The China Sustainable Energy Program
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INTERNATIONAL MAYORS' FORUM ON SUSTAINABLE URBAN DEVELOPMENT

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November 15-16, 2007

Renaissance Tianjin TEDA Hotel & Convention Center
Tianjin, P.R. China

Hosted By:
The Ministry of Construction, P.R. China
Tianjin Municipal Government

Organized By:
China Society for Urban Studies
Tianjin Urban Planning Bureau

With Assistance From:
National Training Center for Mayors of China
China Academy of Urban Planning and Design
The Energy Foundation
America-China City Alliance
United National Development Programme
The European Union
WWF

大卫与露茜尔·派克德基金会
威廉与佛洛拉·休利特基金会 合盟
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The David and Lucile Packard Foundation, The William and Flora Hewlett Foundation, in partnership with the Energy Foundation

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CONTENTS

INTERNATIONAL MAYORS' FORUM ON SUSTAINABLE URBAN DEVELOPMENT

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November, 15-16, 2007
Tianjin • China

HOSTED BY:
THE MINISTRY OF CONSTRUCTION, P. R. CHINA
TIANJIN MUNICIPAL GOVERNMENT

ORGANIZED BY:
CHINA SOCIETY FOR URBAN STUDIES
TIANJIN URBAN PLANNING BUREAU

WITH ASSISTANCE FROM:
NATIONAL TRAINING CENTER FOR MAYORS OF CHINA
CHINA ACADEMY OF URBAN PLANNING AND DESIGN
THE ENERGY FOUNDATION
AMERICA-CHINA CITY ALLIANCE
UNITED NATIONAL DEVELOPMENT PROGRAMME
THE EUROPEAN UNION
WWF

DRAFT AGENDA

NOVEMBER 15, 2007

Morning Session

MODERATOR: MINISTRY OF CONSTRUCTION

9:00 **WELCOME REMARKS**

Ministry of Construction

Tianjin Municipal Government

William K. REILLY, Former Administrator, U.S. Environmental Protection Administration (U.S. EPA); President & CEO, Aqua International Partners

KEYNOTE SPEECHES

9:25 **RESOURCES AND ENVIRONMENTAL ISSUES IN URBANIZATION AND THE SUSTAINABLE DEVELOPMENT OF CHINA'S CITIES**

QIU Baoxing, Vice Minister, Ministry of Construction

9:50 **PLANNING DESIGN AND PRINCIPLES OF TIANJIN'S BINHAI DISTRICT**

CHEN Zhifeng, Vice Mayor, Tianjin Municipal Government

10:15 **SUSTAINABLE URBAN DEVELOPMENT IN CURITIBA**

Beto RICHA, Mayor of Curitiba, Brazil

10:40 **BREAK**

10:50 **IMPLEMENTING SUSTAINABLE CITY PRINCIPLES TO REACH THE ENERGY INTENSITY IMPROVEMENT, POLLUTANT REDUCTION, AND LAND USE TARGETS**

HUANG Yan, Director, Beijing Planning Commission, City of Beijing

11:15 **A VISION FOR SUSTAINABLE CITIES**

Elizabeth DEAKIN, Director, University of California Transportation Center

11:40 **GROUP DISCUSSION: DAI YANDE, NDRC**
HAL HARVEY, HEWLETT FOUNDATION

12:05 **Q&A**

12:30 **LUNCH**

AFTERNOON

13:30-17:15 Breakout Sessions (three venues)

17:25-18:00 Forum Conclusion (main conference room)

17:25 Afternoon Session Conclusion: Eric Heitz , The Energy Foundation

17:30 Breakout Session I Conclusion: Mao Qizhi, Tsinghua University

17:40 Breakout Session II Conclusion: Lang Siwei, Chinese Academy of Planning and Design

17:50 Breakout Session III Conclusion: Joe Ryan, The William and Flora Hewlett Foundation

NOVEMBER 15, 2007

Afternoon Session

Session I:
PLANNING, CONSTRUCTION & MANAGEMENT

MODERATOR: TANG KAI, DEPARTMENT OF URBAN AND RURAL PLANNING, MOC

DISCUSSION: SUSTAINABLE URBAN PLANNING

13:30 **COORDINATING URBANIZATION WITH RESOURCES & ENVIRONMENTAL PROTECTION**

NIU Wenyuan, Professor & Chief Scientist, Institute of Policy & Management, Chinese Academy of Science

13:45 **URBAN AND REGIONAL DEVELOPMENT IN CHINA**

LI Shantong, Director-General, Research Department of Development Strategy and Regional Economy, Development Research Center

14:00 **URBANIZATION GOVERNANCE IN CHINA: CHALLENGES AND POLICY ANALYSIS**

QI Ye, Professor of Environmental Policy and Management, Director of Institute of Public Policy, School of Public Policy and Management, Tsinghua University

14:15 **SUSTAINABLE CHINESE CITIES: PLANNING STRATEGIES FOR LOW-CARBON CITIES**

PAN Haixiao, Professor and Director of Land Use-Transport Studies in the Department of Urban Planning, The College of Architecture and Urban Planning, Tong Ji University

14:30 **ECO-CITY: A GREAT IDEAL AND GOAL, EXPLORING INTEGRATED URBAN ECO-SYSTEMS AND PRINCIPLES FOR ECO-CITY PLANNING**

HUANG Luxin, China Academy of Urban Planning and Design

14:45 **Q&A**

15:10 **BREAK**

CITIES' IMPLEMENTATION EXPERIENCES

15:25 **SUSTAINABLE URBAN PLANNING IN QINGDAO**

HU Shaojun, Vice Mayor, City of Qingdao

15:45 **THE ECO BLOCK: QINGDAO SUSTAINABLE DEVELOPMENT DEMONSTRATION PROJECT**

Harrison FRAKER, Dean, College of Environmental Design, University of California, Berkeley

16:05 **SUSTAINABLE URBAN PLANNING IN DALIAN**

HE Hongxing, Director-General, Planning Commission, Xi'an Municipal Government

16:25 **BEST PRACTICE IN SUSTAINABLE URBAN PLANNING**

John DUGAN, Planning Director, Oklahoma City; Director, America-China City Alliance

16:45 **DISCUSSION SESSION: MAO QIZHI, TSINGHUA UNIVERSITY**

17:15 **RETURN TO MAIN CONFERENCE ROOM**

Session II:
BUILDINGS, ECOLOGY & RESOURCES

MODERATOR: WU YONG, SCIENCE AND TECHNOLOGY DEPT., MOC

DISCUSSION: THE DEVELOPMENT OF GREEN BUILDING

13:30 **GREEN CONSTRUCTION AND BUILDING ENERGY EFFICIENCY DEVELOPMENTS IN CHINA**

ZHU Yingxin, Director, Institute of Built Environment, School of Architecture, Building Energy Research Center, Tsinghua University

13:50 **INTERNATIONAL PRACTICES ON REGULATORY SYSTEMS AND INCENTIVES FOR GREEN BUILDING DEVELOPMENT**

YIN Yongyuan, Professor, University of British Columbia; Environmental Scientist, Adaptation and Impacts Research Division, Environment Canada

14:10 **TOWARDS GREEN REAL ESTATE DEVELOPMENT**

HU Jianxin, Deputy General Manager, China Merchants Property Development Co., Ltd.

14:30 **DESIGN OF HIGH PERFORMANCE GREEN BUILDINGS**

Khee Poh LAM, Professor, School of Architecture, Center for Building Performance and Diagnostics, School of Architecture, Carnegie Mellon University

14:50 **Q&A**

15:10 **Break**

CITIES' IMPLEMENTATION EXPERIENCES

15:25 **THE PRACTICE OF INNOVATIVE GREEN BUILDING DESIGN**

YE Qing, Vice Dean, Executive Chief Architect and Research Dean, Shenzhen Institute of Building Research

16:50 **STRATEGIC ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND SUSTAINABLE URBAN DEVELOPMENT**

CHEN Fan, Appraisal Center for Environment and Engineering, State Environmental Protection Administration

16:15 **DISCUSSION: LANG SIWEI, CHINA ACADEMY OF BUILDING RESEARCH**

17:15 **RETURN TO MAIN CONFERENCE ROOM**

Session III:
TRANSPORTATION, INFRASTRUCTURE & SAFETY

MODERATOR: QIN YUWEN, DEPARTMENT OF COMPREHENSIVE FINANCE, MOC

DISCUSSION: GUIDING THE DEVELOPMENT OF URBAN PUBLIC TRANSPORTATION

13:30 **BUS RAPID TRANSIT DEVELOPMENT, PLANNING, AND DESIGN IN CHINA**

ZHAO Yixin, Chief Engineer, China Academy of Urban Planning and Design

13:55 **TRANSIT-ORIENTED DEVELOPMENT IN CHINA**

YIN Guangtao, Vice-Director, Urban Transport Institute, China Academy of Urban Planning and Design

14:20 **MAKING CHINESE CITIES WORLD CLASS FOR THE 21ST CENTURY**

Walter HOOK, Executive Director, Institute for Transportation & Development Policy

14:45 **Q&A**

15:10 **BREAK**

CITIES' IMPLEMENTATION EXPERIENCES

15:25 **BUS RAPID TRANSIT AND URBAN INFRASTRUCTURE IN JINAN**

TBD, Mayor, Jinan Municipal Government

15:45 **BUS SYSTEM REFORM OF MAJOR CITIES IN KOREA**

Sang-Joo LEE, Deputy Director, Urban Transportation Policy Team, Ministry of Construction and Transportation, City of Seoul, Korea

16:15 **HUMAN SETTLEMENTS, CONSTRUCTION, AND SUSTAINABLE DEVELOPMENT**

ZHANG Guodong, Tangshan Municipal Government

16:15 **DISCUSSION: JOE RYAN, WILLIAM AND FLORA HEWLETT FOUNDATION**

17:15 **RETURN TO MAIN CONFERENCE ROOM**

NOVEMBER 16, 2007

ROUNDTABLE MEETING OF INTERNATIONAL MAYORS

MODERATOR: WANG DEHUI, VICE CHAIRMAN, CHINA SOCIETY FOR URBAN STUDIES

9:00 **EXPERIENCES AND LESSONS FROM CONGESTION PRICING IN LONDON**
Jeremy EVANS, Head of Traffic & Technology, Transport for London, City of London

9:20 **ECO-CITY PLANNING (CHONGMING ISLAND) IN SHANGHAI**
Shanghai Municipal Government

9:40 **MEXICO CITY'S GREEN PLAN**
Martha DELGADO, Secretary of the Environment, Mexico City

10:00 **INTEGRATING THE PLANNING AND DEVELOPMENT OF URBAN AND RURAL AREAS IN CHONGQING**
YU Yuanmu, Vice Mayor, Chongqing Municipal Government

10:20 **GREEN URBANIZATION: THOUGHT AND PRACTICE ON THE CONSTRUCTION OF AN ECOLOGICAL CITY**
ZHANG Bingsheng, Taiyuan Municipal Government

10:40 **BREAK**

10:55 **ENERGY FUTURES AND URBAN AIR POLLUTION: CHALLENGES FOR CHINA AND THE UNITED STATES**
Derek VOLLMER, The National Academies, Science & Technology for Sustainability Program

10:55 **THE SUSTAINABLE REGION INITIATIVE FOR METRO VANCOUVER**
Hugh KELLAS, Manager, Policy and Planning, Metro Vancouver

11:15 **DISCUSSION: IMPLEMENTING RESTRICTIVE TARGETS TO PROMOTE SUSTAINABLE URBAN DEVELOPMENT**

12:10 **CONCLUDING REMARKS**
SHI Shanxin, Vice Chairman, China Society for Urban Studies

12:20 **ADJOURN**

12:30 **LUNCH**

INTERNATIONAL MAYORS' FORUM ON SUSTAINABLE URBAN DEVELOPMENT

NOVEMBER 15-16, 2007

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Professor Fan has also led the following projects: Establishment of seven national environmental protection standards, including "Guidelines for Planning EIA—Urban Planning;" a World Bank project to ""enhance national environmental protection after joining WTO;" research on sustainable development and trade (aluminum and paper); consultation for over 20 inter-regional, inter-sector and inter-trade environmental projects; technical appraisals and auditing projects for EIAs for large-scale projects, such as the east-west electricity transfer; and post-implementation monitoring.

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Dr. Chen Zhifeng, Vice Mayor of Tianjin, is a graduate of Jilin University, with a postgraduate degree in economics and a doctorate in engineering. An economist and planner, Dr. Chen began his career in Inner Mongolia, after which he spent many years at the Tianjin Municipal Tap Water Engineering Company, working as a clerk, Deputy Chief of Planning, Vice Manager, Manager, and company Party Secretary.

Dr. Chen then took up the post of Vice Chairman of the Municipal Youth Federation, and was appointed Deputy Director of the Municipal Urban and Rural Construction Committee in 1991. In July 1995, he was named Chief Officer of the Administration of the Tianjin Binhai New District, before becoming Deputy Chief of Staff of the Municipal Government, and Director and Party Secretary of the Municipal Planning and Land and Resources Administration. In Jan 2003, he was elected Vice Mayor of Tianjin.

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Elizabeth Deakin is Director of the University of California Transportation Research Center and Professor of City and Regional Planning at UC Berkeley, where she also is an affiliated faculty member of the Energy and Resources Group and the Master of Urban Design group. She is co-director of UC Berkeley's new Global Metropolitan Studies Initiative, which involves nearly 70 faculty members from 12 departments. Ms. Deakin holds degrees in political science and transportation systems analysis from MIT as well as a law degree from Boston College.

Ms. Deakin's research focuses on transportation and land use policy, the environmental impacts of transportation, and equity in transportation. She has published over 100 articles, book chapters, and reports on topics ranging from environmental justice to transportation pricing to development exactions and impact fees. She has also been appointed to a number of government posts including city and county commissions and state advisory boards. She has taught courses at universities in Australia, Germany, Sweden, and France, and has served

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John M. DUGAN

John Dugan AICP, is a professional city planner, community and economic developer, and planning educator. He is currently Professor of the Practice of Planning at the University of Oklahoma and Director of Planning for his home town, Oklahoma City. In China, Mr. Dugan has consulted such projects as the Beijing Comprehensive Plan, the Shenzhen Olympic Village and New Town, and developments outside Hangzhou. He holds a Master's Degree in City and Regional Planning from Harvard's Graduate School of Design and Kennedy School of Government.

Mr. Dugan has served as principal planner and planning director for a wide range of government jurisdictions, including Memphis, Tennessee; Loudoun County and Norfolk, Virginia; Sonoma County, California; Aurora, Colorado; and Topeka, Kansas. He has taught in graduate city planning and public administration programs at Memphis State University, Old Dominion University, George Washington University, and Kansas State University. Mr. Dugan also served as Director of Long Range Planning for the federal government in Washington D.C.'s National Capital Planning Commission. He has served on several committees for the American Institute of Certified Planners. He is an active member of the International Economic Development Council, American Planning Association, Urban Land Institute, National Trust for Historic Preservation and America/China City Alliance.

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Jeremy Evans is Head of Traffic and Technology in the Congestion Charging Division of Transport for London. He graduated in Physics in 1968 and completed a MSc in Transportation and Traffic Planning in 1969. He is a member of the Institution of Civil Engineers.

Since 1972, Mr. Evans has worked in Traffic Engineering and Transport Planning for a number of local authorities in the UK, leading a project across London to pilot video enforcement of bus lane violations. He joined Transport for London in 2001, where he has been responsible for traffic management measures and enforcement implementation for the Central London Congestion Charging Scheme and the Western Extension to the Central London Scheme. Mr. Evans is also responsible for trials of newer technologies that can be applied in the development of road user charging in London and elsewhere, including the effectiveness and feasibility of GNSS (satellite positioning), GSM (mobile phone) or DSRC (tag and beacon). The results of these trials have been published on the Transport for London web site.

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Chosen as the fifth Dean and William Wurster Professor of the College of Environmental Design at the University of California, Berkeley, Professor Harrison Fraker was educated as an architect and urban designer at Princeton and Cambridge Universities and is recognized as a pioneer in passive solar, daylighting and sustainable design research and teaching.

Professor Fraker has pursued a career bridging innovative architecture and urban design education with an award-winning practice. He was awarded the Distinguished Service Medal for creating a new College of Architecture and Landscape Architecture at the University of Minnesota and was appointed the founding Dean. He was granted Fellowship in the AIA College of Fellows for his distinguished career of bridging education and practice. He has published seminal articles on the design potential of sustainable systems and urban design principles for transit oriented neighborhoods. He teaches design studio and believes in integrating pragmatic and theoretical analysis to create new knowledge about the most critical environmental design challenges facing society. He is currently pursuing his beliefs through a whole systems design approach for entirely resource-self-sufficient, transit-oriented neighborhoods of 100,000 people in China.

Walter HOOK

Walter Hook has been the Executive Director of the Institute for Transportation and Development Policy (ITDP) since 1993. Dr. Hook received his PhD in Urban Planning from Columbia University in 1996 and taught as an Adjunct Professor at Columbia University's School of Architecture and Urban Planning from 1994 until 1996, and again in 1999. He holds a Masters in International Affairs from Columbia University's School of International and Public Affairs, and a BA from the Johns Hopkins University.

Under Professor Hook's leadership, ITDP has grown into an organization with numerous international donors and representatives in thirteen countries, acting as transport advisor, along with ICCT, to the Clinton Climate Initiative. ITDP has worked to send bicycles to developing countries and to shift World Bank lending from an exclusive focus on road projects to more multi-modal transport solutions. Today, ITDP works on sustainable transport projects with a focus on bus rapid transit (BRT), facilities for bicyclists and pedestrians, traffic demand management, and non-motorized transport. Recent successes include the implementation of the TransJakarta BRT system, the initiation of BRT system development in Guangzhou, Ahmedabad, Dar es Salaam, Dakar, Accra, Johannesburg, and Cape Town, the modernization of over 200,000 Indian cycle rickshaws, and the initiation of the California Bike Coalition, which has sold over 6500 Chinese-manufactured bicycles to Africa. Dr. Hook's most recent publication is the Bus Rapid Transit Planning Guide, co-edited with Lloyd Wright, available on line at www.itdp.org/brt_guide.html.

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Mr. Hu has worked on the technical and managerial aspects of building and real estate for over twenty years, and is now active in green building development. He was project manager of the Shenzhen Taige Service Apartment Project, which received numerous honors: it was named a "Guangdong Green Housing Demonstration Project" (2004), "Energy efficient, land-saving, integrated technology-applying, scientific demonstration project" (Ministry of Construction, 2005), "Shenzhen circular economy demonstration project" (Shenzhen government, 2006), and "Green Building Demonstration Project" (International

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Mr. Huang has many years of experience with consulting and research in the field of urban planning. Two of his papers, "Study on City and Landscape Coordination in Rongcheng" and "Planning Standards for Scenic Areas," received second place for the National Science and Technology Advancement Award. He has also published extensively in such journals as *Urban Planning International* and *Urban Times*. His current work focuses on such subjects as eco-cities, community-building, cultural and creative industries, and urban development.

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Hugh Kellas is Manager of the Policy and Planning Department for Metro Vancouver, Canada, a federation of 21 municipalities providing metropolitan services to the region's 2.2 million residents. The department's activities, overseen by Mr. Kellas and a co-manager, include planning, analysis and monitoring for regional water, liquid waste and solid waste utilities; regional growth management planning; air quality monitoring, planning and management; regulation of air emissions, liquid waste sources and solid waste disposal; social housing policy; programs to reduce environmental impact and demand for utility services by business; and other metropolitan management activities. Mr. Kellas is a Fellow and former President of the Canadian Institute of Planners.

Khee Poh LAM

Khee Poh Lam is Professor of Architecture at the Center for Building Performance and Diagnostics, School of Architecture, Carnegie Mellon University. In the U.K., he received a Bachelors degree with honors in architecture and is a registered architect with the Architects Registration Board, and a chartered member of the Royal Institute of British Architects. He received his Doctorate in architecture in the U.S.

Professor Lam teaches architectural design (with a focus on systems integration), building performance modeling, building controls and diagnostics as well as acoustics and lighting. His fields of research are in total building performance (TBP) studies and the development of computational design support systems. His work has been widely published, and he previously served on the Board of Editors of the International Journal of Corporate Real Estate, USA, and the International Advisory Board of the Journal of Lighting Research and Technology, UK. He is currently a member of the Protocol Committee of the International Performance Measurement and Verification Protocol (IPMVP), USA, and member of the inaugural editorial board of Building Simulation – An International Journal. He is also a building performance consultant on several award-winning projects.

Sangjoo LEE

Sangjoo Lee is the Deputy Director of the Urban Transportation Policy Team, Ministry of Construction and Transportation (MOCT), Korea. He graduated from Seoul National University in 1996, majoring in civil engineering, and earned his Ph.D. degree from University of Colorado at Boulder in 2007, majoring in construction management.

Mr. Lee is currently responsible for planning new transit systems, working to make Seoeul a public transportation model city, and forging international relationships, among other duties. Before joining the team, Mr. Lee was a consultant at the Korean Investment Center (KIC), where he advisded foreign investors in Korea. Prior to that, he was a deputy director on the MOCT planning team for the new airport (Incheon International Airport), and secretary to the Minister of MOCT.

LI Shantong

LI Shantong is a Senior Research Fellow and former Director General of the Development Research Center's Department of Development Strategy and Regional Economy (under the State Council), which provides major policy consultative services to the government. Ms. Li is a member of the National Committee of CPPCC (Chinese People's Political Consultative Conference), and vice president of the Academic Committee of the China Development Research Foundation. She studied mathematics at Peking University, graduating in 1968 with a B.A., and in 1981 with an M.S. She joined the Development Research Center in the same year. In 1990, she became vice director of the Bureau of Development and Forecasting of DRC, a bureau of which she became director in 1995. She was a council member of the International Input-Output Association 2001-2003.

Li Shantong has played a key role in several key national development projects and joint development projects with the World Bank, UNDP, UNIDO, OECD, and the ADB. Her research has covered China's long-term and medium-term national development strategy, regional economic and social development, and economic modeling applied to economic development.

MAO Qizhi

Professor Mao Qizhi is Associate Dean of the School of Architecture, Deputy Director of the Center for the Science of Human Settlement, and Deputy Director of the Institute of Agricultural and Urban Studies, at Tsinghua University. He also holds the following concurrent academic posts: Vice President, The World Society of Ekistics (WSE); Consultant, Rural and Urban Planning Consultative Committee, China Ministry of Construction; Deputy Director, Special Urban Planning Education Steering Committee of Chinese Universities; Vice President, Beijing Urban Sciences Research Society, Director of Historic and Cultural City Committee; Deputy Director, Beijing Urban Planning Academic Committee for New Technology Applications; Executive-Chief-Editor, China City Planning Review; and Member of Editorial Board, Urban Studies journal.

Professor Mao is currently researching and teaching on urban and regional planning, urban design and protection, infrastructure planning, and the application of GIS/RS and virtual reality technology in rural and urban planning.

NIU Wenyuan

At the Chinese Academy of Sciences, Professor Niu Wenyuan is Chief Scientist of the Sustainable Development Strategy Research Team and Director of the Academic Committee of the Center for Nature and Science Interdisciplinary Research. He has held visiting professorships at Yale University and the University of Virginia, is a member of the CPPCC National Committee, and is a consultant to the State Council. Mr. Niu is also a member of China's 11th Five-year Plan Expert Committee, and Chairman of the Editorial Committee of the China Development journal.

Prof. Niu's research focuses on social physics, environment and development, and sustainable development. His publications include China's first article on sustainable development theory ("Introduction to Sustainable Development"), and he has received such honors as the "National Invention Prize" and the Rockefeller Foundation's "Outstanding Prize." Before the 1992 UNCED Earth Summit, Prof. Niu established and was director of China's first "Environment and Sustainable Development Research Office." He began leading China Academy of Sciences reports on sustainable development strategy in 1999, with nine series published to date. Professor Niu has also worked extensively with international organizations, acting as Chief Editor of the Chinese version of UNDP's Human Development Report (1995), participating in the drafting of the global "New Millennium Ecological Evaluation" (2001), and acting as an expert project reviewer for the World Bank and UNESCO.

PAN Haixiao

Pan Haixiao is a professor and Director of Land Use/Transport Studies in the Department of Urban Planning, Tongji University (1996 to present). He holds a Ph.D from the Department of Marine and Ocean Engineering, Shanghai Jiaotong University (1989), and Diploma in Planning from the University of Sheffield, UK.

Professor Pan has served as an urban planning advisor to the Shanghai Government and a Board Member of the Shanghai Urban Economics Institute. His major research focuses on land use and urban transport, especially the impact of metro systems on urban spatial structure, mobility, and sustainability; suburban transport and transport modes; and built environment design. Professor Pan has also applied his expertise on *The Transport Management Framework for Shanghai 2010 World Expo* and *The Transport Strategy Study for Shengyang and Zibo City*. In international collaboration, Professor Pan has served as the co-coordinator of the Sino-European University Joint Studio for Urban Mobility and Sustainability, with three Chinese Universities (Tongji University, South China University of Science and Technology, and Hua Zhong University of Science and Technology) and three European architectural institutes (Technical University of Berlin, School of Architecture Paris val de Seine,France, the Berlage Institute of Rotterdam). One of his collaborations with Chinese universities and Danish architectural firms on China's sustainable development was awarded the 2006 Golden Lion at the Venice Biennale.

QI Ye

Qi Ye is the Distinguished Professor of Environmental Policy and Management at Tsinghua University's School of Public Policy and Management. He also held the Cheung Kong Chair Professorship at the University of California, Berkeley, where he taught ecosystem

management and climate change science at Department of Environmental Science, Policy and Management (1996-2003). Dr. Qi received his Ph.D. in Environmental Science in 1994 from the State University of New York College of Environmental Science and Forestry and from Syracuse University in Syracuse, New York.

Dr. Qi has led numerous research projects on climate change, global environmental policy, environmental and energy policy for sustainable development, and urbanization policy. He was a recipient of the NOAA Postdoctoral Fellowship Award and National Science Foundation Fellowship, working on climate change issues at the Scripps Institution of Oceanography, University of California, San Diego, and the University Corporation for Atmospheric Research. Dr. Qi publishes extensively and serves as a reviewer for a number of international journals, in addition to consulting and advising governments, NGOs, and international organizations.

Carlos Alberto RICHA

Beto Richa has been mayor of Curitiba, Brazil, since 2004. Prior to his election, he was a candidate for the governorship of Paraná State (2002), and served as Vice-Mayor and Secretary of for Public Works (2000), State Representative (1995, 1998), and Councillor (1992). He received his degree in engineering in 1987.

During his two terms in the House of Representatives, Mr. Richa was also a member of the Commissions of Finance, Justice, Public Works, Transports and Communications, Human Rights and Citizenship, Tourism, and Public Health. His legislative contributions include a law to compensate to families of former political prisoners, which was recognized by Amnesty International. As mayor, Mr. Richa has prioritized social needs, education, health, environment, housing, urban planning and public transportation, meeting the goals of his plan of government within only two years of his four-year term. Examples of his contributions include the lowering of public transit fares; inauguration of 1600 new education, health, social, and transport facilities; bus fleet upgrades, which have reduced emissions by 12 percent; construction of the Green Line within the public transit system; and creation of the city's first Biodiversity park. Under mayor Richa's leadership, Curitiba was a signee of the Declaration of Green Cities (San Francisco, 2005), a host for the Council on Biodiversity's COP9 preparations, and was honored at a Model City at the summit for the Communique on Climate for 40 Large Cities (New York, 2007).

YE Qing

Ye Qing is the Vice Dean and Executive Chief Architect of the Shenzhen General Institute of Architectural Design and Research; Dean of the Shenzhen Institute of Building Research; Director of the Shenzhen Key Laboratory for Building Energy Efficiency; and Director of the Testing and Evaluation Centers for Energy Efficiency and Building Energy Efficiency in Shenzhen. Ms. Ye is also Vice Director of the Green Architectural Committee, Agricultural Society of China; member of the Expert Committee for Housing Modernization, Ministry of Construction; member of the Urban Construction and Environmental Resources Conservation Committee of the Standing Committee of the Shenzhen Peoples' Congress; and Vice-Director and Secretary General of the Green Architecture Committee in the Architectural Society of China. She obtained a masters degree in Architecture from Zhejiang University.

Ms. Ye Qing has promoted green building throughout her 14 year career. Her work has contributed significant reductions in peak load, covering 13 million square meters of building area and savings of over 6.2 billion RMB. Her projects have been awarded provincial and urban design awards. In addition, Ms. Ye has been named a "Pace-Setting Shenzhen Woman," and received an individual award for "Excellence in National Building Energy Efficiency."

YIN Guangtao

Yin, Guangtao is Vice-Director of the Urban Transport Institute, China Academy of Urban Planning and Design. His research interests include urban transport policy, regional transport development, urban public transport planning, and transport modeling. He is a leader in comprehensive transport planning projects, including the Beijing metro network, Beijing bus network, Hangzhou comprehensive transport plan, and Jinan comprehensive transport plan.

YIN Yongyuan

Dr. Yin Yongyuan is an Adjunct Professor at the University of British Columbia (UBC), as well as an Environmental Scientist at the Adaptation and Impacts Research Division (AIRD), Environment Canada, Vancouver, Canada.

During the past ten years, Dr. Yin has been working on establishing and implementing projects and activities related to green buildings and urban sustainable development. Some of his major achievements during the past decade have included leading CIDA and GEF funded projects on climate change and sustainability in China, cooperating with UBC's Design Center for Sustainability to explore opportunities of designing sustainable community development projects in Shenzhen (China), and cooperating with WISA Healthy Home to organize study tours for Chinese officials and building professionals from the Ministry of Construction and Chinese urban planning agencies. He was also the coordinator for the Pearl River Delta (PRD) urban sustainability project, initiated by the Sustainable Development Research Institute (SDRI) of UBC (1998 to 2000), and participated in the China Pilot Project for Qingdao under the Sustainable City Initiative. In addition, Dr. Yin supervises graduate students on industrial ecology and application of the LEED green buildings rating system in China.

ZHAO Yixin

Zhao Yixin is the Senior Engineer of Urban Transport Planning and Chief Engineer of the Urban Transport Institute, China Academy of Urban Planning and Design. He received his B.S. in Highway and Urban Road Engineering from Tongji University in 1994. In 2004, he was awarded his M.S. in Urban Planning from Cardiff University, Wales, U.K.

Mr. Zhao has many years of experience in urban transport planning, and in the planning and design of Bus Rapid Transit systems.

ZHU Yingxin

Zhu Yingxin is Professor, PhD advisor, and Director of the Institute of Building Environment and Services at Tsinghua University. Professor Zhu is Chairman of the National Board for Architecture and Building Engineering Education; Chairman of the National Board for Building Environment & Services Engineering Education; member of the National Board of Building Services Engineering Accreditation; Vice-Chair of the Beijing Association of HVAC Engineers; Vice-Chair of the Architecture and Building Engineering Committee, National University Education Council; editorial board member of the Journal of Architecture and Building Engineering (JAABE); and Executive Chairman of the Building Simulation International Conference.

In recent years, Professor Zhu has engaged in research on green buildings, with a prominent role in such projects as the "Green Olympic Building Standard and Evaluation" and "Core technologies for Green Buildings" (a key project of the Tenth Five-Year Plan), receiving the following awards: UNESCO Asia-Pacific Heritage Awards for Culture Heritage Conservation (for the Meridian Gate Exhibition Hall of the Palace Museum, October 2005), Green Building Originality in Innovation First Award (second place, Ministry of Construction, 2007), and the Beijing Science and Technology First Award (second place).

Commentator Biographies

DAI Yande

Mr. Dai Yande is currently the Deputy Director-General of the Energy Research Institute at the National Development and Reform Commission, as well as a Professor. He is also the Director of the Project Management Office of the World Bank/Global Environment Fund's China Energy Conservation Project, Chairman of the Board of Directors of the China Chemical Industry Energy Conservation Technology Association, Vice-chairman of the Board of Directors of the Beijing Energy Society, and a standing member of China Energy Research Society. Mr. Dai graduated from the Oil Refining Department of East China Petroleum University in 1982.

Mr. Dai Yande has been engaging in the field of energy research for many years, and involved in multiple energy research fields including energy economy, energy development strategy and energy planning, energy system efficiency analysis, and energy management information systems. In recent years, the main programs he has been involved in include: A Study on Greenhouse Gases Emission Mitigation Potentials in China and Corresponding Policy, China Energy Conservation Strategy Study in the 21st Century, Study on China's Energy Conservation Mechanisms Transition, the Energy Development Strategy in the "10th Five-year Plan", China's Sustainable Energy Scenarios in 2020, and A Study on Power System Reform and Demand Side Management Policy.

Hal HARVEY

Hal Harvey is the Environment Program Director at the William and Flora Hewlett Foundation. From 1990 through 2001, Hal served as founder and president of the Energy Foundation. Hal was a member of the energy panel of the President's Committee of Advisors on Science and Technology, where he chaired the transportation task force and was a member of the energy efficiency task force. He was also a member of the energy task force of President Bush's Council on Environmental Quality. From 1989 to 1990, Hal served as executive vice president of the International Foundation. In addition to administering the foundation, he directed its energy program and established GlasNet, the first independent computer network in the Soviet Union. From 1986 to 1989, he led a research team investigating the links between resources (especially energy) and international security as director of the Security Program at the Rocky Mountain Institute. Hal is the president of the board of directors of the New-Land Foundation, also in New York City. He also serves on the board of directors and as chairman of the executive committee of MB Financial Bank of Chicago, a $4 billion bank holding company. Hal has B.S. and M.S. degrees from Stanford University in engineering, specializing in energy planning. He is the coauthor of *Security Without War: A Post-Cold War Security Policy* and has written articles for a dozen technical and policy journals and popular magazines.

LANG Siwei

Professor Lang Siwei is Advisory Vice-Chief Engineer at the China Academy of Building Research (CABR). He began working at CABR after graduating from Tongji University in 1963, where he specialized in Heating, Ventilation, and Air Conditioning (HVAC) and was director of the institute from 1992 to 2002. Since the early 1980s, Professor Lang has been

engaged in the field of building energy efficiency, working on research and development and the spread of energy efficient HVAC technologies. He has also been a leader in the development of energy efficiency design standards for residential and commercial buildings.

MAO Qizhi

Professor Mao Qizhi is Associate Dean of the School of Architecture, Deputy Director of the Center for the Science of Human Settlement, and Deputy Director of the Institute of Agricultural and Urban Studies, at Tsinghua University. He also holds the following concurrent academic posts: Vice President, The World Society of Ekistics; Consultant, Rural and Urban Planning Consultative Committee, China Ministry of Construction; Deputy Director, Special Urban Planning Education Steering Committee of Chinese Universities; Vice President, Beijing Urban Sciences Research Society, Director of Historic and Cultural City Committee; Deputy Director, Beijing Urban Planning Academic Committee for New Technology Applications; Executive-Chief-Editor, China City Planning Review; and Member of Editorial Board, Urban Studies journal.

Professor Mao is currently researching and teaching on urban and regional planning, urban design and protection, infrastructure planning, and the application of GIS/RS and virtual reality technology in rural and urban planning.

Joseph RYAN

Joseph Ryan serves as Program Officer and Managing Director for Latin America in the Environment Program. In this position he coordinates all the Foundation's air quality projects in Mexico and Brazil. This work follows four broad themes: (1) introducing ultra-clean fuels in developing nations, (2) dramatically reducing emissions from cars and trucks through regulation, (3) working with government and the private sector to promote cleaner technologies for heavy-duty vehicles, and (4) promoting economically viable public transportation options. Key areas include Bus Rapid Transit, traffic control measures like congestion charging and improved pedestrian and bicycle access. These areas of work support the Program's overall mission to improve the lives of residents in the developing world's largest cities. With the popularity of BRT, Joe's work has expanded to include China, where he serves on the advisory board of the China Sustainable Transportation Center. Joe has lived and worked in Latin America throughout the past fifteen years including the last five in Brazil working with the Hewlett Foundation. A former Fulbright-Hays doctoral fellow, Joe has a Ph.D. in history from the University of California, Los Angeles.

Development Strategy and Implementation Plan of Tianjin Binhai New Area

CHEN Zhifeng
Vice Mayor, Tianjin Municipal Government

Distinguished Mayors, guests and friends,

First of all, on behalf of Tianjin Municipal Government, I would like to extend our warm welcome for your presence today, and cordial appreciation for all the continuous support and concern you have given to the development of this city. It is also my great pleasure to deliver a keynote speech here at the International Mayors Forum on Sustainable Urban Planning 2007.

In the report of the 17th Party Congress, great emphasis has been put on a more significant role that Tianjin Binhai New Area can play in the process of reform and opening-up and independent innovation. This is a key strategic decision made by the CPC Central Committee under the leadership of President Hu Jintao, which fully embodies the great attention and strong expectations that the CPC Central Committee have for the opening-up and development of Tianjin and Binhai New Area. We are proud to be given such a glorious mission and significant task. The second plenary session of the 9th Municipal Party Committee of Tianjin furthered the significant role that Binhai New Area would play in the process of reform and opening-up and independent innovation. It was requested that the whole city should further implement the Scientific Outlook on Development from a broader perspective, both at national and international levels, work harder and be more enterprising to enhance the service, innovation, overall strength and international competitiveness of Tianjin by capitalizing on the most favorable opportunities. It is hoped that a complementary, three-tier development pattern will be made available in Tianjin, with Binhai New Area as the 'dragon head', the central urban areas fully developed, and the districts and counties under Tianjin speeding up development, so as to facilitate the economic development of this region. Now, I would like to talk about the development strategy and implementation plan of Tianjin Binhai New Area from the following three angles.

I. Overall Strength of Binhai New Area

Binhai New Area is located in the coastal belt of eastern Tianjin and the center of Bohai Bay Area, consisting of the three administrative districts of Tanggu, Hangu and Dagang, a development area, a free trade zone, a high-tech area, and Tianjin port. With a population of 1.52 million, Binhai covers an area of 2,270 km^2 and extends along a coastline of 153 km. After over a decade's development, it has become an emerging area in China for its strengths in the following areas:

First, a fast-developing economy. The economy in Binhai New Area has witnessed continuous, strong growth over the last decade. The GDP in the area has increased from 11.2

billion Yuan RMB in 1993 to 196 billion Yuan RMB in 2006, with an annual growth rate of more than 20%, while fiscal revenues have grown to 38 billion yuan RMB for the year 2006, 16 times that of 2.4 billion Yuan RMB in 1993. In the mean time, the exports volume has surged to 22.6 billion USD from 0.5 billion USD, an increase of 45 times. As of the end on 2006, a total of 19.2 billion USD of foreign investment have been actually applied in Binhai New Area, and 82 out of the top 500 MNC (Multinational Corporations) have invested in 203 enterprises in the area. Up to now, Binhai New Area has become one of the places with the highest returns for foreign investors in China.

Second, advantageous location. Binhai New Area is near Beijing. Upon the completion of the high-speed railway in 2008, it will only take half an hour to travel to Beijing from Tianjin. It can also be easily accessed from other inland areas in twelve northern provinces and autonomous regions in China. Facing Japan and Korea across the sea, it is the starting point of the bridge between northern China and Euro-Asian continent. It also serves as an important port for the neighboring inland countries such as Mongolia, Kazakhstan etc.

Third, unique function. Binhai New Area boasts the largest port in northern China, and ranks sixth in the world in terms of throughput, which is expected to reach 300 million tons, or 7 million TEUs by the end of 2007. The Economic and Technological Development Zone in the foremost of its kind in China, and has been ranked first for 9 consecutive years for its overall performance. It is also supported by the largest free trade zone and airport industrial park in northern China, which provides logistics services to the areas in North and Northwest China. It has become a pivot point for Chinese enterprises engaging in economic globalization and regional integration.

Fourth, industrial predominance. Binhai New Area has accumulated special strengths in seven predominant industries, e.g. electronic information, petroleum exploration and processing, marine chemistry, advanced metallurgy, automobile and parts manufacturing, food processing, bio-pharmacy, and new material and energy, As a result, it has formed a solid industrial foundation and generated industrial clusters of high and new technologies, paving a smooth way to adopt new high technology, expand industrial chain and boost the development of neighbouring areas.

Fifth, advanced science and technology. Binhai New Area has built up a multi－level system of science and technology innovation, and provided enabling conditions for high-tech enterprise incubators. Currently, there are 33 engineering technical centres, 67 corporate technical centres, 40 foreign-funded research and development centres and 51 post-doctoral workstations, employing a great number of high-level talents with international advanced expertise and modern management experience. The values generated by the high and new technology products contribute to 45% of the New Area's total output value.

Sixth, abundant resources. In the New Area, there are over 1,200 sq.km of saline-alkali uncultivated land which can be used for ecological development and construction, a vast area rarely seen in other large and medium sized cities worldwide. The oil reserves of Bohai Sea

reach as much as 10 billion tons, with an exploitable amount of more than 4 billion tons. Water and wetlands occupy more than 700 sq.km, or over 35% of the whole New Area, providing favourable ecological conditions.

Most importantly, to facilitate the fast development of Binhai New Area, the Central Government has designated it as the national experimental area for comprehensive and coordinated reform, and supported it with preferential policies in the following four aspects:

1. Encouraging its financial reform and innovation. Trials for major reforms in finance, operations, marketization and opening up can be made first in Tianjin Binhai New Area. Experimental reforms can be tested in industrial investment funds, venture capital, comprehensive finance industry, financial enterprises with varied ownership, foreign exchange management policy, off-shore financial business operation, etc.

2. Supporting land management reforms. On the basis of land-saving and increased effectiveness of land use, Binhai New Area can restructure the land use, create new land management models, and deepen land management reform. It is also allowed to carry out tests in setting up the circulation and profit distribution systems for countryside collective construction land, and in improving the local government's ability to regulate the land supply, etc.

3. Promoting the opening-up of Binhai New Area, and establishing Dongjiang Free Trade Port Area. To meet the needs of building Tianjin into an international shipping and logistics centre in northern China, an integrated zone will be established at Tianjin Port Dongjiang area, based on the principles of the integrated planning, reasonable layout, innovative administration, and incremental implementation, and by learning from the best international practices. It will focus on the development of such operations as international transfers, distribution, purchase, transit trade and export processing. Efforts will be made to explore innovation on the administrative system in the special monitoring areas of the customs to adopt an opener policy.

4. Providing Binhai New Area with preferential financial and taxation policies. For the high and new technology enterprises in Binhai New Area, corporate income tax will be charged at a reduced rate of 15%. To be consistent with preferential policies for the old industrial bases in north-eastern China and other parts, domestic- funded enterprises in Binhai New Area will also benefit from a higher income tax level, and accelerated depreciation of the enterprises' fixed assets and intangible assets. In addition, the Central Government may provide special subsidies to the New Area for its development in a certain period of time on the basis of maintaining the existing financial system.

II. Development Strategy of Binhai New Area

It is an arduous task and a heavy responsibility for us to further Binhai's role in the process of reform & opening up and independent innovation. In order to achieve this objective, we must

deeply understand and fully implement the guiding principles of the 17th CPC National Congress, stick to Deng Xiaoping's Theory and the important thoughts of "Three Represents", and further implement the Scientific Outlook on Development. We need to stay keen to learn from all the advanced achievements both at home and abroad from a broader perspective, and work harder, with an open mind and innovative approach, to promote further development and opening up of Binhai New Area in an all-round way. Our development strategies are presented as follows:

1. Actively promote comprehensive reform.

Firstly, in the current period and near future, great emphasis will be paid on expanding direct financing and improving the overall service functions of the financial sector, in order to promote financial reform and innovation, optimize financial environment, and ultimately establish a modern financial service system and reform & innovation base that provides enabling conditions for the New Area as the economic centre in northern China. Secondly, by focusing on the transformation and commercialization of science and technical outputs, we will deepen the reform of science and technology management system, create an innovative development and management model for high –tech areas, strengthen the predominant role of independent innovation in enterprises, and improve the investment and financing system for S&T to significantly upgrade the corporate capacity for independent innovation. Thirdly, we will focus on the development of Dongjiang Bonded Port Area to promote the innovation of a foreign-related economic system, deepen the reform of international trade, shipping, logistics and port management systems, and explore new approaches in the management system of the special monitoring areas of the customs. Fourthly, we will focus on innovative land management to promote the reform of the land management system and strengthen the local government's ability to regulate land supply, and finally establish a land-saving and intensive land use system that can fundamentally protect the land resources, and make the most of land assets. Lastly, our focus will be made on setting up a sound administrative system and improving efficiency, in an effort to improve the administrative system of the New Area, keep a balance between administrative zones and functional zones, transform the governmental functions, and finally build up a clean, efficient, consistent and coordinated administrative system.

2. Build a high-level industrial structure. We will make our efforts in the three aspects.
1) To enhance the development of predominant industries, namely, electronic information, automobile and parts manufacturing, petroleum and marine chemistry, steel transmission pipes for petroleum production and high quality steel products, bio-technology and modern pharmacy, new energy and material, and environmental protection etc, we will spare no efforts to promote the expansion of industrial chains, facilitate the development of supporting medium and small sized enterprises, contribute to the integration of industry, science and research, highlight the accumulative effect of industries, and establish industrial clusters facing up to the global market.
2) To improve the innovation system of science and technology. We will actively introduce and cultivate high quality talent of various disciplines, accelerate the innovation of products,

techniques and industries, so as to generate a great deal of top-brand products, core technologies and advantageous industries with independent intellectual property rights, and to make the New Area become an application and transfer center for advanced technologies, and an outstanding base to originate and industrialize high technologies.
3) To highlight the development of the modern service industry. We should capitalize on the most favorable opportunity to accelerate transfer of the global service industry to promote the sound and fast development of service industries in Binhai New Area under the framework of the overall planning, based on major projects led by high-level talent, and focusing on the financial and modern logistics sectors with favorable conditions provided by the local government. It is expected that by 2010, the hi-tech production value will make up more than 50% of the total industrial output value in the area, the ratio of added value of service industry versus the total output value will be gradually increased, and a high-end, high-quality and high-tech industrial structure will be initially set up.

3. Accelerate infrastructure development.
1) We will upgrade the role of the seaport and airport of the New Area, and speed up the construction of 12 key projects within Tianjin Port and 22 supporting projects outside the port, developing it into the largest bulk cargo port in northern China, as well as an international container pivot which mainly targets the markets in Northeast Asia but radiates to Central & West Asia; renovate and expand Tianjin Binhai International Airport into an international airborne logistics center and a large hub in northern China.
2) Greater efforts will be made to improve the whole transportation system, speed up the construction of roads leading to the ports, and the backbone railways and highways extending into vast inner land, in order to form a closely knitted transportation network that plays a significant role in connecting both domestic and foreign cities.
3) We will further improve the logistics facilities, and build up a number of logistics centers, including Tianjin Port container logistics centre, Tianjin Port bulk cargo logistics centre, Bonded Area seaport and airport logistics base, Development Area industrial logistics base, Tanggu commercial logistics base, and the trade logistics base in the lower reaches of Haihe River, so as to develop an open, multilevel, and socialized logistics distribution system.
4) We will further improve the customs clearance system to bring the key role of Binhai New Area as an international trade and shipping service centre into full play, and to build up a high standard electronic port to provide better services for the regional development. It is hoped that by 2010, the shipping and logistics capacity of Binhai New District Area will be a world leader, and become a major outlet for national and international bulk cargo, as well as an important pivot connecting all the major cities across China.

4. Accelerate opening up to domestic and foreign markets. In a brand new era, we should positively adapt ourselves to the economic globalization and regional economic integration, and take full advantage of the resources and markets both at home and abroad to develop Binhai New Area into a very attractive place for the businessmen worldwide to start up and run their business here through further opening up and reform, restructuring and development. We will work harder to broaden our perspectives and change the outdated concepts, and introduce good projects into the area regardless of their ownership, size or funding sources. In

the process of upgrading opening up and attracting investment, focus will be on bringing in more advanced technologies, up-to-date management approaches/tools and senior-level talents. While in the process of importing manufacturing procedures, more efforts will be made to bring in regional headquarters, R&D centres and marketing centres of large domestic and international corporations. In attracting industrial projects into the area, we should give priority to modern service projects. Moreover, we should work harder to improve the investment environment. By giving top priorities to the interests of the enterprises, good services and cost-effectiveness, we will set up an integrated platform for attracting business and investment, improve the policies and measures that are conducive to the enterprise's development, innovation and talents introduction, establish a sound system and mechanism that follows international best practices, and create an international-standard investment environment, so as to develop Binhai New Area into a large hub in northern China with its most favourable investment conditions and highest working efficiency.

5. Promote the integration of urban and rural areas. We will stick to the basic approach of considering all factors to advance the integrated development of urban-rural areas, gradually leading to consistent management systems, supporting policies, industrial layouts, public services, and social securities, for the integrated development of urban and rural areas on education, health, culture, physical education, and infrastructure building, etc. In addition, we will follow the guiding principles of the official response of the State Council to the urban master plan of Tianjin Municipality, which was to build three eco-friendly urban districts and key satellite towns in Tianjin Binhai New Area; and under the general framework of the master plan and within the land areas that have been legally approved for construction, to build up small towns, and carry out demonstrations on changing rural residence bases to commercial houses. Finally, great efforts should be made to protect the rights of the farmers. While addressing this issue, we should take all their problems into full consideration, integrating their current and long-term problems, daily life and business operations, employment and social security issues, in order to find effective solutions to improve the farmers' living standards while maintaining the stability and harmonious development of the whole society.

6. Establish an eco-friendly new urban area favourable for residences. We will spare no efforts to restructure our economic growth model, taking into full consideration the carrying capacity of natural resources and environment. Only the new projects that meet the specified standards in technology, resource consumption and environmental protection can be launched, whereas the enterprises with high energy consumption and heavy pollution are strictly forbidden to be introduced into the New Area, so as to promote the sustainable socio-economic development of this area. Furthermore, much attention will be paid on the construction and protection of the 500 sq.km, eco-functionally important area that connects the north and south in Binhai New Area, including a great number of featured but closely linked eco-zones, eco-corridors and eco-groups. Protection of wetland and marine areas will also be enhanced to improve the environment, thus creating agreeable living conditions for the residents, and promoting the harmonious co-existence between human and nature, with an objective to make it become a demonstration area in science-based and harmonious

development. Lastly, we will work harder to promote the development of a circular economy and environmental protection industry, and build eco-industrial parks, eco-chemical industrial parks, and a number of recycling industrial chains. It is planned that by 2010, the energy consumption of gross output value per unit within Binhai New Area will be reduced by more than 20%, while more than 90% of the industrial water will be reused, thus making the New Area move ahead nationwide in developing a society of resources saving and environmental protection.

III. Development Strategy and Plan of Binhai New Area

In line with the request of the CPC Central Committee, Binhai New Area has prepared its guidelines, urban master plan and land use plan during the period of the Eleventh-Five-Year Plan (2006-2010). According to the plans, the functions of Binhai New Area are defined as such: As a base in Beijing-Tianjin-Hebei, providing service to the areas around Bohai Bay, boosting the development of the "Three-Northern" (North, northwest and northeast China) areas, and targeting the markets in Northeast Asia, great efforts will be made to develop Binhai New Area into a hub of northern China for opening to the outside world; a state-of-the-art base for a modern manufacturing industry and R&D transformation; as well as an international shipping and logistics centre in northern China, and gradually to turn it into a prosperous and socially harmonious new district with a beautiful environment suitable for living.

The development goal of the area is as follows: By 2010, the gross production value of Binhai New Area will exceed 350 billion RMB, and the gross industrial output value will reach 850 billion RMB, with the regional financial revenue growing to 70 billion and an urbanization rate of 90%, and the energy consumption of per-capita total output value will be reduced by 20% compared with that of the end of the Tenth Five-Year Plan (2001-2005).

A spatial distribution and industrial layout is developed for Binhai New Area as "one Axis", "one Belt", "Three Urban Districts" and "Eight Functional Areas". One Axis refers to building a "High and New Tech Development Axis" along the Beijing-Tianjin-Tanggu Highway and the lower reaches Haihe River. One Belt refers to building a "Marine Economic Development Belt" along the coastline and Seaside Avenue. Three Urban Districts refers to building three eco-friendly new urban districts, with Tanggu District in the centre, while Dagang District and Hangu District on both sides.

The Eight Functional Areas include:
1) Advanced Manufacturing Area. With a planned area of 97 sq.km, it will focus on the development of advanced manufacturing industries, such as electronic information, machinery manufacturing and modern metallurgy.
2) Near-Airport Industrial Area. With a planned area of 102 sq.km, it will focus on the development of air-transport industry, as well as logistics, civil aviation technology, R & D and its industrialization, aviation equipment manufacturing and services.
3) Binhai Chemical Zone. With a planned area of 80 sq.km, it will focus on the development of petrochemical, marine chemical and fine chemical industries.

4) Binhai High and New Technology Industrial Park. With a planned area of 36 sq.km, it will focus on the R&D and its transformation bases for bio-technology and innovative medicines, high-end information technology, nanometre and new materials, new and renewable energy, and civil aviation technology, etc.
5) Seaport Logistics Park. With a planned area of 100 sq.km, it will focus on marine transportation, international trade, modern logistics, warehousing, allocation and distribution and relevant agent service.
6) Near Seaport Industrial Area. With a planned area of 170 sq.km, it will focus on the port construction, logistics processing industry and other seaport industries.
7) Central Business & Commercial Zone. With a planned area of 10 sq.km, it will focus on finance and insurance, business and trade, entertainment, convention and exhibition-based tourism.
8) Coastal Resort Area. With a planned area of 75 sq.km, it will focus on the development of coastal tourism, resort and wetland eco-tourism.

Currently, we are speeding up the development and opening-up of Binhai New Area in accordance with overall planning. The 250,000 ton, deep-water channel in Tianjin Port will be built by the end of 2007, and the expansion and reconstruction of Tianjin Binhai International Airport will also be completed by the end of this year. Major industrial projects, such as Air Bus A320 large airplane project, programs with capacity of up to millions of tons of ethane and tens of millions of tons of oil refining, are now under speedy construction. Moreover, construction of some major infrastructural projects, such as Beijing-Tianjin inter-city high speed railway, and No. 2 Beijing-Tianjin-Tanggu highway, are also in smooth progress. Dongjiang Bonded Port area, built according to the “Free Trade Zone” model, will launch its 4 sq. km area into the enclosed customs operation at the first stage by the end of this year, and will become the most open area in China upon its full completion. Great breakthroughs have also been achieved in financial reform and innovation. The central government has approved the establishment of Bohai Bank in Tianjin, and a large number of Chinese and foreign banks are entering into Binhai New Area. The first contract-based, industrial investment fund in China, with a total capacity of 20 billion RMB, has raised 6.08 billion RMB, and is now selecting suitable projects in which to invest. Furthermore, the State Administration of Foreign Exchange has approved Tianjin Binhai New Area to implement tests on the direct investment of individuals in overseas securities business, and a series of trials on foreign exchange administration reform have been launched in the area, including the reform of the verification and write-off system in import and export. In general, Binhai New Area is now experiencing a development and opening up in multifaceted way, with fast and sustained growth in each sector.

Ladies and gentlemen, the blueprint for Tianjin Binhai New Area has been drawn, showing us a splendid vision. I sincerely invite our distinguished mayors to visit our Tianjin Binhai New Area, and work together to enhance the communication and cooperation between us for win-win opportunities and a brilliant future.

Sustainable Urban Development in Curitiba

Carlos Alberto RICHA
Mayor, Curitiba, Brazil

It is both an honor and a privilege for me to take part in this round table of the International Forum of Mayors on Sustainable Urban Development. Before anything else, I'd like to congratulate our hosts, the municipal administration of Tianjin and the Ministry of Construction of the People's Republic of China, as well as the Energy Foundation, for this important initiative.

I bring to this debate a little bit of everything that we learned in Curitiba in recent years and, I have no doubts that, on the trip back my baggage will include teachings from my colleagues, mayors of other cities, since one of the striking features of these events is the exchange of ideas and the exchange of experiences about good local governance practices.

I am also fascinated by the opportunity to participate personally in the discussion of one of the most extraordinary mass population movements in the history of mankind. History is fraught with migratory movements, the contradictions and complexities of which can fracture entire peoples, but can create new cities and new societies, pushed by the challenge of exploring unknown frontiers.

Experts in the issue say that China's process of urbanization, driven by its powerful economy, will displace approximately 300 million people by 2020, creating hundreds of new cities and swelling the existing ones, in a scale simply incomprehensible to western eyes, such is its magnitude.

In this case we are dealing with monumental figures but, with taken down to scale, Curitiba is going though a similar situation, in facing demography transformations in urban planning, mass transit, and street structure that have strong impact on the environment.

The capital of the State of Paraná, in Southern Brazil, located four hundred kilometers from the city of São Paulo, Curitiba has, in the last thirty years, undergone major changes as a consequence of accelerated urbanization and industrialization, like all large Brazilian cities.

In this period, my city's population grew nearly fourfold, jumping from 500 thousand inhabitants to nearly two million, or three million inhabitants if we considerer the municipalities of the metropolitan region of Curitiba.

In the late 60s, Curitiba started to apply a set of articulated administrative, legal, tax and environmental measures, all of them guided by a strategic perspective on the potential of long term planning.

Based on the city's new Director Plan and the Zoning and Soil Use Laws, the urban planning tool set was placed at the service of economic development, harmonized with environmental preservation, and the mass transit system was entirely restructured, in order to ensure quality of life and, at the same time, direct the city's growth, stimulating each district's vocational calling and filling in the urban voids.

The establishment of structural corridors comprised of tertiary systems, with dedicated bus lanes at their center, modernized mass transit, creating dynamic vehicle flow and fostering the creation of regional services and commerce hubs, and generating employment and wealth in regions previously condemned to degradation.

These structural corridors evolved quickly, forming the Integrated Transport Network, currently connecting 13 neighboring cities and allowing bus passengers to travel up to 70 kilometers on a single fare.

Simultaneously, dozens of parks, squares, woods, gardens and conservation areas have sprung up throughout the city, changing the urban landscape, promoting quality of life and reinforcing the population's awareness of the need to preserve the environment.

Successful implementation in Curitiba of the pioneering urban waste recycling programs, that generate more health, citizenship and social inclusion, was only possible through the willing participation of the population.

My administration, started in January 2005, gave depth to this set of public policies, which we feel to be essential for the urban development of Curitiba, and we have added a new agenda, determined by the intensification of the migratory phenomenon.

When the city is under the continuous impact of new migratory waves, implementing good urban planning and improvising with creativity is not enough to solve the city's most pressing problems.

It is imperative to look specifically at the newly arrived populations and make sure their process in adapting to the city is as quick and painless as possible. Promoting this effort is fundamental to preserving the identity of families that have left their rural communities or small cities in the interior to face the challenges of the metropolis.

Building schools, day care centers, health services posts, and public sports, leisure and recreation equipment in the outlying districts of the city, in addition to building thousands of public housing units, were the best shortcut we found to integrate the families of migrant workers and make them feel part of the community. This need is as important as ensuring access to work through professional qualification programs, addressed through inclusive social projects that transcend mere assistance and open doors for independent and productive lives.

Migrants only feel they are citizens and part of the community if they have jobs, schools for their children, healthcare for their families and public space for leisure activities.

The city administration's new approach included a number of other measures, of which the first was revitalizing the mass transit system, the quality of which was threatened by a vicious circle of high fares and falling numbers of users.

This was happening in Curitiba, and is still happening in many other Brazilian cities, blocking planning prospects in cities facing strong budget constraints, a common scenario in developing nations.

We have reduced bus fares to one dollar, a cost that has been maintained so far, in spite of the

continuous rise in fuel prices and the heavy federal tax burden incurred by inputs to mass transport, and we have created a special Sunday fare of 50 cents, thus making leisure opportunities more accessible for poor families.

These initiatives have increased the number of bus users to more than one million per month, restoring the economic feasibility and operational quality of the system.

With 1.8 million inhabitants, Curitiba has one million registered vehicles, a ratio far too high by any standards. For this reason, it was fundamental not just to restore the mass transport system, but also to improve the street network, which was done by opening broad avenues, which we have called binaries, in those regions of the city more prone to traffic jams.

In early 2008, we will conclude the Green Line, our boldest street project. With 12 lanes, bicycle lanes, linear parks planted with indigenous plant cover, and a bus-dedicated lane, the Green Line will increase the capacity of the transport system in harmony with the environment, in addition to promoting ordered growth in a region where nearly 300 thousand people live along the 18 kilometers of the Green Line, which will be Curitiba's longest and largest urban avenue.

Buses circulating on the Green Line will be powered by bio-fuel, as will be an impressive part of the mass transport vehicle fleet, renovated in the last two years, equipped with electric engines that reduce emissions of carbon monoxide by up to 50 percent.

Efficient mass transport and street networks are synonymous with quality of life in large cities and are decisive factors in attracting high-tech, non-polluting companies, a main target of our industrial policy, based less on tax waivers than on the offer of a qualified labor force and strong urban infrastructure.

Revitalizing the city's river basins is another fundamental objective in promoting development with sustainability.

We started this program with the recovery of the Barigui river, one of the most important in Curitiba, in a project that pools environmental, education, health, leisure and, above all, housing action, as it will allow families living in high-risk regions an opportunity to relocate to suitable areas, equipped with social and urban structures.

With measures of this nature, Curitiba reaffirms its commitment to actively contributing to the implementation of the objectives of the Convention on Biodiversity, for which Curitiba had the honor to host the last round of debates in March 2006, in accordance with COP 8, the UN world conference on biodiversity.

More recently, in March of this year, we hosted a number of mayors from different countries for the meeting "Cities and Biodiversity" – achieving the 2010 targets, already with COP 9 in sight, to be convened by the UN in May of next year in Bonn, Germany.

At the latter event, the Curitiba Letter was approved, a document we are taking to Bonn, where we will promote a more active role for cities in implementing the objectives of the Convention on Biodiversity, with the conviction that the battle in defense of biodiversity can be fought within cities.

Public authorities play a central role in sustainable development, but the main protagonist in this challenge is society, including all organized communities, non-governmental organizations, representative entities and the private sector.

From the first day of our administration, we have strived to bring in the participation of these segments in different instances, like in the drafting the municipal budget, through public hearings where the population can choose the works, programs and policies it deems to be priorities for the city.

We have attracted partnerships with companies and institutions that have resulted in the renewal and refurbishing of important public spaces, like the wire Opera, The Paiol Theater, The Botanical Garden and, more recently, the former city hall, which will be transformed into a cultural center, open to citizens. Not only did this policy confer more legitimacy to the city administration, but also generated savings whose funds are then reinvested in social works.

Certainly, the tax adjustments carried out in the first year of the administration consolidated its credibility for attracting partners, in such a way that it has become possible to broaden these horizons and cooperate with multi-lateral organisms, such as the International Development Bank, which provided funding for the Green Line, and now the French Development Agency, which is interested in funding housing programs associated with environmental preservation.

Cheered by the spirit of cooperation, we have established closer dialog with neighboring municipalities, in actions targeted at mass transport, food and water supply, and waste collection. It is impossible to function, in large metropolitan regions, without such support.

Sustainable urban development imposes permanent challenges, which are continually renewed and become even more complex in emerging nations, subject to migrations and demographic changes that place cities under heavy pressure.

Under these conditions, good local governance must take a decisive step to prioritize environmentally-driven management, integrated with urban planning, mass transport, water, power and waste reduction and recycling.

This is not just about ensuring quality of life for the populations of our cities, but also about contributing decisively towards reducing the degree of global warming.

A Vision for Sustainable Cities

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Sustainable cities aim to meet the needs of current generations without compromising the ability of future generations to meet their own needs. Increasingly, city leaders have recognized that to make the broad Bruntland definition operational, they need a definition that is both more specific and supported by indicators that address the social, economic, and environmental dimensions of sustainability. A working definition used in many cities states that sustainable development 1) improves that standard of living and 2) the quality of life, while at the same time 3) protecting and enhancing the natural environment, 4) honoring local culture and history, and 5) treating all people equitably. As this definition suggests, the simultaneous achievement of a high quality environment, a sound economy, and social equity is key to sustainability. This is a change of direction from previous thinking where it was sometimes argued that equity can only be achieved by unfettered economic growth, or that to have economic development, environmental quality has to be sacrificed. The need to combat global warming adds a time dimension, suggesting that the entire world must make progress on sustainability in the next 15-20 years and that major results must be in place in 40 years.

How Can We Achieve Sustainable Development?

Simultaneous improvement in economic, social, and environmental conditions is a major challenge, both in cities that are growing fast and in those that are not. But there is no simple recipe for success. The appropriateness of an implementation strategy depends on the context – there is most likely a EU path toward sustainability, and another path that is best for the US, and path that is best suited for China. There are, however, some common principles can be gleaned from progress to date. . One principle is that policy harmonization is key: consistent , mutually supportive policies for land development, transportation , environmental protection, and social equity. This often requires much hard work across the different agencies and groups that have traditionally had separate responsibilities for these sectors. A second principle is that partnerships among different levels of government and also with the private sector and the populace are very important in achieving sustainability, since disagreement on direction can slow progress.

Key Strategies

Key strategies that have proven to be successful ways to improve the sustainability of metropolitan development include:

- Investment and reinvestment to support and strengthen existing districts and neighborhoods
- Preservation, renovation, and re-use of existing structures that reflect local history and culture
- Renewal at higher densities, especially near major transit
- Infill and contiguous growth, to keep the urban footprint compact

- Mixed use (jobs, housing, retail, social-recreational facilities, public services), especially in downtown and other commercial districts but also in residential neighborhoods, to create convenient places to live and work
- Inclusionary development for a mix of incomes and age groups
- Upgraded infrastructure in older parts of the region as well as in new: high quality sewer, water, streets and highways, telecom, parks
- High quality schools and public services (police, fire department, libraries, parks and recreational facilities, health care) in all districts
- Developer requirements that tap private sector funds in support of the area plan.

Many countries are now complementing sustainable metropolitan development strategies with sustainable development policies for rural areas and smaller cities, including

- Preservation and renewal of Main Streets and village centers
- Improvement of schools, services, utilities
- Preservation of rural landscapes, views
- Agriculture and open space conservation
- Cluster development
- Economic development, job training to maintain, increase, diversify, and improve jobs
- Road ecology: programs to protect the local natural environment and prevent the movement of invasive species along transport corridors.

The Role of Transportation

Transportation is a key ingredient in sustainable development both because the transport system is what ties the metropolitan region together and because it is a key factor that can improve the quality of life by facilitating access -- or harm the quality of life by producing excessive negative externalities. Sustainable transport is safe, high quality, accessible to all, affordable, and ecologically sound, and as such is an asset to the community and the region. Sound management of all aspects of transportation --networks, vehicles, operations, and terminals and parking – is necessary to produce sustainable transport. Some of the key strategies for sustainable transport are:

- Sidewalk improvements – adequate width, good surface quality, safe crossing designs, lighting, street trees , benches
- Transit service improvements: timed transfers, schedule adherence, shelters, lighting, traveler information
- Transit-oriented development (TOD), with the choice of transport technologies matched to densities and demand
- Multi-modal access plans for bikes, pedestrians, transit, auto, and freight, designed to be consistent with one another and mutually supportive
- Parking management – on and off-street
- Pricing of transportation and parking to reflect its full costs (including congestion and environmental costs)
- Signal timing favoring person trips rather than vehicle movements (bus and pedestrian friendly)

- Traffic calming and speed control
- Programs to keep streets, sidewalks, and transit systems well maintained.
- Coordinated district, corridor and regional transportation and land use plans for sustainable metropolitan regions.

Planning Processes for Sustainable Outcomes

The planning process for sustainable development requires new thinking, and in particular, requires the recognition that land use, urban design, transportation, and environmental protection are intertwined and can't be planned effectively if treated as separate activities. Indeed, failure to coordinate these elements of the metropolis can lead to lost opportunities or even conflicts. In the new processes for sustainable development, transportation, land development or re-use, and environmental improvements are **together** "the project, " just as environmental quality, equity, and economic development are fundamental objectives, not post-hoc evaluation criteria .

Planners have new and exciting roles to play in sustainable development. They engage not only in **forecasting** what the future will bring (population, employment, and so on), but also **back-casting** to figure out how to get to a future that people want. They **plan at multiple scales**: regional, citywide, corridor, neighborhood. They develop **strategic plans** and focus on continuing improvement through a series of advances and achievements that add up to significant accomplishment. The plans at all levels address **multiple market segments** – different age groups, income groups, household sizes; different tastes; planners aim to expand choices for everyone. They investigate and apply **green building practices and technologies** to help assure continuous improvement in development performance, and carry out **demonstration projects** testing new ideas. They identify and apply **financing mechanisms, including public-private partnerships,** to help implement the best strategies. Finally, they use **benchmarks** to track progress, and revise plans periodically to improve their performance.

Examples

A number of examples show ways that cities have combined urban policy, transportation and land use planning, urban design, and environmental improvements, and public private partnerships. US examples include planning around the Washington DC Metro corridors and the San Francisco downtown planning. The new proposals for the Transbay Terminal and the area around it offer insights into how major projects can be developed and coordinated.

Urbanization Trends in China and their Implications for Energy: A Path to Low-carbon Urban Development in China

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Demographic, energy, industrial and consumption structure are critical elements in China's urbanization process, and are at the core of sustainable urban development. Since 1996, China has moved into a stage of rapid urbanization. It is estimated that this acceleration will last until 2020, when urban population in China will reach 70%. The 15 years of accelerated urban growth will have important implications for China's demographic, energy, industrial and consumption structure.

According to UN statistics, more than 50% of the world populations live in cities, which account for 75% of carbon emissions. Urban energy demand and the expansion of carbon content far exceed capacity, seriously endangering urban and regional sustainable development. Density of population and industry have enabled cities to control per capita resource possession and energy consumption more effectively than less densely populated regions. Regional advantages—in terms of political structure, institutions, policymaking and implementation—have given cities the comparative advantage in de-carbonizing the economy and developing a low-carbon economy.

The fundamental problems of rapid urbanization in China lie in the artificially high level of urbanization that has exacerbated social disparity in the urban population; the structure of urban energy supply and demand and the issue of overcoming the "barrel principle" and "short-board" effect; industry structure and the dilemma of high energy consumption and low efficiency; and the lack of penetration of the concept of modest and "green" consumption and the need to change urban consumption structure. With these problems, the interaction of urban population, industry, and consumption has created complexity and regional disparity.

To build an energy-saving, environment-friendly, low-carbon, livable, and safe city, with healthy economic development and sustained improvement of people's livelihood, and to promote sustainable urban development in production, logistics, consumption and eco-preservation, is an important development pattern for harmonizing regional economy, society, and environment; doing so is also the basic requirement of the state's *Urban and Rural Planning Law* (provisional). At the national strategic level, technology and economic policy formation and implementation must be systematically enhanced in the core areas of urban planning, transportation system and energy-saving buildings in the 11 major city clusters. At the regional planning level, the role of urban development in relation to the larger regional planning scheme must be further clarified. At the community and individual level, shifting to sustainable production and consumption must be enhanced in order to experiment with and spread low-carbon urban development approaches.

To promote low-carbon urban development, one must understand the evolution and overall development trends of urbanization in China; identify a suitable development model and regional set-up to guide urban planning and coordinate development; harmonize the development of population, energy, industry, and consumption; increase resource efficiency to stay below restrictive pollution regulations; increase the management capacity of cities to maintain safety, through warnings and prevention; and optimize structure, technology, and

management. Doing so will facilitate the establishment of a multi-level and multi-element energy safety system, an industrial policy system for sustainable energy use, and a low-carbon market economy enhanced by government, driven by the market, and interacting with the public.

In light of conditions in China, choosing a low-carbon urban development path can be divided into three strategic phases. The short-term phase will concentrate on exploring energy-saving potentials in the urban realm; achieving indirect mitigation effects and increasing energy efficiency through closures and mergers of industrial entities; and developing and spreading energy-saving technologies. The medium-term strategy will focus on green alternative energy, such as renewables; making urban energy structure more rational; and carbon-free and low-carbon energy to optimize urban energy structure and develop a de-carbonized economy. The long-term strategy will be based on CCS technology, developing sustainable low-carbon economic development models through demonstrations in pilot cities of different sizes and types in the key regions, through implementing and spreading relevant strategies, policies and technologies. These models will be extended and applied on larger scale, to gradually achieve overall objectives of low-carbon urban development.

In general, the search for a low-carbon urban development path is a reflection of the scientific approach to urbanization. In response to rapid urbanization, sustainable urbanization can support industry, use resources efficiently, create jobs, balance public utility development, and improve the environment for all citizen

Development Strategy of Chinese Regions and Cities based on Main Function-Oriented Areas

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Since China implemented its reform and open-door policy, its economy has maintained fast growth. At the same time, China has made great achievements in urbanization. Between 1978 and 2006, urban population increased from 170 to 580 million. It is believed that there still will be more and more rural people moving to urban areas for working and living. However, many problems have been encontered, especially resource over-consumption and worsening pressure on the environment. Therefore, it is an important issue for cities to facilitate sustainable growth by developing appropriate strategies.

Besides cities' individual economic and social characteristics, national development strategies, especially regional macro strategies and development strategies for function-oriented regions, will influence urban development significantly. Furthermore, demand and supply of energy within each urban area will play an important role. It is widely believed that because of the transmissability of energy resources, the development of one particular city needn't take local energy endowment into account. However, from a national perspective, the total energy supply is not inexhaustible and energy consumption will directly pollute the local environment, so it is necessary to analyze energy demand and supply for sustainable urban development.

Based on these considerations, this study will (1) examine Chinese regional macro strategies and main strategies for function-oriented regions; (2) forecast economic development and energy demand for each region; and (3) analyze the key issues and strategic characteristics of different types of cities by examining representative cities or city groups, based on economic and social status.

1. Chinese Regional Macro Strategy and Strategies for Function-Oriented Regions

Since the founding of the People's Republic of China, the government has modified regional development strategies four times, based on macro-level conditions at different stages. In the period following liberation, the government emphasized the development of inland areas. The project beginning in the 1960s, "Third-Line Construction," also focused on inland development. Since reform and opening-up in 1978, development strategy has prioritized efficiency, and strategic focus was moved to the eastern coastal areas. In 1999, the central government launched the "Great Western Development" project, in order to decrease inequality between western and eastern regions. For similar purposes, the strategies of "Revitalization of the old northeastern industrial bases" and "Rise of the central regions" have been implemented since 2003. China's current regional macro-level strategy can be summed up as the strategy of implementing the policies of western development and revitalization of the old northeastern industrial bases, facilitating the rise of the central regions, and encouraging eastern regions to take the lead in development.

There is specific statement in the *Eleventh-Five Year Plan for the Economic and Social Development of China* addressing such problems as unequal regional development of the economy and society, conflict between regional demand and supply of resources and environment, and regional disharmony in public services. It is stated that geographical regions

are divided into four main "functional areas" based on their specific resources and environmental capacity, current development density, and future development potential. Regional policies and performance evaluation systems will be revised based on the status of each main functional area. Development strategies for function-oriented regions are actively implemented by the Chinese government, and play an important role in regional and urban development.

2. Forecasting of Regional Economic Development and Energy Demand

Since the 1980s, with the progress of reform and opening-up, all regions have developed rapidly. However, China is a developing country with a huge land area and large population. The differences in geography, climate, and history result in discrepancies in the speed and mode of development among regions. Furthermore, economic structure and resource endowment vary dramatically across areas, generating different resource or environmental problems in the development of each region.

A Computational General Equilibrium model developed by the Development Research Center of the State Council provides evidence that with high investment ratio and sufficient labor supply, most regions in China can maintain fast growth in the simulated period of 2007 to 2015; however, as time passes, the growth rate will continuously decrease. Simulation results show that GDP could increase at an average rate of 8% annually from 2007 to 2015, varying across regions. Overall, more developed areas may attract input of labor and capital more effectively, and keep a high growth rate. Given rapid GDP growth, if the consumption rate of energy keeps improving by 4.1% per year (the actual average rate since 1978), energy consumption per unit GDP growth in most regions will decrease dramatically. The growth rate of total energy consumption will be significantly lower than that of GDP. However, the absolute growth of energy consumption will still be tremendous. For example, the simulation results for Beijing indicate that given current energy consumption rates, energy demand will increase from 46 million tons standard coal in 2005 to over 70 million tons in 2015, which will result in enormous pressure on Beijing's environment. Therefore, we have to consider supply and demand of energy in regional development strategies.

3. Strategy Study for Typical City (Group)

To examine varying types of cities under different conditions, this study selects Beibuwan of Guangxi Province, the district of Beijing, Tianjin and Hebei, and cities with abundant resources in northeast of China, as research subjects. The above three cities (groups) respectively represent the characteristics of the three main types of function-oriented areas, representing key development, optimal development, and limited development. The study first analyzes economic, social, and resource traits, especially resource and environmental capacities. We then analyze function-oriented area type, studying its development strategy based on estimates of energy demand. In this way, we can deduce the main factors that should be considered when planning the development strategy for a city (group) on the basis of the main-functional-area framework.

With respect to resource and environmental capacities, this study analyzes the population capacity of the three typical cities (groups). Population capacity is a type of resource and environmental carrying capacity, referring to the population that can be contained within a certain region, including population capacity for food, land, and water. In addition, we analyze the atmospheric environmental capacity and water environmental capacity, including that of coastal areas. On the basis of these results, considering industry structure and layout, energy

supply, infrastructure, population and employment, resource utilization and environment protection, the study measures and estimates the resource and environmental capacity of the cities (groups), and determines the characteristics and key factors that should be taken into consideration in the process of designing the development strategy for different types of cities (groups) within the framework of function-oriented regions.

Governing China's Urbanization: Challenges and Policy Analysis

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The speed and scale of China's urbanization has no precedent in human history. The nation has made industrialization, urbanization, and modernization its top priority, and even set a deadline to catch up to developed nations by the middle of this century. However, the adverse effects of twenty years of an overheated economy and disordered urbanization and industrialization have not escaped the concern of the central government, which has tried to compensate by adjusting the economy through land and credit regulations. This attempt to balance economic and social development has not achieved the desired effect so far. Take the restraint of real estate prices, for example, the results of regulation often contradict the aim.

What are the causes of blind, overheated urbanization? And why does controlling land and credit not work as expected as macroeconomic regulation? For answers to these questions we must look into how the government operates at many levels and in many roles in the country. Only by deeply understanding the current role of the government in urbanization can we identify the proper role of the government in urbanization.

This study focuses on several key issues. Specifically, we are interested in institutional causes of low efficiency in energy and resource use, as well as environmental degradation. We will explore the different roles played by the central government local governments, business, and civil society in urban planning and construction. The project is designed to recommend effective policy for sustainable urban development.

The rapid urbanization of China has not only caused concern and competition over natural resources, energy, and environmental damage in China and around the globe, but this phenomenon has also severely challenged the social structure, economic development, and spiritual health of the nation. Urbanization causes unprecedented demand for energy and natural resources, which changes the operation, capacities, and incentives of markets, civil society, and the government.

Looking at the government role in urbanization, we see that at once, paradoxically, from the bottom up to the top down. That is, the central government has played a pivotal role in promoting urbanization from the top, while local government, businesses, and of course, individuals have been the drivers. Land acquisition, construction, and the boom of urban populations all manifest tremendous, irresistible impulse of development the essential force of urbanization. However, China's infrastructure, architecture, urban planning, and traffic network all reveal inadequacy and a lack of central planning, standardization, and government management. Neither restraints at the local level nor guidance from the top have been enough to surmount the profound contradictions and severe challenges in managing China's urbanization. The challenges include the following:

a) Lack of expertise and grassroots community participation in urban planning, blind growth, illegal construction, and argumentation
b) Redundant construction of infrastructure and resource waste
c) Unplanned land use results in environmental pollution
d) Performance-driven assessments result in mass drain on state-owned property

e) Damaged historical and natural landscapes

What are the institutional causes of low efficiency in energy and resource use? What are the institutional problems in China's urbanization?

- Too much power rests in the hands of local government
- Local government's excessive ambition for economic development
- Lack of cooperation between local governments

A good distribution of roles, natural resources, and power is critical to healthy urbanization. Overall China's economic development benefits much from the transfer of authority from the distribution of power from central government to local governments. This happens in urbanization as well; in recent years, the central government has adopted a policy of decentralization in urbanization, giving local government - especially the municipal and county governments - the freedom to make decisions on their own urbanizations. Urbanization has happened in cities across the board, from provincial capitals to prefectures, counties, and towns; the population has shifted and construction has boomed. This urbanization shares a common feature: the dominance of local government.

The role of local government is reflected mainly in city planning, financing, construction, and management, while the role of the central government centers on law making and policy (See Figure 1).

Figure 1. Roles played by government, enterprises and civil society in China's urbanization

	Legislation	Planning	Financing	Constructing	Management
Central government	★★★	★★	★		
Local government	★	★★★	★★	★★	★★★
Enterprises		★	★★★	★★★	★★
Civil Society		★	★	★	★

What is the reason for too much power of local government?

a) The rapid expansion of local government powers, since reform and opening
b) Local government has strong power over resource allocation
c) The transformation of government could not match the market economy
d) Lack of clear and specific guidance from central government

What is the reason for excessive ambition of economic development in local government?

a) Performance-driving: excessive demands on economic indicators
b) Financial pressure: power and financial resources do not match
c) Power rent-seeking: development can bring great personal income

What is the reason for lack of cooperation?

a) Little contact between local governments in a single system
b) More competition than coordination between the local governments

Governance is the theory of decision processes by organizations and institutions, such as public sector management, competitive private sector structure of government, civil society participation and voice, and political accountability.

Policy proposals based on the above analysis:

1. Policy Suggestion to Solve the Problem of Too Much Power Resting in the Hands of Local Government

- Enhance the effect of central government and provincial governments in the process of city planning and construction, through legislation
- Strengthen macroscopic control in the management of space development
- More public participation

2. Policy Suggestion to Deal with the Local Government's Excessive Ambition of Economic Development

- Transform the system of assessing achievement and strengthen their public service role instead of their economic role
- Reform the tax system to balance the responsibilities and financial power of local government

3. Policy Suggestion to Deal with the Lack of Cooperation

- Strengthen authority, function, and capacity of the central government and provincial government in the process of city planning
- Promulgate specific guidelines
- Promote cooperation in the Yangtze River Delta, the Pearl River Delta, and Beijing-Tianjin-Hebei

Lessons from Urban Planning for Sustainable Development in China

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Maurice Strong, Secretary General of the United Nations Conference on Environment and Development, pointed out in 1992 that cities are key to a successful sustainable development worldwide.

Characterized by concentrated population, centralized resources, accumulation of wealth, efficient operation, rapid economic development, huge resource consumption, serious environmental pollution, and prominent social problems, cities have become one of the main interests of sustainable development strategists across the world.

China's urban development has been very complex. Its urbanization rate in 1949 was just 10.6%, and still only 17.9% in 1978. In 1994, the urban population reached 343 million, making up 28.6 % of the country's total population.. By 2000, the urbanization rate exceeded 36%, and by 2005, 42.99% of Chinese people lived in cities.

During the first 30 years of the 21st century, the acceleration of China's urbanization will make a huge contribution to the world's urban population. By 2030, the urban population in China will at least double that of 2000, and the Chinese population as a percentage of the world's total urban population will climb to almost 20%. Within 30 years, about one-fourth of the 2 billion new urban dwellers of the world will be in China. J.E. Stiglitz, Nobel Prize Winner and American economist, once pointed to urbanization in China and high technology in the US as the two biggest factors in human development during the 21st century.

After the 1990s, the philosophy of sustainable development started to catch on in China. It's necessary to study the role of urban planning in sustainable development. Currently, China is undergoing complex urbanization accompanied by a developing market economy, globalization, rule of law, increased access to information, and industrialization. In the course of transitioning from a planned economy to a market economy, the role of urban planning will inevitably change.

After more than 30 years of effort, China has established an urban planning system that deal with the rapid urbanization. Only by making sustainable development the goal can a city have long-term vitality. So here's the important question: Can the existing urban planning system effectively promote sustainable development?

China's urban planning system has three different parts: regulatory, administrative, and operating. From top to bottom, the regulatory system breaks down into national laws, administrative regulations, and local rules and regulations. Horizontally, the regulatory system is carried out through major laws and supplementary laws as well as other relevant laws. The institutions in the administrative system include the Ministry of Construction, the Construction Departments/Commissions, and local planning bureaus, which exercise functions like examination and approval of plans, construction administration, and watching out for illegal behavior. The operating system includes the compilation and implementation of urban planning; urban system planning, overall planning, district planning at the level of

strategic development, and implementation of detailed control planning, and building planning at the level of implementation.

As public policy, urban planning is administrative power in practice. Taking China's big cities as examples, an empirical study of local urban planning systems adopted in four cities aims to provide suggestions and strategies for administration and management of urban planning in China. Taking four of China's biggest cities as examples, this empirical study of local urban planning systems aims to provide suggestions and strategies for administration and management—in effect, a guide to urban sustainable development.

Currently, Beijing authorities adopt a highly centralized urban planning system, while Shanghai adopts a two-tier governance and three-tier administration, and Shenzhen adopts a three-tier administrative hierarchy. In Beijing, administration is centralized in the municipal planning committee, where a serious shortage of personnel causes planning to lag behind construction. This situation works against democratization of urban planning. In Shanghai, excessive decentralization of the planning power is to blame for a lack of coordination among individual districts, degrading the overall urban environment. So far, Shenzhen's management style has been relatively successful. There, the hierarchy guarantees rapid implementation and proper application of the planning, a situation that also favors coordination between the central planning administration and individual districts without much conflict, ensuring the harmony between the interests of each and the interests of them all as a whole.

Separation of powers and streamlining of procedure have both evolved into an international trend. Comparing planning styles of China's big cities, Shenzhen's hierarchical and vertical administrative system has proven to be a good example. But the exploration of ways to reform the planning management system cannot stop here. With increasing public interest in participation the planners should pursue the following goals: coordination between cities and between regions, smoothing out the relationship between institutions at the community and public levels, and establishing a planning management system that promotes social and economic development.

Regional integration of urban planning has achieved a great deal in recent years. One example is Huzhou City in Zhejiang Province, which whittled down the number of planned water supply plants in one district from 50 to 18, a cost savings of 40% resulting in hundreds of millions of Yuan saved and a benefit to the water supply overall.

The 5th Plenary Session of the 16th Central Committee of the Communist Party of China pointed out that we should stick to coordinated development among big, middle, and small cities and small towns, and promote healthy urbanization with the principle of step by step development, saving land, intensive development. Furthermore, the newly promulgated regulations in City Planning Law attach importance to urban and regional planning. But there is a lack of control and guidance in regional planning. For example three large-scale civilian airports in the Zhujiang Delta area's Guangzhou Baiyun Airport, Shenzhen Bao'an Airport, and Zhuhai Sanzao Airport, combined with the Macau International Airport and Hong Kong International Airport, make up five airports with less than 200 km between them. The utilization rate of Zhuhai Airport is less than 10%!

Urban planning cooperation has had some success. For example, the promulgation and implementation of "Implementing Regulations on Coordinated Development of City

Agglomeration in Zhujiang Delta of Guangdong Province" and the establishment of Zhujiang Delta City Agglomeration Planning Management Office are a sign of progress of the Implementing Regulations. But there are also local egocentric behaviors like the "173 Plan" put forth by the Shanghai government. In order to adapt to the takeover and transfer of enterprises in the manufacturing industry, Shanghai has expanded the planning land area from 67 square kilometers to 173 square kilometers, and further enhanced the taxation support on newly added key enterprises within the park. The goal is to contend for markets with surrounding established industrial districts such as Suzhou Industrial Park and Kunshan Industrial Park.

In addition, urban planning has a limited role in pushing forth sustainable development in urban and rural construction. This is because China's urban planning authority is defined within the scope of set areas, and village construction beyond them are based on the Regulations on the Administration of Village and Town Planning Construction, which is outside the jurisdiction of urban planning.
In China's urban planning system, urban transportation planning is always one important component.

But to build a city with sustainable development, urban development has to be based on the recognition of mutual influence between land use and transportation. In urban planning, transportation is not just an independent system, and sustainable development can only be realized when urban transportation is taken into account with urban land use.

With this recognition, the interaction between urban land use and transportation is something for planning departments to reflect on. Cities such as Beijing and Shanghai have put forth a transport strategy oriented around public transport, reconsidered the allocation of road construction and right-of-way, and begun to focus on the citizens' daily paths instead of just smooth traffic. Meanwhile, the environmental pressure brought by transportation also makes the planning departments take sustainable development target into account when considering transportation facilities and the layout of urban land.

Favoring mixed land use, the planning department of Shanghai is trying to change the rigid national land-use regulations. In national regulations, any attempt to change zoning is a very arduous and difficult job, and mixed land use - that is, using one piece of land for multiple purposes - could save more land and make downtowns more convenient places to develop transit hubs with economic development potential. The planning department's efforts are credited for the Cloud Nine Shopping Mall connection to a comprehensive transportation hub.

However, restriction of bicycle traffic in some cities has attracted the scholars' attention. The "three-board" split-flow of cars and non-motorized vehicles means Chinese cities have the worlds biggest and most complete bicycle system. Currently, in many cities in China, the proportion of residents traveling by bicycle is as high as 50%, with 80% using mechanized transportation of one form or another. Evaluating energy efficiency per capita in transportation, Chinese cities rank among the top in the world. Many cities, such as Beijing, have recognized how important bicycles are and included them in planning. However, more cities restrict bicycles, which is bad for sustainable development and unfair to bikers.

Urban planning authorities have long been concerned with the transport in urban central areas. However, with the expansion of cities, the transport problems in suburban areas and peripheral residential areas of cities start to emerge.
Since urban residences are a big proportion of total urban construction, housing construction is a target of sustainable development and a focal point of urban planning. The main components of planning housing are density, layout, and medium- and low- income housing.

There are relatively clear regulations in housing construction for sustainable development. For example, GBJ 137 - 90 specifies the per capita land-use standards for various housing. City governments also have their own corresponding standards, such as the Technical Regulations for Urban Planning Management in Shanghai. However, in real construction, there are still some problems, including villa neighborhoods. Before 1995, due to a thriving real estate market, the construction of large amount of villa areas lead to disordered expansion and land waste, as well as triggered many economic problems. In 1995, new State Council policy restricted villa construction under the categories of high-grade and low-density real estate developments. In residential construction, one has to mention the total supply of dwellings. The system should guarantee that urban planning departments can control the annual numbers of houses through an approval process. However, the real estate bubble in the mid-1990s was a serious problem due to city departments losing control over land transfer, and a housing supply being far larger than demand. So large numbers of uncompleted buildings were a hard nut for cities to crack. Meanwhile, in recent years, the urban population grows faster than expected, while housing demand continuously increases. Construction can not meet the demand, which leads to a sharp rise in urban housing prices.

In housing construction in China, there are two unique phenomena – "Mega-Community" and "urban village." With the rapid increase in population and density of Chinese cities, traffic and infrastructure are strained. On the outskirts of large cities, large-scale residential communities (such as Fangzhuang in Beijing, Xinzhuang in Shanghai, and Huanan Xincheng in Guangzhou) have been built. The land usage in mega communities is too simple, which brings about problems with commuting and supporting facilities. The "urban village" phenomenon is caused by urban sprawl, quick suburbanization, and development of urban fringe areas, because local governments developed around rather than inside of villages to avoid huge costs. Residents of urban villages are mainly low-income migrants, and shabby construction,, lack of sunshine, infrastructure, and distance from the city cause social isolation.

Of course, one cannot mention sustainable development without mentioning social sustainable development. China is a developing country with a pyramid-type social structure. The wealthy class is small; most urban medium-income families are typical wage-earners with limited consumption; and even more medium-and-low-income residents still rely on the social security system for housing support. In 2006, the Ministry of Construction responded to the General Office of the State Council in stipulating the proportion of small apartments in the urban development to guarantee housing for medium- and low-income families. But the sharp rise of land and housing prices forces residents with middle- to low- incomes to continuously move to outside urban cities, causing social isolation. In recent years, low rent houses are aimed at the problem, but most are situated on the outskirts of cities, which increases the transportation expenditure of low-income earners.

On the whole, during rapid economic development, problems have appeared in housing construction, and so the city has also adopted regulations and policies to ensure healthy

development. However, those policies are lagging behind, and many foreseeable problems, which appeared in urban development in Western countries, have not been avoided in China. As for the urban planning of housing, we still have a long way to go.

Model of Urban Complex Ecosystem and Planning Principles for Eco-Cities

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Abstract

The rapid development of China's economy and urbanization is occurring in a special historical period. During this period, we must not only think about how to cope with the profound changes in economic and informational globalization, but also ponder the increasingly severe phenomena of global warming, population explosion and energy crisis. Unfortunately, a series of profound problems have occurred in China's urban development, due to lack of proper balance. These problems have attracted much attention from urban planners and resulted in a shift toward ecological urban planning. Despite of the endless emergence of concepts and theories regarding the relationship between urban ecology and urban planning in recent years, it is rare to find any that truly comply with the concept of "Scientific Development."

Although there is a general consensus on the concept of ecological urban planning, there is more dispute than agreement between ecological planning and urban planning, due to differences in expertise. Scholars with backgrounds in ecology and environmental science generally put greater emphasis on research on natural ecology, while focusing less on issues regarding the development of urban society and economy. On the other hand, scholars with backgrounds in architecture, engineering and economic geography are more proficient in applying traditional legal, physical, and spatial planning tools. As a result, they give less consideration to resource limitations and evaluations of the environmental impact of urban development. Other experts and scholars have tried to combine both planning methods in their research; due to the limits of their knowledge, however, they have not yet been able to reveal the nature of urban ecology very clearly. Despite the insufficiencies in practice, however, there has been a gradual development in the urban planning community's attempt to introduce and integrate ecological concepts into traditional urban planning. This has no doubt enriched the practice of modern urban planning in China.

Therefore, this paper focuses on building a mutual foundation for ecological planning and urban planning, tries to establish a model and discover new insights into the nature of the ecology of the urban complex, and probes into the principles and strategies of ecological urban planning by combining the advantages of conventional ecological planning and urban planning.

In this paper, the ecosystem of the urban complex is divided into eight inter-connected and interactive subsystems. Among them, the natural environment is the material and spatial foundation on which cities can survive; the living subsystem, the production subsystem and the service subsystem are the most fundamental operational and functional subsystems of cities; these three subsystems are supported by the operational support subsystem; the sum of these four subsystems is the complete urban subsystem in terms of material and spatial forms; and the input and output subsystems are like two "valves" which exert significant influence on all of the above subsystems.

Based on the principles for building eco-cities, and with consideration for China's actual conditions and development requirements, this paper proposes eight core principles for ecological urban planning:
(1) Regional coordination and integrated planning;
(2) Adoption of measures suitable for local conditions and in proper sequence;
(3) Energy saving, high energy-efficiency and -intensity, and energy security;
(4) Reduction of carbon emissions and development of a circular economy;
(5) Technological advancement, sanitation, and environmental protection;
(6) Social harmony, livability, justice and fairness;
(7) Maintenance of cultural heritage and prominent features; and
(8) Smoothly-running networks and coordinated mechanisms.

From the perspective of enhancing the operability of ecological urban planning, the paper also proposes detailed guidelines for specific planning activities within the overall urban planning endeavor.

Summary: Qingdao Sustainable Neighborhood Demonstration Project

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The Qingdao Sustainable Neighborhood Project (QSNP) is an alternative to China's typical "gated super block" development model. The "gated super blocks" are dependent on expensive central infrastructure support in the form of electric power plant generation and distribution, sewage collection and treatment, water treatment and distribution, and waste collection and disposal. The "gated super block" model is also dependent on the car as the primary mode of transportation. China is currently hard pressed to satisfy the infrastructure demands of the super block model.

By contrast, the QSNP, the Qingdao EcoBlock, uses an integrated whole-systems approach to generate all its energy from on-site renewables, to recycle all of its water and to recycle over 80% of its waste for on-site uses. In addition, the EcoBlock is designed to provide convenient pedestrian and bike access to a new bus rapid transit system located on a major adjoining arterial. The EcoBlock's whole-systems approach is flexible and adaptable to multiple local conditions and climates and is widely replicable throughout China.

The integrated approach to energy begins with multiple strategies of conservation (insulation, passive solar heating, shading, natural ventilation, day lighting and energy efficient lighting, appliances and controls), which reduce the energy demand by 40%. The remainder of the load is provided by: 1) building-integrated, vertical axis wind machines on the tops of the tall buildings (50%), 2) building integrated photo voltaic panels on the roofs and as shading devices (35%), 3) building integrated solar domestic hot water panels (5%), and 4) a 2-phase anaerobic biogas digester which powers back-up electric turbines (10%). The digester uses food waste (garbage), green waste from the landscape and sewage sludge from primary sewage treatment as the biomass supply.

The water recycling is a dual system - 50% gray water, 50% potable water. Potable water from sinks and showers, gray water from washing machines and black water from toilets is collected in a primary treatment settling tank. The sludge is pumped to the biogas digester. The remaining effluent is distributed to secondary treatment via constructed wetlands (or "living machines"). 50% of the secondary treated water is collected and recycled for gray water supply to toilets and washing machines. The other 50% is combined with collected rain water, receives tertiary treatment through reverse osmosis and ultra violet disinfection and is then recycled as potable water for sinks and showers. Storm water is treated on site in "bio-swales", collected and recycled for landscape irrigation.

Waste collection is accomplished by a neighborhood vacuum system, which draws the different waste streams to a central plant for processing and recycling. The garbage and green wastes go to the biogas digester to be converted to energy. Metal, glass and plastics are processed for recycling. The vacuum system has been successful in multiple applications around the world (including China) and avoids the environmental problems of on site garbage collection.

The integrated, whole-systems approach is made of proven existing technologies. The innovation lies in how the systems work together. The sustainable systems add 5-10% to the cost of typical development and have a 6-10 year payback, depending on the policy regulations of the city. The concept has the potential to be a profitable business opportunity for the developer who is also the property manager. While the systems do not depend on any change in homeowner operation and maintenance, the systems give the homeowner a more environmentally responsive home to operate to their advantage, if they wish.

If the Qingdao EcoBlock's whole-systems approach works as well as the pre- feasibility study indicates, it will be the first (almost) self- sustaining neighborhood in the world and could help lead China to a more sustainable future.

Presentation Outline: Best Practices in Sustainable Urban Planning

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Background:

Over the past decade, several urban planning movements have developed in North America and Europe that have defined the intellectual and practical framework for a more sustainable urban development. These are *Smart Growth, New Urbanism* and *Transit Oriented Development* (TOD). In this presentation, these movements will be briefly defined and illustrated, and their implications for urban energy conservation described.

Best Practices:

Best Practices will be listed and explored in some detail by city. These will include San Francisco, and Santa Monica, California, Seattle, Washington, Portland, Oregon, Chicago, Illinois, and others. These cities have adopted comprehensive sustainability plans and policies that guide all aspects of both public and private-sector development. Examples of these policies and their pragmatic impacts on city-wide development will be addressed. Other Best Practices will focus on urban sector or development projects that exemplify specific aspects of sustainable energy-conservation urban development. Examples of these projects include: 1. Projects to reduce urban heat islands. 2. Co-generation heating and cooling projects, 3. Transit oriented development projects. 4. Mixed Use Development.

Future Prospects:

This part of the presentation will discuss the synthesis that is occurring in sustainable development policy and practice in the new LEED-ND (Leadership in Energy and Environmental Design-Neighborhood Development) program. LEED-ND seeks to synthesize the design and sustainability goals of Smart Growth, New Urbanism, and TODs, It is fostered by the US. Green Building Council, Congress for New Urbanism, and the National Resources Defense Council. LEED-ND expands the sustainable design standards and rating criteria established for individual buildings to neighborhood and district-wide developments of hundreds or thousands of acres. Key energy conservation rating criteria such as solar access and cogeneration will be reviewed. This program is in a pilot planning stage, with more than 200 projects underway, worldwide, including projects in Wuhan and Guangzhou, China. The prospective outcome of the LEED-ND program will be an international community development standards defining the operational aspects of sustainable urban development, including energy conservation.

Strategies for Urban Green Building Development in China

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Currently, China is in the process of building a "moderately well-off society," with corresponding urban construction of unprecedented speed and scale. However, the severe impact on the environment, energy, and resources has recently become a problem. The key question is how to improve the utilization efficiency of resources and energy and reduce pollution and protect natural resources while improving quality of life. Based on the principle of sustainable building, this paper analyzes direct and indirect influences on energy and resources in China, considering scale and speed of urban construction, and the status of building energy consumption, and key milestones for our work in the near future.

Rapid urban construction in China has driven the development of our building materials industry, which is characterized by high energy consumption per unit production value. In 2005, energy consumption which was directly and indirectly caused by steel and other building materials used in building construction, water conservation, or transportation accounted for nearly 20 percent of the total commercial energy consumption in China. If construction scale can be halved, the total energy consumption will reduced by 10 percent. Overly rapid urban construction has also led to misuse of land. Currently in some inland cities in eastern China, there is a shortage of supply, and no more land is available for construction. At the same time, the increase of buildings in cities is much faster than the increase in population, so building area per capita increases. China's building and residential area per capita is now on par with some developed countries and regions in Asia. The effect of building materials, resources, energy consumption, and pollution from new construction in eastern China is very serious.

Currently, energy consumption for building operation consumes 20% to 22% of total energy consumption in Chinese cities. Energy consumption for heating per unit area is 2 to 3 times of that in developed countries in the same climate condition zone as China, showing that China has large potential for energy savings. However, heating energy consumption aside, other sources of energy consumption in residential buildings and public buildings is much lower than in developed countries; for example, these categories of energy consumption in China are only 1/3 to 1/4 of the U.S.'s, due to differences in the use of air-conditioning, lighting and hot water. However, with the rising standard of living, the changes in living styles, and the mentality of "overtaking the advanced world", the unit energy consumption of these kinds of buildings is likely to increase continuously. Not only will the energy-use disparity with developed countries be reduced, but total building energy consumption will increase. If total urban building area doubles, total building energy consumption is likely to at least double. Even more than energy use per unit area, it is the total quantity of buildings that has the greater effect on building sector energy consumption.

The scale of new annual civilian construction should be controlled. Quantity should be reduced to 6 hundred million in 5 years, down from the over 10 hundred million now existing now. This guideline should be distributed to every province and city, and included in evaluation of officials all levels. In this way, the current trends can be reversed.

Controlling the scale of urban construction reasonably and planning our future construction according to future demand should be important parts of constructing a resource saving society, and are also at the basis of sustainable development and construction according to the scientific development principle.

Abstract: International Practices on Regulatory Systems and Incentives for Green Buildings Development

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This presentation is part of a project funded by the Energy Foundation entitled "Global Green Building Development Situation and China: A Review and Policy Recommendations". Since the beginning of the project in August 2007, a "quick-scan" literature review has been carried out by the project team to identify some key best practices of energy efficient in buildings. This paper presents the preliminary results of the "quick-scan" of best practices in building energy efficiency regulation programs, and economic incentive instruments.

The presentation will illustrate what the global communities are doing, in regulatory and financial incentive instruments and practices in promoting energy efficient buildings. Some general recommendations for how the Chinese building sector can make greater progress in developing energy efficient buildings will also be provided.

Why Green Buildings?

The concept of green buildings differs slightly between the EU and the US. In the US, the focus is on energy efficiency in buildings. In Europe, the concepts of sustainable buildings and sustainable construction are more commonly used, which includes energy efficiency and other green aspects, such as the reduction of CO2 emissions to meet the Kyoto targets and reuse of building materials. In this presentation, we mainly focus on energy-efficiency in buildings.

Today we are facing several huge challenges, including climate change, air pollution, energy shortage (security), and un-sustainable urban development. All these challenges are related to a rapid increase in energy consumption, particularly fossil fuel use. The building sector has a profound impact on environmental quality, global climate change, energy security, and human health. In most countries, buildings account for more than 40 percent of all energy use, including about 40 percent of CO2 emissions, the primary greenhouse gas (GHG) associated with global climate change.

It is estimated that the building and construction sectors account for 46.7 percent of overall energy consumption in China according to Mr. Wang Guangtao, China's former Minister of the Ministry of Construction. He also predicted that by the end of 2020 the floor area of new buildings will be 25 to 30 billion m^2. Based on the current energy consumption level, the annual energy consumption amount will be about three times of current buildings energy consumption nationwide.

Green buildings are expanding around the world. This movement is important for global sustainability for three reasons. First, buildings affect energy security, the indoor and outdoor environmental quality, and greenhouse gas emissions, and thus climate change. Given the environmental and economic impacts of current energy consumption and projected rapid growth in the building sector, the success of the green building movement is critical to achieve global sustainability. Improving energy efficiency in buildings can reduce these impacts and also enhance human health, while also reducing costs and risks. Second, sustainable buildings can be showcases to teach us many useful lessons about being green,

humane and smart, and in so doing will serve as demonstrations for transformation of the building industry to more sustainable practices. And third, green buildings represent the application in one place of many of the sustainable concepts and practices such as energy efficient technologies, environmental management systems, waste prevention and recycling, and green product purchases.

Green buildings, which provide an effective approach to significantly improving energy efficiency and reducing energy consumption, are considered a solution for energy shortage in China. The Chinese government has already established an energy strategy to improve energy efficiency through international cooperation to learn advanced technology and successful management experience in green building development. It is recognized by the Chinese government that promoting the green building industry is crucial to implement China's energy strategy since the building and construction sectors are a major factor of energy consumption.

As a developing country, China needs advanced knowledge and skills to improve decision-making to deal with issues related to green building, energy efficiency, and sustainable urban development. However, lack of knowledge and scientific capacity in the country has become a barrier to promoting green building development. China needs to learn from the U.S. and other developed countries in green building development. In the last few years, the trend towards sustainable building design in the U.S. and European Union has proved that green buildings are transforming the building sector into a sustainable industry. In order to achieve global sustainability, however, the transformation must extend to China. Developed countries need to assist China in developing and implementing green building technologies, policies, regulations, products, and processes.

What are the Barriers of Green Buildings Progress?

While many green buildings can be constructed at comparable or lower costs than conventional buildings, integration of high-energy performance features in buildings can increase initial costs. Benefits from energy efficient buildings usually are accumulated over many years. In general, decision-makers rarely use life-cycle cost analysis to account for those reduced operating costs or other kinds of benefits, such as enhanced human health and societal well-being. This first-cost bias is the major barrier for accelerating energy efficiency in buildings. Moreover, benefits generated from energy efficient buildings are often social or societal, while the first costs are the responsibility of building developers.

Given extremely high energy prices, why do companies and consumers fail to take advantage of the energy-efficient buildings available to them? The existence of such unrealized opportunities for energy efficient buildings implies that there are numerous market barriers (or failures), which are obstacles that contribute to a slow diffusion and adoption of energy-efficient buildings. Barriers to energy efficient buildings identified in the literature are very diverse and consist of many different types of impediments, obstacles and hurdles.

Although barriers in literature are classified in diverse ways, they can be grouped mainly into five types: 1) technical; 2) knowledge/informational; 3) institutional; 4) the investor-user dilemma; and 5) lack of interest. A good understanding of the different market and institutional barriers or failures in the energy efficient buildings movement is essential in defining potential effective best practices and policies.

How to Overcome Barriers? - Best Practices of Energy Efficient Instruments

This presentation provides findings on best practices of energy efficient instruments in the building sector to overcome various barriers, and recommends effective instruments to promote energy efficient building decision making in China. In particular, it addresses the question of how government regulations and financial incentive instruments are possible and necessary for overcoming barriers and the various policy instruments that are likely to be effective, cost-efficient and legitimate.

Based on the "quick scan" literature review, the presentation gives an introduction of the current situation of global green building policy instruments in terms of current government regulations for green buildings, economic instruments and financial incentive measures. The strengths and weaknesses of these policy instruments will be briefly described. The presentation will focus on energy efficiency codes, standard, economic incentive instruments, energy tax and tax credits. Lessons learnt from implementing these instruments in several key developed countries are also discussed briefly.

General Recommendations

Based on the findings of the "quick scan" literature review and assessment, the presentation will provide the following general recommendations for the improvement of China's green building decision making:

- ✓ A range of appropriate instruments should be selected based on specific targets and conditions.
- ✓ It is quite clear that building energy efficient instruments or policies should be mainstreamed into sustainable urban development strategies or plans.
- ✓ Building codes must be updated to reflect advances in building technologies and practices;
- ✓ More effort should be placed on encouraging code enforcement and verification to ensure regulations are effective and meeting the standards.

Towards Green Development

HU Jianxin
China Merchants Property Development Ltd.

Harmonious community development model – Shekou, Shenzhen, an integrated community development case study

Speech summary

In the past, Shekou was a desolate, infertile place. Today's Shekou is a green and harmonious international community situated between the mountains and the sea. What makes Shekou so attractive?

Shekou's attractiveness is naturally inherent, but more importantly, it is the result of China Merchants Property Development's (CMPD) 20 year practice of its "towards the most suitable place for people to live in Shekou" concept, which was initiated by Mr. Yuan Geng, the founder of China Merchants Shekou Industrial Zone. China Merchants believes in the sustainable development concept, its "home is where the heart is" mission, social responsibility, and caring for humanity. We pursue the tri-fold economic, social and environmental sustainable development theory, and we practice integration, material and spiritual combination. We aim to explore a sustainable green development route with CMPD characteristics.

CMPD's dynamic and continuous development of Shekou has made it a green and harmonious home between mountains and sea, and it has created an environmentally friendly and sustainable situation with a growing economy and a harmonious society. Here, CMPD played two roles: Business Park Developer and Green Estates Developer.

The Business Park Developer role is shown through the primary land development in Shekou's construction. Industry and housing interaction is the core of an integrated community development model: multiple functions facilitate each other, and create a social eco-system with the ability of self-regulation. Residents can live, work, shop, entertain, and have their health care and education needs met within the same neighborhood, ensuring high efficiency, low energy consumption, and low carbon emissions. The integrated community development model provides an environment with economical sustainable development, vigor, a creative culture, and a socially diverse international community. It has attracted and gathered a large number of national and international professionals, as well as attracted and grown quite a few well-known enterprises! Currently there are more than 1000 overseas students enrolled in the two international schools in Shekou.

The Green Estates Developer role is shown through Shekou's secondary land development. CMPD aims to protect the environment, to reduce resource consumption, and to reduce polluting emissions. Following the green development strategy – which was to be applicable, economical, and beautiful – CMPD integrated a green development concept which was practiced throughout the whole development process. CMPD constructed a green ecological technical system by respecting the original ecological surroundings, reviving old buildings, creating eco-gardens, and using sustainable materials, energy, and facilities.

Today, the sustainability concept has already been deeply integrated into CMPD's development history. We will keep ourselves up-to-date, will continuously explore further green development with CMPD features, and will treat sustainability as our everlasting belief and mission. Let's walk towards green development together.

Design of High Performance Green Buildings

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INTRODUCTION

In the 21st Century, the Asia Pacific will be the world's fastest growing region, and it is anticipated that over half of the world's mega cities will be in Asia. This phenomenon poses an unprecedented challenge both to governmental agencies and the community at large in these countries to conceptualize, build and manage such massive developments in a sustainable manner. One critical success factor is to adopt a holistic approach to the entire process – from the macro scale of urban planning to micro level of individual building design.

The World Business Council for Sustainable Development recently published their first report on Energy Efficiency in Buildings (WBCSD 2007). It states that buildings are responsible for at least 40% of energy use in many countries, mostly by consuming energy derived from fossil fuels. Energy use is increasing by an annual rate of more than 3% in the U.S. alone, and is growing rapidly in countries such as China and India. Worldwide energy consumption by buildings is expected to grow 45% over the next 20 years. The concern is not just about the sustainability issues related to dependency on non-renewable sources of energy, but equally if not more importantly, the impact of by-products of energy production systems on the environment and their effects on climate change. The building industry is being challenged to create energy efficient and high performance buildings and it starts right at the project inception, when the client meets the architect for the first time to formulate the design brief.

INDUSTRY MOTIVATION

It has been said that "how we are paid and who pays us determine all our attitudes" (Duffy, 1990). The building industry is no exception. Every member of the building delivery team is enraptured by his/her end product. This is evidenced by the fact that the entire vocabulary of the industry revolves around floor areas, structures, facades, "intelligent" M&E systems, etc. These are then quantified as elemental or unit cost of construction by the contractor and ultimately as rental rate by the owner or leasing agent. This is all about the building object and not about what buildings are for and how they function or perform.

Driven by potential economic gains, the industry is obsessed with finishing the job fast, using whatever methods or technologies available at that time. The team disperses and moves on to the next job, hoping never to return, as though it is a "crime scene", as some have unkindly suggested. Records are utterly synchronic and rarely extend to building-in-use. Sadly, diagnostic procedures are only called for when problems arise and litigation is imminent. Understandably, under such circumstances, the publication of information derived is restricted and hence does not benefit the general education of the industry members.

The WBCSD also reported that key players in real estate and construction misjudge the costs and benefits of green buildings, creating a major barrier to more energy efficiency in the building sector. The global survey estimated the additional cost of building green at 17 percent above conventional construction, which is more than triple the true cost difference of about 5 percent. In the USA, studies by the US Green Building Council showed that the average green cost premium versus the level of green LEED Certification varies from 0.66% to 6.5% from the basic to platinum level certification.

If people cost are factored into the economics over the life cycle of occupying the building, the numbers are even be more persuasive. There are numerous reports of success stories in the literature where owners have adopted such an attitude and approach to holistic design. The Center for Building Performance and Diagnostics (CBPD) at Carnegie Mellon University has developed an Investment Decision Support Tool (BIDS), a case-based decision support tool that calculates the economic value-add of investing in high performance building systems, based on the findings of building owners and researchers around the world. About 300 case studies have been identified that link quality building materials, components and system choices with life-cycle building and occupancy benefits.

Introduction of any new process or product into the building industry will inevitably generate uncertainty and risk, which is reflected in the initial cost premium associated with its deployment. However, having a consistent, comprehensive and "sustainable" building delivery framework will help significantly in managing these risks. Furthermore, it has been observed that as the number of green projects continues to increase, the acquisition of experience and knowledge will lead to a decline in cost over time.

PRESCRIPTIVE VERSUS PERFORMANCE-BASED DESIGN

Every building project starts with a brief. This is a very important document as it sets the framework and performance benchmark for the entire process. The quality of the end result will be affected by the comprehensiveness and clarity of the brief. We are more likely to get what we want if we know what we want. Therefore it is worthwhile spending some time and resource in formulating this upfront.

In the past, we accepted rule-of-thumb solutions with "static" singular indices within each domain that purportedly represent the "common average" conditions because it was technically prohibitive to perform in-depth dynamic design analysis, due to the lack of local data and knowledge, and costly in time. With rapid advances in computational technology and reduction in cost, coupled with ongoing data acquisition on local environmental conditions, we are in a better position to embark on relatively more detailed and accurate computational design analyses according to a performance-based approach (Lam et. al 2002). This will help in refining the decision making process, giving designers certain flexibility in meeting performance requirements of an environmentally responsive building.

TOTAL BUILDING PERFORMANCE CONCEPT

To illustrate the performance-based approach, there is a-well established model based on the Total Building Performance (TBP) concept. This concept was originally advocated by a team at Carnegie Mellon University, USA in the early 1980's (Hartkopf, et. al., 1986) and applied to several projects in North America, Europe and Asia. For example, it has been adapted and

contextualized for Singapore by the Centre for Total Building Performance at the National University of Singapore and applied to some award winning projects such as the National Library Building, and the Urban Redevelopment Authority Building.

TBP is an integrated and holistic knowledge-based framework for conceptualizing, specifying, designing, analyzing and commissioning a building project. It can provide a comprehensive brief for a client as well as the project team who are committed to quality and high performance throughout the project duration, from inception to completion, and can even extend to post-occupancy management and maintenance. TBP is not just about the application of "hi-tech" building systems and/or materials. TBP seeks to rationally and systematically exploit the synergy of the various relevant technologies and management know-how to bring about desirable building performance at a reasonable cost.

The TBP concept embraces six principal performance mandates, namely, **spatial, acoustical, thermal, visual, indoor air quality, and building integrity**. Each mandate comprises a set of performance metrics/targets which are occupant-oriented deliverables that pertain to the environmental or physical attributes of the building which impact the physiological, psychological, social and economic well being of the occupants. These mandates encapsulate the comprehensive range of environmental factors which we should consider in the design process. Associated with these mandates are diagnostic methodologies developed for the appraisal of the building design in terms of the various performance indices.

Instead of a singular target figure often found in the prescriptive approach, the performance concept requires the definition of a 'comfort zone' for each performance mandate. Limits of acceptability should be established depending on occupancy type and requirements for four major human and societal conditions, namely, their physiological, psychological, sociological and economical (resource management) needs. There are close inter-relationships between the design mandates and the limits of acceptability.

Adopting the TBP model will facilitate a holistic approach to mapping the environmental performance requirements to the occupant requirements. The same model can be consistently applied in the brief development stage as well as the design evaluation stage. It can also be incorporated into the tender specifications to ensure the objectives are clearly transmitted to the bidders and bid submissions can be objectively evaluated. This practice should be encouraged as it explicitly recognizes that the lowest price may not be the single best criterion for awarding a contract if it compromises on fulfilling stated performance requirements.

INTEGRATIVE DESIGN AND CONSTRUCTION PROCESS

The ultimate success in delivering environmentally responsive buildings depends as much on the construction process as on the design specifications. It is crucial therefore to effectively communicate the integrated design intentions behind the systems selection (namely, structures, enclosures, M&E, interiors) to the prospective contractor, particularly under the normal design-bid-build process as they often impact the delivery of multiple building performance mandates concurrently.

These informational matrices of inter-relationships need to be translated into project-specific specifications and incorporated into the contractual documentation. They will serve as

checklists for evaluating appropriateness of system implementation in delivering the performance mandates, particular in instances where the contractor may recommend certain variations or alternative proposals to the design during the construction phase.

CONCLUDING REMARKS

To compete successfully in the new global economy, providing world-class infrastructures and high performance buildings to accommodate and support the various economic activities is no longer an option. In the face of rapid changes and advances in technology, sustainability is a key issue to contend with. Buildings must be adaptable to changing requirements and consideration of life cycle cost competitiveness will become more important than mere concerns of first cost.

Performance-based design can only achieve its maximum benefit when it is deployed right from the project inception stage, with dedicated support from the multi-disciplinary professional team. It must first establish a clear set of performance targets. This will facilitate optimization of the design for performance, avoidance of conflicts, elimination of omissions and abortive work, and wastage of resources. Specification of the building elements and systems are only means to mediate between the external "uncontrollable" environment and the internal "controllable" environment to achieve the desired conditions and functionality in a building. Proposed design solutions should be evaluated using the most appropriate techniques or tools that will take into account the specific macro and micro climatic and environmental conditions on site. This will at least help to surface any potential problem before it becomes a costly remedial exercise (if it is at all possible) after the building is constructed.

Knowledge and integrated teamwork are clearly essential ingredients within the strategic framework for success in developing future high performance buildings.

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Putting Green Concepts into Practice With Innovative Green Building Design

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In construction, we prefer not only green design, but also green concepts. We think this is the only path to sustainable development.

Construction and buildings consume half of our natural resources, produce about half of our solid waste, and use most of our drinking water. Each year, hundreds of thousands of hectares of forest and farmland have been developed. As urbanization accelerates, construction consumes more energy and resources year by year. The problems we face now mean that we cannot simply copy the experience of developed countries. Green building through recycling materials is a trend in the construction industry. We need to deeply consider how to accomplish this goal scientifically.

Green building means maximizing resources—energy, land, water and materials— protecting the environment, and reducing pollution in the lifetime of a building. Green buildings have to be livable, efficient, and healthy for inhabitants. Meanwhile, the green concept means considering construction from the perspective of caring people, saving resources, and a friendly environment, so that the city can have sustainable development and coexist with nature. The green concept includes three key factors: first is balance of various spheres: technology, politics, economy, climate, and culture. We may not be able to achieve perfection of each realm, but we pursue the best integration. The second key factor includes integration of both time and space. Integration of time means considering the lifetime of a city, from planning to building, to managing and updating. Spatial integration means making sure that the impact of the city or a building on the natural environment is considered from a global perspective. The last key factor includes three smaller ones: a comfortable and healthy living environment, minimal consumption of natural resources, and a minimal impact on the environment. In conclusion, the green concept will lead to significant changes in building design in all areas of thought and action.

Green building design requires delicateness and suitability, aside from creativity and balance. “Delicateness” means using the normal technology delicately. “Suitability” means using suitable technology. Additionally, green building needs to combine digital tools, scientific decision-making, and efficiency testing.

We practiced green building design in Long Gang, the New Sport Town Community. The government developed Long Gang to compensate farmers whose land it imposed on. Expenses were tight. To coordinate with the construction of the Universidad Sport Center, we were short on time. Furthermore, due to their complicated origins, the tenants asked for lots of complex functions. So accomplishing green design under such conditions became a big challenge. In the end, we finished the integrated design, using suitable new technology, and achieving the green goal of cost-effective technology for energy efficiency. This project became one of the earliest demonstrations of renewable energy and was awarded by the National Economic Bureau and Construction Bureau in 2006. Currently, the first phase has been finished.

In recent years, we have completed about 2,000,000 square meters of green design and consultancy projects. They include Zhenye Town in Shenzhen, the first group of green building demonstrations in China; the Tai Yuejin River Community of Wuhan; the fourth phase of Vanke Town, the first group of green building demonstration projects in China; the Software building of Shenzhen; the Ting Quan house of Shenzhen; Xinyu of Hangzhou and the headquarters of our company, which is also one of the first demonstrations of renewable energy, awarded by the National Economic Bureau and Construction Bureau in 2006.

In our opinion, what you think determines what you do, and the concept determines the path to a solution. We believe that the green concept will transform urban planning and development.

The Development and Planning Guidelines for Bus Rapid Transit in China

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With the rapid development of China's economy and society, the public is eager for a more diversified and higher quality public transport system, which can offer quick, comfortable, economical, and flexible services.

The conventional bus system faces challenges from the changing characteristics of public trips. Characterized by large capacity, quality service, low investment, and high efficiency, the planning and construction of Bus Rapid Transit (BRT) systems is experiencing remarkable growth as a viable transportation mode in China. Many mega-cities in China have deployed BRT planning, design, or construction, including Kunming, Beijing, Hangzhou, and Jinan. Moreover, the first BRT system in China, which opened in November 2005 in Beijing, has experienced satisfactory performance.

Development of BRT in China

Based on the review of international BRT development experiences and Chinese conditions, three aspects of development – definition, function, and adaptability – are emphasized to promote healthy development of BRT in China,

1) *The definition of a BRT system*
BRT is a comprehensive mass transit system with dedicated lanes. It flexibly integrates specifically designed stations, operations, customer service, and use of Intelligent Transportation System (ITS) to offer reliable, speedy, comfortable, and low-cost services.

The definition delineates three basic characteristics of BRT. Firstly, BRT systems should receive priority in land use decisions, facility planning, and financial investment. Secondly, BRT is a comprehensive system that integrates facilities, and advanced management and customer-oriented operations. Thirdly, BRT is a flexible system that can include varying components depending on a city's scale, economic status, spatial layout, and development stage.

2) *The functions of BRT system*
According to a review of overseas BRT development and operations, BRT has three basic functions:

1. BRT is an important public transit mode. The BRT system can be treated as an extension, supplement, or connector for the metro system in metro-based cities. BRT can also be viewed as a public transport mode linking the metro system and regular bus system.

2. BRT can bring about consumer market development, guide land use, and lead to new layout for urban spaces.

3. BRT can improve urban public transport services, city reputation, and protection of historic urban areas.

3) *The adaptability of BRT system*

1. City scale, economic status, spatial layout, development stage, and corridor and road construction plans should be taken into considerations during BRT implementation.

2. A BRT system is an inextricable component of the overall public transport system, along with the railway and conventional buses.
   a) Most Chinese cities have well-developed conventional bus networks. BRT system implementation should focus on its flexibility to operate as one part of the public transport network.
   b) Different BRT operating modes, including direct and trunk-feeder BRT, should be adopted to improve the corridors' efficiency. BRT corridor selection should be customer-oriented and should not be restricted to specific road types. Priority should be assigned to BRT corridors over private cars. Private vehicles should be directed to proceed along nearby roads when necessary.

Guidelines for BRT Planning and Design

Due to a shortage of domestic implementation experiences, there is still uncertainty about the role of BRT among city governments, planning departments, and operational units. There are significant differences in their understanding of the adaptability of BRT. Guidelines for BRT planning, design, construction, and operation can promote healthy BRT development in China.

The guideline for BRT planning and design includes six technical elements: system planning, BRT-dedicated lane design, station and depot design (including pedestrian crossing facilities), operation design, ITS design, financing policies, and ticketing guidelines. These elements are laid out in the general regulations, principal design content, a technical index, and three case studies.

The general regulation includes terms and definitions, classification and functional role, planning or design procedures, and design objectives and principles.

The principal design content and key technical index involves detailed illustration of such BRT elements as bus exclusive lane design, for example, with a comparison of central bus exclusive lanes, roadside bus exclusive lane, lane widths, exclusive lane closure, and intersection traffic organization.

Case studies examine the specific planning and design content of successful international BRT projects, to supplement the guidelines and to offer effective practice experiences for reference.

Transit Oriented Development Strategy in China

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Abstract

Climate change, energy consumption, economic growth and traffic congestion have become common challenges facing every country in the world. Amongst all the strategies to meet these challenges, decreasing reliance on the automobile is a strategy that can be met with consensus. Undoubtedly, Transit Oriented Development (TOD) strategy can be regarded as one measure to decrease reliance on the automobile. This research asks how to promote TOD in China, focusing on policy, the national level and the real situation on the ground.

China's situation is different from those of other countries in many aspects, including urban spatial structure, motorization, and cultural background. Firstly, in terms of urban spatial structure, China is characterized by rapid expansion through mostly new development, while in Europe and America development of the already fixed spatial structure is characterized mostly by regeneration and renewal. Secondly, in terms of motorization, in China, the current issue is to shape the structure for car development, with this shaping process now underway, while in America the main challenge is making a U-turn from automobile oriented development, and for European countries it is maintaining public transit development. Thirdly, in terms of social, economic, and cultural background, in China people exhibit different decision-making styles from those found in other countries.

Although the TOD concept in most countries can be regarded as including common features such as mixed land use (commercial and residential), high density development (higher FAR around transit stations than in other areas), design focused on green transport modes (walking and bicycling–focused design), and open space design (convenient walking spaces, easy access to transit), in different countries there should be different ways to reach the same goals.

When we think about TOD it should not only be regarded as a design measure, but also has to be considered as a principle for us to obey at the planning level. The most important point, which cannot be neglected, is that we should consider people's demands and put function first in order to attract more people to choose public transport. While typically nodal in form, TOD corridors and transit villages have taken or are beginning to take shape. For China, each of these new forms should be focused on and considered to shape people's decisions; a fundamental point is that these TOD forms, with scopes as yet to be determined, should seek to have more integrated functions.

The first step for us in obeying the TOD principle is using China's statutory planning regulations to promote TOD strategy. Without considering the national planning regulations a valid and appropriate strategy cannot be set out. In China the planning procedure is divided into two processes: creation of the master plan and of the detailed plan. We can promote TOD strategy by using four aspects of the master plan: through reinforcing the position of public transport in the urban transport strategy; through using the issue of city center and district center location to stress the need for transit station support; through considering the

differences in the land layout plan's density figures depending on whether or not there is transit support; and through looking at transit support as a baseline for affordable housing in the housing plan. In the detailed plan we can give different density or functional layout guidelines to areas depending on whether or not they have transit station support.

The second step in promoting TOD in China is setting out a partnership action plan program to discover a method for implementation. The partnership action planning process will differ from normal planning processes in four ways. First is the scope of the plan, which will be defined by taking the transit station as central and considering provision of integrated local service functions for residents. Second are the participants: the partnership action planning process will together involve residents, local firms, transit agencies and local government. Third is the aim, which will be to reach consensus among different participants in the planning process not only on regulation, but also on implementation. The fourth is content; the partnership action plan will focus on factors such as public space, public service centers, walking space, and other public needs.

The third step in promoting TOD in China is to set out a fiscal support policy to ensure that projects are implemented through public-private partnerships. This policy will focus on how to distinguish between project aspects which need to be publicly financed and those that need to involve the private sector, and also on how to distribute duties and responsibilities amongst the involved parties.

Our research has just begun. In future, using detailed surveys and in-depth analysis, we plan to set out an integrated policy framework to promote TOD strategy in China. As Chinese experiences with TOD accumulate, new lessons and improvements on existing knowledge will no doubt be forthcoming. We can weigh the outcomes carefully to advance further practice of TOD in China.

Making Chinese Cities World Class for the 21st Century

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With inputs from Karl Fjellstrom, Deputy Director, ITDP, and Luc Nadal, Technical Director for Urban Revitalization, ITDP

Global Economic Trends and their Impact on Global Cities

As China has joined the ranks of economic superpowers, Chinese cities could join the ranks of world-class cities. What it means to be a world-class city has changed since the Post World War II era. In the 1960s, a world class city needed to have impressive limited access superhighways which allowed wealthy and middle class people to move out to large houses in suburban areas with a big parking garage, leaving all the air pollution, crime, and congestion of the city behind, at least in the evening. In those days, the US was the global economic hegemonic power, and we kept the global economy moving in part by consuming large amounts of automobiles and suburban housing. The auto industry represented somewhere between 20% and 30% of the US economy in those days. As a result the US has only 5% of the world's population, but it consumes 26% of the world's oil, generates a quarter of the world's CO2 emissions, 90% of our trips are made by private car, and we kill about 50,000 people a year in roadway fatalities. Many cities around the world took inspiration from US cities, and problems of air pollution, oil dependence, auto dependence, and traffic congestion spread to many cities around the world.

Heavily government subsidized investments into roads, and the growing use of automobiles by consumers, created the conditions where mass retailers like Wal-Mart and Carrefour, who externalize their travel cost onto the consumers, and have powerful monopolistic control over suppliers, have a distinct economic advantage over smaller scale indigenous retailers. In socialist and formerly socialist economies, this has led to these mass market retailers rapidly taking control over more than 40% of retail market in some countries (Argentina, Czech Republic, etc). Their influence in China is significant, and they are about to enter India.

China has made large strategic investments in its automobile industry, and this industry is doing well, and likely to become globally important. Mayors in China, rewarded for GNP growth, have invested heavily in roads, and the impact on growth to date has been impressive. These economic gains, however, need to be balanced against the negative social and environmental impacts that all this road construction causes, particularly the construction of roads in dense urban areas, with adverse impacts on air quality and the quality of life.

From the US to China, however, the world and the economy have changed dramatically since the 1960s. Smaller businesses are working together to convince city governments to focus more investment on revitalizing city centers, where local firms have competitive advantage over foreign big box retailers. Younger people are finding life in the suburbs to be alienating and boring, and upper income people are moving back to city centers which are more exciting, offer more cultural amenities, and have historical neighborhoods that give people a sense of identity in an increasingly alienated and globalized world. Despite the attacks on the World Trade Center on September 11, 2001, the population of New York City proper has been growing faster than at any time since the 1940s. Oil has become more expensive, and

many experts believe oil prices will triple by 2020. Hurricanes are hitting the US with alarming regularity, making people believe that climate change really is a problem. While the oil and automobile industry remain powerful, they are no longer as pre-eminent as they once were: information technology, bio technology, tourism and entertainment, and other service industry firms have grown in importance relative to automobiles. These new industries thrive on access to happy, cooperative, intelligent, and inexpensive young people, who tend to be attracted to exciting, humanized urban environments. These underlying economic changes are increasingly manifesting themselves on the streets of world-class cities.

Today, world cities, those that are the command and control centers of the global economy, like New York, Tokyo, Paris, London, these cities are changing dramatically. These 'world cities' are successfully managing to balance the economic needs of the largely declining automobile manufacturing industry with the needs of livable and clean cities. By carefully regulating vehicular emissions, and carefully regulating the use of automobiles in high density urban environments, while improving mass transit, walking and cycling facilities, these world cities are creating the proper milieus of production which are key to attracting the cutting edge knowledge-based industries that will be predominant in the 21st Century. One of ITDP's donors, for example, handles two percent of the transactions on the New York Stock Exchange through the internet. His offices, full of brilliant and energetic young people, are in downtown New York, and most of them bicycle to work.

This brief paper reviews these major urban changes that are taking place.

Tearing Down Urban Highways

An increasing number of cities are tearing down the very same urban highways that they built in the 1950s to the 1970s. Urban highways often require the relocation of tens of thousands of people. In China, they generally receive good alternative housing, but often in locations less convenient, farther from friends and family, and less desirable for everyday life. This is stirring up some unhappiness. These blighting urban roads also damage the quality of life in the surrounding neighborhoods. The elevated ring road in Guangzhou is within 100 meters of 5 hospitals and many high-density apartments; something that would not be allowed in US or European cities due to the adverse impact of concentrated emissions and noise on human health. China is not alone in this. US cities did the same thing in the 1950s and 1960s, and it led to rioting and urban unrest. Mexico City and Santiago de Chile both built damaging urban highways in the last ten years, and Indian cities are building highway flyovers as fast as they can build them.

Seoul, Korea won the Sustainable Transport Award in 2006 because it is Asia's most radical example of re-orientating a transportation system. Korea is selling a lot more cars in the US than China, but Seoul tore down a blighting highway over the most important river in the city center. The city grew up around this river, and it had been buried under concrete since 1965. They had spent over $100 million and 20 years of work constructing it. In 2005, they tore it down, and they put in Bus Rapid Transit on parallel surface streets. This has led to unprecedented increases in the real estate values of the downtown properties. Real estate along this river used to be some of the poorest in the city, as nobody wanted to look out over a highway. Today, these buildings look out over a beautifully cleaned and redeveloped river park which has become a national tourist attraction. San Francisco's Trocadero freeway collapsed during the earthquake and decided not to rebuild it. Boston buried its urban

highway, one of the most expensive construction projects in history. Milwaukee tore down an urban expressway, and New York City is considering tearing down the Sheridan Expressway. While the US and other countries are still building highways in suburban areas, nobody has built a highway in a dense urban area in a major US or European city in three decades. This is something you only see in India, Africa, and China.

Rivers and waterfronts are particularly valuable cultural assets, because people like to walk along them. Shanghai did a great job revitalizing its waterfront. Rivers and waterfronts create great opportunities for new bicycle and pedestrian facilities because there are no turning conflicts with motor vehicles and they can be used for recreational purposes as well as for transport. It is not a bad thing to provide cycle trails for recreational purposes. Our trip to work should feel like recreation, why not? England has a national network of bike paths, so does the Netherlands. Why not great bike and pedestrian and cultural facilities along all of China's major rivers and the Grand Canal? A grand, human gesture of this sort might go a long way to counteract the negative publicity of the inhuman monumentalize represented by some of China's mega projects.

In 2007, Guayaquil Ecuador won the Sustainable Transport Award in large measure because of their remarkable waterfront redevelopment. This formerly blighted industrial city has experienced an amazing renaissance due to the beautiful pedestrian and bicycle promenade along its waterfront, complete with cultural amenities.

The Global Bus Rapid Transit Phenomenon

Bus rapid transit (BRT) has also become an unprecedented global movement. BRT has been around since 1974, when it was more or less invented in its current form by Jaime Lerner, the former Mayor of Curitiba, Brazil. It was during the first oil crisis. At that time, BRT did not become a global phenomenon until the 21st Century. Bogota, Colombia built the first BRT system with a capacity comparable to the world's best metro system in 2001, making people see BRT as both complimentary and also a viable alternative to far more expensive rail based modes. Today, in Asia alone, there are eleven systems under development in India. The system in Seoul, (2005), does not have all the amenities of a 'full' BRT system, but it is working well. Jakarta, Indonesia has expanded this year its TransJakarta BRT system (2004) to 97 kilometers, carrying around 200,000 daily passengers, and by January of 2008 it will add another 170 kilometers. It has a lot of operational and design issues, but it will be the biggest system in the world by 2008. Mexico City's BRT system opened the same year, and is carrying 250,000 daily passengers. The Mayor has already finished constructing a second line, and three more lines are in the detailed planning stage. By the end of the Mayor's administration, he has promised 10 lines. Beijing opened its BRT system shortly afterwards, and Hangzhou and Kunming also have BRT systems. Chengzhou has a BRT system under construction. Xian, Jinan, and Guangzhou are all in the detailed planning stages.

ITDP is directly involved in Guangzhou, with our partners from the Construction Commission and the Guangzhou Municipal Technology Development Corporation. If built according to plans, it will have more than 20,000 passengers at the peak hour alone, making it by far the biggest and highest capacity BRT system in China. Some unique features include bike parking facilities at the stations, bike lanes along the entire corridor, and a BRT-only elevated roundabout at an intersection that allows for a high speed zero conflict four way intersection within a fully grade separated environment. Something similar exists in Bogota, but it is off the corridor, and Guangzhou's will be the first real BRT only roundabout that I

am aware of. Careful integration with the Guangzhou metro is another world-class innovation being planned. Integration with the metro ensures that the system will compliment rather than threaten the metro network. This does not mean that the metro construction interests have not tried very hard to resist and scale down the project but it does mean the metro will benefit from higher ridership when the system opens, and passengers will benefit from a larger network of integrated high speed high quality mass transit options. The Guangzhou BRT will also be innovative in that it is a hybrid between the 'closed' trunk and feeder systems like Bogota and Curitiba, and the 'open' systems like Sao Paulo and Seoul. Guangzhou's BRT will combine the off-board pre-paid platform level stations, with buses that will operate both within the BRT system and in mixed traffic to minimize transfers and the need for large transfer terminals.

Increasingly, new BRT systems are passing directly through congested city centers, often on streets that are closed to all traffic except buses and pedestrians. These new BRT streets are completely redesigned to have all the best urban amenities, with beautiful trees, street furniture, innovative lighting, public art and other beautification measures. Guayaquil, Ecuador, and Perreira, Colombia, are outstanding examples of BRT systems in smaller, high-density cities with BRT routes passing through dense historical centers. In Guangzhou, we have also planned one stretch to be a transit mall.

BRT is no longer just a developing country phenomenon. Paris, despite being the capital of a country where rail giant Alstom is based, has already built 3 BRT lines, and 150 more are planned in the greater Paris metro area. Paris' Mobilien' BRT system passes down dense urban boulevards, and in some places where speeds are slow, the bus lane is shared with bicycles. This combination seems to work fine in relatively slow speed sections of the BRT system, where bus frequencies are not that high. Experience from Mexico City and Curitiba shows that bicycles will tend to encroach on bus lanes anyway in such sections if quality bike lanes are not provided. Paris has also done some great small-scale bus priority measures for low floor minibus circulators for the very narrow downtown streets. Los Angeles' Orange Line is probably the best BRT system in the USA, with Pittsburg a close second. New York City also has plans for 5 BRT corridors that are in the advanced design stage.

Both metro and BRT systems, if they are married with changes in zoning laws, will lead to transit-oriented real estate development along the transit corridor, that will ensure that many people will be well served by the mass transit system for decades to come. Curitiba's BRT system, which was coupled with up-zoning in the BRT corridors, is a great example of this. Chinese cities seem to rapidly increase in density around virtually any new transit investment due to the rapid growth of the cities.

Congestion Charging

The next major breakthrough has been with congestion charging. Again, back in the early 1970s, again contemporaneous with the first oil crisis, Singapore created the world's first 'area licensing' plan. At first drivers paid to have a special sticker on their windshield that allowed them to enter the city center. It was enforced by police standing at the gantries which marked the charging zone. Since then it has been upgraded to 'electronic road pricing.' Each car has to have a smart card inside with a transponder, and whenever the vehicle passes a cash point, the fee is deducted from the cash card. Cameras on the gantries also take pictures of the license plate of violators. This was easy to do in Singapore because it was an island state, so everybody in the city was more or less from the city. If you were

from out of town, you could pick up the cash card and transponder at a few locations on the highway.

Few other major cities copied their example until 2003, when London was the first major city to follow suit. People believed that it could not be implemented in a democracy. London Mayor Livingston staked his political career on proving everybody wrong, and he won. London charges £8.00 to enter the city center. Cameras are used to identify the license plates of everyone entering into the charging zone. Everyone has a responsibility to pre-pay the fee through a variety of payment methods including on-line and cell phone use of credit cards. If you pass a camera in the zone and you have not paid the fee, the computer will know that you have not paid the fee, and then you have until midnight to pay the fee. After that you are fined up to £250 for non-payment, and if you don't pay the fine you lose your license. Congestion dropped by 25 percent, and the charge raises £123 million a year for mass transit improvements.

Soon after London, Stockholm implemented a congestion charge. Stockholm's congestion charge is more similar to Singapore. It was implemented temporarily in 2005, and after six months it was suspended until voters decided whether to keep the system or not. Though initially against the idea, in the referendum voters to decide to reinstate the system.

In the United States, in April of 2007, New York City Mayor Bloomberg announced he too was planning to implement a congestion charge. The current plan is to charge anyone entering Manhattan south of 86th Street $8. It faces a vote in the State Legislature in March and then in the City Council in March of 2008 before it can be implemented, but it is the most advanced congestion charging proposal in the United States. San Francisco is also studying the possibility.

Elsewhere, China's Nanjing and Shenzhen are both exploring congestion charging. Bombay is exploring Congestion Charging. In Sao Paulo, a detailed study was completed in 2004 under the former Mayor Martya Suplicy of the workers party (PT), but it was suspended when she lost a re-election bid. It is again being discussed by both major political parties, but is unlikely to be implemented until after the next Mayoral election. Mumbai, Bogota, and several other cities around the world are also studying the option.

Cities that are not implementing congestion charging are turning to other options to regulate private motor vehicle traffic. Many cities, like Mexico City, are increasingly regulating on street parking and charging commercial rates for on street parking. This is standard practice in most of Europe and in an increasing number of US cities. The creation of traffic cells, re-routing traffic out of town centers by changing through streets into streets that do not allow drivers to pass through the center are increasingly used all over Europe.

One thing is certain: congestion pricing and other market based mechanisms for making sure that motorists pay the full social costs for the privilege of driving in a city, are the wave of the future.

Improving Public Spaces

Another major trend in global cities is the dramatic expansion and improvement of public spaces. Copenhagen has some of the world's best public spaces. In 1962, all 18 historical squares in the town center were functioning as parking lots, and there were no pedestrianized

streets. Today, all of them have been pedestrianized. There were zero square meters of pedestrian zone in 1961. Today, there are 95,750 square meters of pedestrian space in Copenhagen.

This idea is taking off well in China. Most major cities have a pedestrian area now. However, given the high volumes of pedestrians, and the popularity of these pedestrian zones, every major district in Chinese cities would like a pedestrian zone. Creating integrated, pedestrian routes is the logical next step.

Making great public spaces, however, is not just about getting the cars out. It is also about how to make public space work. Jan Gehl Associates, close collaborators of ITDP, have spend the last 20 years perfecting the science of public space, and have played a key role in the reinvention of Copenhagen and Melbourne, and they have recently been contracted by Sao Paulo and New York city to lead public space revitalization efforts in these great cities.

Jan Gehl's team marries architecture with human behavioral psychology. They study human interaction in public space, and determined that people interact best when:

- **They are not divided by walls**
- **Distances are short, and streets are narrow**
- **Vehicles move slowly and people move slowly**
- **Elements of interest are all at the street level, the human scale**
- **When public space is designed so that people face other people rather than blank walls.**

ITDP worked with Gehl Associates to analyze why a famous Pedestrian zone in Sao Paulo is not popular and filled with vagrants. The reasons were primarily because the area was inaccessible by pedestrians, and the street facades are mostly blank brick walls.

These alienating street facades are a major problem in China, particularly in the large housing estates which many people feel a bit alienating. There is a great area in Guangzhou where the surface level of the housing estate has been turned into ground level cafes, and the area landscaped with trees and street furniture. This has become now a very pleasant and fashionable area, despite the otherwise dreary buildings looming overhead. Hungary's 9th district has done similar excellent work with outmoded, inhuman housing stock, widening inner courtyards, and creating wonderful children's playgrounds.

Making public space work is not only about the physical design. Like with a BRT system, the management of the space or the system is as important as the original design. Bogota built some great public spaces, but it didn't do much to put the maintenance and control of this space into the hands of people who will take care of it. Sometimes district governments do a great job with public security, maintaining street furniture and other public amenities, and with cleaning up garbage. Unfortunately sometimes governments do a poor job in these tasks. In the US we have solved this problem by creating public private partnerships with businesses and merchants who pay a small tax to an association they partially control, and this association maintains the street, provides additional street cleaning and security guards, and holds events that attract people to the area. Sometimes there are a lot of old deteriorated buildings, and the government needs to take them down and assemble land into bigger plots and prepare modern infrastructure in order to attract new developers with clients. One of the most successful such public private partnership is the Times Square Alliance, and its

government counterpart the Empire State Development Corporation's 42nd Street Partnership. Together, they turned Times Square from a district notorious for pornography and drugs, giving all of New York a bad reputation, to being one of the safest and most popular destinations for tourists in the city, and a huge magnet for real estate development.

Violent crime in Times Square dropped 90%, property tax revenues increased by 50%, office space by 50%, hotel rooms by 30%, and pedestrian flows by 100%. Dealing with the flood of pedestrians has led New York together with the Partnership to redesign Times Square to radically expand the pedestrian space. There is a real possibility that part of it will be pedestrianized by 2008.

These partnerships, called Business Improvement Districts in the US, are organized into the Downtown Partnership, which has information and programs. There is also the US Trust for Historic Preservation, with whom they frequently collaborate.

Full pedestrianization is not necessary to make the streets friendly to pedestrians. Traffic calming, which uses planters and irregular parking patters to slow traffic speeds, can effectively make a street that was unpleasant and unsafe to walk and cycle, perfectly safe with normal mixed traffic.

The most recent innovation is called 'shared streets.' Shared streets, a concept really pioneered by Dutch highway engineer Hans Monderman and propagated by his British Associate Ben Hamilton Bailey, simply redesigns a street open to cars to look like a pedestrian mall. When a car enters a street redesigned to be a pedestrian space, they have found that motorists drive extremely slowly, like guests walking into a living room with muddy boots on. The same team have removed traffic lights from intersections on fairly small streets, and they have found that this significantly reduced traffic accidents, much to everyone's surprise. While the most famous 'shared streets' are in Denmark and Holland, we found some excellent shared streets in Guangzhou. We do not know what the intention of the district government was, whether it planned to pedestrianize fully the road or not, but it works pretty well even open to traffic. This can be a nice approach when access by vehicle is important but slow speeds are also important.

Cities with hills are doing some very interesting and innovative things with escalators and elevated pedestrian walkways. Hong Kong has an escalator that leads up into the hills, and the restaurants and bars around it have become some of the most popular in Hong Kong, particularly due to its proximity to streets pedestrianized in the evenings. We are trying to introduce similar escalators in hilly Sao Paulo. Hong Kong's elevated walkway infrastructure has also created an amazing and unusual type of public space, where mostly immigrant domestic workers congregate on weekends to have picnics.

Bicycles

While many Chinese cities have spent most of the last decade removing and narrowing what were once world class bicycling facilities, the tide seems to have turned, and some cities are again building bicycle lanes.

Other major world class cities are also embracing the bicycle in historically unprecedented ways. As China currently controls more than 50% of global bicycle production, this should be good news for Chinese manufacturers.

Copenhagen, which is one of the most pedestrian friendly cities in the world, is also one of the most bicycle friendly, with 36% of all trips made by bicycle. Only China and the Netherlands have cities with similar level of bicycling. This was not always the case in Denmark and Holland. Cycling recovered from very low levels in the 1960s, and continues to increase its mode share today.

New York City's Mayor Bloomberg has announced that he will build 200 miles of Grade A cycling facilities, and some of them, like the West Side Bikeway, and the 9th Avenue bikeway, are already in operation. Cycling in New York has increased by 100% since 1985, though from a very low baseline (less than 1% of trips). Bogota, of course, famously built 350 km of great cycling facilities, and increased bicycle mode share from 0.5% to 5% in only 5 years.

Paris has made remarkable progress re-introducing cycling. Particularly interesting is the Paris Bike Sharing program, called 'Velib.' Velib, which replaced 6000 car parking spaces with places to park securely a shared public bike, attracted over 1 million riders in the first 18 days of operation. These public bikes are rented to anyone who has a credit card, and they can rent them for free for half an hour, but they must return them to another bike parking station or they lose their deposit. Velib is the biggest bike sharing program of its kind in the world. It was implemented by a private company, Decaux, who actually makes all their money not off the bike program but from a contract with the city to sell advertising on the city's many advertising kiosks. Decaux also maintains the street furniture. It is an interesting contracting innovation that may be worth exploring in China.

In the US, there is another NGO called Bike Station that creates very fancy bicycle parking facilities at major destinations. These are designed by famous architects, and provide a place to securely park a bike, rent a bike, buy a bike, repair a bike, drink a coffee, and get bike related information. They are generally operated on city land so the operator doesn't have to pay rent (bike parking is not that profitable), but then operate more or less along commercial lines. China has enormous bicycle parking facilities, but they lack the architectural panache of Bike Station. Perhaps Chinese cities should turn their bicycle parking facilities into places of civic pride, with top quality architecture, symbols of a new attention to human scale travel, rather than just leaving bike parking to ugly on-street parking. There are examples of beautiful bike parking facilities all over Europe.

China, of course, still has the best bicycling facilities in the world. This is something that Chinese cities should be proud of. I am going to highlight some excellent, world class cycling facilities in China that ITDP and the rest of the world have studies and are emulating in other countries.

China has the highest volumes of bicyclists in the world, so it is the only place where one can study bicyclist behavior at such volumes. Hangzhou's new BRT system has very nice cycling facilities. China's fully grade separated bicycle intersections, many of which are being encroached upon by motor vehicle traffic in East coast cities, are still unique in the world for providing a car-free cycling environment through a major highway interchange. This design was emulated by Bogota bicycle planners, who built the only similar facility we are aware of outside of China. The handling of large volumes of bicyclists through intersections is not always done well, but Chengdu and along the BRT corridor in Kunming, huge volumes of cyclists are moved through intersections in a reasonably well regulated

manner safely every day. We are studying these intersections for application in India and other cities with similar bike volumes.

Bike, Pedestrian, and Transit Oriented New Towns

In the 1950s urban planners and architects developed some entirely new towns. Most famous are Chandigarh in India, designed by Le Corbusier, and Oscar Niemeyer's Brasilia. Perhaps one would include Columbia, Maryland designed by the Rouse Corporation. These are examples of the 1950s-era auto-dominated urban paradigm of the time. These cities have their admirers and their detractors. Both are heavily dependent on private automobiles and motorcycles. Neither turned out to the urban paradise imagined by their designers.

Critics of these auto-dominated urban paradigms have started to develop new 'greenfield' new town developments that run counter to the aims of Brasilia and Chandigarh. Architects usually called the "New Urbanists" changed direction. Peter Calthorpe began in the 1990s to develop "Pedestrian Pockets", urban communities built around minimizing walking times to a central transit hub. Andres Duany and Plater-Zyberk developed Seaside in Florida to mimic the charms of small town America. In Holland, the small town of Gouten, on the outskirts of Utrecht, was designed with roads for motor vehicles only on the perimeter of the settlement, while all trips within the settlement are non-motorized, creating an extremely safe environment for children. Many of these Greenfield developments achieved their transport sector aims, but they also tend to remain a bit lifeless, somehow lacking the organic quirkiness that makes cities interesting.

Nonetheless, new town planning is being discussed again in several places around the world. Colombia is thinking about building a new town outside of Bogota, which they plan to design as a completely ecological city, designed around bike lanes and mass transit hubs. The Metrovivienda low income housing projects designed in Bogota under the Penalosa administration went a long way in this direction but were not that well integrated with the TransMilenio system. Sao Paulo is also thinking of an ecological new town for the more than 100,000 people they plan to relocate from a flood plane.

Many Chinese cities in the Pearl River Delta were almost non-existent 20 years ago, and have grown to be megacities. These new town designs have been more heavily influenced by the sort of Le Corbusier and Oscar Niemeyer Modernism than by the New Urbanists or ecologists.

With the sort of urbanization rates that China faces, it would be a good idea to think long and hard about the criteria for new town design guidelines that would minimize the need for private motorized travel and minimize its adverse social costs, while not foreclosing this option completely. Paying close attention to making working trips enjoyable by bicycle and walking, longer trips accessible by BRT or other mass transit options, and ensuring that public spaces attract life and commercial activity rather than remaining sterile and alienating, it is possible that new town planning could be done better. On the other hand, New Town planning has been gotten wrong so many times in the past that such grandiose notions are perhaps beyond the capacity of planners and best left to regulation and coordination among autonomously motivated individuals defining urban space in their own way.

Dare to Dream Magical Cities

The cities of the future need not be alienating, inhuman spaces dominated by cars, machines, and infrastructure where one rarely encounters another human face, or where one only sees walls of human faces rushing between congested subway trains. The cities of the future could just as easily be pedestrian zones served by bicycle and mass transit, with lively public squares. Streets need not function solely as a place between two destinations, but can become destinations in themselves. China's greatest artists and architectural minds could turn for a moment away from a focus on private buildings and develop some redesigned plazas and streetscapes, making them playful, artistic destinations in their own right. Few great architects have thought about what goes on in front of the building as well as inside the building. One of those that has was an Austrian architect named Hundertwasser. Hundertwasser was a collage artist who decided to also design housing, public buildings, public toilets and public squares. They are whimsical creations that enliven public space and indicate a possible alternative, more human direction for the future of our cities. China's young artists and architects could no doubt come up with completely unique ways of redesigning Chinese urban space, combining elements of China's urban heritage with completely new elements of modern China. China's cities are some of the oldest and richest in the world. China did not invent the automobile, and for thousands of years its cities did fine without them. To make China's cities truly world class, public roads and plazas should be worthy of its greatest poets. It will require that Chinese architects and urbanists, and of course developers, dare to rediscover what is truly unique, or what could be truly unique, about Chinese cities.

Bus System Reform in Major Korean Cities

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Increased per-capita income and car ownership in South Korea have spurred growth in travel demand. Since 1970, real per-capita income has risen dramatically. Expressed in constant, inflation-adjusted 2004 US dollar, per-capita income rose from only $311 in 1970 to $2,044 in 1980, $7,378 in 1990, and $16,291 in 2005. That represents a 50-fold increase in real per-capita income in only 35 years.

Private car ownership has also increased at almost the same pace as per-capita income. While only a tiny percentage of Koreans owned cars in 1970 (2 cars per 1,000 persons), the rate of car ownership rose to 308 per 1,000 persons by 2006. Car ownership in Seoul is almost identical to the national average, but it is higher for Gyeonggi Province, which consists of more car-oriented, lower-density suburbs.

The rise in the number of passenger cars contributed the most to the increase in travel and total number of automobiles registered. The large increase in car ownership and use in the 1980s and early 1990s diminished public transport's share of total travel in Seoul. Thus, the combined modal share of bus and metro fell from 75% in 1980 to a low of 60% in 1996. By comparison, the private car's share of trips rose from only 4% in 1980 to 21% over the same period. 1996 was a turning point. Thanks to a combination of metro system expansion, public transport's share of trips rose from 60% in 1996 to 65% in 2002, while the car's share fell from 21% to 18%.

Previously, buses were the primary means of transport for over eighty percent of the daily commute; the remainder was taxis (17.6%) and subways (1.1%). The share of buses began to fall sharply as subway lines came into operation, but much of the drop is attributed to rising private car use, as mentioned. Because private companies have operated buses in Korea, this gap in the number of passengers and buses caused financial difficulties in bus companies. And financial difficulties have induced deterioration of bus services, further reducing the number of passengers.

The aim of the bus reform project was to create an efficient bus network, providing better services to public. Three strategies were set up: improved efficiency of the public transport network, changes to the bus operation scheme, and introduction of new bus facilities.

1. Improved efficiency of the public transport network

Functional classification of bus routes: trunk line-feeder line system
Buses colored according to function
Organization of bus numbers based on area code

2 Changes to the bus operating scheme

Revenue-sharing system
Distance-based fare system

Introduction of route tendering

3 Introduction of new facilities

Introduction of exclusive median bus lane:
Bus Management system
New smart card system for fare payment

- Introduction of low-floor bus and CNG bus

In two weeks after the implementation began on July 1st, 2004, the level of citizen satisfaction with the bus services before was and after reform was 16.7% satisfied, 45.8% dissatisfied. But the level of satisfaction increased by September, three months later, to 31.6% satisfied and 30.0% dissatisfied.

With successful implementation of the new bus system in Seoul, other major cities in Korea made note. Daejeon, Daegu, Gwangju and Busan have implemented similar bus reform schemes. Each city's schemes are slightly different, but main change was the introduction of revenue sharing schemes to revitalize the bus industry. As seen in Table 1, most cities have increased the number of bus passengers and the degree of passenger satisfaction. Also, complaints from passengers and bus-related accidents have decreased after bus reform. With introduction of the transfer free fare system, transfers on public transport have increased, and as a result, use of the smart card system for fare payment has also increased. Based on these data, the results of bus reform have been positive.

Table 1. Results of bus reform

Criteria		Seoul	Daejeon	Daegu	Gwangju
Number of bus passengers (thousands trip per day)	Before	4,870	352.5	657.7	424.4
	After	5,404	392.3	683.6	421.7
	Difference (%)	10.97	11.29	3.94	-0.65
Ratio of transfer trip (%)	Before	22.94	0.48	10.2	12.8
	After	38.20	11.53	12.6	19.1
	Difference (%)	66.52	2302.08	23.53	49.83
Smart card use (%)	Before	77.4	44.7	46.0	74.5
	After	88.3	64.5	84.3	80.5
	Difference (%)	14.08	44.30	83.26	8.10
Bus related accident (accident/month)	Before	663	671	97	N.A.
	After	466	660	87	N.A.
	Difference (%)	-32.73	-1.64	-10.31	N.A
Passenger's level of satisfaction (%)	Before	22.4	13.0	N.A.	N.A.
	After	30.4	29.8	40.6	N.A.
	Difference (%)	35.71	129.23	N.A.	N.A.
Number of passengers per bus	Before	666	365	383	455
	After	682	382	438	467

(passenger/veh./day)	Difference (%)	2.40	4.66	14.36	2.64

However, a problem with bus reform is increased operating costs and public subsidies. Standard operation costs agreed upon by local government and bus operators have sharply increased, mainly due to increases in driver salary. Increases in Seoul have been greatest. However, with the exception of Daegu, there was almost no change of number of buses (Seoul has reduced about 200 buses 2005 based on agreement between Seoul Metropolitan Government and bus operators). Thus, even though the number of passengers has increased, operation costs for each passenger have also increased.

The bus system reform in Korea is continuing. Despite some problems, it has produced positive results, such as the increased number of bus passengers and levels of satisfaction, and the decrease of bus-related accidents and complaints. One of the most important contributions is that bus system reform has made clear the importance of public transport in the urban transport system in Korea. Attention and policymaking with regard to public transport have increased.

Mexico City's Environmental Policy For the 2007-2012 Period

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Mexico City, including the surrounding metropolitan area, is classified as the world's second largest megalopolis. There are 20 million residents in a contiguous area that equals just 1% of national territory, with 9 million residents living in Mexico City itself. The city is the political and economic center of the country.

Mexico City's contribution to Gross Domestic Product represents almost 20% of the national total, reflecting the capital's dominance of Mexico's centralized development scheme. In the last seventy years, this dominance has made Mexico City the nation's main attractor of public and private investment, as well as important for migratory flows.

Due to secondary migratory flows from the Federal District-Neighboring Municipalities and the consolidation of other interior cities as centers of regional development, in the country's capital the phenomena of urbanization has given rise in the last 20 years to stabilization of population growth.

Nevertheless, the population size achieved by Mexico City and its metropolitan area, combined with its economic dynamism, put it in the position of needing to resolve problems of a very different nature and of much greater magnitude than those faced by other cities. Among these challenges, we will mainly discuss those of an environmental nature.

As a product of its very rapid economic and population growth, especially in the second half of the 20th century, and as a result of the absence of effective planning and governmental organization, Mexico City has accumulated a series of environmental liabilities; in order to ensure the long-term viability of the capital, it is necessary to address these environmental problems.

Some indicators of factors threatening Mexico City's viability are:

1. While air quality has improved, there are still elevated concentrations of particulates and ozone, and there is a lack of sufficient data to determine the concentration of toxic contaminants in the air;
2. In the last 20 years, agro-ecological spaces have been lost at a rate of 412 hectares per year;
3. More than 12,000 tons per day of solid urban waste are created, most of which receives no later treatment;
4. The supply of green areas per person is far from the standards recommended by international agencies;
5. There are problems guaranteeing a sufficient supply of potable water;
6. The intense vehicular traffic has become a variable with a significant impact on air quality and quality of life;
7. Recent changes in the micro-climatic regime make the city vulnerable to meteorological phenomena;
8. Different plant and animal species characteristic of the Mexico City valley are threatened or at risk of extinction, among many other indicators.

This trend towards progressive deterioration of the quality of life in Mexico City cannot continue. The time has come for us to turn to the search for environmental sustainability, a topic which is currently central to the Mexico City government's agenda.

It is time for Mexico's different policies and sectoral strategies to incorporate an environmental vision. This is the only means of containing and reversing the processes that give rise to environmental deterioration.

Therefore, the Mexico City General Development Plan (MCGDP), which will govern development of the city during the next six years, has incorporated environmental sustainability as one of its governing principles.

To guarantee achievement of the objectives put forward by the MCGDP, the Cabinet for New Urban Order and Sustainable Development has been created. This body considers the participation of local government agencies which influence the defining and implementation of actions impacting local environmental quality, such as the Secretary of the Environment; the Secretary of Urban Development and Housing; the Secretary of Transport and Roads; and the Secretary of Works and Services.

This inter-institutional coordination mechanism pursues objectives with crossover impacts, particularly with regard to the design, coordination and application of currently unlinked or even contradictory public policies. Despite the importance of this body, its creation is not enough.

It is worth highlighting the political will of the current administration, headed by Mr. Marcelo Ebrard Casaubón, to advance environmental sustainability in the capital of Mexico. As a result of this interest, city government has taken on the task of creating a Green Plan for Mexico City, with reference to similar experiences of cities all over the world.

The Green Plan is one aspect of the current city administration's duties. This 2007-2015 planning instrument addresses those topics, strategies and projects that were identified as most important due to their potential for containment or reversal of environmental degradation processes. The Green Plan is thus a medium term governmental plan, unusual in Mexico, which seeks to reorient the direction of the city towards the achievement of clear, pertinent and possible goals. The Mexico City Green Plan is structured around seven main topics:

1. Soil Conservation;
2. Livability and Public Space;
3. Water;
4. Mobility;
5. Air;
6. Waste; and
7. Climate Change and Energy.

The Green Plan includes 27 strategies and 86 action points that will demand the coordinated action of all agencies of the Mexico City government, and especially the commitment and participation of the public and its most representative organizations and institutions. The Green Plan's source of legitimacy is not only the exercise of governmental authority in a

democratic system, but also a broad public consultation, called the Green Consultation, which submitted to public opinion the central proposals that were later incorporated into the Green Plan.

Examples of these Green Plan proposals are: no vehicle circulation on Saturdays; obligatory school transport; the building of a comprehensive solid urban waste management center; the development of ten transport corridors and a new metro line; the realization of projects for infiltrating water into the aquifer in order to recharge it; the renewal of public passenger transport with energy efficiency criteria and low issuance of pollutants; cargo transport vehicle emissions verification and regulation; and increased signage for environmental crime.

More than 1 million residents of the Federal District – that is, one out of eight – participated in the Green Consultation, making it the most successful participatory democratic exercise in the history of Mexico City. Following this public consultation, the Secretary of the Environment has defined its work program for the next six years. Its program of work includes topics that correspond to its responsibilities under the legal framework, among them those which have been incorporated into both the MCGDP and the Green Plan.

The working program of the Secretary of the Environment consists of a broad catalog of programs and projects whose fulfillment will contribute to solving the serious environmental problems faced by Mexico City. Among the most important projects, some are notable: the rescue of the only active river watershed in the city (Magdalena River); the recovery of the last "remnants" of the natural areas of Xochimilco and Tláhuac; the promotion of non-motorized transport and the building of a network of bike paths; integrated solid waste management; the preparation and launch of a climate action plan; the definition of a governing plan for natural and protected areas; the design of urban environmental sustainability indicators; the updating of the territory's ecological regulations; the broadening of the automatic monitoring network; and the remodeling of the Museum of Natural History, among others.

This program, along with political will and social consensus, contributes to a scenario that is ideal for launching a change of direction for Mexico City, raising residents' expectations for a better quality of life.

Metro Vancouver: From Livability to Sustainability

How Metro Vancouver, Canada, is Using Land Use and Transportation Planning and Technological Innovation to Improve Energy Conservation

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Introduction

Metro Vancouver is a federation of twenty-one municipalities located in British Columbia on the west coast of Canada. The Metro Vancouver region is home to 2.2 million people, and will likely grow to three million by 2030. Geographically, Metro Vancouver is nearly 3000 square kilometers in size, stretching from the Coast Mountains on the North to the United States border on the south. Metro Vancouver, the regional corporation, delivers utility services such as drinking water, sewage treatment, recycling, and garbage disposal, growth management planning, regional parks, air quality management, social housing and other services. The corporation has a strong relationship with Translink, the regional public transit and major roads agency. Metro Vancouver strives to protect and enhance the quality of life in the region by managing and planning for growth and development, while protecting air and water quality and the region's spectacular natural spaces.

Moving from Livability to Sustainability

Metro Vancouver often ranks as one of the world's most livable regions but its high energy consumption means that it is not one of the most sustainable. In 2001, Metro Vancouver launched the Sustainable Region Initiative (SRI) to identify public values regarding regional sustainability, the principles that should guide regional development, and necessary key actions. Today, the SRI is the overarching framework for all Metro Vancouver activities and represents a commitment to value the long term in plans and actions, and to care for the region's natural, social and economic capital.

The presentation will situate Metro Vancouver geographically and describe the organization's role. It will then provide some contextual basis about the region's energy use, greenhouse gas production, and recent policy commitments for energy conservation. For example, in early 2007, the Province of British Columbia, in which Metro Vancouver is situated, committed to reduce greenhouse gas emissions by 33% from current levels by 2020. As part of that commitment, GHG reduction strategies and targets will be required by all municipalities and regions. As a result, energy conservation and resilience will now be explicit and intentional outcomes of regional land use and transportation policy. This has

substantial implications for Metro Vancouver as the agency responsible for regional growth management planning and utility provision. In Metro Vancouver, transportation is the largest single source of GHG emissions at 49%, and buildings are the next largest source accounting for an additional 28% of GHG emissions.

The Role of Growth Management in Sustainability

Growth management is a critical dimension of energy sustainability for a number of reasons. The pattern of urban development has an impact on how much land is needed to accommodate growth, the protection of natural resources and air and water quality, the energy required for public travel and goods movement, and the greenhouse gas emissions produced. It influences the region's economic competitiveness as an attractive and efficient place to do business. And it impacts the cost of infrastructure in roads, utilities and community services.

The presentation will describe how Metro Vancouver is utilizing the *Livable Region Strategic Plan* to maintain the region's quality while improving energy efficiency and resiliency and reducing the region's greenhouse gas emissions. The presentation will show how land use and transportation policies within Metro Vancouver determine how the region:

- structures and contains urban growth, and protects the natural environment and agricultural land base;
- promotes transit-oriented, clustered, mixed use development through regional and municipal town centres connected by higher capacity public transit;
- increases use of transit, cycling and walking while providing efficient goods movement through the provision of accessible and diverse transportation options; and
- provides the space and infrastructure for economic development.

Growth management for energy conservation needs to be supported by technological innovations in energy use and production. The presentation will illustrate how Metro Vancouver is using green building technology to improve energy conservation. It will also illustrate how micro-hydro, sewer heat recovery, landfill and bio-gas recovery, and waste-to-energy plants are being used to increase efficiency in energy development.

Conclusion

Metro Vancouver's objective is to increase its sustainability as it grows from 2.2 million to three million over the next 20 years. With over 1.3 million cars on the region's roads currently, and energy demand anticipated to grow between 25-40% over the next 20 years, Metro Vancouver has significant challenges. Land use and transportation policies, as well as technological innovation are providing the framework for accommodating this growing and changing population, dealing with competing interests on a limited land base, supporting a vibrant economy, all the while protecting the region's spectacular natural areas and resource lands, enhancing energy resiliency and addressing climate change