Healthy Futures for APEC Megacities

Vol. I Summary Report of a Foresight Project

Asia-Pacific Economic Cooperation

APEC Industrial Science and Technology Working Group

The APEC Center for Technology Foresight
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ISBN 974-7360-14-4

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Published for the APEC Secretariat by:
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APEC # 00-IT-01.3

ISBN 974-7360-14-4
Printed and bound by Jirawat Express Co., Ltd, Bangkok, Thailand

Designed by
The Public Information Department
Thailand's National Science and Technology Development Agency
www.nstda.or.th
Bangkok, Thailand.
September, 2000

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Preface

One short year ago, the world was gearing up for the problem known as "Y2K." Millions of people readied themselves for the complete and total shutdown of the electronic world, and others prepared for the end of the world entirely. Thus did we approach the beginning of the 21st century. Yet for the most part, nothing happened; computers did not melt, nor airliners crash, nor our beloved cell phones quit their merciless rings. When we opened our eyes on the new century in fact, little had changed. Our world still held its promise and its problems. It hummed with new life and fantastic ideas and opportunities and groaned under the grinding weight of poverty, social injustice, inequality, war, and famine.

It seems, then, that we have been given our time on this earth not only to appreciate its beauty and wonder, but to clean up the mess we have often made of it. In this new century we must face the challenges ahead, using all the skills, intelligence, and courage that we possess to put things right. One issue that will profoundly affect the health of our children is that of the health of megacities. Our work at this APEC meeting was both exhausting and exhilarating. We now invite you to review the results of our deliberations and to become a participant in the dialogue of this community of thinkers and doers who want to make a difference, who understand that how we address the critical issues facing our megacities affects us all.

Richard Joseph Jackson, MD, MPH, FAAP
Director
National Center for Environmental Health
Centers for Disease Control and Prevention

Foreword

The APEC Center for Technology Foresight was launched in Bangkok on 3 February 1998, with the objectives of:

- Promoting the adoption of technology foresight across APEC member economies
- Providing a means for comparison of technology foresight exercises and implementation in APEC member economies and across the world, with a view to stimulating Best Practice in appropriate methodologies for Foresight in APEC economies
- Conducting technology foresight exercises on an APEC-wide basis, and between relevant member economies
- Improving the quality and effectiveness of technology-related planning and development and priority-setting for research, across APEC member economies; and
- Developing a technology foresight research and application capability available to APEC member economies and international agencies

The Center has adopted the following definition of foresight:

"Foresight involves systematic attempts to look into the future of science, technology, the economy and society, with a view to identifying emerging generic technologies and the underpinning areas of strategic research likely to yield the greatest economic, social and environmental benefit".

As part of the program of the APEC Center, the issue of Sustainable Megacities in the APEC context was addressed. Urbanization was particularly pronounced in the Asia-Pacific region in the second half of the last century. By the year 2025, Asia alone is expected to become predominantly urban, and home to over half of the world's megacities.

Megacities have both positive and negative values. They generate higher than average proportions of their economy's output of goods and services, are centers of innovation in science, arts and lifestyles, contain many cultural assets of the economy and offer some of the better opportunities for people to lead full and satisfying lives. Yet they also offer potential shortages of water, environmental pollution, traffic congestion and a proliferation of slums, crime and social alienation.

The APEC Center covered urban water issues in its study on "Water Supply and Management in the APEC Region", published in a report in December 1998. Transport issues were addressed in a subsequent study, published as "Sustainable Transport for APEC Megacities: Issues and Solutions", published in February 2000. The present topic of "Healthy Futures for APEC Megacities", while including aspects of these previous topics, extends the debate to a wider range of issues dealing with sustainable megacities.

Given the breadth of the topic and the diversity of professions involved, the Center decided to call together a small group of experts in Bangkok on 1-3 February 2000, to critique a Discussion Paper. This had been prepared by the Kenan Institute of Private Enterprise, Kenan-Flagler Business School, University of North Carolina at Chapel Hill, USA, and the The National Center for Environmental Health, Centers for Disease Control and Prevention (CDC), Atlanta, USA. This meeting developed 3 scenarios for the future of megacities and identified a set of key

issues to be addressed. These served as inputs for a meeting of a much wider group of experts in Bangkok on 29th-31st May 2000. The Experts Meeting drew together 46 experts from 10 economies, with strong representation from Thailand. We are particularly grateful to the experts for their time and experience to create an extremely successful meeting. This report is drawn from the Discussion Paper, the information provided by experts attending the Experts Meetings, the outputs of those meetings, and some additional research by the APEC Center. The report is aimed at policy makers and their advisors. It sets out the essential steps in the process of the study, outlines the key issues for the development of healthy megacities and the policy implications.

We are grateful for strong support throughout the project from The National Center for Environmental Health, Centers for Disease Control and Prevention (CDC), Atlanta, USA, through Dr Melinda Moore, and the Kenan Institute of Private Enterprise, University of North Carolina at Chapel Hill, USA, through Dr Jack Kasarda. They and their colleagues have contributed enthusiastically throughout the project. Critical inputs were provided by Professor Ron Johnston, Executive Director of the Australian Center for Innovation and International Competitiveness, University of Sydney, and by Professor Greg Tegart, Executive Advisor to the APEC Center.

We were aware that the World Health Organisation had been extremely active in the area of Healthy Cities, and were fortunate to enroll the enthusiastic and very expert participation of Professor Evelyne de Leeuw, Director of the WHO Collaborating Center for Research on Healthy Cities, University of Maastricht. This ensured that the vast experience gained from the WHO work was reflected in the project.

The APEC Center wishes to acknowledge generous financial support from the APEC Central Fund and from the Royal Thai Government though the National Science and Technology Development Agency.

Arthur Carty
Honorary Director

Chatri Sripaipan
Co-Director

Executive Summary

This report describes a multi-economy Foresight study on the subject of Healthy Futures for APEC Megacities. It was conducted by the APEC Center for Technology Foresight, located within the National Science and Technology Development Agency of Thailand in Bangkok, and in partnership with the National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, USA, and the Kenan Institute of Private Enterprise, University of North Carolina at Chapel Hill, USA. The Foresight process included consultation, the development of a discussion paper, identification of the key drivers and uncertainties, followed by scenario development and analysis. It involved around 50 experts from a wide range of disciplines linked to megacities from 10 member economies, with additional inputs from experts from the World Health Organization Healthy Cities Program, and from the UN Urban Management Program.

Fifteen key issues have been identified for the healthy futures of APEC megacities:

1. Population dynamics
2. Resources
3. Governance
4. Infrastructure
5. Mobility
6. Planning
7. City Structure
8. Waste Management
9. Social Connectedness
10. Participation of individuals and communities
11. Livelihood Opportunities
12. Heritage
13. Safety
14. Living Environment
15. Health care delivery and health promotion

These form the components of an **ecosystem model for healthy megacities** based around resource inputs, dynamics of megacities and quality of life.

This study has firmly placed people at the center of the debate on the future for APEC megacities. Thus we concluded that:

- With more and more of the world's population going to live in megacities, the goal of healthy megacities is both realistic and essential;
- Healthy megacities depend on collective action of communities of people with a common goal;
- People cannot have a good quality of life in an unhealthy city; equally, a city cannot be healthy if its citizens are not;
- Foresight is an effective mechanism for grasping and tackling the complexity of planning for the future megacities;
- Priority areas for research and for policy development can be identified;
- APEC already contains a wealth of experience which can be drawn on, to work towards healthy megacities for the 21st century;

The study highlighted the necessity to consider the linkages between policies and actions in different aspects of megacities. A systemic approach is required, to ensure that resources (both physical and human) are used most effectively. New technologies offer many opportunities to ensure healthy futures for megacities, notably in the application of information and communication technologies (ICT) for governance, education, economic development, social interaction, communication and health care, in new transport technologies and in new environmental technologies for cleaner production and treatment of waste.

Finally, there is growing awareness of the challenges posed by rapid urbanization, particularly in the less developed economies of APEC, and the necessity to address these in a holistic manner to ensure that the growing number of large cities and megacities in the region all have healthy futures in the decades to come. The Sustainable Cities initiative of APEC, taken at the Manila Ministerial meeting in 1996, offers the opportunity to provide leadership in cooperation between APEC economies. This could include exchange of experience in governance, development of databases, joint R&D programs in areas such as public health, transport, water supply and management, technologies for learning and culture, environmental protection and clean production, and encouragement of more effective public-private partnerships.

The choices that we make now can profoundly influence the health of megacities in APEC in the next decades and the quality of life for the citizens of those cities.

1. Introduction

1.1 The APEC Center for Technology Foresight

The APEC Center for Technology Foresight was established in Thailand in February 1998 with the aim of serving and involving all APEC member economies, in diffusing technology foresight expertise across the region. This is achieved through training and public seminars, information exchange via a web site, consulting to member economies, and most importantly, by conducting foresight research at multi-economy level.

Topics are selected for multi-economy study on the basis of 4 key criteria:

- The topic must be of concern to most member economies, with at least 4 participating in the study, and with potential to share the results to many more;
- The topic must transcend national boundaries, so that it can go beyond what might be achieved by a national or bi-lateral study;
- The topic must be of general public benefit and not one that is likely to be addressed by the private sector;
- The topic should have important technological, but not necessarily ' high-tech', components.

The importance of the topic of 'Megacities' emerged from discussion at a Technology Foresight Symposium held in Chiang Mai, Thailand in 1997, attended by over 100 participants from 16 member economies. It was agreed that the issue of sustainability in megacities would be increasingly important to the economy of the APEC region and the quality of life of its citizens in the 21st century, and that Foresight could assist policy-makers and planners to understand and resolve problems.

Aspects of megacities were discussed in earlier studies of the APEC Center, notably that on "Sustainable Transport for APEC Megacities: Issues and Solution", carried out in 1999. It was clear from this study, and from discussion with experts from the Kenan Institute of Private Enterprise and the CDC, that the many different problems occurring in megacities were inextricably interlinked and no one sector could be addressed in isolation to the others. It was therefore decided to undertake a foresight study that would try to encompass the health of the megacity as a whole, recognizing that this was a major determinant of the health of the city's residents.

1.2 Urbanization

Over half of the world's population is already urbanized and this trend looks set to continue in the opening years of the new century, with at least 60% of the world's population expected to live in cities by 2030. Of course not all of these people will live in megacities; in fact, more than half of all current urban dwellers live in cities of under half a million. But it is also true that megacities are becoming larger, more numerous and sheltering an increasing proportion of the world's urban dwellers.

Table 1: The World's biggest cities (APEC members in italics)

- CITY, Economy by World Rank in 1999	Population Size in 1999 - Millions	% increase expected between 1995-2015	- CITY, Economy by predicted World Rank in 2015	Predicted population Size in 2015 (Millions)
1 *TOKYO, Japan*	*26.3*	*2.6*	1 *TOKYO, Japan*	*26.4*
2 *MEXICO CITY, Mexico*	*17.9*	*15.8*	2 BOMBAY, India	26.1
3 BOMBAY, India	17.5	72.7	3 LAGOS, Nigeria	23.2
4 SAO PAULO, Brazil	17.5	23.4	4 DHAKA, Bangladesh	21.2
5 *NEW YORK, U.S.A*	*16.5*	*6.7*	5 SAO PAULO, Brazil	20.4
6 *LOS ANGELES, U.S.A*	*13.0*	*13.5*	6 *MEXICO CITY, Mexico*	*19.2*
7 *SHANGHAI, China*	*12.9*	*11.2*	7 KARACHI, Pakistan	19.2
8 LAGOS, Nigeria	12.8	125.3	8 *NEW YORK, U.S.A*	*17.4*
9 CALCUTTA, India	12.7	44.7	9 *JAKARTA, Indonesia*	*17.3*
10 BUENOS AIRES, Argentina	12.4	18.6	10 CALCUTTA, India	17.3
11 DHAKA, Bangladesh	11.7	124.3	11 DELHI, India	16.8
12 KARACHI, Pakistan	11.4	97.4	12 *METRO MANILA, Philippines*	*14.8*
13 DELHI, India	11.3	69.0	13 *SHANGHAI, China*	*14.6*
14 *OSAKA, Japan*	*11.0*	*-0.3*	14 *LOS ANGELES, U.S.A*	*14.1*
15 *BEIJING, China*	*10.8*	*35.2*	15 BUENOS AIRES, Argentina	14.1
16 *JAKARTA, Indonesia*	*10.6*	*88.4*	16 CAIRO, Egypt	13.8
17 *METRO MANILA, Philippines*	*10.6*	*59.4*	17 ISTANBUL, Turkey	12.5
18 RIO DE JANEIRO, Brazil	10.5	16.9	18 *BEIJING, China*	*12.3*
19 CAIRO, Egypt	10.3	44.3	19 RIO DE JANEIRO, Brazil	11.9
20 *SEOUL, South Korea*	*9.9*	*-3.2*	20 *OSAKA, Japan*	*11.0*

Source: U.N. Dept of Economic and Social Affairs Population Division World Urbanization Prospects (The 1999 Revision) City size estimated on basis of urban agglomeration, not administrative boundaries

1.3 Healthy Megacities

As the World Bank recognizes:

"Cities everywhere are makers of wealth, magnets for the industrious, motors of invention".

Even in developing economies, more than 50% of all gross domestic product (GDP) now originates in cities while in some advanced economies, it may exceed 80%. But although healthy cities will produce wealth, it is clear that wealth does not necessarily lead to healthy cities. Despite fantastic growth rates in some of APEC's Asian economies in the early 1990s, many Asian megacities grew in ways that raised critical issues of health and well being, in the face of potential breakdowns in key functions. At the same time, megacities in some of APEC's more advanced economies displayed significant and persistent pockets of urban poverty, social exclusion and unrest.

Megacities are often defined on the basis of population size - over 5 million or over 10 million for example, but there is no universally agreed definition. Any definition needs to be set in a historical framework: the megacities of the 1950s were perhaps those with over 1 million people; there were about 90 such cities worldwide at that time and only New York City exceeded 10 million. In 2000, there are approximately 20 cities worldwide exceeding 10 million, and by 2020,

there will be many megacities of over 20 million. It is not clear if there is an optimal size for a city, but there is evidence that the sheer scale of megacities creates an added level of complexity in both the genesis and resolution of difficulties. However, even some of the largest cities, such as Tokyo, can be considered to work relatively well, while some smaller cities may have terrible problems.

Along with the question of what constitutes a megacity is the most important question of whether the growth of a city into a megacity represents a positive development or a negative one. According to Herbert Girardet, an author and consultant with the United Nations Habitat II project

> "*A city is a living thing. It has a complex metabolism, a voracious appetite and very poor eyesight. Improvements in transportation and communication mean that its feeding ground is now global and the consequences of its consumption distant and forgettable*."

If this is true, then can the largely unrestrained growth that results in the creation of a megacity occur without significant hazards developing for both the residents of the megacity and others who are indirectly impacted by its existence? While to some, the phrase 'healthy megacity' is a contradiction in terms, the basis of this study is that it is something worth striving for. And therefore it is important to try and delineate the goal. What is a healthy megacity?

Any definition of health must comprise physical, mental and social well-being; health is not merely the absence of disease. According to the WHO Healthy Cities Program, a healthy city is "one that is continually creating and improving those physical and social environments and expanding those community resources which enable people to mutually support each other in performing all the functions of life and in developing to their maximum potential".

Cities must be able to grow, develop, meet challenges and assure a decent quality of life for all their inhabitants. If a significant portion of a city is poor, excluded, or disadvantaged, the city cannot be healthy. Health will not exist while large segments of the population are uneducated, lack opportunity, or remain unemployed. A healthy city does not exist when children are undernourished, abandoned, grow up in a physically polluted environment or do not receive moral and ethical guidance. As for individuals, the concept of health applied to cities can also be considered to have a spiritual or ethical dimension. Corruption or social exclusion can be seen as signs of disease, while healthy cities will have institutions and enterprises that operate in open and effective ways, endorsing the concepts of social and environmental sustainability.

"Growth" does not necessarily imply either population increases or geographic expansion, but rather refers to the ability of individuals and society to be creative (taking initiatives that appear desirable) and to adapt and change in response to external pressures. Change is inevitable, and therefore successful adaptation to change is essential in any system that hopes to survive. In order to create health in a megacity, many forces and actors must join (or be joined) together. Humans both affect and are affected by their environment and therefore, actions must be both proactive and reactive, marshalling and responding to dynamic forces. The complexity of the problems faced in megacities, and the need for multi-disciplinary understanding and multi-sector action is illustrated by the case of asthma and other breathing disorders (see box below).

Help our children breathe -

Asthma is one of the most common and costly diseases in APEC. In the USA, for example, asthma is the single largest reason children miss school. And it is not only the children who must stay home - their parents must take time off to care for them. In addition, asthma accounts for an estimated 3 million lost workdays annually for asthmatic American workers. Nearly 5 million American children suffer this terrible disease, and between 100 and 200 of them die from asthma each year.

The prevalence and severity of asthma is increasing, and it is hitting hardest and disproportionately among poor, inner-city children. Poor air quality and the stresses of living in poor inner-city neighborhoods are clearly implicated.

Asthma is a long-term, often progressive disease in which the airways become temporarily blocked. While the effects of air pollutants are not well defined, there is absolutely no doubt that they can trigger an attack and aggravate symptoms. Children are more vulnerable to air pollution than adults because they breathe more per pound of body weight - a child absorbs double the amount of pollutants for its weight than an adult. The breathing zones of children are also lower in height where air quality is poorest, and their bodies are growing and developing, a process that pollution may inhibit or alter.

A critical part of controlling asthma is reducing exposure to the triggers in the environment - both indoors and outdoors - that cause these children to gasp and struggle for breath. The daily decisions of urban planners and administrators can have a dramatic effect on asthma, through, for example, strict controls on industrial pollution, reduction of car fumes through promotion of effective mass transit options, design of public buildings and homes and so on. Thus public health concerns should permeate every decision made by the many different professionals working for the megacity.

Children living in megacities in developing economies face double jeopardy from poverty and degraded environments. Pollution particularly affects those already suffering malnutrition and infectious disease, which lower their ability to resist chemical pollutants. Illnesses such as bronchitis and asthma are aggravated by levels of air pollution two to eight times above the maximum World Health Organization exposure guidelines. For most children in megacities in developing economies, breathing the air may be as harmful as smoking two packs of cigarettes a day. Toxic pollutants like lead also affect children's physical and neurological development: for example, around 50,000 children in Bangkok are reportedly at risk of losing 4 or more IQ points due to high lead levels.

1.4 Megacities and APEC

Asia-Pacific Economic Cooperation (APEC) was established in 1989 in response to the growing interdependence among Asia-Pacific economies. APEC is the primary regional vehicle for promoting open trade and practical economic cooperation, aiming to advance prosperity and improve quality of life in the Asia-Pacific region. APEC's 21 member economies are: Australia; Brunei; Canada; Chile; China; Hong Kong, China; Indonesia; Japan; South Korea; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; the Philippines; Russia; Singapore;

Chinese Taipei; Thailand; the USA, and Vietnam. Despite the financial instability of 1997-98, the Asia-Pacific remains one of the fastest growing regions in the world. By 2000, APEC member economies accounted for 55% of total world income and 46% of global trade. Development that is sustainable both economically and environmentally is a key APEC concern, and sustainable cities were identified at the Manila Ministerial Meeting in 1996 as one of its three top priorities.

The APEC region, which comprises both advanced and less developed economies, is expected to become predominantly urban by the year 2020, with at least 15 cities exceeding 10 million residents (some estimates put the figure much higher). Many of these cities will be in the form of Extended Metropolitan Regions (EMR), as the expansion of large cities overtakes the surrounding countryside and incorporates nearby urban areas. In some megacities, the EMR has already been given formal administrative status, such as JABOTABEK (the Jakarta Metropolitan region encompassing Jakarta, Bogor, Tangerang and Bekasi) in Indonesia.

By 1999, half of the world's 40 biggest cities were located in 12 different APEC member economies.

Table 2: APEC's biggest cities

APEC Megacities	APEC Economy	World Rank in 1999	Size in 1999 (in Millions)	% growth expected between 1995-2015
1. Tokyo	Japan	1	26.3	2.6
2. Mexico City	Mexico	2	17.9	15.8
3. New York	USA	5	16.5	6.7
4. Los Angeles	USA	6	13.0	13.5
5. Shanghai	China	7	12.9	11.2
6. Osaka	Japan	14	11.0	-0.3
7. Beijing	China	15	10.8	35.2
8. Jakarta	Indonesia	16	10.6	88.4
9. Metro Manila	Philippines	17	10.5	59.2
10. Seoul	S. Korea	20	9.9	-3.2
11. Moscow	Russia	22	9.3	1.0
12. Tianjin	China	24	9.1	19.4
13. Lima	Peru	26	7.3	40.8
14. Bangkok	Thailand	28	7.1	54.5
15. Chicago	USA	29	6.9	7.9
16. Hong Kong	Hong Kong	30	6.8	23.5
17. Santiago	Chile	36	5.4	31.5
18. St Petersburg	Russia	38	5.1	0.3
19. Chongqing	China	39	5.0	119.7
20. Wuhan	China	40	5.0	65.1

Source: UN Dept of Economic and Social Affairs Population Division World Urbanization Prospects (The 1999 Revision) City size estimated on basis of urban agglomeration, not administrative boundaries.

The global trend for greater urban population increases in less developed economies is also indicated within APEC, and can be seen more clearly from data about slightly smaller cities. The variation in growth rates of APEC cities is enormous, ranging from over 2% per annum in many of China's cities for example, to zero or even negative in some advanced economies.

Quality of life for APEC's urban residents also varies enormously, both between cities, but also, most importantly, within cities. No megacity is without environmental problems: even New York for example, in one of APEC's most prosperous member economies, regularly records levels of ambient sulfur dioxide above the WHO standard. But not surprisingly, the worst levels of air pollution are found in the less developed economies. Beijing, China, for example, regularly records sulfur dioxide levels 5 times the WHO maximum guideline during the winter. Within cities, data disaggregated by district and/or socio-economic status indicate great variations in health of residents, with the poor experiencing the brunt of environmental hazards. For example, in Manila a three-fold difference in infant mortality between poor and non-poor areas was found in 1996; tuberculosis rates were 9 times higher in poor areas, diarrhea rates twice as high and typhoid rates 4 times as high.

1.5 The Global Knowledge Economy and APEC Megacities

It is not a new idea that knowledge plays an important role in the economy, nor is it a new fact. All economies, however simple, are based on knowledge about how to farm, to mine and to build, and this use of knowledge has been increasing since the Industrial Revolution. But the degree of incorporation of knowledge and information into economic activity is now so great that it is inducing profound structural and qualitative changes in the operation of the economy and transforming the basis of competitive advantage. The growing intensity of the world economy and our increasing ability to distribute that knowledge have increased its value to all participants in the economic system.

The Global Knowledge Economy is emerging from two driving forces: the rise in knowledge intensity of economic activities and the increasing globalization of economic affairs. The rise in knowledge intensity is being driven by the combined forces of the IT revolution and the increasing pace of technological change. Globalization is being driven by national and international deregulation and by the communications revolution. The rise of the Global Knowledge Economy has profound implications for the future of megacities.

The key features of the current transition to the Global Knowledge Economy in terms of megacities are:

1. The growth of global telecommunications and fast transport networks;
2. The convergence of previously separate information and communication technologies. including the Internet
3. Their further linking with transport and land use.
4. The shift to information and knowledge as a resource base for new industries.
5. The strengthening of the role of megacities as economic entities, network nodes, and centers for generating, exchanging and processing information.
6. The growth of informational services, particularly finance and business services, and e-commerce.
7. The competition among megacities for these new key elements of the urban economy.

The megacities which will survive the best will be those which learn to create globally competitive, knowledge-intensive industrial and service activities and base their work on the local capacity for learning, innovation and change.

Table 3 contrasts the elements of a mass production economy with those of a learning economy; these elements are reflected in megacities of such economies. It is important to recognize that megacities are likely to remain major centers of manufacturing and that the learning economy will develop alongside it, as discussed in Section 3.3 on 'Livelihood Opportunities'.

Table 3: Elements of Mass Production and Learning Economies

	Mass Production	Learning
Basis of competitiveness	- Comparative advantage based on natural resources - Physical labour	- Sustainable advantage based on knowledge creation - Continuous improvement
Production system	- Mass production - Physical labour as source of value - Separation of innovation and production	- Knowledge-based production - Continuous creation - Knowledge as source of value - Synthesis of innovation and production
Human infrastructure	- Low-skill, low-cost labour - Maximising worker efficiency and productivity - Fixed education and training - Skilled elite	- Knowledge workers - Continuous improvement of human resources - Continuous education and training
Physical / communication infrastructure	- Domestically oriented	- Globally oriented - Electronic data exchange
Industrial Governance system	- Adversarial relationships - Command and control regulatory framework	- Mutually dependent relationships - Network organisation - Flexible regulatory framework

Source: adapted from Richard Florida *Learning Regions* Futures Vol 27, No.5

2. The Conduct of the study

Given the breadth of the topic and the diversity of professionals involved, the APEC Center for Technology Foresight decided to call together a small group of experts to a Core Experts Meeting held in Bangkok in February 2000. The meeting critiqued a discussion paper prepared by colleagues from the Kenan Institute and the National Center for Environmental Health. These discussions clarified a number of issues in the study and the APEC Center subsequently prepared a revised Discussion Paper.

The Discussion Paper had succeeded admirably in its goal of documenting the linkages between all the different aspects of megacities, and of stimulating debate with experts around the region. The primary purpose of developing the scenarios as the next stage of the project was therefore to focus the study; the scenarios were initially used to identify the key issues that needed to be addressed. The scenarios constructed were alternative visions of future megacities, not best or worst case scenarios. While they contained some surprising elements, nevertheless, all aspects of the scenario were intended to be plausible.

Following the Core Experts Meeting, the scenarios were refined to reflect some issues more clearly, including some of the policy debates already occurring around them. All of this material was then used as background for an APEC-wide meeting of 46 experts from 10 member economies, held in Bangkok in May 2000. These experts provided further inputs of issues based on their experience, together with material relevant to their national megacities. The scenarios were then reviewed and analyzed, in order to draw together a comprehensive set of issues and policy actions relevant to healthy futures for APEC megacities over the next two decades. Students of scenario-planning may be interested to note that the more brief and dramatic scenarios were more successful at stimulating ideas at the APEC-wide Experts Meeting than the fuller scenario.

Technologies relevant to the issues were explored in general discussion.

2. 1 Scenario-based futures

The scenario technique was used to identify key drivers in the development of megacities, and to speculate on possible, even improbable events, which could occur to change the pattern of development. These are listed in table 4.

Econologic City is one of the top 5 cities in the world, in terms of wealth and standard of living. Major environmental redesign has provided cabling for electronic connectivity, and open and safe meeting spaces to facilitate social connectivity. Energy sources are 'alternative', water is recycled and transport is low-polluting. Econologic City is highly IT committed and internet connected, with an electronic communication system that underpins community involvement and responsive government, as well as a strong health care system. Migration to Econologic City is strictly limited but would-be residents find ways around the system to get hold of that precious "EC-card".

Monopolis, the intelligent tropical megacity places great emphasis on survival and self-sufficiency. With substantial independence from national government, Monopolis has been radically redesigned, with more efficient resource allocation, mixed use land planning, innovative transport modes, and a target of 4 square meters of open space for every resident. Monopolis is a city of advanced and accessible technology, significantly Internet-linked throughout the city, to

the region and internationally. Regulations are stringent, with slums demolished and private cars banned!

Table 4: Key Drivers and Uncertainties in the Development of Megacities, identified at the Core Experts Meeting.

Key drivers Expected significant influences on the development of megacities.	Uncertainties Possible but unpredictable influences; new developments in these areas could have a major impact (positive or negative) on the health of the megacity, if they occurred.
1) Demographics	Genetic or medical revolution transforms the implications of aging / reproductive technologies / epidemics / bioterrorism
2) Digital Economy / Global Knowledge Economy	Ownership and regulation of the Internet / backlash against modern information and communications technologies
3) Economic Performance	Natural disasters / disasters following from technology, eg. major antibiotic resistance / plagues
4) Education and Capacity building (information skills)	Reaction against cultural dominance of 'western' world / mono-culture
5) Technology based health delivery	Personalized health management / backlash against technology / 'smart health care'
6) Governance / Polity capital	International and national regulation / public-private-NGO partnerships / 'aid with positive strings'
7) Environmental hazards	Climate change / food contamination
8) Social Values	'Virtual communities' / social alienation
9) Inter-group tensions	Rise of nationalism / immigration controls / tribalism
10) Transnational activity	War / education / labor mobility

Based on these ideas, three scenarios were created and named by their creators as 'Econologic City', 'Monopolis' and 'Fat City'. **In the year 2020 -**

Finally, ***Fat City*** 2020 is bulging at the seams, a vibrant cauldron of intercultural and intellectual interaction. It is not really a megacity at all, but rather a concentrated network of self-governing communities. The corrupt and convoluted bureaucracy has been superseded by rational and open administration, a positive development reinforced by significant local democracy and participation. With low unemployment, concern for the elderly and disadvantaged and substantial decision-making at community level, Fat City is a megacity on a human scale.

The full scenarios are presented in Appendix 1.

3. Key Issues in Healthy Futures for APEC Megacities

The preparation of the Discussion Paper, and the scenario-planning process used in the Experts Meetings, led to the identification of fifteen key issues. Many of these are interlinked but a conceptual approach to grouping them is given in Figure 1. This was inspired by an extended metabolism model of human settlements developed by Kenworthy and Newman, and reflects the concept of the city as a living organism.

3.1 Issues Related to Inputs

As noted in the Introduction (Section1), cities have a voracious appetite and megacities even more so. They exist and grow because of the inputs they receive from vast distances outside the cities. Improvements in communication and transportation mean that they draw on global resources, both economic and physical as well as human. Here we group the issues of:

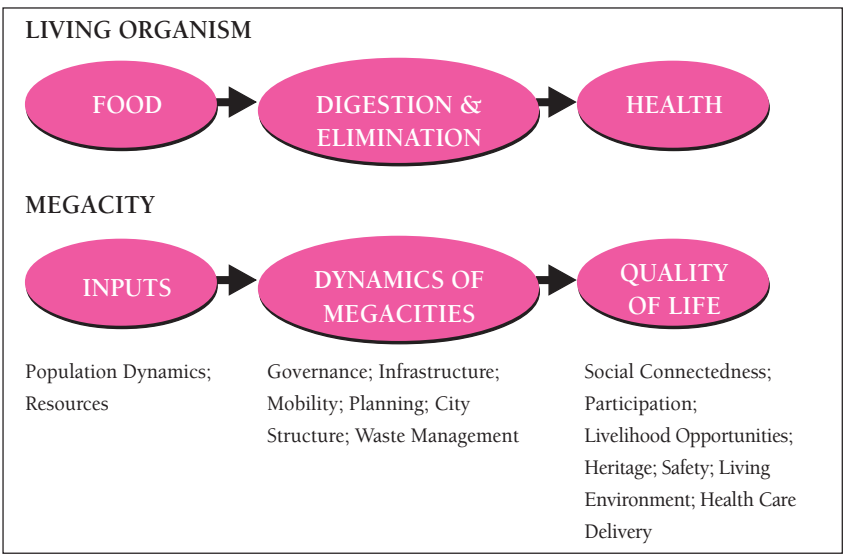
- Population dynamics
- Resources

Population Dynamics

It took ten thousand years for the world's population to reach 1 billion in 1800, another one hundred years for it to double to 2 billion in 1900, and less than another hundred for it to triple to nearly 6 billion by 2000. Demography may well become the dominant force shaping world development over the 21st century.

APEC's developing economies which have yet to experience their demographic transition - from high fertility, high mortality to low mortality, low fertility - are mostly expected to do so during the early part of this century. During this transition, populations will surge as the decline in fertility lags behind that of mortality. Within cities, in addition to this natural increase, cities will be swelled

Figure 1: The Megacity as a living organism: A conceptual approach to the key issues identified in the study



with increasing numbers of migrants from rural areas. As an extreme example, it is estimated that the size of China's urban population will triple by the end of the century, when 90% of the Chinese population is expected to be urban. This urban population explosion - in the poorer economies - has massive implications for the health of megacities.

The working-age population seeking employment in many megacities in less developed economies may double by 2025. Up to the present, rural to urban migration in APEC economies has been largely related to 'pull' factors, with migrants generally succeeding in improving their standard of living by moving to the city. But with the anticipated levels of population growth, remedial action will be essential to prevent widespread destitution and serious social problems. Alternatives to uncontrolled growth, such as the establishment of other industrial centers in rural areas based on local skills and resources should be seriously considered. For example, over the past two decades, the SPARK program in China has been very effective in establishing rural agri-food and industrial enterprises, but this has also created local environmental problems.

In the more advanced economies, a converse problem is occurring. With low fertility rates, populations are hardly growing at all, or are even in decline, but improvements in health care and social welfare have prolonged life expectancy to the extent that the share of the elderly in the population is rising quite dramatically. This will create immense pressure on public finances generally, especially health and social care, as well as having major implications for many aspects of city life. Based on current legal working ages, the dependency ratio between those employed and those unable to work will increase from 52% to 65% in the US, and from 44% to 86% in Japan over the period 1998-2050. Economies which are undergoing the demographic transition very rapidly, such as China, may experience problems of 'aging population' quite soon; by 2025, the average age in China will be 40 (in 1995 it was 27). Fertility tends to fall fastest in urban areas, where more and more women are not having children at all.

Table 5: Urbanization and rates of urban growth in APEC member economies

APEC economy	% of population which is / will be urban		Average annual growth rate 1995-2000		APEC economy	% of population which is / will be urban		Average annual growth rate 1995-2000	
	1999	2030	Urban	Rural		1999	2030	Urban	Rural
Australia	84.7	88.5	1.0	1.0	Brunei	71.7	82.6	3.0	0.1
Canada	77.0	83.6	1.1	0.6	China	31.6	50.3	2.5	0.2
Chile	85.4	90.7	1.7	-0.4	Hong Kong	100.0	100.0	2.1	0.0
Indonesia	39.9	63.5	4.2	-0.3	Japan	78.6	84.8	0.4	-0.4
S. Korea	81.2	90.5	1.7	-2.8	Malaysia	56.7	72.7	3.3	0.4
Mexico	74.2	81.9	1.9	0.9	N. Zealand	85.7	89.8	1.1	0.3
PNG	17.1	33.0	3.8	1.9	Peru	72.4	81.9	2.3	0.4
Philippines	57.8	73.8	3.7	0.0	Russian Fed	77.3	85.2	0.3	-1.7
Singapore	100.0	100.0	1.4	0.0	Thailand	21.2	39.1	2.5	0.5
USA	77.0	84.5	1.1	-0.1	Vietnam	19.6	33.7	1.8	1.5

Source: UN Dept of Economic and Social Affairs Population Division. Urban and Rural Areas 1999 Factsheet (Data for Chinese Taipei not provided)

Resources

Megacities are clearly dependent on external inputs of essential materials as well as people to make them operate and grow. Here we consider food, land, energy, water and building materials as resources to feed the megacity.

Food supply is a critical issue for the sustainability of megacities. With expanding populations in the developing economies, there is a need to increase food production perhaps even to double the present output by 2025, especially if average consumption per head rises as low income economies improve their per capita incomes. Resulting from increasing urbanization, there is a need to develop production logistics and distribution structures that suit the megacities of the future. The current supply chains are complex, costly and energy intensive, particularly in terms of packaging, transport, preservation and waste.

Land supply is linked to food supply since urbanization is encroaching on arable farmland and will continue to do so. The decline in farmland could be as much as 15% in the next 25 years which means that there will have to be a significant increase in yields if demands are to be met. This will mean application of new technologies in biotechnology, weather forecasting, harvesting and handling, and water usage.

Energy supply is critical to megacity growth. The average per capita consumption of energy in developed economies is up to 20 times higher than in developing ones. Over the coming decades, the combination of population growth, urbanization and industrialization in developing economies could lead to a fourfold increase in energy demand. Such demands will have to be met by existing fuels especially gas, oil and coal, over the next 20 years. Supplies of oil are likely to run out in the next 40 years, with gas lasting a little longer, and thus renewable energy sources must be expanded, together with more energy-efficient buildings and transport systems.

Water supply for megacities of the future is a major concern with the demand for water increasing at a greater rate than increases in population and associated economic activity. Current total human usage is about half of the available identified sources and thus the predictable demands of increased population will approach the limits of water availability. The impact of climate change due to global warming could be severe. The APEC Center for Technology Foresight addressed issues and policy options for urban water supply and management in an earlier report.

Building materials are a vital input for growth of megacities. Already, these have to be brought from considerable distances for many megacities. While some have natural routes on waterways, others have more limited access through rail and road and expansion is difficult. Sources of cement and stone are in short supply in some economies and technology for recycling existing structures after demolition needs to be employed.

3.2 Issues Related to Dynamics of Megacities

The inputs to megacities must be adapted and used to ensure that cities are able to grow, develop, meet challenges and ensure a decent quality of life for all their inhabitants. Using the analogy of a healthy city as a living organism, the dynamics of megacities can be likened to the digestion and utilization of inputs to provide sustenance for thinking, breathing and movement.

Here we group the issues of:

- governance
- infrastructure

- mobility
- planning
- city structure
- waste management

Governance

Throughout Asia-Pacific megacities, there is growing recognition that good governance is essential to creating the conditions for sustainable and healthy development of megacities and economies. Good urban governance refers to the complex set of values, norms, processes and institutions by which cities are managed. This message has been promoted by the Urban Management Program, a global technical cooperation program of the UN, which works with metropolitan administrations towards the goal of making cities more efficient, equitable, safer and sustainable. Their 10 elements of good urban governance can be summarized as follows:

1. Accountability (serves whole community; free of vested interested and corruption)
2. Transparency (provides reliable and understandable information, in a form that people can make use of)
3. Participation (all men and women included in decision-making)
4. Rule of law (fair, impartially enforced)
5. Predictability (of the processes of making and changing laws)
6. Responsiveness (serves all stakeholders and reacts to their concerns)
7. Consensus orientation (mediates different interest fairly)
8. Equity (all residents have equal opportunities to improve and maintain their well being)
9. Effectiveness and efficiency
10. Strategic vision: a long term perspective and sense of what is needed to achieve it, that is shared by government and citizens.

Experience shows that good urban governance is based on effective partnerships between government, civil society and the private sector. A number of key characteristics of innovative practices to improve conditions within cities can also be identified. These include the importance of building the credibility of local government through improved administration, beginning with a few critical and highly visible areas that affect daily life such as refuse collection or street-lighting. A responsive administration is crucial to success, even if action to address grievances is not immediate; citizens must feel that they are being heard. Successful change comes from within the system, not forced by higher levels of government. In fact, in some cases, higher levels of government did not support change but they yielded once public support was evident. Demonstration effects are important, so that dissemination of experiences and information through local government networks, award schemes etc is valuable.

OECD has identified a number of barriers to the development of innovative projects and programs aimed at sustainable cities. They were reinforced by the APEC Experts' discussions and can be recognized in studies of individual APEC megacities. Thus, faced with the breadth and complexity of ecological thinking and planning, bureaucrats at the local level tend to succumb to inertia, uncertainty and confusion. Integrated policy making is hampered by the fragmentation of a policy responsibility both horizontally (across ministries and departments) and

vertically (across levels of government - municipal / local, regional and national). Moreover, in many economies, city administrations are underbounded, with substantial parts of the metropolitan areas outside the boundaries of the central city's jurisdiction.

Implementation difficulties include shortages of suitably qualified staff at national or local level, problems with territorial integration across political boundaries and lack of experience with new forms of cooperative agreements and partnerships, increasingly with the private sector.

Infrastructure

This issue overlaps those of Resources and Mobility. It is also a vital element of Planning, particularly in terms of financial resources. Thus, in the case of water supply and sanitation needs, perhaps as much as US$1 trillion will be needed to provide for the urban population of developing economies, while the existing infrastructure of large- and mega-cities in developed economies is in need of upgrading or replacement at smaller but still very substantial cost. The lack of provision of adequate facilities for sewage treatment can have disastrous environmental effects, leading to equally disastrous effects on human health.

As noted in the issue of Mobility (below), the pressure on transportation systems in megacities of developing economies will increase, both as population and affluence increase. The enormous problems posed by private vehicles in cities such as Bangkok and Manila will increase and pose demands for more public transport systems. Like most of the infrastructure in megacities in the future, this can only be provided through public/private partnerships providing financing on a long-term return basis. Many different models of 'PPP' have been tried, with some more successful than others, and there is a need to analyze these in a number of case studies to provide guidance for future financing of infrastructure.

Physical infrastructure tends to lock megacities into distinct, slow-to-change patterns of travel, work, leisure and lifestyles in general and thus making it difficult to move towards sustainable cities. Their renewal requires long lead times and thus it is necessary to plan and build infrastructure now with sustainability clearly at the forefront.

Mobility

The transport of people and goods is a vital factor in the operation of megacities. All aspects of life in the megacities depend on transport and the challenge is to maintain a sustainable transportation system which is environmentally sound, socially equitable and economically sound.

Environmentally, sustainable transport systems should: a) use energy resources and other natural resources at a rate not greater than the renewal rates of those resources; b) produce no more waste than can be accommodate by the planet's restorative capacity; and c) make use of land in a way that has little or no impact on the integrity of ecosystems. Present transportation systems in virtually all the major APEC cities fail to meet these criteria. Incidentally, it is notable that those modes of transport that can be reconciled most easily to these goals are also those that could be most directly beneficial to human health, such as walking and cycling. The incidence of traffic congestion, air pollution and excessive use of oil characterize unsustainable systems which impact on the economic performance of cities and on the health and quality of life of residents, as well as on the global environment of continuing climate change.

Experience shows that the demand for mobility in the cities of developed

APEC economies tends to rise at a similar rate to the rise in real incomes (currently relatively slowly because of low growth rates and relatively stable populations). However, in the cities of the developing APEC economies, demand for mobility is rising much more rapidly because of the more rapid rise in per capita incomes (albeit from a low base) coupled with rapid urbanization. The threat of increasingly unstable transportation systems for many APEC megacities is a major issue for the future.

There are many uncertainties about future influences on urban transportation. The demand for mobility could be affected by changes in economic growth, for example, changed patterns from heavy industry to manufacturing and service industries, increasing the importance of air transport compared to road or rail, or by changes in commuting preferences, such as a major switch from private to public transport. Technological change and innovation is likely to have a major impact at every level of transportation in the coming decades. It can take many forms, from non-transport alternatives meeting accessibility objectives through telecommuting, Internet shopping, tele-education and tele-video-conferencing; or changes in design and operational characteristics of motor vehicles; through alternative fuels, electric and hybrid vehicles; advanced materials and navigation systems; or new possibilities for traffic management through electronic road pricing, intelligent vehicle-highway systems and logistics management.

The key message is that a well planned, readily accessible and affordable public transport system is essential for a sustainable megacity.

Planning

The potential of megacities is enormous with urbanization presenting a major opportunity for developing economies in particular in terms of overall planning. Channeling rural migration into cities can help to relieve damaging population pressure on marginal rural lands and areas of increased agricultural productivity. Focussing development on megacities can, on balance, continue to bring about economies of scale in transport, waste treatment and business. Thus scale and agglomeration economies increase with city size at least to the size of current megacities. Specifically:

- *Scale economies*: include increased efficiency and specialization with city (or settlement) size. They result from a larger market and production system for both goods and services enabling increased production economies for these goods and services, increased specialization of services - including producer services, increased size of labor markets, skills, job opportunities, participation rates, and increased income and income-per-capita as a result.
- *Agglomeration economies*: include increased self-containment of the economic (or settlement) system and its production processes and services, and consequent reductions in inter-city transport energy and cost, increased cross-fertilization, innovation, industrial alliances, a wider range of goods and services available, for this larger population, and further increased income-per-capita as a result. The availability of most or all goods and services within the city also holds down transport costs of residents and firms.

Linking smaller centers and remote regional areas into the larger centers via telecommunications and fast transport- will increase the scale of the markets and production systems yielding potentially substantial scale and agglomeration economies

The APEC Center Study on Sustainable Transport highlighted the need for integration of urban land planning with transport planning. There is a clear need to control and direct the pattern of urban growth since informal urban development can get out of hand. It can spread quickly, creating very low density suburbs which are difficult to service for transport and which encourage widespread use of private motor vehicles, as in most megacities. Such urban sprawl often uses prime agricultural land or land that should not be urbanized - because it is too high to be supplied cheaply with water or too low to be drained, because it is environmentally attractive or because it is too close to polluting or dangerous neighbors.

A major problem for achieving national outcomes for planning is that land use planning is rarely coordinated at the metropolitan level, which usually involves dozens of local jurisdictions with authority over neighborhood zoning and community design. Even if institutional and jurisdictional level issues can be overcome, the community needs to be persuaded of the benefits of land use planning that differs significantly from those that prevail.

It was repeated on several occasions by the Experts that: "*Plans are not implemented, and what is implemented is often not planned*"!

City Structure

The issue of city structure is intimately linked to those of Mobility and Planning but it deserves discussion in its own right. As noted in the Introduction, if a significant proportion of the city is poor, excluded or disadvantaged, the city cannot be healthy. Health will not exist while large segments of the population are uneducated, lack opportunity or remain unemployed. The structure of cities plays a significant role in creating and maintaining such inequalities.

The problems include:

- A lack of employment in the urban sprawl of modern megacities;
- A concentration of social disadvantage, e.g. squatters and periphery communities in megacities in developing economies
- Limited transport options for low-income groups, due to the inadequacies of public transport; and
- A lack of choice or opportunity for self-development.

There is a need to ensure that healthy communities are developed in megacities by means of:

- Close association between residential areas and areas of employment, personal services, education and recreation;
- Public transport interchanges that facilitate association with adjacent land uses;
- Promotion of walking and cycling between land use activities.

Inner city areas are being revitalized but the danger is that this is associated with growth and location of service industries seeking better access to global and regional networks and markets, and attracting 'knowledge workers' with higher incomes seeking better environments. This creates a healthy neighborhood but exacerbates the inequality of workers in manufacturing plants in the outer suburbs.

Waste Management

Sanitation and waste water treatment have been discussed briefly under Physical Infrastructure but we need to recognize that there are significant differences between and within megacities. Thus it appears that central sewer

systems are only affordable for a megacity where average per capita income is greater than US$1000. This is simply not the case in most of the megacities in developing economies, where alternative appropriate technologies are needed, probably based on serving local communities rather than a city-wide system.

Industrial liquid wastes present significant problems since they contain heavy metals and toxic compounds with severe impacts on human health. Cleaner production needs to be introduced with a strong 'polluter-pays' regime.

Urban populations generate more solid waste per capita than rural residents. In megacities in developed economies, nearly 100% of the population is served by municipal waste services and solid waste collected is disposed of in sanitary landfills, incinerated or recycled. In developing economies, it has been estimated that between 20-50% of waste is not collected, especially from slum and squatter communities, leading to environmental and health problems, particularly in cities like Bangkok and Jakarta, for example, where the urban poor comprise around 20-30% of the total population. Adequate management of solid waste is a critical factor in the development of sustainable megacities, particularly in Asia. Recycling measures must be encouraged and penalties imposed for improper disposal.

Air pollution is primarily a result of fuel combustion and industrial processing. Topography and meteorological conditions often exacerbate the air pollution problem. High amounts of fuel consumed per capita and the quality of fuel - the presence of sulphur, inorganic ash and toxic additives (such as tetra-ethyl lead in petrol) - lead to excessive air pollution which poses serious threats to a city's health and environmental condition. Transportation constitutes the largest share of air pollutants in APEC's megacities, particularly with rapid growth of vehicle usage in Asian cities where quality of fuel is low. This poses a significant barrier to healthy futures for megacities unless drastic policy changes are implemented on increasing public transport, reducing private vehicle usage and strict control on fuel emissions. New technology options are raised under Mobility. Energy production and industrial fuel use are significant contributors particularly where high sulphur, low-ash coal is used as in Asian cities like Beijing and Shanghai. Particulate matter from these sources and diesel engines is also a major health concern in many cities. While air quality in megacities in the developed economies is generally improving with clean fuels and strict emissions controls, it is continuing to worsen in Asian cities and is a barrier to sustainable growth.

3.3 Issues Related to Quality of Life in Megacities

This study has emphasized the view that people cannot have a healthy life in an unhealthy city and that the driving force in ensuring a healthy and sustainable city is to maximize the quality of life for its inhabitants which in turn, leads to a successful economy. Here we group the issues of:

- Social connectedness
- Participation of Individuals and communities
- Livelihood opportunities
- Heritage
- Safety
- Living Environment
- Health care delivery and health promotion

Social Connectedness

This issue links to those of City Structure and Mobility. A continuing theme of both workshops was the need to ensure that megacities do not lead to alienation of individuals, and of significant sections of the community. Thus the design of comprehensive, mixed-use neighbourhoods instead of isolated subdivisions and developments, can lead to the development of urban 'villages' within the megacity. Linking of these by affordable public transport systems further contributes to social connectedness.

As the proportion of aged people grows, particularly in the developed economies, the need to ensure that they are adequately linked into health care and community is crucial to ensure a good quality of life. The breakdown of family structures in cities leads to aged poor being neglected by society.

A particular concern was that of alienation of individuals working from home and interacting only with computers and through the Internet. While this may present problems in a minority of cases, the general conclusion from available studies is that creative use of information and communication technologies will lead to the expansion of horizons through life-long learning and expansion of opportunities for social connectedness. However, this needs a clear sustained commitment of public authorities, private enterprises, education and research institutions and civic organizations to placing learning and knowledge dissemination at the center of development. In fact, their sense of common purpose can be a driving force in cultivating shared values and networks within megacities.

Participation of Individuals and Communities

As noted in Governance, participation in decision making is an essential element of good urban governance. In many megacities, individuals and communities are unable to participate in determining the future of their cities for a number of reasons:

- corruption in city government and electoral processes;
- pressure from vested interests with strong financial backing, eg. developers, industries such as the automobile industry;
- lack of appropriate forums to express their views;
- lack of understandable information about what the city is doing, and plans to do;
- lack of education and thus ability to articulate their needs and desires;

A more balanced approach to the development of megacities must come from a "bottom-up" process involving citizens moderating a "top-down" approach by administrators. The combination of both is essential; a democratic process of eliciting citizens views must be facilitated by the city administration, and constructive links with independently organized forums must also be built. The ability of an informed citizenry to alter planning decisions has been demonstrated in megacities in developed economies and it is clear that significant improvements need to be made in megacities in developing economies. Such participation can improve the quality of life.

An option to improve participation is to move the responsibility for local decisions from a central administration to community authorities. This was the case in cities in developed economies but in recent years there has been a move to amalgamation and consolidation in the name of economic rationalism with, in many cases, a loss of local participation. Clearly a balance needs to be struck in considering possible models for better participation.

Livelihood opportunities

As noted in Section 1.6, the transition to a global knowledge economy has significant implications for livelihood opportunities in megacities. Thus as telecommunications converge with computing, there is a spatial dispersal of activities, including globalisation of markets and of firms and e-commerce, the lowering of national barriers, and increasing competition between cities and regions for the production of goods and services. In developed economies, there has been a shift of employment from manufacturing to services, as manufacturing has been out-sourced to plants in developing economies - especially in East Asia. Conversely, and by way of compensation, older-established cities in developed economies have attracted new industries, particularly information-based activities. They act as a magnet for producer services - financial services, design services, media services - which not only serve local clients but increasingly act as footloose, export-oriented activities, operating from selected global cities which form the nodes of worldwide information networks. Acting as innovative milieux, and aided by the amenities and urban ambiance, they attract a host of small, new, highly-innovative firms in a range of activities that span traditional manufacturing, new technologies, producer services - particularly in the design and media-based industries, and e-commerce which increasingly depend on very sophisticated and specialized computer-based technologies - including increasingly high performance computer technologies and the Internet.

Further changes are also under way. In megacities in developed economies, information technology is continuing to replace labor through automation of routine and increasingly non-routine manufacturing tasks, allowing some manufacturing industries, such as motor vehicle production, involving larger or heavier products, to be retained in these cities, with potential for new manufacturing industries to be established as automation capabilities increase. Information technology is also introducing a very wide range of new products and services. At the same time, the globalization of markets, including finance and business services has seen the export of these services to major centers in the developing economies of Asia - and the creation of supplementary local services to support manufacturing and resource development. In this way, Asian cities are in rapid transition to industrial- and also information-based complexes, while megacities in developed economies are retaining some manufacturing as automation increasingly replaces expensive labor, with the prospect that this manufacturing also may increase with further advances and cost reductions in information technology and automation.

These changes alter the skills needs of workers in megacities and this in turn impacts on education and planning systems. Initially these changes will impact on megacities in developed economies but they will flow through to megacities in developing economies. In the latter case, the challenge is to create employment for the projected large flow of young people into the labor force. By 2025 the labor force in developing economies will have almost doubled - a formidable challenge to ensure stability and sustainability since the majority will be in large or mega-cities. It is important to recognize the role of the informal sector with low skilled jobs providing significant amounts of employment in developing economies.

Heritage

Most megacities have evolved over a long period of time and have changed their character with the development of technologies for high rise construction

and changes in transport modes, particularly the demands of the automobile. Concerns were expressed in the workshop that, in the process of development of megacities, it was important to ensure that the heritage of the city was not destroyed. Heritage can contribute to a sense of civic pride and belonging which can mitigate alienation, and social cohesion can be promoted through, for example, cultural festivals or the restoration of neglected heritage by local communities. The unique character of a megacity could be a source of competitive advantage, both for attracting tourists but also attracting longer term investment in the city.

In developed economies, it appears that there is a sufficient fraction of concerned citizens to ensure that heritage is preserved but in the developing economies there is less evidence of such commitment. There is clearly a balance to be struck, since not all heritage is positive. Thus the redevelopment of slums in a manner ensuring the continuation of communities with better housing and facilities is to be welcomed, but redevelopment of historic buildings and sites by high rise buildings removes good heritage. This is an issue linked to Planning and City Structure which impacts on the quality of life of the inhabitants through provision of facilities such as museums and libraries which preserve heritage

Safety

The issue of safety has both collective and individual connotations. In the collective sense, high densities of both people and man-made structures mean that natural disasters such as floods, tsunamis, storms and earthquakes can cause major loss of life and significant damage in megacities. While some hazards can be mitigated by good design in construction of infrastructure, recent disasters in Kobe and San Francisco indicate that even advanced economies are at risk. Fires, again, present a danger in megacities, particularly in very tall buildings, and in the squatter settlements of the poorer megacities. These shanty towns are often located on marginal lands which are also more vulnerable to natural hazards like flooding. The issue of man-made disaster due to poor safety standards is also important - megacity residents are concerned about collapsing buildings, inappropriate storage of toxic or flammable materials, poor standards of construction and industrial safety.

On an individual level, crime in general is on the increase in megacities both through personal assault in the streets and theft from dwellings and vehicles. This can be linked with persistent poverty and increasing inequality and social alienation, including the related increase in drug abuse.

Living Environment

This issue relates both to the domestic situation and the workplace. Thus people who live in poor quality housing in slums, and are exploited in poorly service factories clearly have a low quality of life. These situations exist in both developed and developing economies but tend to be exacerbated in the latter due to the sustained pressure of migration from rural areas and the lower per capita incomes.

The provision of adequate housing is an essential task for planners and city managers. Thus policy should provide for a mix of public and private housing to increase social cohesion and to promote dialogue between groups of differing incomes and aspirations. Adequate housing implies adequate infrastructure services such as electricity, clean water and sewerage disposal. Modern techniques of prefabricated construction, use of polymers and composites and technology for small treatment systems offer opportunities to supply public housing at an affordable cost. In more affluent economies, the living environment will be changed by the application of information technology to produce 'smart' kitchens and

houses with preprogrammed controls to react to changed external environments. People need areas for recreation, physical exercise and social interaction and thus the provision of adequate green spaces and community centers is essential for a healthy living environment.

'Smart' office buildings will reduce energy input and provide better working conditions. Moving to cleaner production and better waste management, as noted earlier, will clearly improve the workplace and environment for many workers.

Health Care Delivery and Health Promotion

While advanced and high-tech medicine is available in all of APEC's megacities, basic medical care is still a problem for significant sections of all these cities too. In less developed economies, the poor are still suffering greatly from preventable and/or treatable diseases such as polio, gastro-intestinal infections and malaria. The appearance of diseases like dengue fever and AIDS, and reemergence of TB, are indications that even the advanced economies need to pay much greater attention to public health measures, illness prevention and health promotion, and the need to reorient health services towards primary level care. The issue of socio-economic equity remains fundamental to the health status of urban populations as we enter the 21st century.

Some health problems occur more frequently in megacities or are exacerbated by urban living, such as many mental health problems, drug and alcohol abuse, accidents, and assaults including domestic violence. There are also, of course, health consequences arising from environmental degradation and pollution. The aging population is a problem in megacities, as it is in the wider economy. Although megacities in the less developed economies are kept relatively youthful by immigration of workers and emigration of the elderly back to the countryside, this may change over the next 20 years as urban workers gradually loosen their ties with the countryside. It is therefore worth noting that the older age groups are disproportionately heavy users of health care services, and also require support and specialist housing to live in the community as they become more frail. As traditional patterns of family support break down through the demands of modern living, especially job mobility, the needs of those impeded by age or disability will have to be addressed.

Emergency medical care is a major concern, especially as most of APEC's megacities lack anything approaching a comprehensive and accessible ambulance service. This is a perfect example of how the problems of megacities have to be addressed holistically, since the resolution of this problem involves not just health services but also transport, communications, policing etc.

Further technological developments, especially in IT and biotechnology, have great potential for health care improvements at both hospital and community levels, as well as for health promotion. For example, modern ICT enables much more comprehensive and effective disease surveillance, while storing personal health records on the Internet would permit much better coordination of care, if concerns about security of information can be resolved. Telemedicine and remote diagnosis could play a key role in increasing accessibility of health services.

Global warming presents important threats to future urban health, such as the possibility of tropical disease vectors spreading more widely across the region, increased incidence of heatwaves which threaten the lives of the vulnerable, especially the very young and the very old, and more severe storms.

4. Implications for Healthy Futures for Megacities in the APEC region

4.1 Foresight as a Strategic Planning Tool

The essence of scenario-based foresight is that it engages a wide range of people, from different backgrounds and perspectives, in a process of imagining different possible futures and then looking back to see the steps that brought them there. Thus it is quite different to other planning techniques based on extrapolation from the current situation. Experience over the past few decades in both the public and private sectors has clearly shown that the Foresight process has a number of benefits as a strategic planning tool. It is especially valuable when dealing with very complex problems involving diverse groups of people with different interests and agendas. By using a structured process to getting them to develop a set of plausible futures, they identify issues of common concern and policy actions to deal with them.

The benefits of Foresight have been summarized as the "6 Cs", namely: better ***communication*** and ***comprehension*** between researchers, users and funders; greater ***concentration*** on the longer-term future; improved ***coordination*** among researchers and between researchers and users; more effective ***consensus*** generation on desirable futures; and finally, clearer ***commitment*** to convert the ideas emerging from foresight into action.

The APEC Center for Technology Foresight has carried out Foresight studies on a number of topics since its launch in February 1998, and its experience with multi-economy Foresight confirms these benefits and the value of Foresight as a strategic planning tool across the boundaries of APEC economies. Scenario-planning coupled with consultation with stakeholders has proved to be a powerful tool, with the Delphi approach somewhat less successful in a multi-economy context. The present exercise reinforced the value of Foresight as a tool for dealing with the complex problems of healthy futures for megacities and there was evidence at the second Experts Meeting of moves towards at least one megacity developing a group to carry out a specific exercise in their city. We encourage other APEC Megacities to follow this example.

While many of the participants in the workshop saw immediate benefits in using Foresight in their strategic planning, the full benefits of the study can only be achieved by an intensive post-Foresight exercise in as many economies as possible. This should consist of a structured presentation of the results of the study to experts and policy makers in megacities, leading to a critical debate of the issues in the context of their own megacity. Desirably, this should lead to the creation of case studies which could be fed into an APEC database for sharing experiences and which could be compared at a future workshop.

"As a public health official working in a megacity, I had never before sat down to talk with experts in transport planning, waste management and urban design... yet these 3 areas alone have the potential to enhance or undermine just about every public health measure we might try to implement..."

"Presenting information generated by this meeting, comprising multiple disciplines and countries makes for very powerful arguments for making policy changes. In addition, if case studies could be compiled, it would serve as a basis of conversation to use to create policies."

Comments from participants in the APEC-Wide Experts Meeting Bangkok May 2000

4.2 Policy Outcomes from the Study

This study has dramatically reinforced APEC Minister's views that the topic of Sustainable Megacities requires urgent attention, to ensure future wealth creation and social stability of APEC economies. Through consultation with experts across the APEC region, this study has identified a set of key issues critical to the health of megacities, and policies need to be developed to address these. It has been emphasized throughout this study that none of these issues is resolvable in isolation: integrated policy making and implementation is essential. Yet this remains hampered by the fragmentation of public responsibility, both horizontally (different agencies dealing with the same concern) and vertically (different levels of government). The lack of involvement of stakeholders in the policy formulation and decision-making processes is an equally important problem which impedes the development of healthy megacities.

The Experts identified the following key policy areas as critical to the future of megacities:

- Managed growth, of both population size and megacity area, to ensure sustainability;
- Integration of land use and transport planning;
- Effective participation of all stakeholders in decision-making, via both 'top-down' and 'bottom-up' processes;
- Equity for all city residents, including especially disadvantaged groups such as recent migrants, workers in the informal economy and ethnic minorities;
- Good Governance at all levels;
- Implications of the development of knowledge-based cities for employment;
- Multi-modal and sustainable transport systems;
- Integrated information and communications technologies, especially their applications in health, education and skills training, governance and public participation, and commerce;
- New approaches to funding and operating 'megaprojects' for infrastructure and services, including assessment of the effectiveness of public-private partnerships;
- Reduction of pollution by cleaner production systems, improved waste management and a shift from private to public transport;
- Better understanding of population dynamics and migration to urban areas;

While individual APEC Megacities must tackle these within their own economic systems, there is a role for APEC to:

- give leadership in ensuring that experience with these different issues is shared;
- facilitate the development of standards data bases;
- support multi-economy and multi-disciplinary R&D programs in areas such as public health, transport, water supply and management, technology for learning and culture, environmental protection, public-private partnerships, and cleaner production;

5. Conclusion

The major challenges to the sustainability of APEC's megacities can appear overwhelming. The Foresight approach was helpful for defining and assessing these challenges, providing a mechanism for grasping the complexity of the problems and for reconciling the many different perspectives and areas of expertise required to solve them. The Foresight process also enabled excellent networking across cultures and levels of development. The study outlined the core elements of megacities that need to be addressed in order to move towards healthier futures, and identified critical areas for research and the development of policy.

The study firmly concluded that, with more and more of the world's population going to live in megacities, the goal of healthy megacities is both realistic and essential. Megacities that function well will make a highly significant contribution to the economic wellbeing of the whole economy but there is no room for complacency. Generating healthier megacities depends crucially on political vision and will to understand the threats to future megacities, and to implement major changes. Equally crucial is the much wider participation of megacity residents from all sections of the community in decision making. It is vital to recognize the symbiotic relationship between the health of the megacity and the health of its residents. You cannot have healthy people in an unhealthy megacity, and you cannot have a healthy economy without healthy people. For the millions of people living in APEC's multiplying megacities, actions to create healthy megacities are the critical link between the first APEC goal of increasing prosperity, and the second - improving quality of life.

Background Reading

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Appendix 1: Scenarios developed during the project: Healthy Futures for APEC Megacities

Scenario 1: Econologic City 2020

Econologic City is booming, recognized as one of the top five megacities. Its population has stabilized at 17 million, its economy is strong, its housing and transport infrastructures widely admired. This success can be traced to a series of crucial decisions made at the beginning of the 21st century.

In a landmark report recognizing the emerging power of the digital economy and that the centers of economic power were shifting from nations to cities, the Mayor of Blatsfurgh proclaimed a bold new future for the emerging mega-city. It was to be renamed to present an image more appropriate for the new millenium and reshaped according to four principles - connectedness, ecological sustainability, social responsibility and PPPs - public-private partnerships. These were enshrined in the charter of the Econologic Futures Corporation (EFC), in which public and private sector organizations joined to plan and manage the future of the great EC, as it quickly became known.

The first visible initiative was the commitment, through an agreement with the national telecommunication carrier and a global IT company, to provide all residents with direct access to the Internet, by the 'free' provision of set-top connectors for all television sets. (In fact, the deal involved an offset to the companies to have first call in tenders for the delivery of city information services for a 10-year period).

Senior school students were recruited to provide home training for all residents who needed it, as part of their IT curriculum and social service obligations, along with a small monetary reward. As a consequence internet literacy, e-commerce, and new internet-based goods and service companies boomed. There was soon stiff competition for the Mayor's monthly 'Best New Internet Company' Award. Particularly popular was the rate rebate scheme for all who took new learning courses on the City Internet, and who contributed to the economy, regardless of age.

The second major initiative was in the area of environmental redesign and control. A major international competition was held to redesign the old Blatsfurgh precinct according to the four principles. Particular emphasis was placed on cabling to support electronic connectivity, open and safe meeting spaces to facilitate social connectivity and enhance local cohesion, recycled water systems, alternative energy sources, effective low-polluting transport and spaces that were both green and productive.

Of course, there were some tough and controversial decisions. The decision to knock down all irredeemable slum areas met with strong opposition, and there were significant casualties, and some deaths during the police-enforced evacuations. Many fled. But once the remaining residents were guaranteed new accommodation, and a say in the design of their future house and neighborhood, most of their energy was channeled into community design competitions. The extremely strict urban planning process was met with cries from special interests. But after the extensive communication programs through the city and community Intranets, and clear evidence that the fat cats were not going to benefit, agreement rapidly emerged.

Control of the growth of the population of the city through the process of housing permits, and the very strict vagrant control unit, met with little opposition. That is if you carried an EC identity card. But for outsiders trying to get in, there was ruthless harassment. TV images of the deportees sent the message that EC was for ECers only. Once you had that EC card, you protected it with your life.

Organized crime was largely under control, because of the absence of any drivers for a black economy. Gambling and prostitution were city-controlled industries. Petty crime of course still existed but the strong ethos of social and community responsibility kept this to what was considered an acceptable level.

The health system has been much admired, and imitated. The communication system provided the basis for an extremely efficient public health database, and home-based medical consultation and diagnosis. This underpinned a proactive health ethos, in which residents were provided with personal health profiles, and case managers identified likely areas for intervention. When unpredictable disease outbreaks did occur, they were rapidly controlled by well-prepared response teams, supported by a strong research effort.

How was this all achieved? The key element was probably in the way that the EC communication system rapidly grew into a mechanism for consultative government. At first it was just a matter of advising residents of bills, development approvals, award recipients, etc. But it rapidly became transformed into a medium for discussion and debate among citizens and with their elected representatives on a wide range of matters, from local guttering to appropriate environmental targets. The move to monthly referenda on major issues made everyone feel that they had a say in the grand future of EC.

Scenario 2: Monopolis - Out of Disaster, Dynamic Development

No one should ever forget those dreadful years of 2003-2006. We all knew about global warming, but who could have imagined the way that destruction rained down on us. Some said it was the seven plagues of Moses all over again. First the two years of searing drought, barely a drop of rain, hot winds blowing every day, the sky filled with ash and smoke from the fires in the country. Food was rationed, and a bath was just a dream. Then the drought was broken by the record floods - not just once, but three times in 18 months.

Life was very hard. The economy declined and jobs were hard to find. At least that meant that the 3 million people who used to come into Monopolis to work no longer added to the 10 million residents. But people focussed on surviving. You didn't move much outside the neighborhood. Bartering food, basic goods, and services were a way of life.

But that was long ago - just a distant memory. Now Monopolis soars as a unique intelligent tropical city. A lot of the credit has to go to Pedro Yi Chun. His spectacular rescue of those drowning people made him an instant hero. And then when he got all his workmates operating as an emergency response team, he soon had a force he could summon (Pedro's people we called them) to deal with any problem. Little wonder he was pushed to run for the Council, and won with 91% of the vote. He just cared about people. His slogan of 'Together, Never Again' had everyone roaring in support. Everyone felt they could contribute, and be listened to. And they did.

Mind you, there was none of the 'good old days' for Pedro. To be sure it didn't happen again, we needed new approaches, and the best technology. 'Survival means self-sufficiency' said Pedro. So he persuaded the national government, itself coping with endless problems, to establish Monopolis as a 'City-State within the State'. This gave the city management substantial powers to control planning. As part

of the deal, the national government directed its disaster relief commitment to long-term projects, like improved weather forecasting, appropriate building and transport technologies, new approaches to food production, renewable energy technology, and waste disposal. That money, and the investment associated with the International Tropical City, was leveraged to pull in some big development projects, and brought a lot of international expertise, and investment, to the city.

Stringent new procedures and regulations were established to ensure flood and land-use planning were effective, and that slum developers and landlords would have no place. Dramatic new building regulations encouraged the construction of platforms above the flood plains, with the principles of 40 % open space, 'living above community above commerce', and a radical transport system linking the tower blocks at roof, rather than ground level. In addition the flood plains were channeled to provide the basis for an extensive 'underground' system of water buses and taxis.

This gave the economy a huge boost. The city economy quickly moved close to full employment, when you took into account all the people who were tele-working for overseas service companies. This was supported by the move to cleaner production and transport, the more efficient allocation of water access, and the move to mixed use land planning.

The notions of survival and self-sufficiency were also translated into the approach to health. The emphasis was on positive self-care first, backed up by a comprehensive system of preventative and curative services. Healthy lifestyles are accepted as common-place and obvious. There are also a lot less traffic-related injuries, taking a lot of pressure off the hospital and ambulance systems.

Monopolis, the intelligent tropical mega-city, has a great future.

Scenario 3: Fat City

Fat City 2020 is bulging at the seams. Rich in people, in cultures and in languages, it overflows its political and physical boundaries, defying definition or limitation. And still people come. While rural to urban migration has slowed to a trickle (and at weekends, it goes the other way!), transnational migration to this world class city is still a feature, and one that provides a youthful balance to the aging of the 'indigenous' citizens.

Migrants are welcomed to Fat City for more than 'cheap labor'. Cultural diversity is seen as a major attraction for tourists; in Fat City, you can find better tortillas than in Tijuana, better 'pad thai' than in Thailand. More importantly, their variety of experiences and ways of doing things provide an influx of new ideas to those who are willing to listen.

Another key element is the way Fat City is run. The old central administration had no hope of keeping up with the dramatic doubling of the population. By 2010, official figures showed an increase from 8 million, to 16 million people, in only 20 years, but most people reckoned there were a few more million on top of that. By luck, or necessity, a new system of substantially autonomous community 'nodes' grew up, each committed, through local action, to making life better for their community, but recognizing the need for cooperation with other nodes. They raise their own revenue, and receive central government funding for their achievement against national targets of employment and environmental management. Fat City isn't a mega-city at all; it's a concentrated network of connected cities, with only a minimal (but important) overall planning system.

There is still a ceremonial Mayor of Fat City, who enjoys opening the big infrastructure projects and travelling the world to 'market' the city to potential investors. If rates on business seem somewhat high, he explains that the city

supports a healthy and educated population, and provides partnering funding for many basic infrastructure projects. He also describes the rebate scheme for investors that promote social and environmental good. More far-sighted entrepreneurs realize that a healthy population that looks forward to, rather than fearing, the future is more productive and creative. And creativity and innovation are the key to Fat City's prosperity in a global economy where knowledge and mental skills have become the major source of competitive advantage. Under these conditions, both the knowledge and the cultural industries boomed. Fat City quickly became known as the home of the 5th generation Internet companies. The cultural industries, and the restaurants, attracted tourists, and investment capital.

Those entrepreneurs with good hindsight also remember the disastrous consequences of the extreme flood/drought cycles of 06-07. Who could concentrate on their work, or even get to it, when the subway was flooded, and schools and offices had to close whenever there wasn't enough water to flush the toilets. Only the bottled water manufacturers did well out of that situation. With drug-resistant cholera decimating the poorest and most marginal communities, even the most committed advocates of 'laissez-faire' economics felt that such instability and extremes required coordinated intervention.

That coordination didn't come easy to the plethora of agencies charged with running the city - or to be more accurate - running that tiny bit of the city that fell into their jurisdiction. But, as the city of Surat showed back in the late 90s, a crisis can be the spur to turn things around; it went from a plague ridden rubbish dump to the cleanest city in India in only 2 years. In Fat City, government workers used their informal networks and links to get swifter action. Some of them had known for years that they were smarter than the boss! Or rather, that they knew more than he did; and the crisis gave them the opportunity to step outside the shackles of bureaucracy and vested interests, and act on their professional judgement of what needed to be done. The response to crisis showed in practice that planning and regulatory systems could be simplified immensely, and in just 4 years, Fat City transformed itself from a corrupt and convoluted bureaucracy, to a rational and open administration.

Of course, let's be honest, that willingness to cooperate didn't happen everywhere, or on every issue. But where the shackles of bureaucracy held fast, you often found that residents took matters into their own hands. Fat City residents got tired of waiting for help that never came from national and municipal government. Via the Internet based 'citynet' network, they were empowered with insights into the experiences of other cities, And out of desperation, communities mobilized to solve their own problems. Residents associations, trade unions, religious and social centers, local institutions like schools, hospitals and firms, sent representatives to regular neighborhood meetings to decide what to do, and how to organize the means of survival.

At the height of the crises, nightly meetings would work out how to ration water fairly in times of drought, how to rehouse those washed out of their homes in times of flood. As the extremes of weather waned, meetings schedules eased up to weekly, then monthly; but still more than 10 years later, local democracy and participation are key features of the city. Communities remember with pride and confidence, their ability to take control of the direst situation, and expect and demand a political system that responds to their needs. This is reflected in local elections, where turn out exceeds 75%. Voter registration is annual, and homeless and transient people are able to register to vote if they can show they have a job in the city or a child in a city school.

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