storage capability of mountainous areas. The ground water resource in the south western karst areas will be actively developed as strategic reserves for mega-droughts. More efforts will be put in the irrigation and drainage projects to improve the agricultural irrigation system and enhance the drought-resistance capacity.

Secondly, improve the flood control and disaster relief engineering system. Floods are always a vital threat to the Chinese nation. We must further step up the treatment measures to ensure the safety of the rivers. Following the flood control plan approved by the State Council for the seven major river basins, we will have to keep forwarding the management of major rivers, lakes and key tributaries, improving the basin-wide flood control project system. The security of key flood storage and detention plains will have to be built up, guaranteeing the security of the residents in the plains against floods, making sure that the floods could be diverted in, stored at and retreat from the flood plain. We have to carry out concentrated systematic management for the medium and small river

sections which witness frequent floods and serious damages, gradually improve the capacity of small and medium counties and townships against floods. The mountain torrents prevention will have to be carried out in an all round way in order to minimize the casualties and losses caused by these disasters.

Thirdly, improve the emergency response capacity against floods and droughts. Accelerate the second stage construction of the national flood control and drought relief command system to modernize the flood control and drought relief work. More emphasis will be put on the establishment flood control and disaster relief contingency plan, improving the plans in all kinds of scenarios including disaster prevention, goods protection, human retreat and victim rescue, forming a thorough contingency plan covering all the aspects, establishing a prompt, efficient and orderly contingency response mechanism. We should keep improving the national hydrological station network, intensify the rainfall regime and water regime forecast, establish a drought monitoring, alarming and decision making support system, making the forecasting and alarming of floods and droughts more advance and more accurate. The service system for flood control and drought relief should also be strengthened, building a complex mechanism including the professional teams, community groups, military forces and the armed policemen together with sufficient material supply to enhance the mechanism's service ability.

Fourthly, strengthen the comprehensive water management in an all round way. Implementing the most strict water resource management rules should become the key approach to promote the transformation of the economic growth mode. More efforts will have to be put in establishing and improving the index systems for water utilization, pollutant containing in water function zones as well as water use efficiency control, etc. The relevant legal system should be improved to exert a better management and monitoring over the water licensing, water resources verification, water saving evaluation, the setup of outfall of sewage into rivers. Water resource should play a fundamental, constrictive and guiding role in the transformation of economic growth mode, curbing the inappropriate water demand, improving the aquatic-eco-environment, raising water use efficiency and benefit, maintaining economic development while considering the bearing capacity of water resources and water environment.

Fifthly, optimize the water resource allocation and regulation. Accelerate the construction of the South to North Water Diversion Project, forming a strategic pattern of water resources with four horizontal routes and three vertical routes, with water more reasonably distributed between north and south and with eastern and western China supporting each other for common development. Keep displaying the role of regional water allocation projects to help relieving the serious water shortage in some regions. Actively explore the river and lake network which could help to realize the diversion, storage, drainage and regulation of water, so that water can be diverted as needed, different water sources can supplement each other, water can be regulated between flood and dry seasons and years, clean water can be used to dilute polluted water. Strengthen the unified regulation

of reservoirs, displaying the regulation and storage capacity of reservoirs, ensuring the water demand of downstream areas for domestic, industrial and ecological water use.

Sixthly, vigorously put forward the water saving society development. Focusing on water demand management, establish a system based on water right market, forming a mechanism in favor of water conservation. The development mode shall be more self-disciplined and more voluntary in saving water. Water saving irrigation should be regarded as a revolutionary measure for agricultural development. Therefore the efficiency upgrading of large and medium irrigation areas as well as well-irrigation areas should be accelerated, while the high techs in water saving irrigation like seepage control of channels, pipe water transition, sprinkler irrigation, dripping irrigation and micro irrigation shall be vigorously promoted. At the same time, the regional industrial structure shall be optimized with more efforts being put into the development of recycling economy, focusing on the water saving management of the high water consuming industries, strictly require these enterprises to design, install and use water saving and treatment facilities during the whole process of production. In urban areas, we should intensify the management of water supply and public water use, accelerate the upgrading of water pipe network, and broadly spread the water saving instruments and raise people's awareness.

Ladies and gentlemen,

It is the common responsibility of the whole human being to adapt to the global climate change and ensure the water security. China would like to enhance our exchange and cooperation with the relevant international organizations and countries in a series of areas including flood control, drought alleviation, water resources allocation, conservation and protection, etc. We hope to make new greater contribution with our joint efforts, on the adaptation of global climate change and ensuring the water security in China and the world!

Finally, I wish the conference a great success!

Thank you!

Strengthen Water Pollution Control to Ensure Water Environment Security -- Speech at the High-level Roundtable on Global Climate Change and Water Security in China

Wan Bentai
Chief Engineer, Ministry of Environment Protection

Mr. Chairman, Ladies and Gentlemen:

Good morning! I am very pleased to participate in the "High-level Roundtable on Global Climate Change and Water Security in China " jointly organized by the Global Water Partnership China and the Swiss Development and Cooperation Agency. Entrusted by Minister Zhou Shengxian, I would like, on behalf of The Ministry of Environment Protection of the People's Republic of China, to express my warm congratulations to the holding of this conference!

As we all know, water security and the sustainable development of economy, society and human ecological systems are closely related, and water security has become an important element of national security, enjoying equally important strategic position with national defense security, economic security and financial security. Water environment security is an important part of water security. Today, water environment security has become a key factor restricting China's economic and social sustainable development. Today, I am going to exchange views with all the friends here on China's water environment challenges, the efforts made by the Chinese government and the future plans.

I. Water Environment Security Challenges that China is Facing

China has serious water problems. Water shortages, water environmental deterioration
And frequent floods and droughts are becoming increasingly prominent. In recent years, due to global warming, changes have been taken place on water resources amount and timing and spaces of rainfalls and the extreme floods and droughts also frequently occur which are affecting the water environment security. Meanwhile, the long time extensive mode of growth brought rapid economic growth while a huge resource and environmental costs were also paid, and with long time existing conflicts unresolved, new environmental problems appear gradually. In this case, protecting the water environment is facing severe challenges.

The present situation of water pollution is not optimistic. According to the relevant study, national

water pollutants far exceed the total capacity of the water environment, and fundamentally improving the water quality of the environment has a long way to go. In the state-controlled cross-sections of the surface water, the proportion of class V section exceeds one-fifth. Eutrophication in lakes and reservoirs become increasingly prominent, and water in some lakes and reservoirs blooms frequently.

Safety of drinking water is still under threat. At present, environmental management of drinking water source in China is still weak. There is no spare water source in some cities, and part of the rural population have unsafe drinking water problem there. The iron, manganese, nitrate and other substances in some local underground drinking water sources exceed standards.

Global climate change has aggravated the water environment problem. Global warming brings drought and water shortage, making rivers dried up, groundwater overexploitation, wetlands and river shrinking, desertification and other ecological and environmental problems more prominent, and the serious water pollution situation can not be fundamentally changed in a short time. In addition, higher temperatures result in biological growth and water distribution changes, and easily produce new water ecological problems, such as accelerated eutrophication problem.

II. China's work in the protection of water environment security

Water environmental problems will harm people's health, affect the social stability and ecological security and seriously restrict sustainable social and economic development. Increasing water pollution control efforts and improving water quality of the environment and water environment security are crucial issues that must be dealt with for the building of ecological civilization and achievement of economic social good and fast development. Therefore, the Chinese government has made the following efforts:

Water environmental protection basic system has been gradually established. The newly revised "Water Pollution Prevention Law" came into effect on June 1, 2008. The new "Water Pollution Prevention Law" clearly calls for protection of drinking water security, full implementation of the system of pollution permits and establishes mechanism and principles for dealing with excessive pollution and illegalness and for mandatory elimination of pollution and low production factories. In this Law, such items are also added: the water pollution accident treatment, centralized sewage treatment facilities supervision and pollutant source automatic monitoring equipment and in particular penalties for illegal activities are strengthened. It further rationalizes water pollution control management system, improves environmental management systems, specifies the responsibility of local governments and lays a solid legal basis for governments and relevant departments at all levels to comprehensively promote the water pollution control work.

Total discharge of water pollutants is under effective control. The State Council has set up the leading group of the national response to climate change and energy conservation with Premier Wen Jiabao as the Head and released a "Comprehensive Energy Conservation and Emission Reduction

Plan" and "China National Climate Change Responding Plan" thus laying out comprehensive plans for energy conservation and climate change adaptation work which includes reducing total discharge amount of major water pollutants. From the central to local, the measures such as strictly controlling the total discharge amount of water pollutants, strengthening water pollution control efforts, reinforcing the industrial restructuring, eliminating the backward productions , raising the standard for environmental considerations and implementing the policies on clean production are carried out which gradually play an important role. In the first four years of the "Eleventh Five-Year Plan", the total energy consumption per unit of GDP decreased by 14.38% compared to 2005 and COD emissions dropped 9.66% compared to 2005.

Water pollution control for the key river/lake basins has got breakthrough. The Chinese Government attaches great importance to the water pollution control work for "three rivers and three lakes" (Huai River, Hai River, Liao River, Taihu Lake, Chaohu Lake and Dianchi Lake), the Songhua River, the Three Gorges Reservoir Area and its upper reaches, South-to-North Water Diversion Project water sources and along its channels, the Xiaolangdi Reservoir Area on the Yellow River and other key rivers' pollution prevention, and organizes the working out and implementation of the special plans and puts forward the policy of " restoring the natural rivers and lakes" . In the "Eleventh Five-Year Plan" period, as specially planed, 2712 pollution control projects have been arranged with a total investment of 160 billion yuan. By of the end of 2008, there have been 1270 projects completed and under construction, accounting for 46.8% of the plan; 785 projects to be constructed, accounting for 28.9%. The State has established the inter- ministries joint meeting system on national environment protection for the periodic discussions on water pollution prevention issues for the key river/lake basins . The State Council has issued the "Interim Regulations on Examinations for Implementation of Water Pollution Prevention for Key River/lake Basins " and the assessment and examination system for trans-provincial cross-sectional water quality for the major river basins has been established which has helped promote pollution control for the major river basins . In recent years, the ecological security assessment and investigation has been carried out in nine key lakes and reservoirs including Taihu Lakeand Chaohu Lake and the corresponding comprehensive management programs put forward trying efforts to make one policy for one lake.

Safety of drinking water has been continuously strengthened. The State has developed and implemented the "National Urban Drinking Water Safety Planning", taking protection of the sources of drinking water as a core task; also formulated the "National Urban Drinking Water Source Environmental Protection Plan", clarifying the objectives, principles, major tasks and measures to be taken for the protection of drinking water source in urban areas. In order to solve the serious water quality problem affecting the health of farmers as well as the serious water shortage in some areas, the "Eleventh Five-Year Plan for National Rural Drinking Water Safety Projects " has been implemented the and the nation-wide survey on environment in the urban and township centralized drinking water source areas undertaken thus preliminarily making it clear about the actual situations. And for the first time the centralized drinking water sources for 4002 urban areas and 25,000

townships have been identified for the environmental management purposes and the corresponding protection measures proposed as well.

Environmental law enforcement and emergency management has been gradually strengthened. In recent years, China has been carrying out special actions of cracking down illegal sewage enterprise and protecting public health and environment. In 2009, 2, 42 0,000 law enforcement officers were sent out in the whole country, 980,000 enterprises were investigated and over 10,000 cases against environmental law found out. The "Regulations on Strengthening Environmental Emergency Management" had been issued a national environmental emergency expert group set up to promote the establishment of environmental emergency management system. The local governments also worked out more than 3500 programs for the various environment emergencies and 24-hour emergency on-duty system conducted thus effectively preventing the occurrence of water environmental accidents.

III. China's water environment protection objectives, principles and counter-measures

For the next five years or ten years, it is the strategic opportunity for China's economic and social development, the critical time for achieving the goal of building a moderately prosperous society and an important period focusing on improving people's livelihood, building a harmonious society and achieving sound and fast economic and social development. By 2015, major water pollutant discharges need to be under control and water quality need to be essentially improved. By 2020, discharges of major water pollutants should be under effective control and water ecological and environmental quality significantly improved and water environment safety basically ensured.

The basic principles of China's water environment protection: follow the laws of nature and set up ecological concepts. We should let the rivers and lakes recuperated, the aquatic ecosystems restored and renew, have the relation between environment and economy balanced based on the water environmental capacity and carrying capacity , humanly care the lakes and rivers and improve ecosystem functions of water environment by integrated approaches to realize the harmonious coexistence between human and water.

Water quality and quantity should be coordinated. The major water pollutant discharge control system and water resources management system should be strictly implemented taking watershed as an unit, combining water quality and water quantity and having cross-sectoral, inter-regional coordination so as to promote the effective protection of water environment and water resources.

The point source and non-point source pollution should be unified controlled. Taking the pollution reduction as the starting point, the point source pollution control work will be further strengthened and in particular the source pollutants reduction, the process control and the management at the end of the pollution source. The surface source pollution control work for the key lakes should be enhanced and the strict management and treatment for the moving sources of pollution in the

navigated waters conducted.

The river/lake basins and coastal waters should be coordinately protected. The river/lake basins management and the ecological and environmental protection for the near coastal waters will be integrated coordinated taking full account of the capacity requirements of the near coastal environment to further control water pollution for the river/lake basins and the rivers entering into seas.

To achieve these objectives, in accordance with the above principles, in the next five to ten years, the following countermeasures will be taken for China's water environment security:
Implementation of protection strategy for the key basins ‘water environment protection and promotion of the regional pollution control. With unremitting efforts, pollution control for the key basins, the heavy metals water pollution control for Xiangjiang River and the construction of pilot projects for major cities’ rivers and lakes hydro eco-systems restoration. With optimal allocation of water resources as the basis, pollution control for the basin and regions will be coordinated. For the nation -wide and basins common problems, the comprehensive requirements for the protection of drinking water sources, industrial pollution prevention and control, construction and operation of urban sewage treatment facilities and surface source pollution control have been worked out. Considering the characteristics of the pollution in key river/lake basins, the regional pollution control strategies are implemented by making separate plans for different regions and identifying priorities for pollution control.

Strengthening of pollutants discharge control and the reduction of major pollutants discharges. The focus will be on promoting the reduction of structural discharge, engineering discharge and managerial discharge and the close-down of paper-making, brewing, printing and dyeing, leather, pharmaceutical, mineral processing and a variety of chemical industries that are backward in production capacity so as to promote the completion of key pollutants discharge reduction projects on time and with good quality and ensure their operation. The efforts will be made to strengthen the environmental law enforcement, crack down the environmental violations, promote in-depth clean production and actively and orderly develop the cycling economy.

Improvement of environment risk prevention mechanism and strengthening of drinking water source protection. The provisions of "Water Pollution Control Law” should be strictly followed, the drinking water source protection areas scientifically divided and the measures for protection in the protection areas strictly taken. The drinking water safety standards will be gradually raised. The management of the drinking water source protection at different levels should be improved and the supervision and management of the construction projects and human activities in the protected areas enhanced. The capability for monitoring the quality of drinking water source environment will be gradually improved to ensure water quality from the origin of sources of drinking water. The rural drinking water pollution emergency warning system should be established and improved to prevent

water pollution accidents endangering drinking water safety.

Speeding up of the ecological construction and protection of water eco-environment safety. The relevant "rivers and lakes rehabilitation" policies and measures should be implemented to ensure the ecological safety of the river/lake basins in accordance with the principle of focusing on prevention and combining the prevention with management. The land eco-system of origin of waters in the basins should be well protected and in particular the natural forest breeding strengthened. The ecological restoration will be scientifically carried out and the more efforts on comprehensive management of water and soil erosion such as returning the occupied farming land to grassland made. In the rural areas, the typical technology and skills of soil testing and fertilization as well as protective farming management will be demonstrated and promoted to reduce water, soil and nutrient losses. The models of ecological agriculture, forestry and grazing should be promoted according to the local conditions to develop ecology-charactered economy.

Improvement of the investing and financing mechanisms for water ecological and environmental protection to scientifically support water, ecological and environmental protection. A diversified investing and financing mechanism of "government guidance, local-based, marketing and social participation" should be established. The rewarding and penalty mechanism combining the ecological compensation with the pay-back for pollution will discussed and developed The environmental economic policy system will be established and improved to improve water pollution control work by means of tax, credit, insurance, trade and others . Study on scientific and technological support for water body pollution control should be further carried out including the implementation of the State major research project of "water body pollution control and management" to effectively solve the major science and technology problems for water pollution control.

Ladies and gentlemen,

The Chinese government is make unremitting efforts to achieve the objectives of protecting water environment security. We attach great importance to and continue to strengthen the international cooperation on water ecological and environmental protection. Over the years, we together with UN agencies in China, international financial organizations and foreign governments and relevant agencies have carried out a series of water system management and environment protection projects and received international community's concern and support. Here, on behalf of Ministry of Environment Protection of The People's Republic of China, I would like to express my heartfelt thanks to those international organizations and countries for their support!

Ladies and gentlemen,

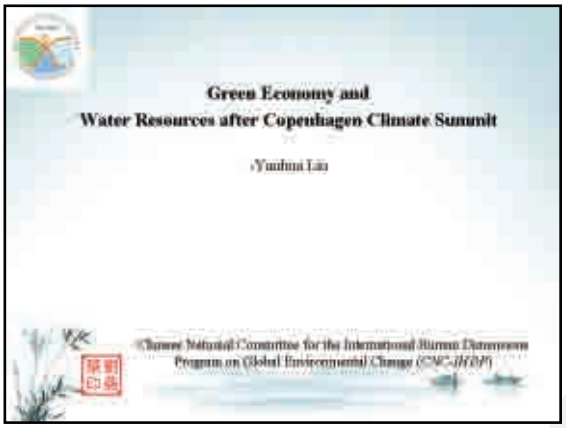
Climate change is today's global hot issue drawing international community common concern. Global Water Partnership China and Swiss Agency for Development and Cooperation on climate

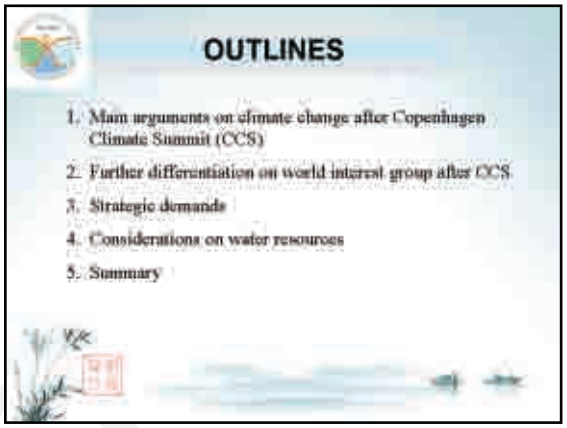
change have done a lot of fruitful work on climate change adaptation. The regional cooperation and coordination mechanism they promoted have become an important concept in promoting adaptation to climate changes to ensure water supply security and ecological security. We firmly believe that, through the joint efforts and cooperation from all departments and sectors and the whole society, the new progress on the water environment protection will be achieved! China will put the strengthening of water environment protection and the promotion of ecological civilization construction into a more prominent position, and through unremitting efforts, effectively improve the water environment quality, protect the water environment safety, more widely carry out international exchanges and cooperation on environment , actively be involved in responding to climate change and other global environmental challenges and make new contributions for the world's people to enjoy a better tomorrow and for the promotion of human civilization.

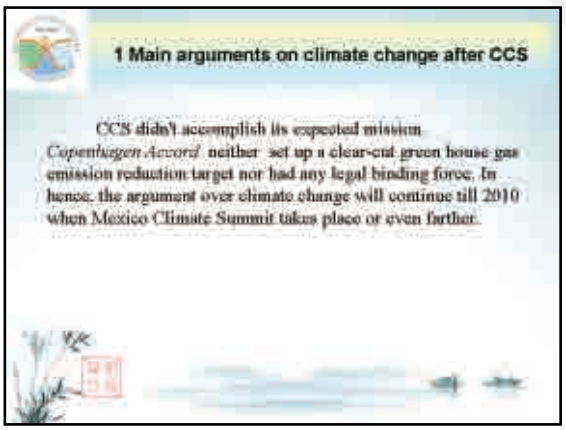
Finally, I wish the conference a complete success!

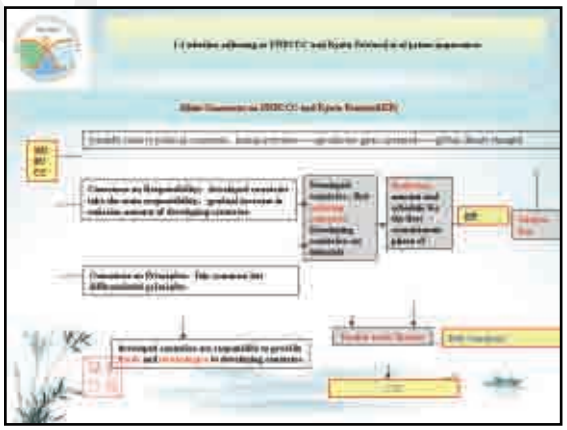
Green Economy and Water Resources after Copenhagen Climate Summit

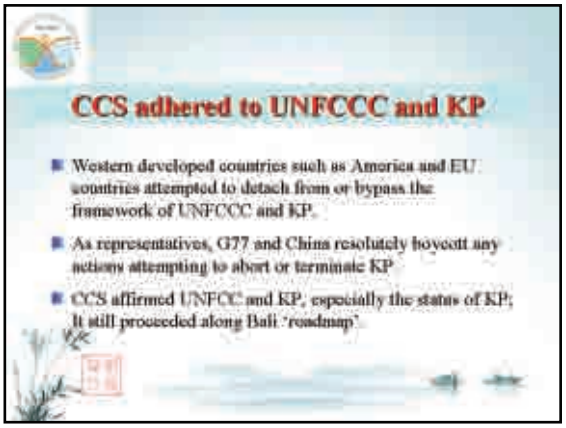
Mr. Liu Yanhua
Consultant to the State Council,
former Vice Minister of Science and Technology Ministry











What Framework for Future International Negotiations?

- Single-track or Double-track System for negotiations (Tribal-track?)
- Mid-term goal and long-term goal
- In the allocation scheme of emission reduction or emission amount, how to reflect fair and differentiated principles?
- How to maintain the reduction differences between developed and developing countries?
- How to look at the emerging differences within developing countries?
- Would China and other countries accept the compulsory objectives or *Three Do's* as autonomous emission reduction?

1.2 Will 2℃ rise range link together with 450ppm?

- CCS's preliminarily named 2℃ rise range from scientific conclusion to political consensus and made it a referential objective for the world's emission reduction
- 450ppm will be the objective for next political consensus, whether 2℃ rise range links together with 450ppm will be the central issue for next scientific argument

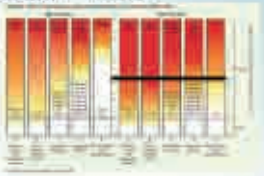
scientific conclusion to political consensus

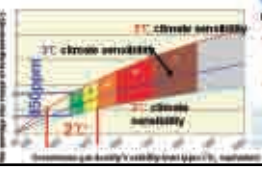
Scientific issue	Scientific conclusion which have already turned into political consensus	International action
Reasons for the climate having warmed	Human activities leading to (UNFCCC)	Emission reduction
Influences of climate change	2℃ rise range (CCS)	The objectives for emission reduction
The density of greenhouse gas after the temperature rises 2 ℃	450ppm?	Half emission amount in 2050?

science—morality----rules?

Uncertainty in term of science

- 2℃ influence range does have scientific understandings of uncertainty
- Insufficient evaluation of its positive influence
- Some crucial conclusions can only be half-reliable





- 2℃——450ppm: their relations depend on the climate sensitivity
- 2℃—greenhouse gas density is a range
- 450ppm—rising temperatures is also a corresponding range

Allocation of intangible resources like environment

The linking will regulate the general emission amount

- **Whether 2℃ rise range links with 450ppm seems to be an issue of science. In fact, it's an issue relating with emission amount.**
- **The greenhouse gas corresponding with 2℃ rise range will determine emission amount in future.**
- **2℃ rise range's linking with 450ppm is a prerequisite of the half-emission-amount objective of 2050**
- **After 2℃ rise range has linked with 450ppm, struggles for the limited emission rights will arise.**

Solidify the disparity between rich and poor countries

The pitfall set by developed countries

Scientific conclusion + political consensus

2℃ rise range

450ppm density for objective

The annual emission amount

Emission amount reduces to 50% in 2050
(about 800 billion tons' emission amount of CO_2)

Developed countries take the lead to reduce emission amount of 80% (44% emission rights, 1.5 billion people)

The highest possible preferential emission rights

No forceful amount of emission reduction for developing countries before 2020 (only 36% emission rights, 4.9 billion people)

Emission amount is restricted

Moral power is restricted

1.3 Resources and uses of funding aiming for climate change

The achievements on funds and technologies by CCS

- Short-term funds: developed countries commit to provide new and additional funds ~ USD 30 billion for the period 2010 ~ 2012 for developing countries.
- Long-term funds: developed countries commit to a goal of mobilizing jointly USD 100 billion dollars a year by 2020 to address the needs of developing countries. However, it doesn't clarify the specific resources of long-term funds and the funding proportion of each developed countries. It might be a pie in the sky in future.
- In the aspect of technology, *Copenhagen Accord* decides to establish a Technology Mechanism to accelerate technology development and transfer. However, no more details on Technology Mechanism on the accord.

Bill commanding or dialog?

Argument on the funding issue

Items	Developing countries	Developed countries
Nature	Historic debts, obligation	Denying historic debts
Prerequisite	No additional conditions	Requesting other main countries to meet the transparency degree demands by America
Amount of funds	"still not enough" 1% of developed countries' GDP (China's expectation)	2010-2012, committing to provide USD 30 billion "gentlemen's agreement" USD 100 billion dollars a year by 2020
Resources	Can't rely on market	Depending on market mechanism for 85%
Funds management	Special funds	IMF and World Bank
Allocation and use of funds	Can't be created separately	'Most Fragile Countries' (…) as access to use the funds by developing countries like China.

1.4 Carbon market in future

- Three agile cooperation mechanisms in Kyoto Protocol
  - International Emission Trade Mechanism (ET)
  - Joint Implementation Mechanism (JI)
  - Clean Development Mechanism (CDM)

New market brought by international politics

- Carbon Finance would be fundamental to the future reconstruction of International Monetary System and International Financial Order.

International carbon trade market

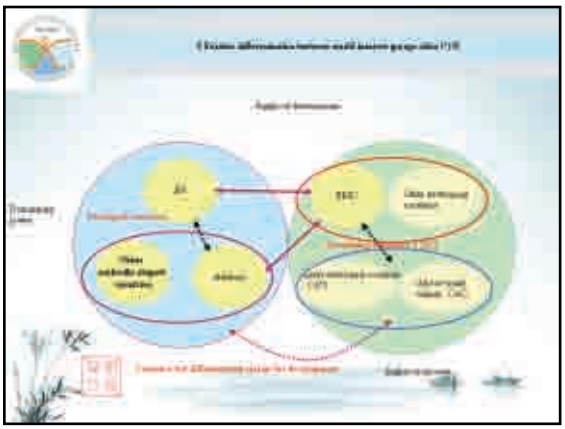
- Trade commodities
  - One is CO_2 emission quota and financial derivatives such as quasi-option and futures which derive from the former.
  - The other is the relatively complicated emission reduction projects.
- Trade scale
  - In 2008, the market value of international carbon trade amounted to US 126.35 billion dollars, rising 100.6% from the last year (Provided by IETA)
  - In 2012, US 150 billion dollars (Provided by World Bank)
  - In 2020, US 150 billion dollars ,It's hopeful to be the biggest market in the world, overtaking petroleum market (Provided by British New Energy Financial Affairs Company)

Price in carbon trade market

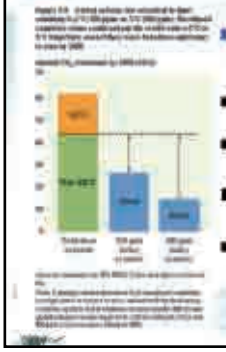
- Developed countries have mastered the discourse power on the price for carbon emission trade
  - European Union Emission Trade System (EUETS)
  - British Emission Trade System (BETS)
  - American Chicago Climate Trade Market (CCX)
  - Australia New South Wales' greenhouse gas emission system (NSW)
- China have no access to bargain on the price.
  - Carbon emission reduction amount which is offered by China has taken up 30%+ of the international market.
  - Most buyers are overseas enterprises, China takes the lowest status in carbon trade chain.
  - The price for carbon emission trade is about euro 17 each ton in international market, euro 8-10 per ton in domestic market.

Discourse power in carbon trade market

- Carbon trade quota、Offsetting rights
- Will the technology of Carbon Catching and Saving (CCS) bring about clean development mechanism?
- The deciding power on carbon emission price
- Credit rating power
- Carbon market and carbon financing



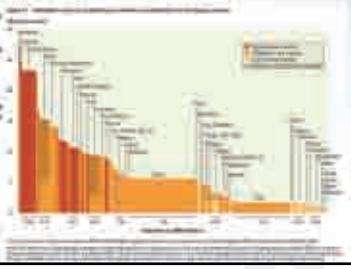
2.1 Enlargement of inner consensus within developed countries



- Umbrella-shaped countries tend to be positive towards emission reduction and stand nearer to EU.
- Special emphasis on technology and total amount-emission rights trade system
- Special emphasis on clean energy and competing power on low-carbon economy
- **Special emphasis on laws and carbon tariff**
- Highly agree on the pressure imposed on emerging big countries —— only the big developing countries can achieve the goal.

- Disparities
  - Argument over the dominating power between European countries and America
  - Disparity still exists on the commitment and roadmap of emission reduction
  - The disparity on emission reduction commitment is increasingly prominent
  - Umbrella-shaped countries may reunify

2.2 Enlargement of inner disparities within developing countries



- **Inner disparities within developing countries**
  - BRIC: Autonomously reducing emissions, forming a united front and becoming the fundamental power in 'Grouping to Fight Back' in developing countries
  - African countries: Demanding for funds assistance fiercely, being marginalized, however, keeping in the same general direction as other developing countries
  - Small islands countries: Requesting assistance in funds and technology, demanding big developing countries to jointly reduce emissions.
  - Rainforest Ally: Taking the lead to treat developing countries separately, suggesting emphasizing on Reducing Emissions from Deforestation and Forest Degradation (REDD).

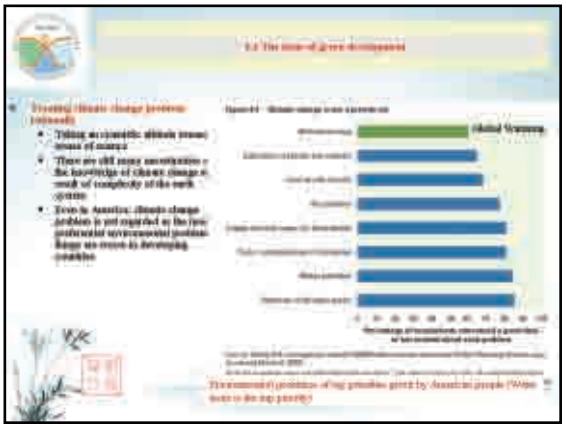
2.3 China's being pushed under spotlights

- After America's veering its stand, spotlights are now cast on EU,USA and BRIC.
- Small islands countries and least developed countries may impose pressures on BRIC.
- As an economic power and emission power, China is pushed under spotlights.

3 Certain numbers of strategic demands

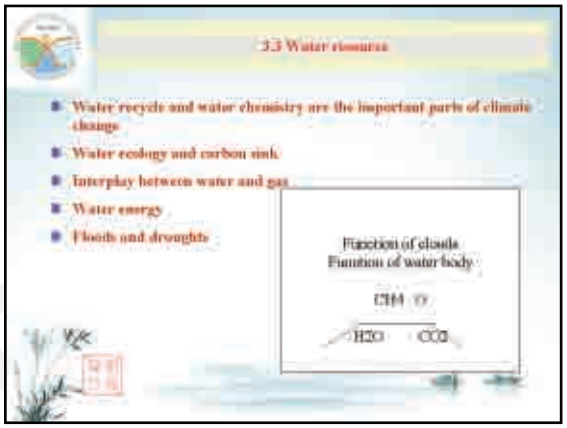
Climate change problem is not only an problem of science, moreover, it has turned to be an problem of international politics and economy which is detrimental to national economy security and social development

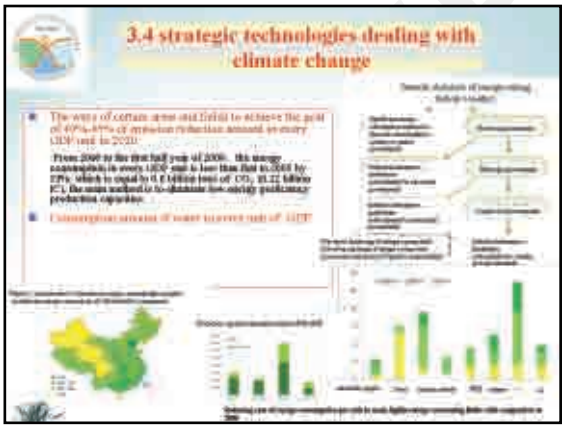
- Urban economy development and economic structure's adjustment
- Environment and allocation of emission
- Water resources
- The strategy of giving high priority to technology

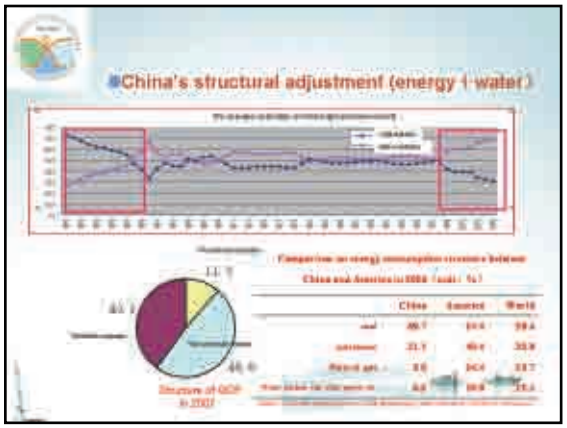



Designing and evaluation of the system of international climate change

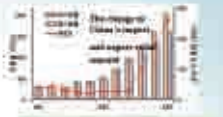

3.2 Environment and allocation of emissions (surviving environment and safety)
The allocation (designing) of emission rights is an 'enclosure' movement of intangible recourses (assets)
It's an urgent need for developing countries to improve ecological environment and prevent pollutions
Would other problems come out after the CO2 problem?
The source of life—Water


3.3 Water resources
Water recycle and water chemistry are the important parts of climate change
Water ecology and carbon sink
Interplay between water and gas
Water energy
Floods and droughts
Function of clouds
Function of water body
H2O
CO2


3.4 strategic technologies dealing with climate change


China's structural adjustment (energy + water)

- Whether the high-emission foreign trade structure should change



- Emission reduction – technology and innovation in technical economy
- Standards of inspection of emission reduction

Water consumption amount in carbon emission?

Conceptual model of technical innovation chain

4 Considerations on water resource

- The change of supply and demand of water and its adaptation caused by climate change
- Interplay between water recycle and climate change
- Stability of water resource system caused by climate change
- Problems of Risks relating with water and resulting from climate change
- Water ecology and environmental protection
- Problem of power mechanism (basic research)
- Monitoring system (basic competence)
- Evaluation system (measures, models)
- Technology system (counter measures)

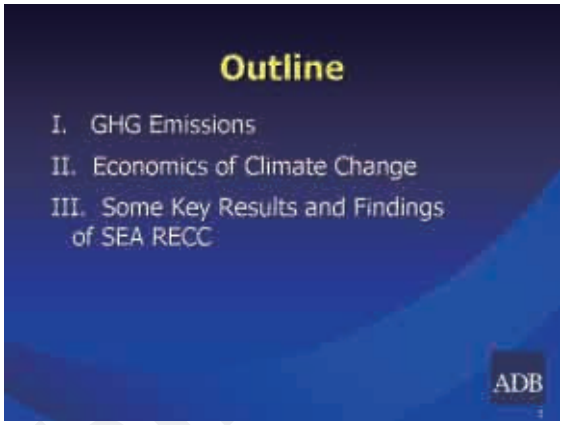
5 Summary

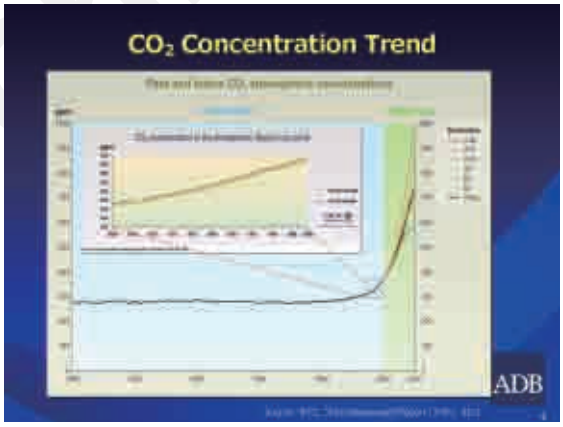
- Climate change problem has evolved from a scientific problem to an international political and economic problem. Although there are still many uncertainties of scientific knowledge of the problem, once it turns into a political consensus, it will directly exert influences on international political and economic behaviors.
- In fact, the arguments and negotiations over climate change problem are concerned with energy and resources. The real intentions of contentions for resources amount and rights are finally and essential, and also interests.
- International camps are undergoing changes. China has been pushed to the spotlights in international actions and negotiations of emission reductions.
- Researches on science and technology of climate change require an positive attitude to satisfy national strategic demands.
- Chance favors prepared minds.

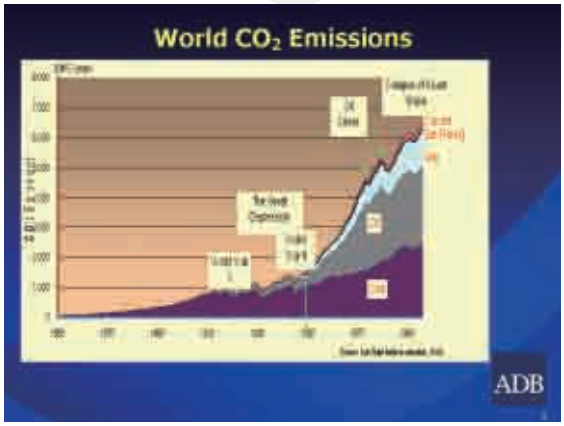
Thank you!

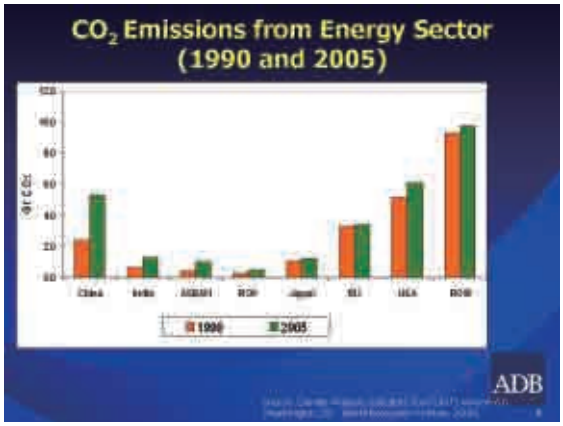
Economics of Climate Change-Impact and Adaptation

Mr. Tae Yong JUNG, Senior Climate Change Specialist, ADB

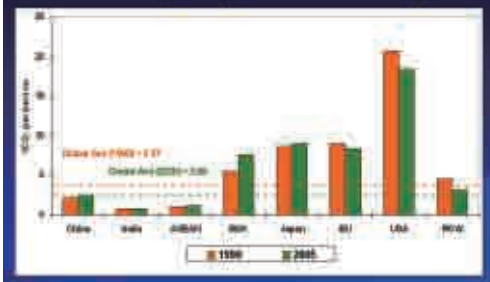








CO_2 Emissions from Energy Sector Per Capita (1990 and 2005)



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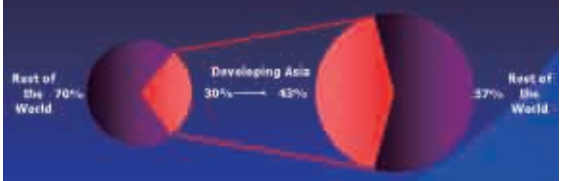
Developing Asia's Share in Global CO_2 Emissions from Energy Consumption



2006
Actual
Total = 27,888 Mil tons CO_2

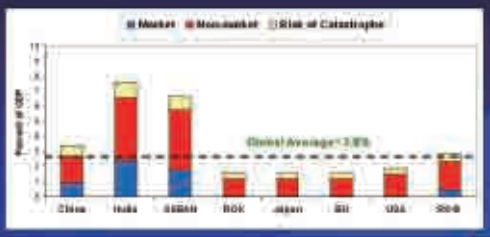
2030
Projection
Total = 40,553 Mil tons CO_2

ADB

II. Economics of Climate Change

ADB

Mean GDP Loss by 2100 under A2-Reference Scenario



ADB's internal calculation

ADB

What is the Economics of Climate Change?

Analytic foundations:

Climate change is an externality with a difference:

- Global
- Long-term
- Uncertain
- Potentially large and irreversible

Hence key roles:

- Economics of Risk
- Ethics
- International Action

From the Stern Review

ADB

Methods or approaches that assesses the magnitude of the risks and associated costs

- physical impacts on economic activity on human life and on environment
- use of integrated assessment models
- comparing the marginal abatement costs curves with the social cost of carbon

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Key Messages from the Stern Review

- Unless emissions are curbed, climate change will bring high costs for human development, economies and the environment
  - Concentrations of 550ppm CO_2e and above - very high risks of serious economic impacts
  - Concentrations of 450ppm CO_2e and below - extremely difficult to achieve *now* and with current and foreseeable technology
- Limiting concentrations within this range is possible. The costs are modest relative to the costs of inaction.
- Decisive and strong international action is urgent: delay means greater risks and higher costs

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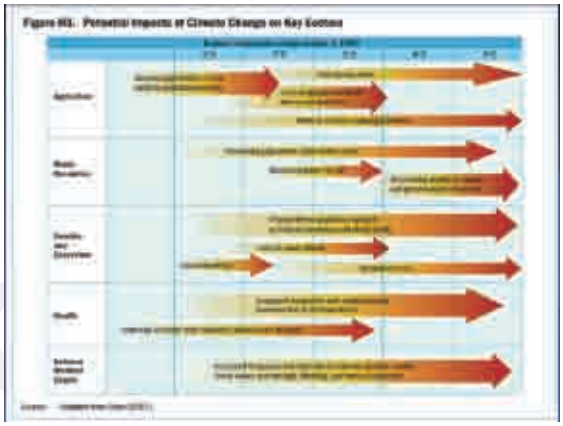
III. Some Key Results and Findings from SEA RECCS

ADB

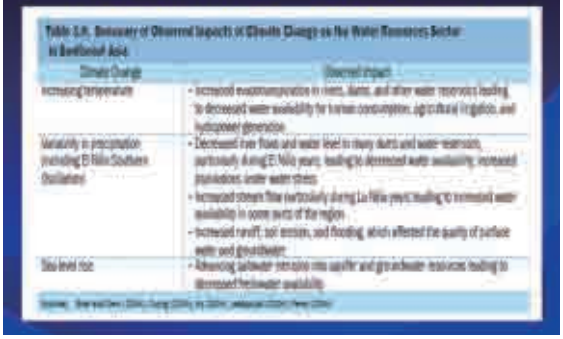
Regional Economics of Climate Change - Objectives -

- Contribute to regional debate on economic costs and benefits of unilateral and regional actions on mitigation and adaptation
- Raise awareness about the urgency of climate change challenges and their potential socioeconomic impact on the participating countries, while informing other stakeholders of the same
- Indirectly support government and private sector actions in the region to mitigate and adapt to climate change

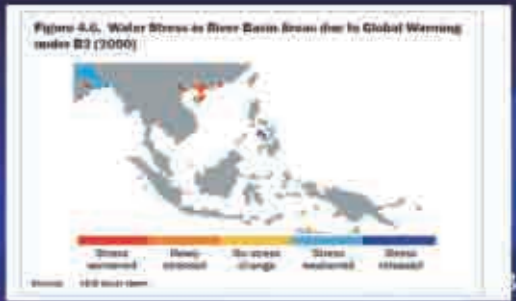
ADB



Regional Impact of Climate Change on the Water Resources Sector



Modeling Climate Change and Its Impact in Water Sector



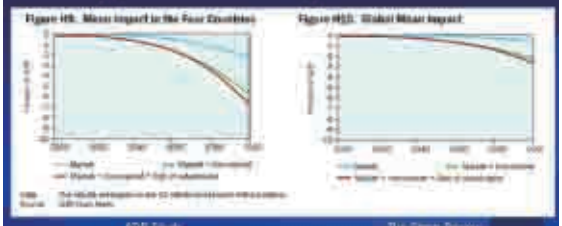
Adaptation Options and Practices in the Water Sector

- 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
- Integrated river basin development water catchment areas
- Reclamation of used water
- Sea water osmosis plant

ADB

Mean GDP Loss by 2100 (A2-Reference Scenario)

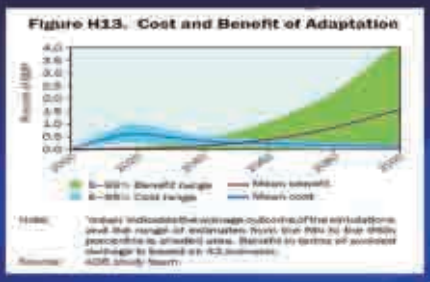
SEA (4): 6.7% of GDP by 2100



ADB Study The Stern Review

ADB

Economics of Adaptation GDP: Combined GDP of SEA



ADB

Policy Implications for Southeast Asia

- Adaptation toward enhanced climate resilience
- Mitigation toward a low-carbon economy
- Funding, technology transfer, and international/regional cooperation
- Strengthening government policy coordination
- Undertaking more research on climate change-related issues
- Turning the economic crisis into an opportunity

ADB

Need for Global Solutions

- Addressing climate change requires a global solution built on common but differentiated responsibility.
- As a global public good, addressing climate change requires all nations in the world, developed and developing, to work together on a global solution.
- An essential component of an effective global solution would, therefore, involve adequate transfer of financial resources and technological know-how from developed to developing countries.
- Global climate change cannot be tackled without the participation of developing countries.
- The international community has agreed to the Bali Road Map to step up efforts to combat climate change.

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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; CDM
- More Investment Projects:
  - River Basin Management (e.g. Sanjiang, Chao Lake, Hei River etc.)
  - Wetland Management (e.g.Baiyangdian, Yancheng, Jiaozhou etc.)
  - Urban Water Supply and Treatment (e.g. Nanjing, Wuhan etc.)
  - Water-saving Irrigation (e.g. Qinghai, Guizhou, CAD etc.)
  - Flood Prevention and Reservoir Rehab. (e.g. Yunnan, Shangdong 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
  - Natural Disaster Insurance
  - Agriculture Public Expenditure Review

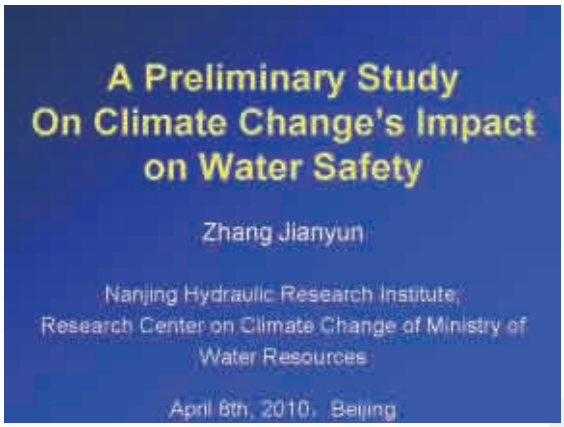
ADB

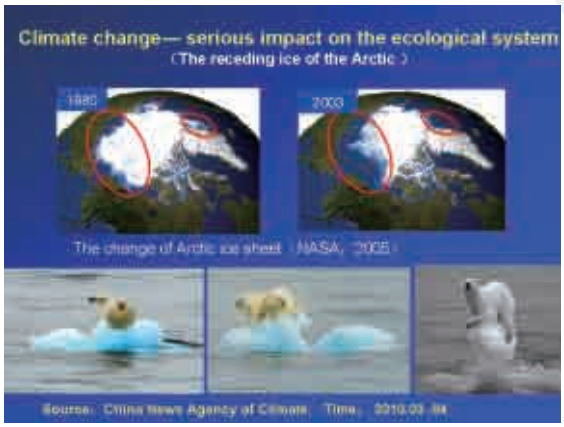
Thank you!

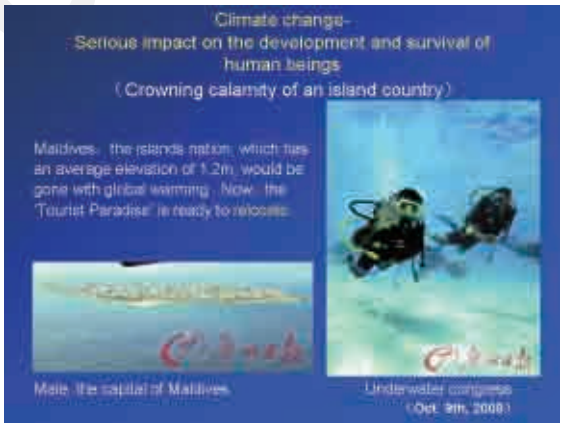
ADB

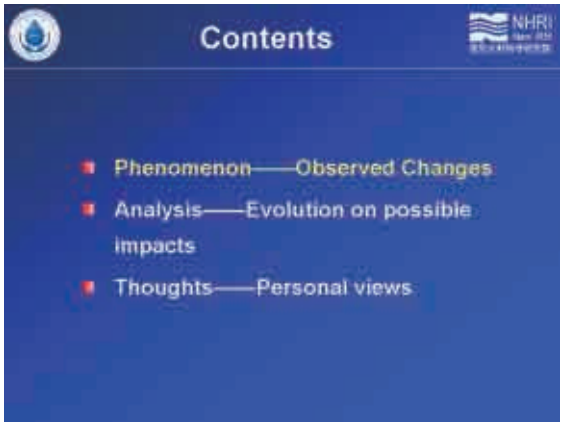
A Preliminary Study on Climate Change's Impact on Water Safety

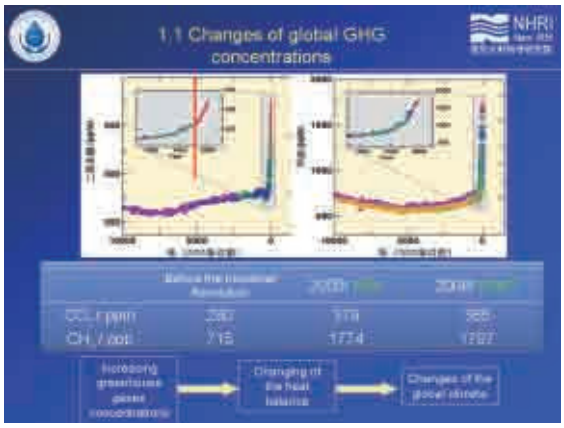
Mr. Zhang Jianyun
Academician, Director of Climate Change Research Center, MWR;
Director of Nanjing Hydraulic Research Institute

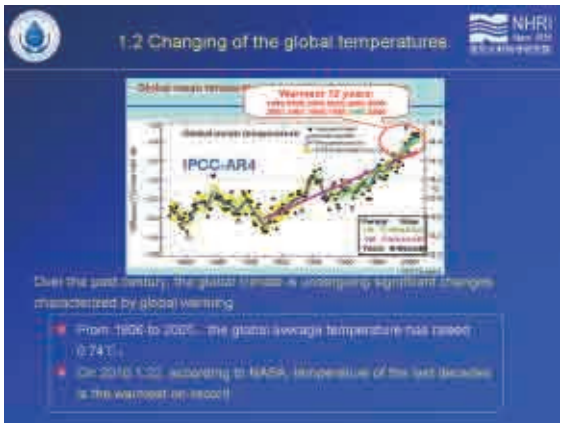


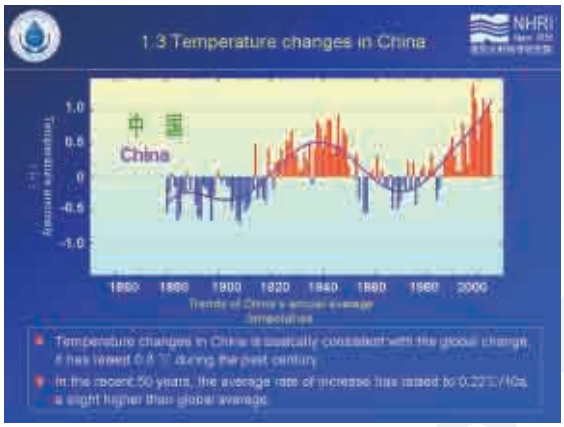


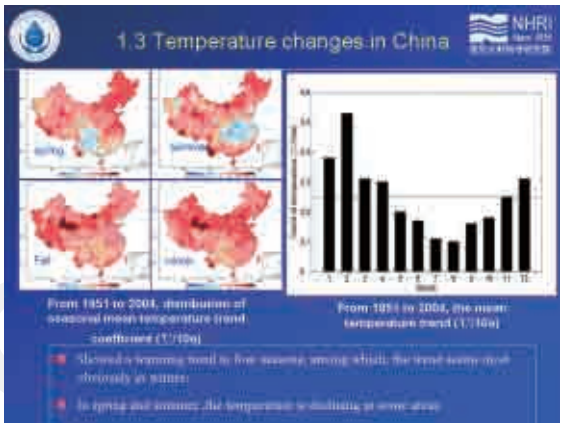


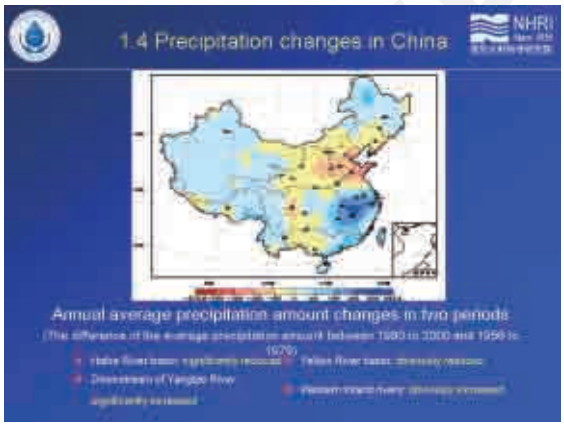



1.1 Changes of global GHG concentrations
NHRI


1.2 Changing of the global temperatures
NHRI
IPCC-AR4


1.3 Temperature changes in China
NHRI
China


1.3 Temperature changes in China
NHRI


1.4 Precipitation changes in China
NHRI


1.5 Rainstorm changes in China
NHRI

1.5 Sea-level changes in China

Over the past century, the world's sea-level has raised 1-2 mm per year, and in China raised 1-3mm during this 50 years.

2009 China's sea level Communiqués pointed out that, in 2009 the coastal sea-level of China is at a highest place of the recent 30 years: 80mm higher than usual (1975-1993), 90mm higher than 2008, and 2008's is 10mm higher than 2007's.

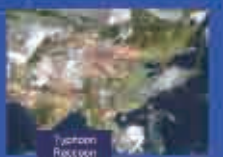
In the recent 30 years, the coastal sea-level of China generally showed a upward trending, the average increase rate is 2.6mm per year, higher than the average rate of global.

1.6 Typhoon Changes in China

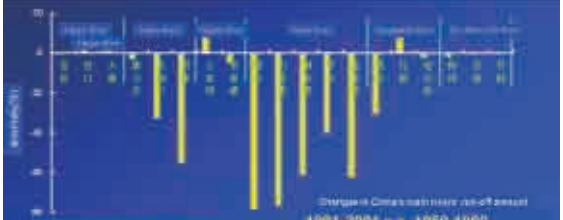
Strength	1970s	1980s	1990s	2000-2009
Typhoon Rate12-13	15	9	15	18
Violent typhoon Rate14-15	0	2	2	4
Super typhoon Rate over 16	0	0	0	1

The frequent occurrences of tropical storms shows an increasing trend.

Statistics of China's typhoon from 1970 (Maximum wind speed landing statistics)



1.7 River run-off changes



Change in China's main river run-off amount

1991-2004 v.s. 1950-1980

- General tendency: Declining
- Significantly reduce tendency: Haihe River, Yellow River, Liaohe River
- Slightly reduce tendency: Huai River, Songhua River, Zhujiang River, Yangtze River
- Slightly increase tendency: The river middle reaches of Yangtze River, the up reaches of Huai River, Nanjiang River

1.7 River run-off changes

The measured river-off changes in Haihe River Basin

Hydrological station	Average Rate (m³/s)			Anomaly Percentage (1991-2004) (%)	
	1955-2004	Before 1980	After 1980	Compare with 1955-2004	Compare with 1980-1980
Guantai	31.3	48.8	10.8	-65.4	-77.8
Shidaikou	18.1	34.7	6.77	-64.2	-79.6
Xianxian	8.81	11.2	6.88	-22.4	-40.1
Zhangjiafen	17.4	25.0	9.4	-45.6	-62.2

Jianyun Chang, etc. The change of nearly 50 years of China's main rivers and river runoff. *The Development of Water Sciences*, 2007 (5)

1.7 River run-off changes

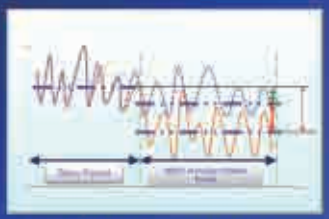
The measured run-off changes in Yellow River Basin

Hydrological station	Average Ration (%)			Anomaly Percentage 1951-2004 (%)	
	1955-2004	Before 1980	After 1980	Compare with 1955-2004	Compare with 1950-1980
Tangnaihai	627	638	617	- 1.6	-3.3
Huayuankou	1240	1480	975	-21.4	-34.9
Lijin	1020	1360	905	-40.5	-56.9

The main reduce of river runoff concentrated in the middle and lower reaches (About 30% impact from climate change, men's activity as the main reason)

Jianyun Chang, etc. The change of nearly 50 years of China's main rivers and river runoff. The Development of Water Science, 2007 (5)

Attribution recognition technology of runoff change



1. Method of determining the basic period (Order-clustering method and M-K law)
2. Natural Runoff Regression Method

1.8 Drought changes

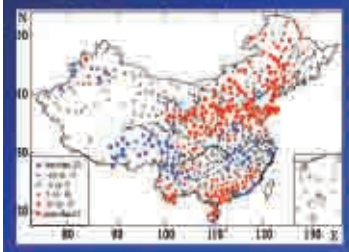
The trend of long-term drought areas the 10 river-basins (1951-2007)

District	Trends of drought areas (%/10a)
Songhuajiang River Valley	1.37
Liaohe River Valley	2.09
Haihe River Valley	2.79
Yellow River Valley	0.53
Huaihe River Valley	1.40
Yangtze River Valley	0.13
Southwest Rivers Valley	0.44
Zhujang River Valley	0.49
Southeast River valley	-1.38
Northwest River Valley	0.18
The whole Country	0.24

Italics and underlines have passed the 0.05 Reliability Test

1.8 Drought changes

Changes of drought frequency



The differences of average draught days per year between 1979-2007 and 1951-1978

Increased frequency of drought area:

- Liaohe River Valley
- Haihe River Valley
- North of Haihe River Valley
- Most of Yellow River Valley
- Most of Zhujang River Valley

The southeast rivers reduced the frequency of drought

1.8 Drought Changes

Since the establishment of PRC, the severity of drought become more and more serious

Comparing with the figure in early PRC, till 20th century, the average rate of drought, the average disaster rate and the rate of drop production are 2.5, 4.3, 2.6 times more, respectively

Statistics of drought conditions of China in different periods

Periods	Average rate of drought/%	Average disaster rate/%	Drop of production rate due to drought/%
1949—1959	7.35	2.36	3.32
1960—1969	12.4	5.91	4.46
1970—1979	11.56	5.01	3.18
1980—1989	10.65	6.12	4.82
1990—1999	10.80	7.15	4.05
2000—2007	10.05	10.05	5.14

1.9 Changes in glacier and snow cover

A wide range of glacier shrink, the area of snow cover decreased, the permanent permafrost degradation

The Investigation of China's Glaciers and Changes (2007) shows comparing with the First Glacier Survey (the late 60s of last century), the area has reduced the proportion of 7.4%

The permafrost has redacted and the lower bound of the frozen soil has increased in the Qinghai Plateau. Comparing with the 60s of last century, the former one has raised 7.1m, and the thick of seasonal frozen ground average decreased 16cm

Qori Kalis Glacier, Peru

1.10 Lake Areas Decreasing

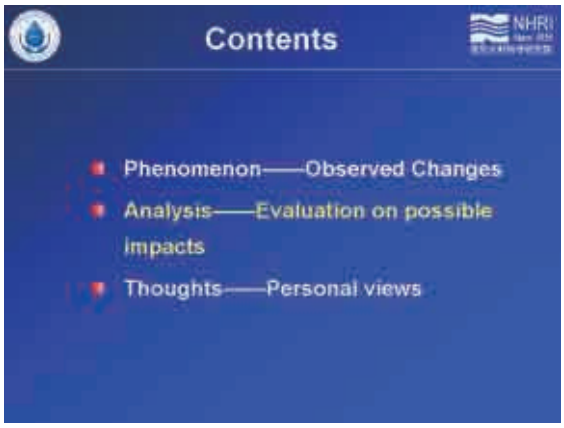
From the 1950's of the last century, 142 lakes in China have desiccated more than 10km², the total area has reduced 9574km², which account for 12% of the whole area of the former lakes, the storage capacity has reduced 51.6 billion cubic meters, which account for 6.5% of the total capacity

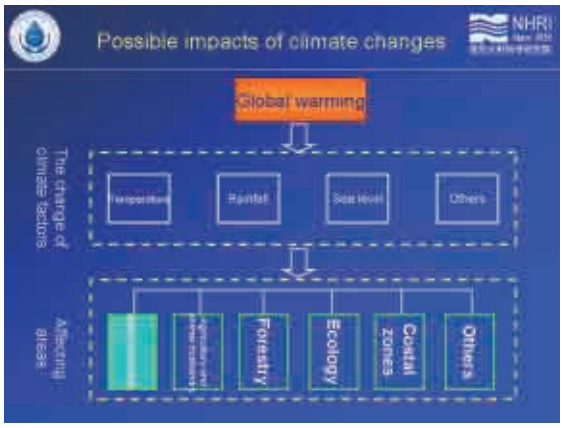
Statistics of shrinkage of different types of lakes in China

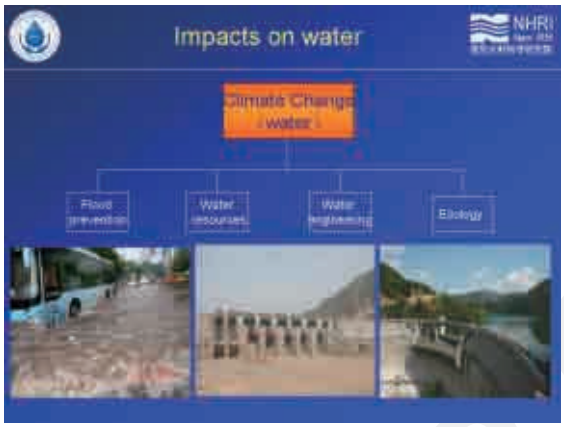
Type of lakes	Number of lakes		The area		The storage capacity	
	Numbers	Account for (%)	Reduction of areas (km²)	Account for (%)	Reduction of capacity (billion cubic meters)	Account for (%)
Freshwater lakes	105	46.5	7797	19.6	31.08	11.7
Saltwater lakes	27	11.3	1176	4.3	18.9	4.1
Salt lakes	10	7.5	601	5.6	1.6	2.7
Whole country	142	23.9	9574	12.4	51.58	6.5

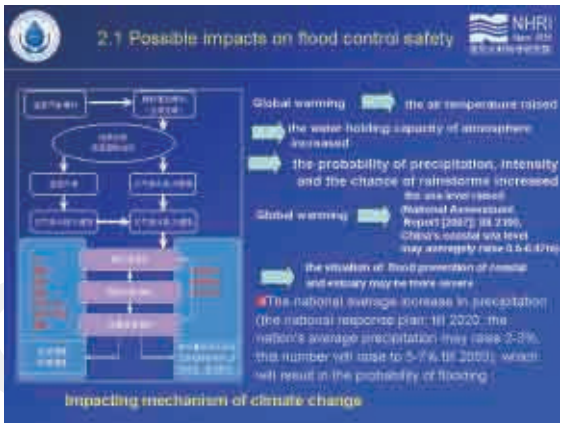
1.11 Wetland Degradation

Regional warming and drying lead to the degradation of the wetland resources, the reduction of anti-jamming capacity, the less variety of biodiversity, the addition of endangered spices and natural degradation

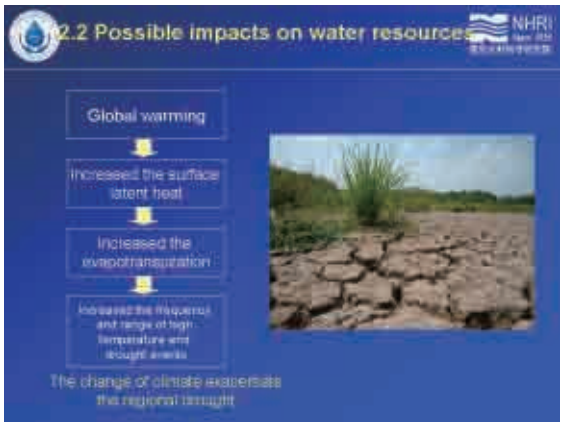

Contents
Phenomenon——Observed Changes
Analysis——Evaluation on possible impacts
Thoughts——Personal views


Possible impacts of climate changes
Global warming
The change of climate factors
Temperature
Rainfall
Sea level
Others
Affecting areas
Forestry
Ecology
Coastal zones
Others


Impacts on water
Climate Change
water
Flood prevention
Water resources
Water engineering
Ecology


2.1 Possible impacts on flood control safety
Global warming
the air temperature raised
the water holding capacity of atmosphere increased
the probability of precipitation, intensity and the chance of rainstorms increased
Global warming
the situation of flood prevention of coastal and estuary may be more severe
Impacting mechanism of climate change


2.1 Possible impacts on flood control safety
The extreme climate events of China has a trend of increasing frequency and intensity
Flooded
Housed


2.2 Possible impacts on water resources
Global warming
Increased the surface latent heat
Increased the evapotranspiration
The change of climate exasperate the regional drought

2.2 Possible impacts on water resources

2008, Gansu and Chongqing suffered once in a century drought
2008, in spring, hundreds of days without rain and snow in north of China, 15 provinces suffered severe drought
Since last September, in almost half a year, most of southwest areas' rainfall amount is less than 200 mm, which is less than the half of normal amount, 5 provinces suffered once in a century severe drought
Till 31st, March, 0.116 billion mu farmland suffered drought in the whole nation, 24.20 million mu farmland suffered dry caught, 15.15million mu farmland reaped yielding crops, 24.20 million people have drinking problems, the direct economic losses reached 23.66 billion yuan



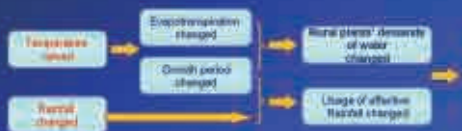
2.2 Possible impacts on water resources

The water resource distribution of areas focused on economic development (A2) in 2050: the water shortage may become more and more severe in the north of China

- The incidents of floods and drought disasters may increase in China
- The flood of south and the drought of north may not greatly change
- As the development of the economy, the shortage of water may become more and more serious in the north of China

2.2 Possible impacts on water resources

The increasing of the irrigation water



2.2 Possible impacts on water resources

Global warming --> temperature rising --> water need increasing

Preliminary analysis:

- Agriculture: Increased 2.7% (relate the scene of 1℃ rise of temperature, 3% rise of precipitation)
- Industry: every increase of 1℃ temperature leads to the increase of 1~2% of cooling water
- Livelihood: every increase of 1℃ temperature leads to about 1% increase of domestic water
- Ecology: evaporation increased --> ecological water increased
- Supply and demand contradictions are more prominent

2.2 Possible impacts on water resources

Temperature's rising
Water body's entrophication
Water quality's declining
Lack of water quality impact
the security of water supply


2.3 Possible impacts on water projects safety

Engineering security response to climate change:

(1) The changes of the climate zone in China lead to the slender of engineering design
(2) Extremely low temperatures affect the features of the hydraulic materials
(3) Long time of high temperature and drought impacts on the engineering safety

2.3 Possible impacts on water projects safety

In terms of temperature, the global warming means in the whole range of the world, the rise of average temperature, at the same time, the range of temperature change increased, the possibility of low-temperature wave and high-temperature heat increased.

In resent years, 3 obviously cold wave happened:

1、In the winter of 2004 & 2005, China suffered 2 large-scale of cold processes, which lead to a long duration of temperature drop and cold winter.

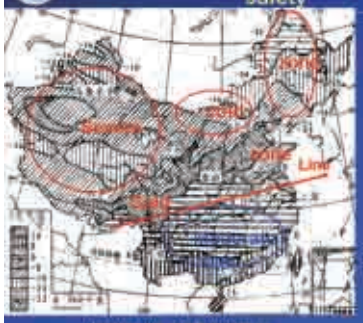
2、The freezing rain snow weather in the south of China on Jan. 2008.

3、The cold wave and heavy snow of North China from last winter till this spring.

Therefore, in the background of global warming,

the annual average temperature will continue to rise, at the mean time, there is possibility of extreme low-temperature cold wave.

2.3 Possible impacts on water projects safety



January average temperature distribution of China

Anti-freeze Hydraulic Structure Design

Severe cold zone: T<-10℃
Cold zone: -10℃≤T<-3℃
Moderate zone: T>-3℃

Revised edition?

2.3 Possible impacts on water projects safety

Impact of extreme low-temperature weather

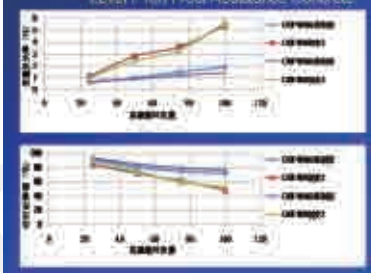
Cold wave

Cold wave

2.3 Possible impacts on water projects safety

The experiment of hydraulic concrete frost resistance

Level F100 Frost Resistance Concrete



2.3 Possible impacts on water projects safety

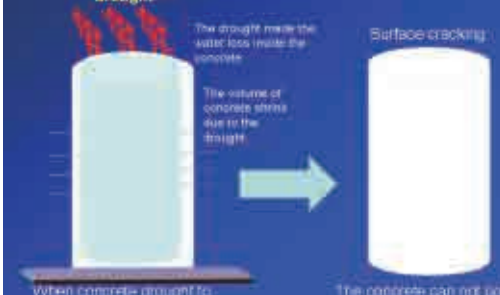
The destroying of Freeze-thaw on hydraulic architectures

Leading to the aggregate exposure of architectures

Leading to the surface cracking of architectures

2.3 Possible impacts on water projects safety

The impact of sustained high temperature and drought



2.3 Possible impacts on water projects safety

NHRI

The impact of sustained high temperature and drought to the hydraulic architectures

Concrete arch dam, Fengle

2.3 Possible impacts on water projects safety

NHRI

The impact of the saltwater intrusion

Global warming

Raise of sea level

Change of the concentration

Low salinity zone changed into high salinity

Enlarged the erosion area

Increased the intensity of erosion

2.3 Possible impacts on water projects safety

NHRI

Statistics of economic loss due to the concrete corrosion

Nations	Years	Direct loss per year (billion)	Account the proportion of GDP(%)
USA	1975	82 US dollars	4.9
	1998	275.7 US dollars	3.75
Former Soviet Union	1975	15.0–23.1 US dollars	2.0
	1985	40 Ruble	—
Federal Republic of Germany	1968–1969	10 DM	3.0
	1982	40 DM	—
Japan	1975	2540.93Yen	—
	1997	3937.59 Yen	—
UK	1957	3.5 Pounds	—
	1958	1.365 Pounds	3.5
Canada	1965	1 US dollars	—
Australia	1973	9.87 Australian dollars	—
	1988	25Australian dollars	4.5
Sweden	1986	35 Sweden from	4.2
India	1960–1961	1.5 Rupee	—
	1984–1985	40 Rupee	—
China	1998–2001	600 Yuan	5.0

2.4 Impact on ecology—water body pollution

NHRI

Rivers and lakes warming, which chang the thermal structure and the water quality, increasing the algae and plankton

On April 2007, the average water temperature of Taihu Lake was 19.561℃, which is the highest in 25 years, provided appropriate basis for the outbreak of algae.

The outbreak of blue algae in Taihu Lake

2.4 Impact on ecology —water and soil erosion

NHRI

Drought → Vegetation degradation

Increased extreme rainstorm → Strengthen erosion

→ Reinforce the water and soil erosion

Census Data(2005):

The soil erosion nationwide is 2.67 million kilometer, accounting for 27.8% of the erosion nation of which, 1.61 million kilometer water erosion, the annual loss reaches 5 billion tons each year, great deal of the soil go into the rivers

2.4 Impact on ecology —coastal lines

NHRI

Global warming, sea level raising, reducing runoff to the sea increasing intensity of typhoon and storm surge, growing numbers of extreme events, all those have a series of impacts to on coastal lines

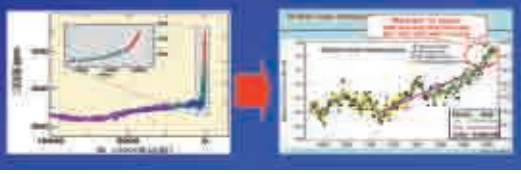
- Estuary salinity intrusion
- Coastal erosion
- Coral reef and mangroves reduced
- Marin organisms and fish reduced

Contents

- Phenomenon——Observed Changes
- Analysis——Evolution on possible impacts
- Thoughts——Personal views

Thoughts

1. A large number of observed data shows that, the global climate is characterized by global warming changes. Apart from the changes in natural cycle, the changes are mostly caused by the large amount of greenhouse gases, which are brought about by human activities.



Thoughts

2. Climate change has already had a severe impact on natural areas like water, agriculture, forestry, ecology and so on, as well as the social economy, and in the future, those problems may be more serious.

Water is the most direct and significant area of climate change. Our future planning and management should consider the impacts of local climate changes.

Thoughts

3. Low-carbon economy is a kind of economic model which takes on the low energy consumption, low pollution and low emission. It is another major progress following the agriculture and industrial civilization.

The essence is the efficient use of energy, the development of clean energy and the pursuit of green GDP.

The core is the innovation of energy and the emission reduction technologies, as well as the industrial structure and institutions. It also means a fundamental change of human survival and development.

The background is the challenge which comes with the global warming, to human survival and development.

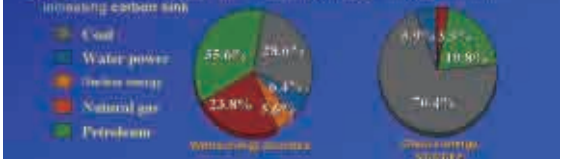
The development of low-carbon economy is both goal and means, which is a good method for China's current energy saving, economic development transformation and speeding up industrial restructuring.

Thoughts

Water conservation should counter actively climate change and exert influence on low-carbon economy. Development of water energy resource (water power-generating capacity will total 200 million kw this year. Representatives in PC and PCC suggested that power-generating capacity reach 350 million kw in 2020 to meet the demand of non-fossil energy taking up 15%.)

Development of clean energy such as nuclear energy to help counter climate change. (China's nuclear power-generating capacity is less than 10million kw, proactive development of nuclear power is a planning objective for mid and long term periods)

Strengthening preservation of water and soil, preventing area soil erosion, increasing carbon sink



On the cold weather of last winter and this spring in northern hemisphere

Northern hemisphere is extremely cold in this winter, hitting several records in recent years.

- From Dec 19-20, 2009, torrential snow visited many areas of eastern America, snow depth reached 61cm in Washington area, hitting the record since Dec 1932.
- In the end of middle December 2009, snow storms swept away Europe. It's rare in history that snow depth was more than 50cm in some areas.
- On Jan 4, 2010, snow depth was more than 25 cm, hitting the history record since 1937 when records began.

On the cold weather of last winter and this spring in northern hemisphere

Northern area is haunted by low temperature and torrential snow

- Beijing (2010.1.5-10.1) experienced the coldest morning since 1966 and the heaviest snowfall since 1951
- The snow depth of Xinjiang, Aletai, etc. were continuously breaking records, snow disaster was grave there
- Bohai Rim experienced most severe sea ice disaster in recent 30 years

On the cold weather of last winter and this spring in northern hemisphere

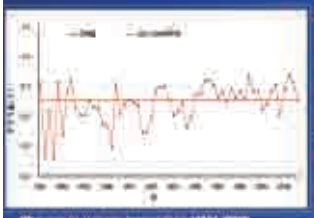
Theory of cold winter and global cooling?

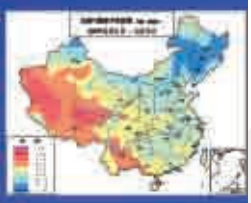
Mojib Latif, German famous meteorologist

- The globe is undergoing a 'mini' Glacier Century', which may exist for 20 to 30 years
- Climate has close relations with ocean cycling. There are 20 to 30 years of alternations of coldness and warmness in ocean cycling periods. Currently, oceans are in the state of 'cooling pattern', as a result, global climate will cool down

On the cold weather of last winter and this spring in northern hemisphere

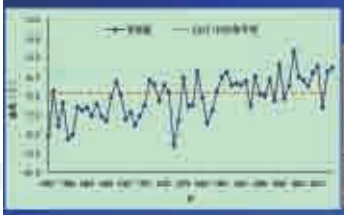
- Monitoring data of China's meteorological Bureau: natural fluctuations exist between scales of year and between-year climate system. The average temperature in cold periods from 2000 to 2010 is all higher than that of 1970s in the same period

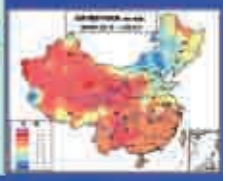




Changes in average temperature (1951-2009)
the average temperature of Dec. 2009 is slightly higher than the average level

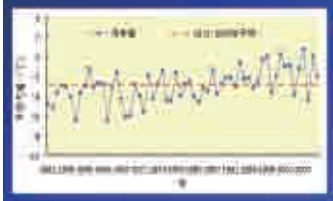
On the cold weather of last winter and this spring in northern hemisphere

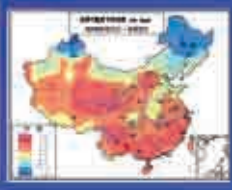




Changes in average temperature (1951-2010)
the average temperature of Jan. 2010 is higher than the average level

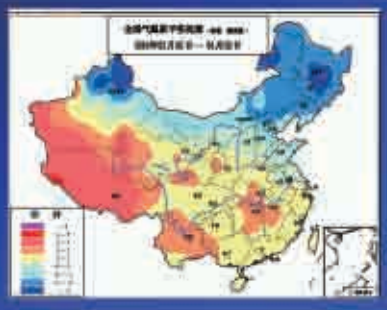
On the cold weather of last winter and this spring in northern hemisphere





Changes in average temperature (1951-2010)
the average temperature of Feb. 2010 is obviously higher than the average level

On the cold weather of last winter and this spring in northern hemisphere



Changes in average temperature(1951-2010)
Mar. 2010

4、On the cold weather of last winter and this spring in northern hemisphere

Yihui Ding, academician of China's climate center：

'Arctic oscillation' is a leading cause for extreme cold weather in this winter.

Since the beginning of this century, positive phase begins to weaken gradually, and turns to negative , namely that barometric pressure of pole regions is escalating gradually. Cold air masses of pole regions which were only active in circling west wind band area originally begins to spread into south. It brings about intrusion of cold stream of pole regions which moves toward south along three paths into eastern areas of Northern America (Especially southeastern area of North America); North Europe and West Europe; East Asia (Especially Northeastern Asia).

4、On the cold weather of last winter and this spring in northern hemisphere

Dr. Yan Hong, vice secretary-general of WMO

We shouldn't put the long-term trend of global warming and cold weather in this winter in the same pool, nor contradict with each other. On the contrary, inner relations exist between each other.

Short-term abnormal climate is mainly caused by natural factors. However, the driving force of global warming trend is increase in greenhouse gases. When these factors are fixed, global warming trend is still heading in the future.

4、On the cold weather of last winter and this spring in northern hemisphere

From the climate's natural fluctuations, abnormal circumfluence, el nino and etc., We can draw a conclusion from analysis that this cold weather was only an episode in the process of long-term warming. It's a natural fluctuation in the great trend of global warming. The great trend of global warming has never changed its direction.

Thoughts

5、Current prediction and impact evaluation on climate change are of much uncertainty, which involve intersection between different disciplines. In this field, we have little discourse power, it's suggested that basic researches on countering climate change are strengthened.

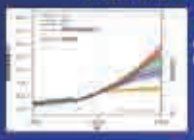
Problems of biggest concern：

How will it change in the future?

What impacts will it bring?

Thoughts

Four main difficulties in current research



1st difficulty：Great uncertainty in future prediction

2nd difficulty：Attribution analysis of the fact of change in water resource is not accurate enough.

3rd difficulty：Coupling research on water cycle and land-process mechanism in looking for water resource impact research.

4th difficulty：Countering measures are short of research on disaster mechanism and regulating theory.

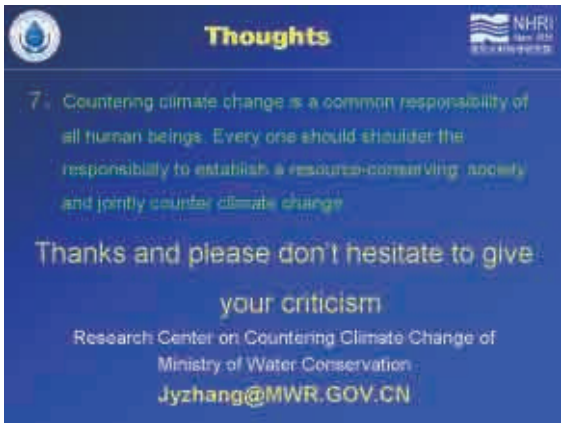
Thoughts

6、On the 2010 severe drought in Southwest China

Features：It's the most grave drought on record in history. Long-duration, large drought area, highly negative impact.

Climate：Since last September, rains were rare for over 200 days. Comparing with normal periods, rainfall amount of whole southwestern area declines 50%+, especially in Yunnan and Guizhou. Meanwhile, the temperature of Yunnan was extremely high, with 2 ℃ higher than usual and high amount of evaporation. All these lead to severe drought.

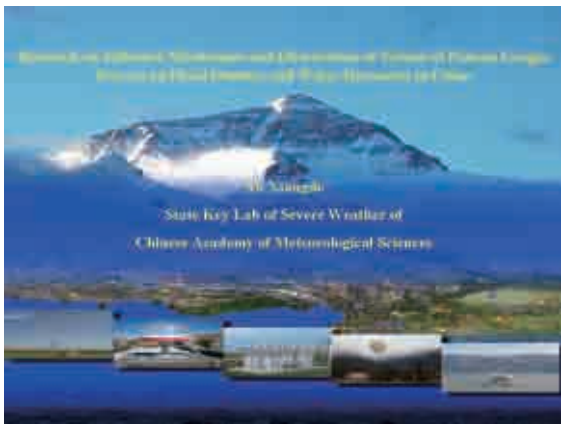
Reasons：Rainfall demands the converging of cool and warm air mass. In the special geological environment-Tibet Plateau (Roof of the world), water vapors move from Indian Ocean and along the southern side of the roof. It's a significant transporting belt of water vapor. However, in the past 200 days, the belt was exceptionally weak than usual, with little water vapor conveyed. Hence, from last fall to winter, there were more cool air masses in eastern area, unable to converge with warm and wet flow of southern area.

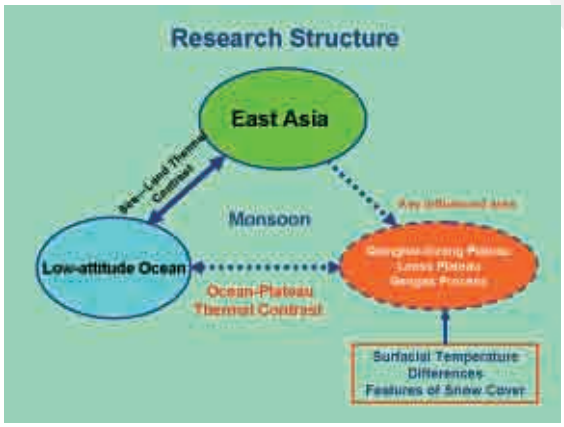

Thoughts
NHRI
7、Countering climate change is a common responsibility of all human beings. Every one should shoulder the responsibility to establish a resource-conserving society and jointly counter climate change
Thanks and please don't hesitate to give your criticism
Research Center on Countering Climate Change of Ministry of Water Conservation
Jyzhang@MWR.GOV.CN

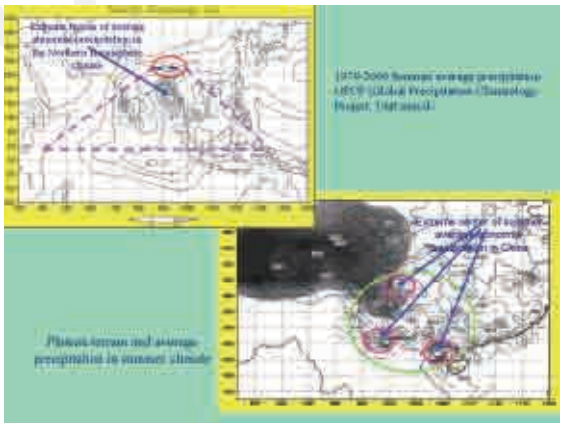
Process on Flood Disaster and Water Resources in China

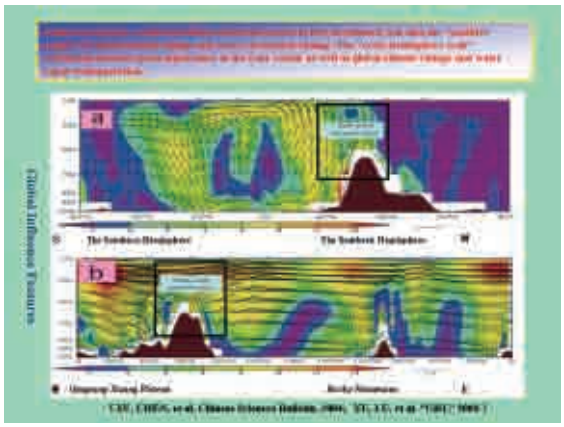
Mr. Xu Xiangde, Academician, China Meteorological Research Institute

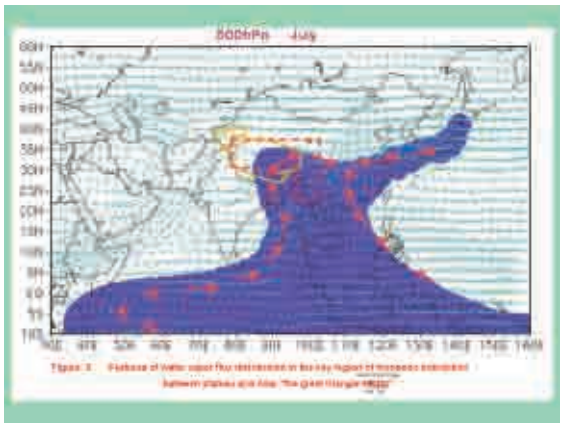
Research on Influence Mechanism and Observation of System of Plateau Geogas

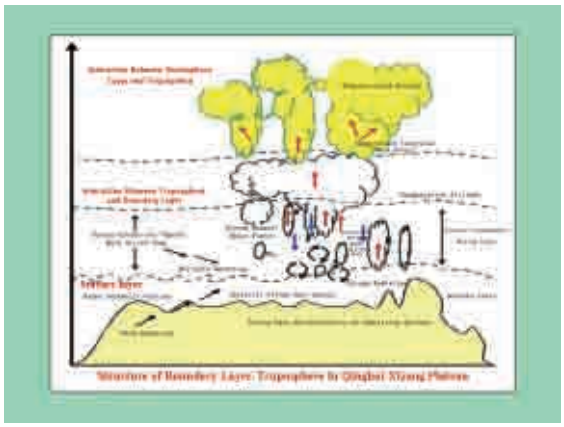


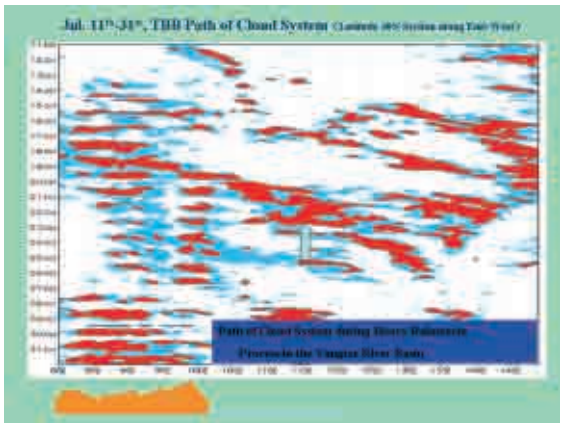


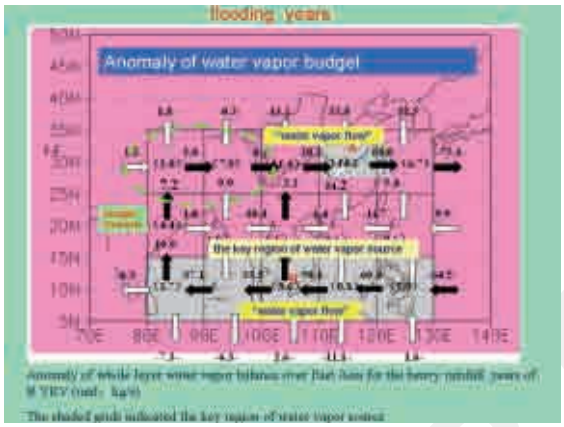


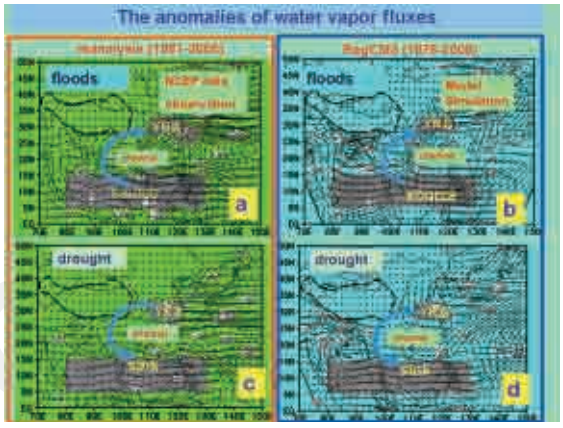


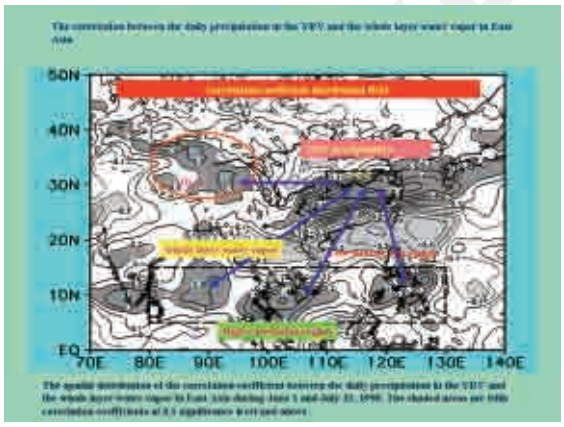


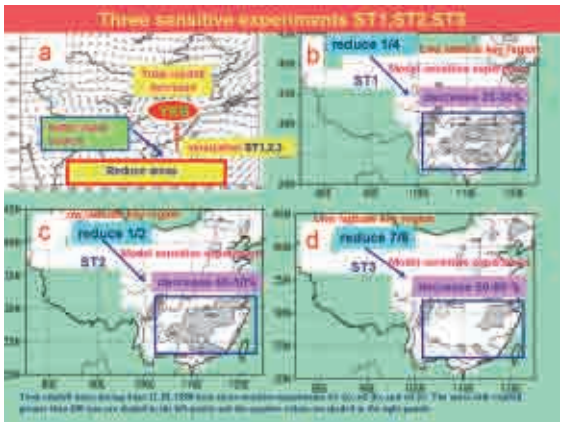


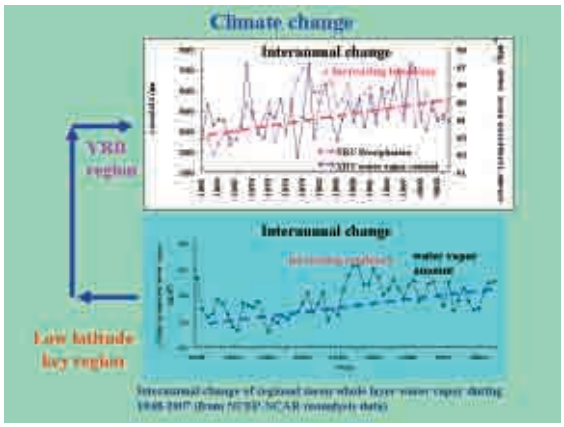

Jul. 11th-31st, TBB Path of Cloud System

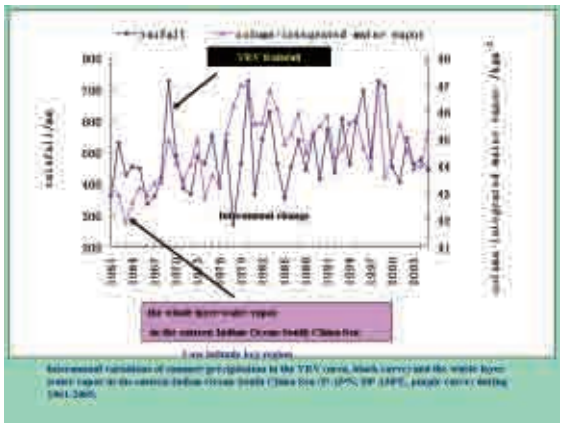

flooding years
Anomaly of water vapor budget
the key region of water vapor source

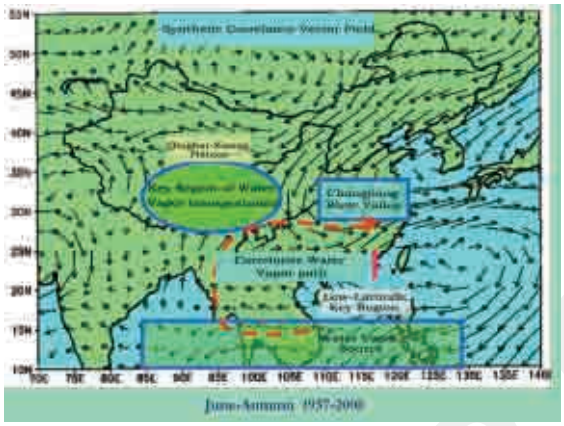

The anomalies of water vapor fluxes
floods
drought

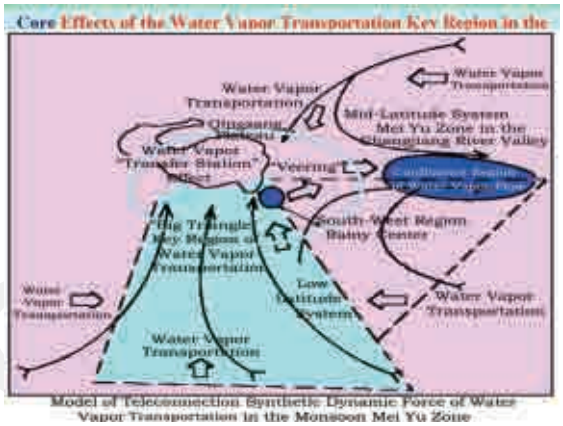

50N
40N
30N
20N
10N
EQ
70E
80E
90E
100E
110E
120E
130E
140E


Three sensitive experiments ST1,ST2,ST3
reduce 1/4
reduce 1/2
reduce 7/8

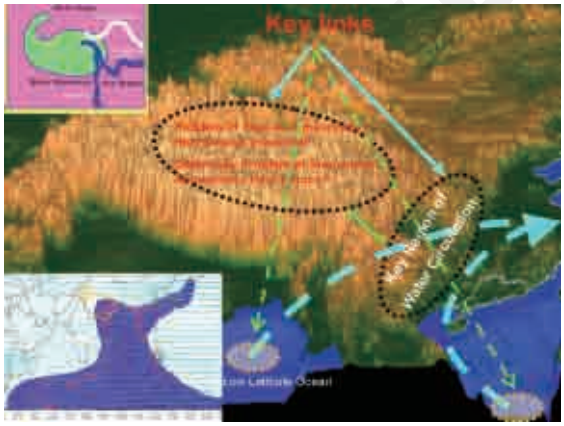




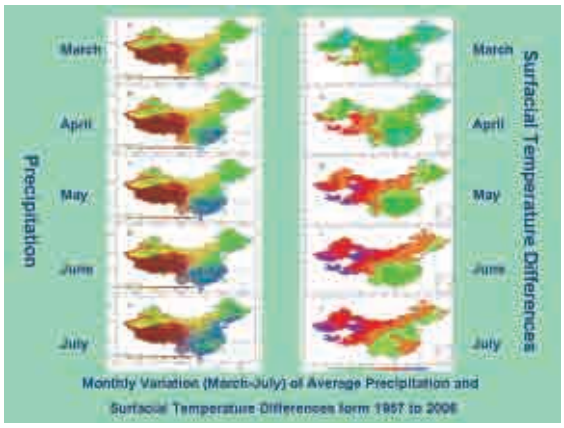




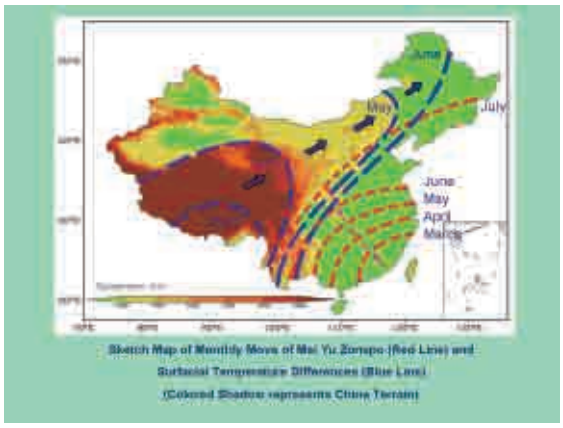
Model of Teleconnection Synthetic Dynamic Force of Water Vapor Transportation in the Monsoon Mei Yu Zone



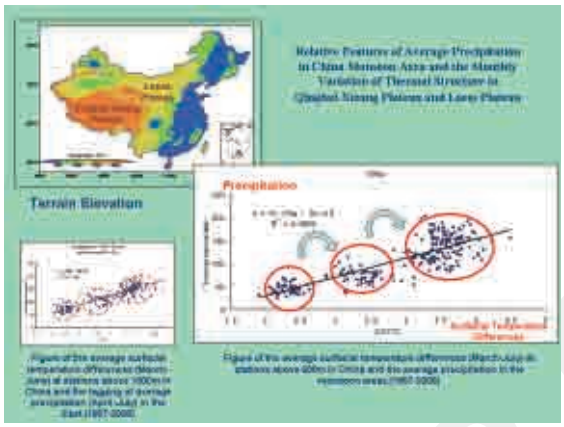
Regional Features of Precipitation Variation Trend in China under the Global Variation Circumstance



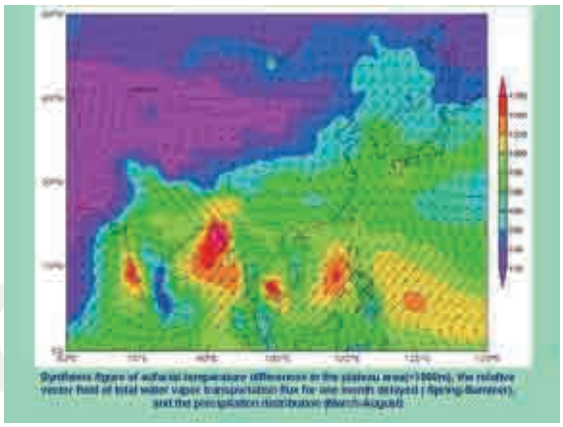
Monthly Variation (March-July) of Average Precipitation and Surfacial Temperature Differences form 1957 to 2006

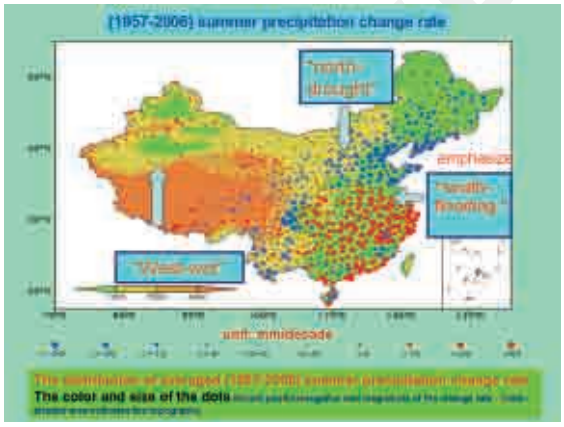


Sketch Map of Monthly Move of Mei Yu Zonspo (Red Line) and Surfacial Temperature Differences (Blue Line)
(Colored Shadow represents China Terrain)

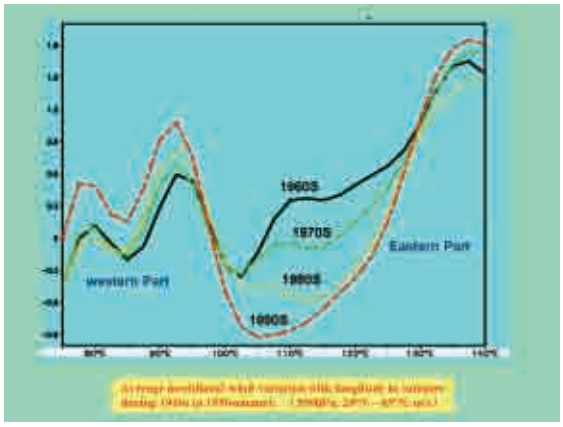


Relative Features of Average Precipitation in China Monsoon Area and the Monthly Variation of Thermal Structure in Qinghai-Xizang Plateau and Loess Plateau

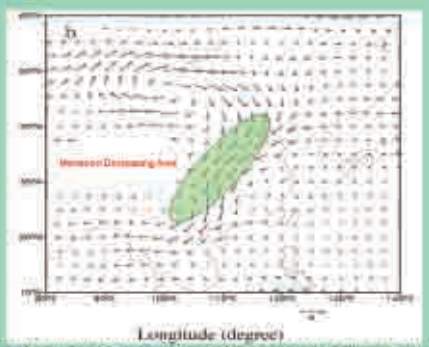

Synthesis figure of surfacial temperature difference on the plateau area(>1000m), the relative vector field of total water vapor transportation flux for one month delayed (Spring-Summer), and the precipitation distribution (March-August)



The distribution of averaged (1957-2006) summer precipitation change rate
The color and size of the dots



The Interannual Variations of Summer Monsoon in the East Asia

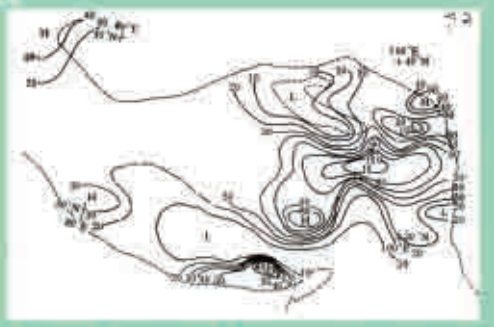


Deviation wind field in the 850hpa isobaric surface in summer in the time of 1979-2000 and 1961-1977.(m•s-1)

Interannual Variations of Surfacial Temperature Differences in Spring（1957~2006）

Analysis Materials

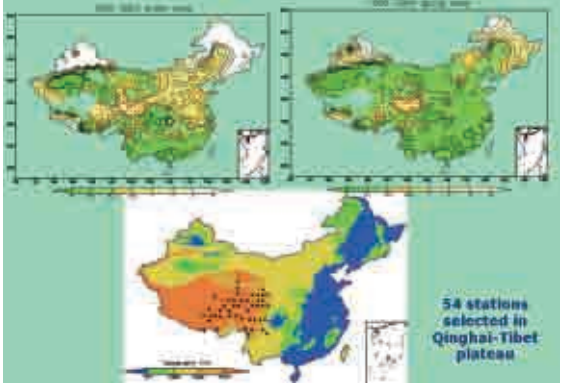
Analyzing synthetically the problem of influences upon China summer monsoon and its precipitation distribution features, deriving form the interactive feedback effects between the plateau snow cover "the wet soil" and the atmosphere, by using the measures of surfacial temperature differences and the depths of the snow information based on the monitoring data from the 753 stations in China during 1955-2004, the snow cover information based on the satellite RS and NCEP reanalysis data.



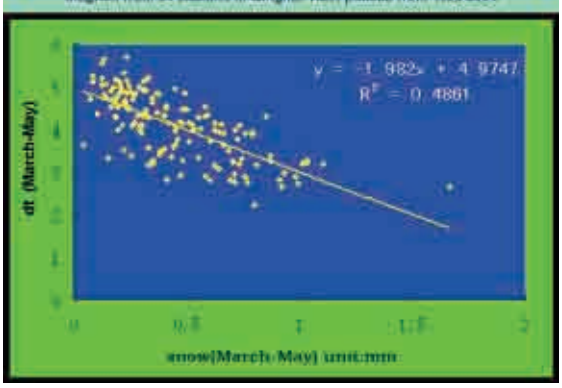
Multiple years' distribution of average days of snow covering in Qinghai-Tibet Plateau from October to April

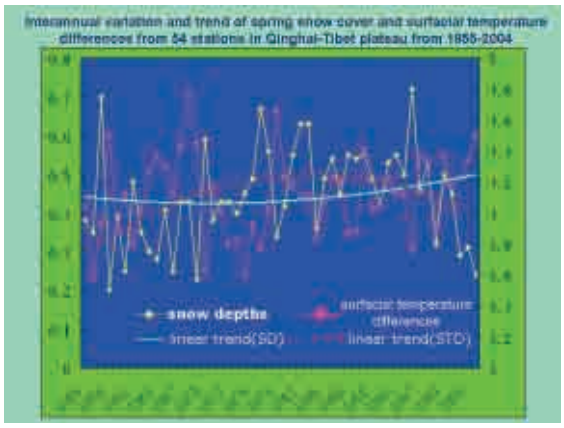
Multiple years' average depths of the snow in winter from 1955-2004

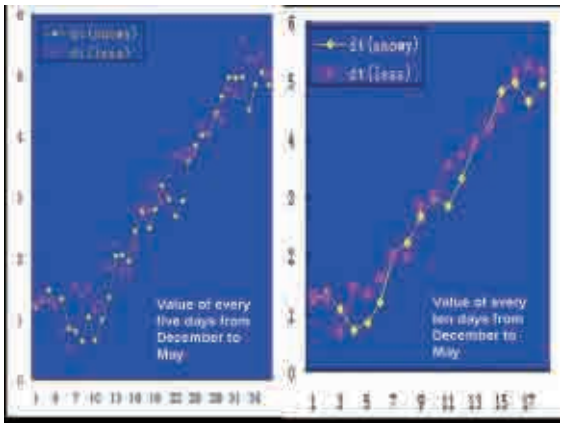
Multiple years' average depths of the snow in spring from 1955-2004

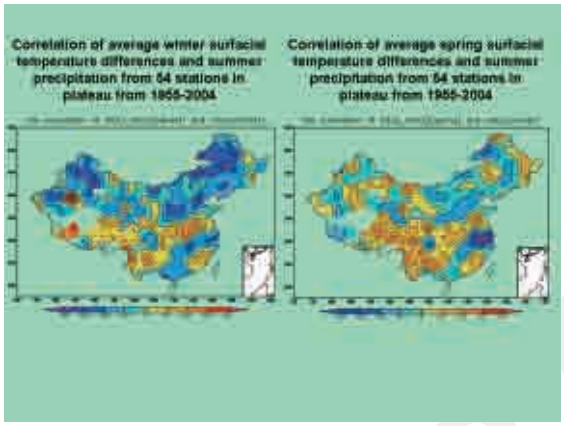


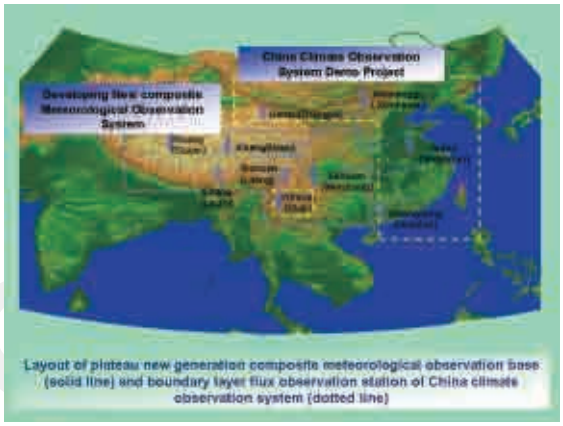
Monthly surfacial temperature differences and snow depths relative scatter diagram from 54 stations in Qinghai-Tibet plateau from 1955-2004





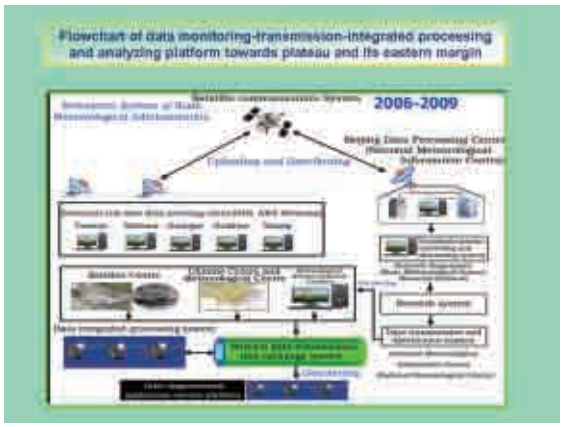


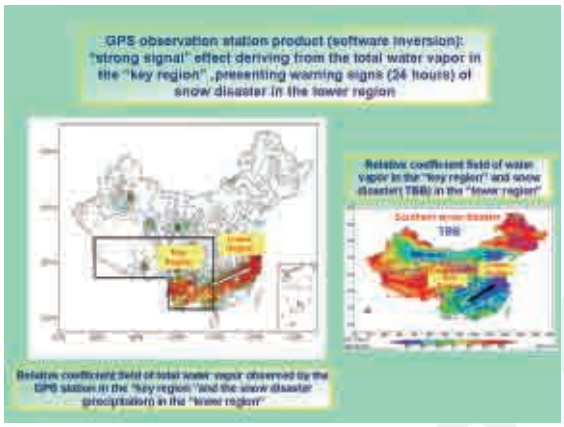


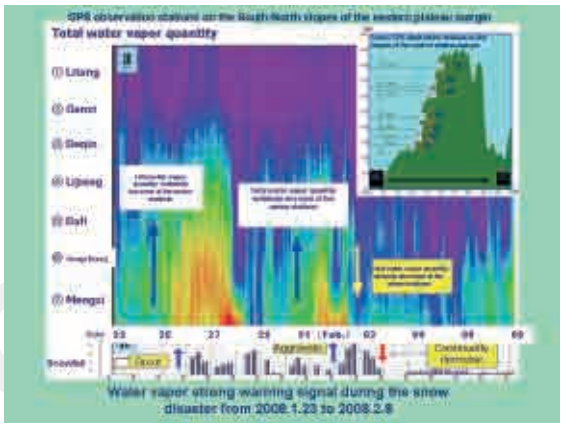


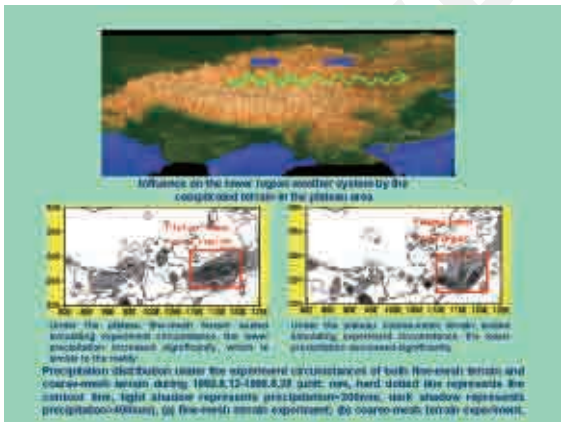
Designation and Application of Observation System in Qinghai-Tibet Plateau and Its Eastern Margin (JICA)

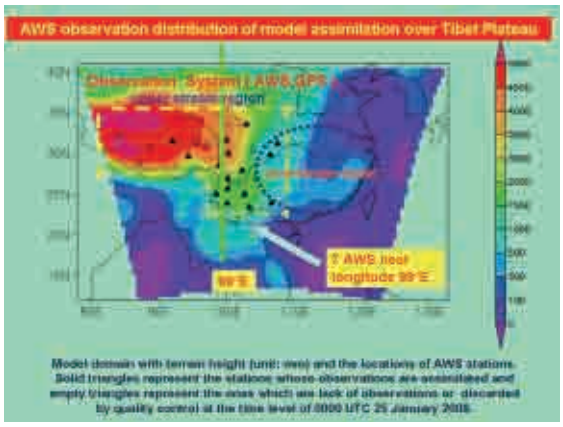

Shangye
(Gansu desert)
Dali
(East plateau margin)
Xilinhaole
(Mongolia grassland)
Dianbai
(Guangdong coast)

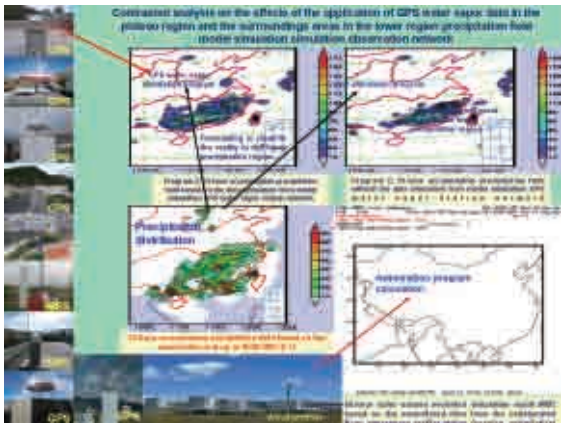

Flowchart of data monitoring-transmission-integrated processing and analyzing platform towards plateau and its eastern margin
2006-2009

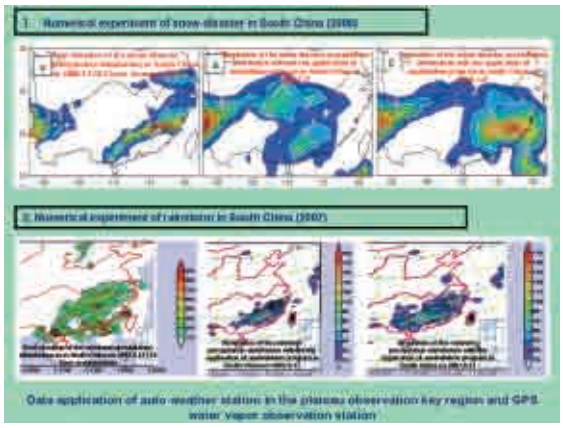

GPS observation station product (software inversion): "strong signal" effect deriving from the total water vapor in the "key region" ,presenting warning signs (24 hours) of snow disaster in the lower region
Relative coefficient field of water vapor in the "key region" and snow disaster TBB in the "lower region"
TBB
Relative coefficient field of total water vapor observed by the GPS station in the "key region "and the snow disaster precipitation in the "lower region"


GPS observation stations on the South-North slopes of the eastern plateau margin
Total water vapor quantity
① Litang
② Garzi
③ Daofu
④ Ljiaoqi
⑤ Dali
⑦ Mengzi
Water vapor strong warning signal during the snow disaster from 2008.1.23 to 2008.2.6


Influence on the lower region weather system by the complicated terrain in the plateau area
Precipitation distribution under the experiment circumstances of both fine-mesh terrain and coarse-mesh terrain during 1800.8.12-1800.8.28 (unit: mm, hard dotted line represents the contour line, light shadow represents precipitation>200mm, dark shadow represents precipitation>400mm), (a fine-mesh terrain experiment, (b coarse-mesh terrain experiment.


AWS observation distribution of model assimilation over Tibet Plateau
Observation System (AWS,GPS and sounding)
? AWS near longitude 99°E
Model domain with terrain height (unit: mm) and the locations of AWS stations. Solid triangles represent the stations whose observations are assimilated and empty triangles represent the ones which are lack of observations or discarded by quality control at the time level of 0000 UTC 25 January 2008.

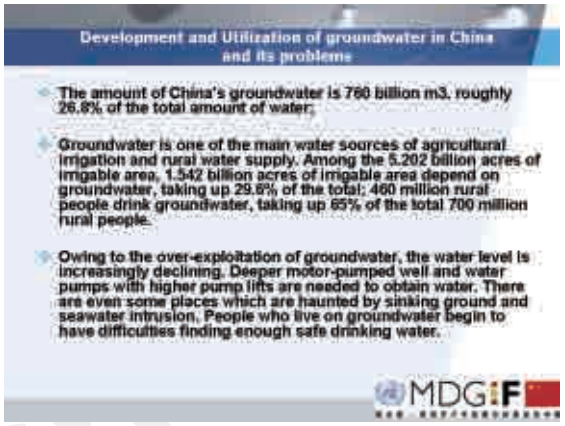

Precipitation distribution

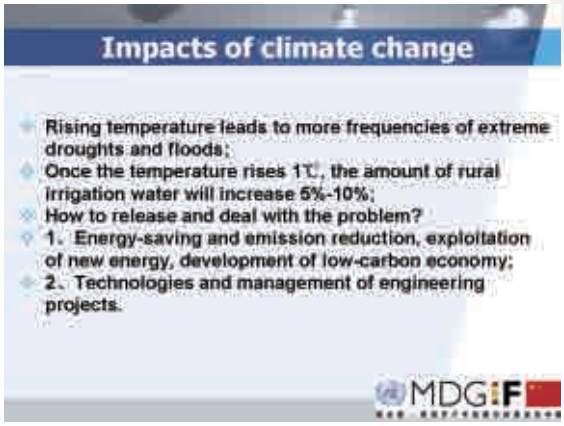

1 Numerical experiment of snow disaster in South China (2008)
2 Numerical experiment of rainstorm in South China (2007)
Data application of auto-weather station in the plasma observation key region and GPS water vapor observation station

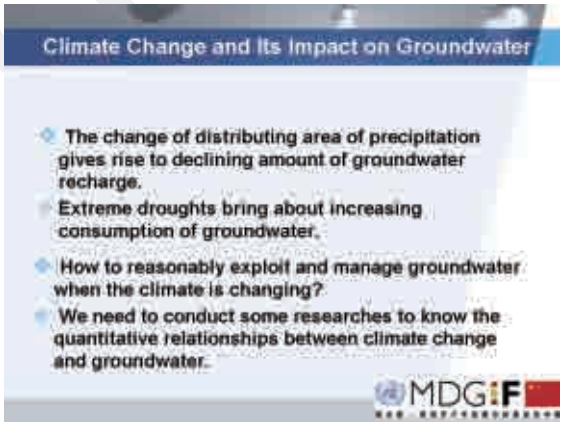

THANKS

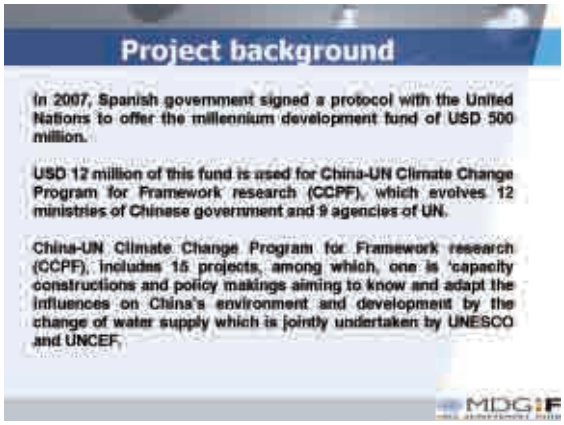
Climate Change and Its Impact on Groundwater

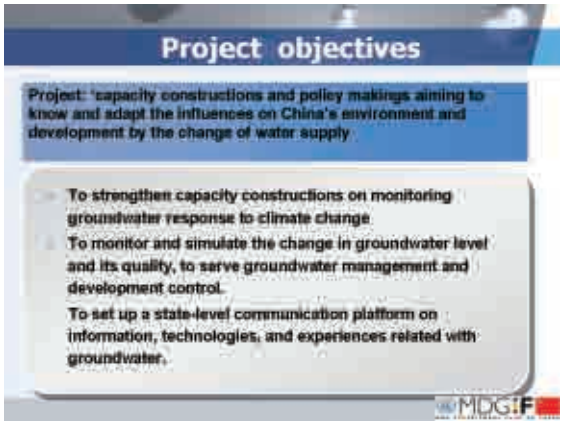
Mr. Gao Zhanyi, Team Leader,
MWR-UNICEF Climate Change and its impact on Groundwater Programme





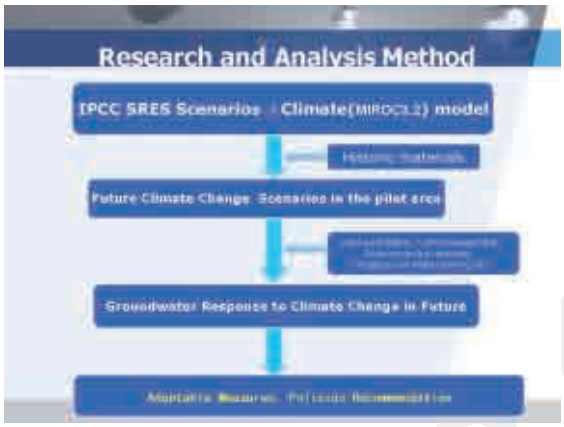


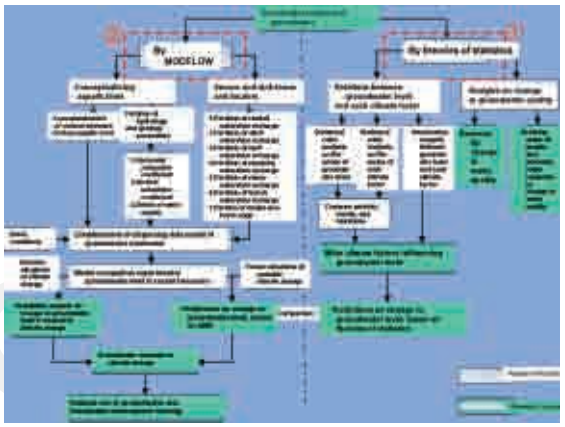


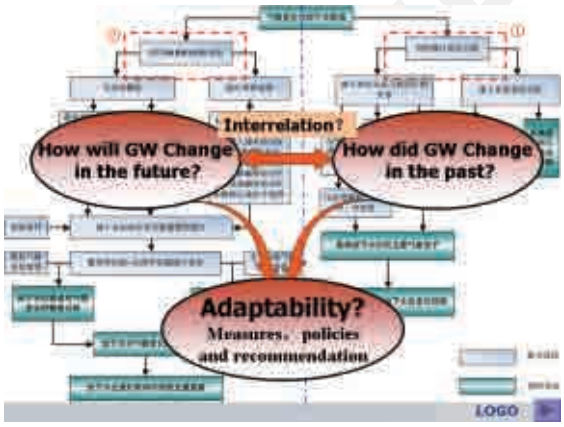


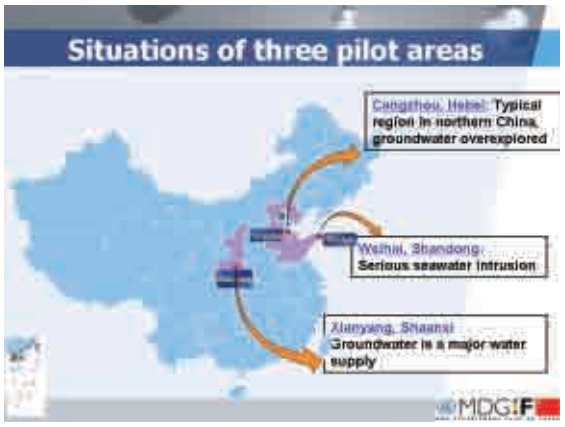

Capacity Building on Groundwater Monitoring
A
Renewing equipments on monitoring groundwater level in three pilot areas
MDGIF

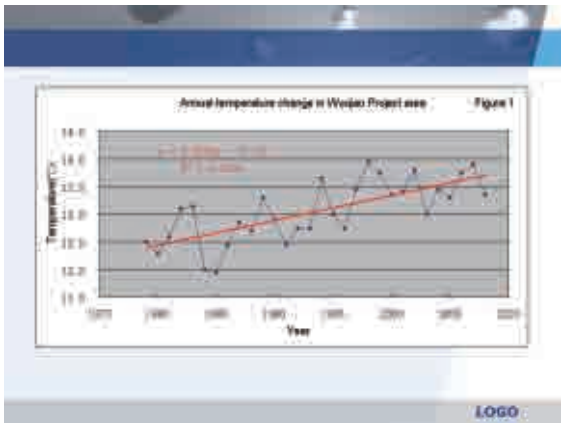

Capacity Building on Groundwater Monitoring
B
Field technical trainings in these 3 pilot areas
Field technical training
MDGIF

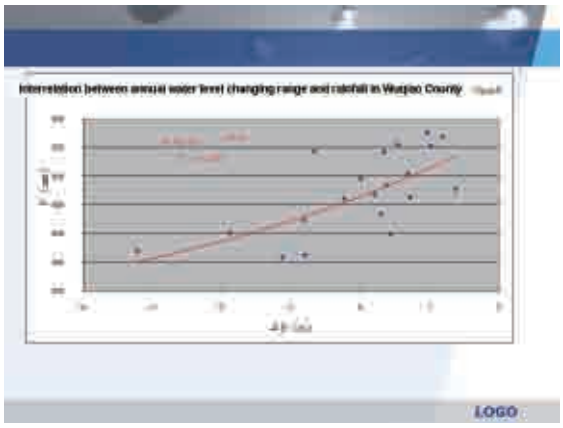

Research and Analysis Method
IPCC SRES Scenarios
Climate(MIROC3.2) model
Future Climate Change Scenarios in the pilot area
Groundwater Response to Climate Change in Future

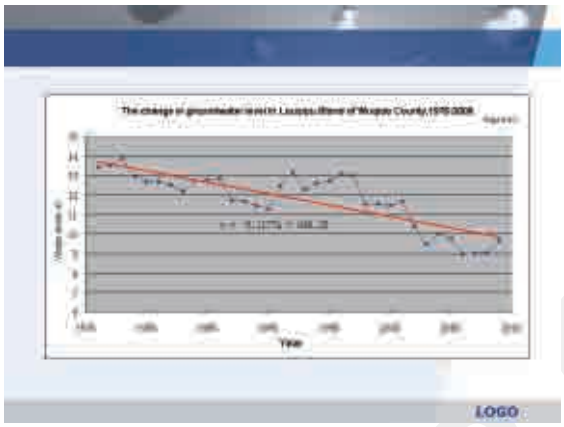

By MODFLOW

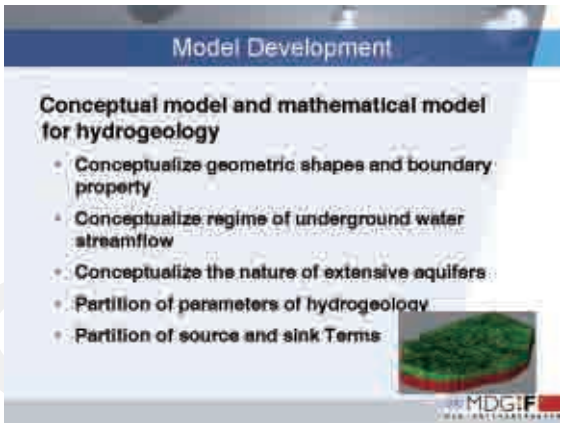

How will GW Change in the future?
Interrelation?
How did GW Change in the past?
Adaptability?
Measures、policies and recommendation
LOGO

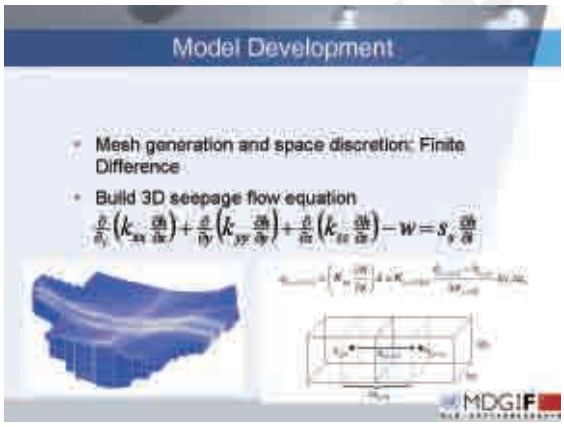

Situations of three pilot areas
Cangzhou, Hebei: Typical region in northern China, groundwater overexplored
Weihai, Shandong: Serious seawater intrusion
Xianyang, Shaanxi: Groundwater is a major water supply
MDGIF

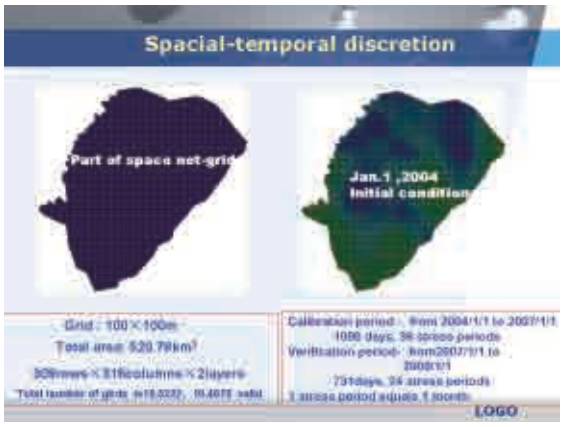

Annual temperature change in Wuqiao Project area
Figure 1
Temperature/℃
Year
LOGO


LOGO


Year
LOGO


Model Development
Conceptual model and mathematical model for hydrogeology
Conceptualize geometric shapes and boundary property
Conceptualize regime of underground water streamflow
Conceptualize the nature of extensive aquifers
Partition of parameters of hydrogeology
Partition of source and sink Terms
MDGIF


Model Development
Mesh generation and space discretion: Finite Difference
Build 3D seepage flow equation
MDGIF

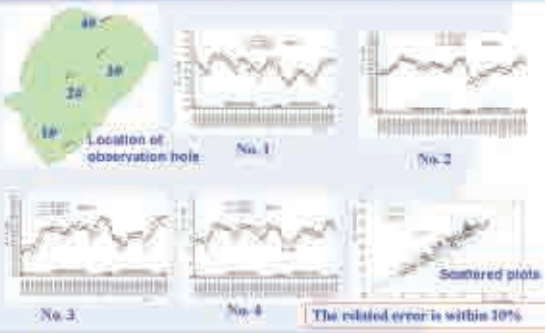

Spacial-temporal discretion
Part of space net-grid
Jan.1 ,2004
Initial condition
Grid : 100×100m
Total area: 520.79km²
LOGO

Partition of Source and Sink Terms

Pilot: Cangzhou, Hebei

MDGIF

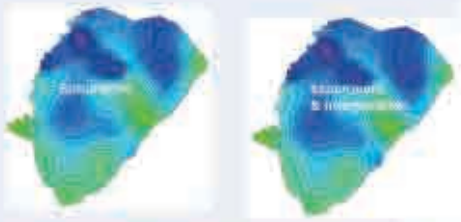
Calibration and Validation of Model



Pilot: Cangzhou, Hebei

LOGO

Calibration and Validation of Model



The simulation of flow field of groundwater is basically consistent with experiment – interpolation results

Pilot: Cangzhou, Hebei

MDGIF

Initial analysis results

The change of groundwater level is mainly influenced by rainfall and human activities in the late 30-40 years.

Human activities and rainfall deeply interact with each other.

Evaporation and temperature exert weak direct-influence on groundwater, but great influence on usage amount of groundwater. It also exerts great indirect-influence on groundwater level.

In shallow groundwater areas and by-river areas, weight of rainfall on groundwater level is 25%-30%, but only about 10% on deep groundwater areas (confidence level=0.05).

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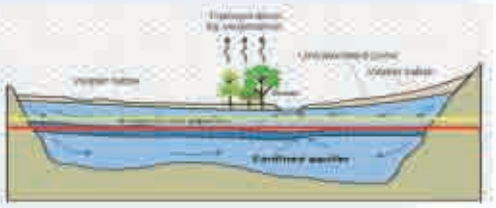
Impact of Climate Change on Groundwater by Human Activities

MDGIF

Policies on ground water utilization and management



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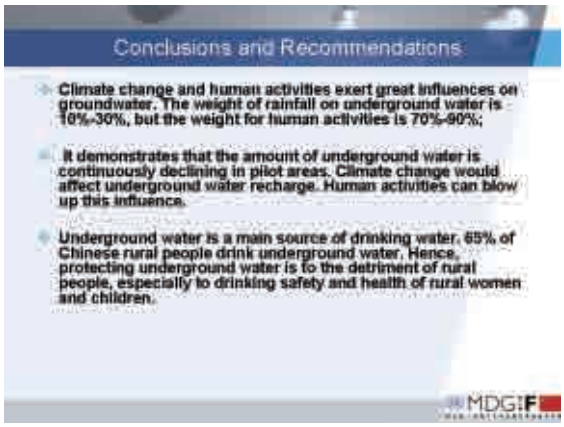
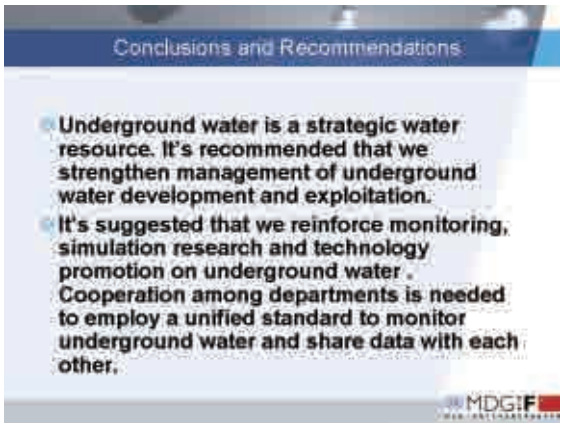
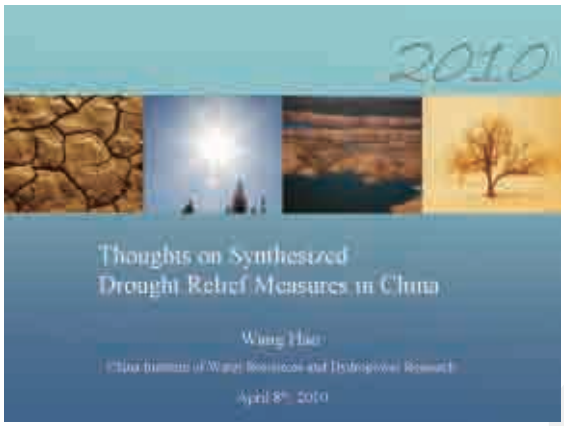

Conclusions and Recommendations
Climate change and human activities exert great influences on groundwater. The weight of rainfall on underground water is 10%-30%, but the weight for human activities is 70%-90%;
It demonstrates that the amount of underground water is continuously declining in pilot areas. Climate change would affect underground water recharge. Human activities can blow up this influence.
Underground water is a main source of drinking water. 65% of Chinese rural people drink underground water. Hence, protecting underground water is to the detriment of rural people, especially to drinking safety and health of rural women and children.
MDGIF

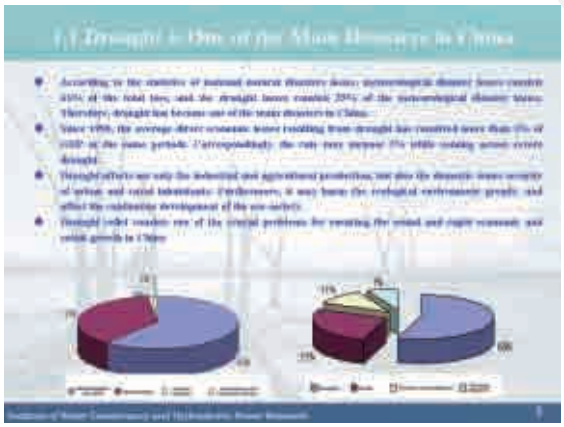

Conclusions and Recommendations
Underground water is a strategic water resource. It's recommended that we strengthen management of underground water development and exploitation.
It's suggested that we reinforce monitoring, simulation research and technology promotion on underground water . Cooperation among departments is needed to employ a unified standard to monitor underground water and share data with each other.
MDGIF

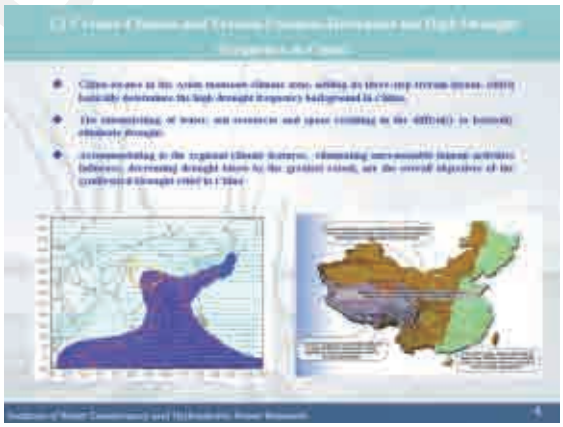

Thank you !
MDGIF

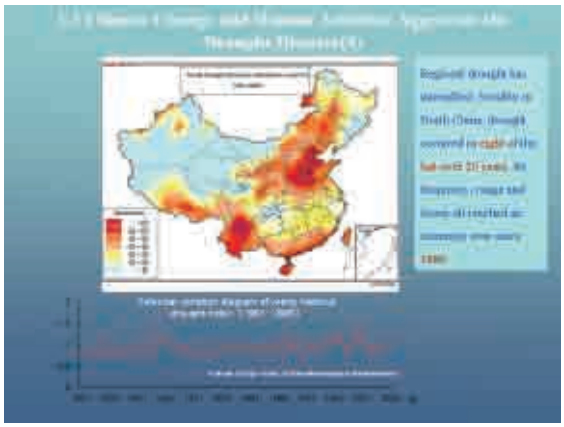
Thoughts on Synthesized Drought Relief Measures in China

Mr. Wang Hao, Academician,
China Institute of Water Resources and Hydropower Research (IWHR)



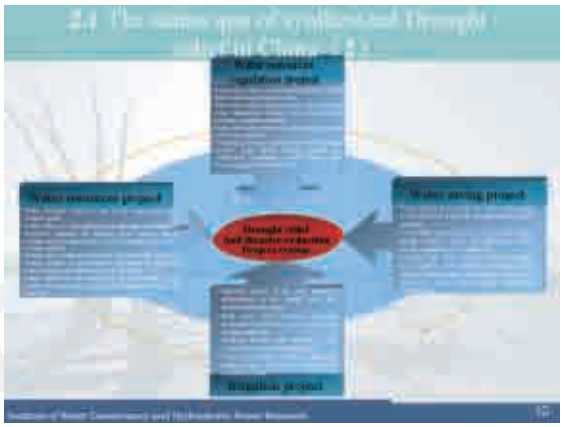







Drought features and its new developing trend in China
The status quo and problems of synthesized drought relief in China
Key technologies of synthesized drought relief in China


Drought relief means preventing and easing the adverse drought influence on living, productive activities and ecological environment, by employing project measures and non-project measures.
According to different targets, drought relief and be divided into agricultural drought relief, urban drought relief, and ecological Drought relief.




Drought relief and disaster reduction non-project system


By the time of 15:00 on 17th March, in Guangxi, Chongqing, Sichuan, Guizhou, Yunnan areas, up to 51.049 million people had been affected, 16.09 million people and 12.055 million large livestock had been lack of drinking water, 4.3486 hectares of crops had been stricken, among which 940.2 thousand hectares of crops had been completely destroyed. The direct economic losses had reached 10.02 billion yuan.

2.2 Drought in Southwest China and Its Cause(1)

Analysis on the causes of drought in Southwest China.

The flood period ended 2 months earlier in 2009

Continuous low and less of rainy

Water storage decreased

Soil dried (lack of moisture)

Lack of water supply from new resources

Over transpiration and water consumption increased

Water Conservation Project:

Backwardness of water conservation infrastructure and the supporting projects.

Lack of emergency water resources

Management System:

Lack of effective early warning and forecasting

Backwardness of emergency management system

2.3 The Existing Problems of Drought Relief in China

- With respect to drought relief, to which we have not paid enough attention, on which we have not laid enough stress, for which we have not formulated a plan, at which we have held old-fashioned ideas, and at the same time we have been lack of the conception of "putting prevention first". Drought and water-lacking factors have not been taken into consideration while building the regional economic structure.
- On one hand, attaches great importance to project measures, while ignores the non-project measures. On the other hand, drought relief infrastructure are still lacking, projects are in great shortage, the collection of drought relief are on the low side.
- Economic, legal, scientific measures have not been suitably used in some regions; systematic problems have existed in drought relief management; not enough drought relief funds have been placed; funds raising mechanism have not been built.
- Deficiencies of drought surveillance and information gathering measures; lacking in a scientific, accurate drought statistical sampling and assessing index system; insufficient in relevant basic researches.

2.4 Objectives and Tasks of Drought Relief and Disaster reduction in China (1)

Basic principles

- People Oriented
- sustainable development
- In line with local conditions
- Act according to actual capacity
- Be Scientific
- In accordance with law
- Give top priority to results

Overall objectives

Through the integrated application of administrative, legal, economic, projective, scientific, and managerial measures, establish and promote the drought relief (DR) organization administration system, DR project support system, DR legal system, DR funding system, DR new technology popularization system, and DR social services system, and build DR services price formation mechanism in accordance with market economic structure, so as to strengthen the national awareness of drought relief and disaster reduction, and improve the national overall capability of drought relief and disaster reduction.

2.4 Objectives and Tasks of Drought Relief and Disaster reduction in China (2)

Main Tasks

- Strengthen drought relief (DR) legislation
- Formulate comprehensive and scientific DR planning as quickly as possible
- Set out general layout of DR project
- Strengthen emergency DR capability
- Establish DR structure, mechanism, and legal system
- Promote relevant basic work and etc.

OUTLINES

Drought features and its new developing trend in China

The status quo and problems of synthesized drought relief in China

Key technologies of synthesized drought relief in China

3.1 General Thoughts on Synthesized Drought Relief in China Under Transition

- Transition from "risk management" to "combining risk management with routine management"

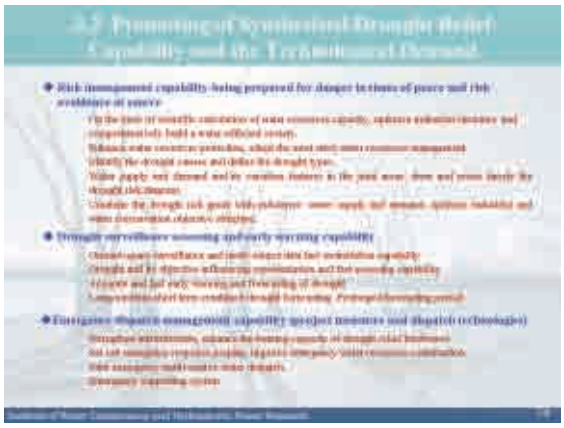
  integrate drought relief in the routine synthesized water resources management, set up risk management model, so as to evade drought risks

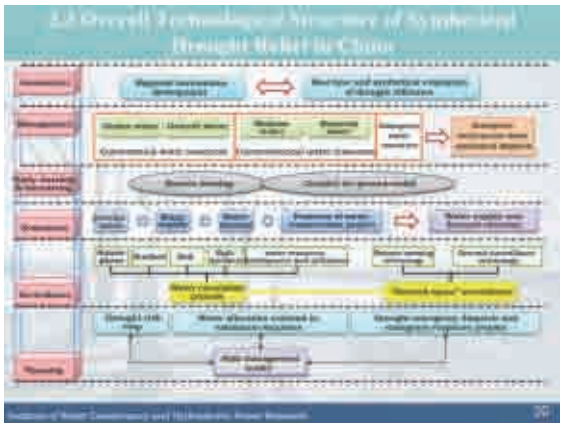
- Transition from "short term risk management" to "long-medium-short terms integrated management"

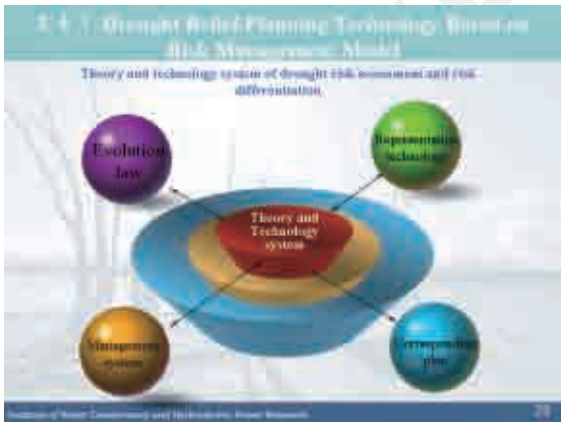
  On the basis of water resources capacity, integrate drought into regional water development planning and synthesized water resources planning, set drought relief aims, according to which optimize the industrial and water conservation project layout, formulate emergency program

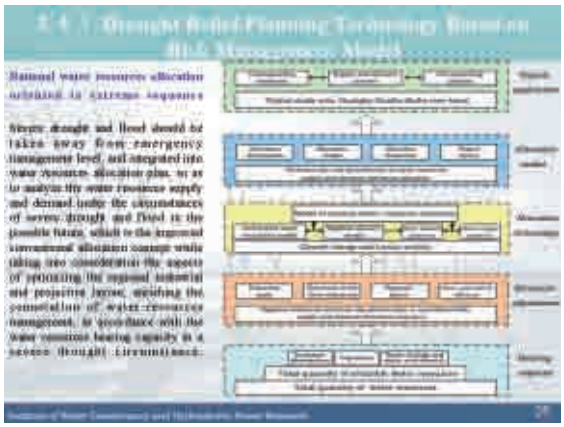
- Transition from "limited objectives management" to " combined entire course synthesized management"

  Establish a "ground-space" surveillance warning system, so as to combine drought early warning, real time drought relief decision, and drought influence assessment together

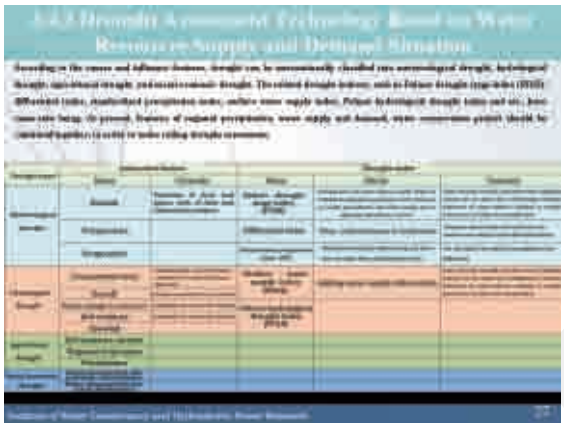




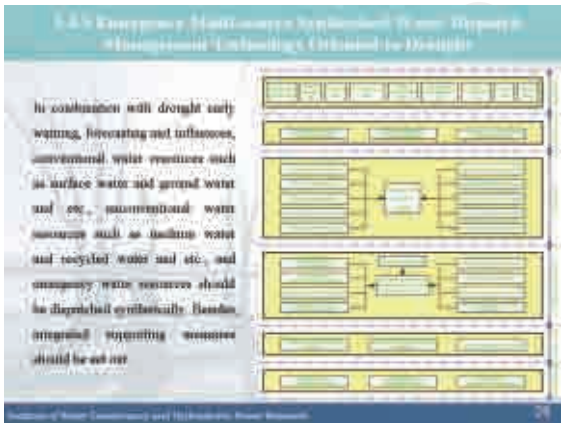

Evolution law
Theory and Technology system


Annual water resources allocation oriented to extreme sequence
Strict drought and flood should be taken away from emergency management level, and integrated into water resources allocation plan, so as to analyze the water resource supply and demand under the circumstances of severe drought and flood in the possible future, which is the improved conventional allocation concept while taking into consideration the aspects of optimizing the regional industrial and projective layout, applying the connotation of water resources management, in accordance with the water resources bearing capacity in a severe drought circumstance.


Synthesized surveillance on the atmosphere process, surface process, soil process, subsurface process of water circulation, and the development and utilization status of water resources, combine the remote sensing technology (including satellite remote sensing, sounding and etc.) together with the ground surveillance technology, so as to implement a integrated "ground-space" surveillance.




Under a circumstance of unified physical model, the relevant technologies such as remote sensing technology, atmosphere forecasting, hydrological forecasting, ecological similarities, and crops simulation should be integrated into the drought forecasting, so as to prolong the drought predictable period and its accuracy. Besides, rollover amendment and ensemble forecasting technologies have been improved.


In combination with drought early warning, forecasting and influences, conventional water resources such as surface water and ground water and etc., unconventional water resources such as medium water and recycled water and etc., and emergency water resources should be distributed synthetically. Besides, integrated supporting measures should be set out.


Real time evaluation should be made on the social, economic and ecological influences from drought disaster, so as to provide a basis for rollover amendment to corresponding measures. Besides, overall evaluation should be made on the comprehensive influences from each drought disaster, so as to provide a basis for post-disaster construction, amendment to drought planning and management.
Natural influence
Social influence
Economy influence
Ecological influence
Environmental influence
Set out overall corresponding plan, enact emergency project
Timely amendment to corresponding plan
Reconstruction, and amendment to emergency project


THANKS

Concluding Remarks at High-level Roundtable on Global Climate Change and Water Security in China

Wang Shucheng
Chair, Global Water Partnership China

Distinguished guests,
Ladies and Gentlemen:

By the joint efforts of all the participants and experts, all the agenda items of the conference have been completed according to plans. On behalf of the Organizing Committee, now I would like to make a brief summary on the conference.

The conference atmosphere is very good. We come from different industries, different areas and have different experiences, and it can be said there are also different views, but everyone can openly express his or her views, speak his or her minds with mutual respect and communicates with each other, which is undoubtedly a very useful way for us to further study the context of climate change and water security in China. The participants include policy- makers, managers, representatives from NGOs and business community and experts and scholars with an open and interactive way and the atmosphere of equality which fully embodies a new meeting pattern of partnership and thus having achieved the desired results. However, due to the limited time, and some participants could not be able to speak or speak more.

To sum up, we can say that the conference has achieved fruitful results, and the main results can be summarized in the following four aspects.

Firstly, it is made clear that the protection of water security is an important area to deal with global climate change. The participants have fully discussed the causes of climate change, climate change trends and their impact on China's water resources, touched upon such major issues as China's flood control safety, drinking water safety, food security and ecological security in the context of climate change; analyzed the ways of improving energy efficiency, developing renewable energy, low-carbon technologies as means to reduce greenhouse gas emissions; explored possible adaptation systems, technologies and measures by the use of integrated water resources management concepts to address climate change and to protect China's water security. These discussions fully demonstrated that water is the most direct and affected area by global climate change. Only by facing realities and fully relying on institutional innovations, management innovation and technological innovation and progress, could we upgrade the overall national ability and level to deal with climate change and

safeguard water security.

Secondly, climate change is a global issue. The environmental problems brought by climate change are global environmental problems. Of course, we need to work together to deal with them. Both developed and developing countries should work together to solve major problems facing mankind. China as the largest country in greenhouse gas emissions also has a weak capacity to respond to natural disasters. Therefore, China should adopt a positive attitude to be involved in addressing this global challenge. The Chinese government has studied many strategic goals, and we will soon work out the 12th Five-year Plan. In the 12th Five-year Plan, the three indicators that the Chinese government has committed to the world should be implemented in the specific work and this is the most important thing.

Thirdly, the common understanding of China's water situation has been achieved. There is a great challenge on China's water resources problem or climate change impact on China's economic development. To meet these challenges, the cost is also great. Our focus in the conference is the water security and the changes in water resources resulted by natural disasters, greenhouse gas emissions and the Earth's temperature rise. Practically speaking, in reducing carbon dioxide emissions for China, the challenge is even more acute. The Chinese government committed in 2020 non-fossil energy should take 15% of primary energy consumption. For this 15%, is it so easy? Of course not. China's 70% of electricity are now generated by coal. In fact, non-fossil energy source is renewable energy plus nuclear power, known as non-fossil energy source. China's nuclear power is just in the beginning, with now less than 10 million kilowatts, and by 2020 it should contribute at least 50 to 60 million kilowatts. Our hydropower development has quickly come to 200 million kilowatts. But if we really want to meet the requirements of this 15%, the hydropower should install capacity of additional 11 million kilowatts, otherwise we can not make the indicator. China's wind power is now developing with annual increase rate of 100 percent, and will soon gain the upper hand over the United States as the leading country in using wind power. But only 70% of the wind power can now get into the power grid, simply because the instability of wind power has caused great difficulties to the regulation. Besides, the annual use of wind power is less than 2000 hours. Therefore it can only solve a thermal power plant's generating capacity. Also because it is expensive, with the electricity price into grid of 0.55 Yuan RMB. That's why it is a bit uneasy to be accepted into the power grid. On one hand thermal power plant is shutting down, on the other hand there is a need to accept the high price of new energy, which is then hard to accept it both politically and economically. From one side I would like to express that the Chinese Government has the determination to realize their commitment on the three objectives; on the other side, I'd like to let the world be aware and understand that China has paid a price to achieve these goals and it is indeed very difficult.

Fourthly, the public awareness on climate change adaptation and water security has been raised. Many media reported on the conference, and the media information will help promote the better public understanding on climate change and China's water security issues and better understand

climate change and water security policies and actions, and this will also help raise the public awareness on protection of water resources and climate. This will be the extra gains and achievements of the conference.

This is my brief summary of this conference. Based on this summary, we will compile a report on the discussions and results of this conference and send to the relevant governmental departments, participants and the media.

We expect that these results of the conference will make a positive contribution to address climate change and water security in China and play a role in promoting climate protection and protection of water resources in China.

Thank you!

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