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**pwc**

# Slaking the thirst of a huge nation



By Gabriel Wong

On cover: A worker prepares a new water pipe in Ningbo, Zhejiang province.

Above: Shanghai's Jin Mao Building and Oriental Pearl TV Tower.

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**To understand China's thirst for water**, look no further than Beijing. This city of 20 million people possesses only one tenth of the world's average water resources per capita. Beijing has endured droughts each year for the past decade; its supply of surface water from reservoirs, rivers and lakes has dwindled dramatically; and its groundwater tables have dropped at a perilous rate, with water pumped out much faster than it can ever be replenished.

Beijing's chronic water shortage is emblematic of the broader challenge facing China — and, indeed, facing many water-scarce developing nations such as India, South Africa, Brazil and Turkey. In India, nearly three quarters of the population lives in water-stressed regions, yet water demand continues to surge, both for agriculture and industry. Likewise, in Brazil, soaring water demand is being driven by rapid urbanization and rising industrial use. Severe pollution has compromised the quality of the limited water supplies in these and many other emerging nations. And climate change only intensifies the uncertainty, not least by making rainfall patterns increasingly unpredictable.

**China provides the perfect example of a developing nation grappling** with these urgent issues. The United Nations, which lists China as one of 13 countries contending with serious water scarcity, says it has 21% of the world's population, but only 6% of its freshwater. Overall, China's per capita availability of water is just 25% of the world's average, and more than 400 Chinese cities are short of water.<sup>1</sup> These shortages are mostly concentrated in the parched north, which receives much less rainfall than the south.

**Government planners and foreign investors alike are wrestling** with the implications of these shortfalls. A 2011 HSBC report entitled China's Rising Climate Risk warns that nine Chinese provinces "suffer from extreme water scarcity." It cautions that 14 out of 31 provincial economies "could be at risk from water stress," since they rely heavily on water for everything from power generation to manufacturing. China's water shortages are further exacerbated by pollution: the World

<sup>1</sup> *China's Thirst for Water*, Dow Water & Process Solutions, April 2011. [http://www.futurewecreate.com/water/includes/DOW072\\_China%20White\\_Opt1\\_Rev1.pdf](http://www.futurewecreate.com/water/includes/DOW072_China%20White_Opt1_Rev1.pdf)

China has 21%  
of the world's  
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But only 6%  
of its freshwater

Source: United Nations

Water Organization says at least half of the country's mainstream rivers and lakes contain water unfit for human consumption, while the World Bank says 300 million people in rural China drink contaminated water daily.

With China's economy still growing at an impressive rate, water demand will only increase. But this growth requires abundant energy. The coal industry alone is expected to account for 27% of China's water use by 2020, deepening concerns about the conflicting need for energy and water.<sup>2</sup> Meanwhile, China's population is projected to expand from 1.3 billion to 1.45 billion by 2029, according to the *Washington Post*. The government thus estimates that China's water consumption will rise from 599 billion cubic meters in 2010 to 670 billion by the end of this decade.<sup>3</sup>

Small wonder, then, that China's leaders have made water a top priority. In March 2012, Li Keqiang — now China's Premier — warned: "Drought and water shortages are severe restrictions on the country's social and economic development."<sup>4</sup> Hu Siyi,

China's vice minister of water resources, added: "The constraints of our available water resources become more apparent day by day... If we don't take strong measures, it will be hard to reverse the severe shortages."<sup>5</sup>

**What measures will help? It starts with infrastructure.** The most ambitious megaproject under way is a scheme to build over 2,500 kilometers of canals to carry trillions of gallons of water from the wet south to the arid north. It's ultimately expected to be the biggest construction project in history and to cost at least \$60 billion. "Water transfer is very expensive," said Xiao Jincheng, a senior official at China's National Development and Reform Commission, speaking in May 2012 at a New Cities Summit in Paris. So there's also mounting pressure to conserve water. "Local governments are very strict on water usage," said Xiao. "In every city, there are water plants to treat dirty water, especially for reuse in landscaping, parks or for industrial needs." Beijing and other northern cities have already adopted water-recycling programs designed to convert

wastewater into so-called "gray" water that can be used for tasks like flushing toilets and washing cars.

Aware of the mounting need to reduce pollution and use water more efficiently, the government is also investing heavily in infrastructure projects such as sewage networks and wastewater treatment plants. In their quest for greater efficiency, energy companies and utilities are also building advanced power plants that require less water to produce more electricity — an illustration of the critical role that technology must play in any country that is battling water shortages.

There is also a growing awareness in China of the need for other solutions that are relatively prosaic but highly effective. For

<sup>2</sup> *How China Is Dealing With Its Water Crisis*, Earth Institute at Columbia University, May 2011. <http://blogs.ei.columbia.edu/2011/05/05/how-china-is-dealing-with-its-water-crisis/>.

<sup>3</sup> *Food supply, Fracking, and Water Scarcity Challenge China's Juggernaut Economy*, Circle of Blue, October 2012. <http://www.circleofblue.org/waternews/2012/world/choke-point-china-ii-introduction/>

<sup>4</sup> *China Daily*. [http://www.chinadaily.com.cn/china/2012-03/22/content\\_14884786.htm](http://www.chinadaily.com.cn/china/2012-03/22/content_14884786.htm).

<sup>5</sup> "China warns on growing water shortages", *Financial Times*, Feb 16, 2012. <http://www.ft.com/cms/s/0/131bb6dc-588f-11e1-9f28-00144feabdc0.html>.

*China is spending hundreds of billions of dollars on infrastructure to alleviate its ominous shortage of water. That's great news for foreign companies such as IDE Technologies, which has built one of the world's most sophisticated desalination plants in the parched city of Tianjin.*

example, public-service campaigns can be employed to encourage Chinese citizens to use water less wastefully. Likewise, collective initiatives are being explored by water companies to promote better practices among farmers, including improvements in the use of irrigation. There is also pressure to expand the use of meters in order to limit the amount of water needlessly wasted in sectors such as agriculture and industry. In addition, efficiency can be significantly enhanced simply by reducing the amount of water lost through leakage — for example, from faulty toilets and poorly-maintained sewers. These low-tech, high-impact measures are central to China's efforts to manage its water woes.

Goldman Sachs says China has seen “slow but steady growth” in water-related infrastructure over the past decade, with 89% of the population having access to “improved water facilities,” versus 96% in Russia and 97% in Brazil.<sup>6</sup> But China's need for water infrastructure remains huge. “Massive investment in water services is required in China,” says the OECD, “especially in the second-level cities and in wastewater collection and treatment and pollution control.”<sup>7</sup>

**“We really need technology to cope with water scarcity,”** Xiao said at the New Cities Summit. “In future, we'll try to use desalination of sea water.” Indeed, China is already emerging as the next great market for this vital, yet controversial technology. It's easy to understand the appeal of desalination, which involves

converting seawater or brackish water into freshwater. In 1961, U.S. President John F. Kennedy observed: “If we could ever competitively — at a cheap rate — get freshwater from salt water, that would be in the long-range interest of humanity, and would really dwarf any other scientific accomplishment.” As the global water crisis deepens, this has become a more pressing objective, and the world is expected to produce double the quantity of desalinated water in 2016 as in 2008.

**Until recently, China had merely dabbled in desalination.** Compared with places like Saudi Arabia, the United Arab Emirates and Israel, its installed capacity remains meager. But the government plans to boost China's capability for producing desalinated water from about 680,000 cubic meters per day to 3 million cubic meters by 2020. The National Development and Reform Commission has assembled a team of top experts to map out China's five-year plans for the sector. Guo Youzhi, a team member who also heads the China Desalination Association, recently assured the Chinese media: “Technologies related to seawater desalination will enjoy great policy support.”<sup>8</sup>

This government backing has sparked an international gold rush, attracting foreign firms that sell everything from miniscule components to entire desalination plants. International companies that have flocked to China include the French giant Veolia Environment, Singapore's Hyflux,

America's Dow Chemical, and Norway's Aqualyng. Bullish projections abound. A 2012 report by TechSci Research predicts that China's desalination market will grow 18% annually for the next five years.<sup>9</sup>

**What does it take for foreign companies to succeed in this highly competitive market?** Few executives are as well positioned to answer that question as Avshalom Felber, CEO of the Israeli desalination company, IDE Technologies. In 2011, Global Water Intelligence named IDE as the 2010 “Desalination Company of the Year,” based largely on its success in “winning a significant portion of the Chinese desalination business.” IDE was specifically hailed for its “stunning project win” in Tianjin, an enormous port city about 150 kilometers from Beijing.

**Tianjin is now emerging as a global showcase** for the latest in desalination technology. With 10 million residents and an expanding industrial sector, it has an almost limitless need for water. Other coastal cities like Dalian and Qingdao will also drive China's desalination sector, but Tianjin has led the way, with its two biggest desalination projects accounting for as much as one third of China's total capacity.

China's largest desalination project, the Tianjin Beijiang Power and Desalination Plant, is IDE's brainchild. The state-owned investor behind it, S.D.I.C., picked IDE to provide the cutting-edge technology for this flagship project. Felber, IDE's CEO, sees the plant as part of a much broader effort by China's government “to solve the huge challenge” of water shortages in economically critical areas. “The biggest barrier to economic growth in that region, the northeast, is water scarcity,” he says. “All these industries like steel mills and refiners that are very popular there are held back by lack of water.”

6 A Progress Report on the Building of the BRICs, Goldman Sachs, July 22, 2011. <http://www.goldmansachs.com/our-thinking/topics/brics/brics-reports-pdfs/progress-on-building-the-brics.pdf>.

7 OECD Reviews of Regulatory Reform: China 2009 — Defining the Boundary between the Market and the State, OECD, 2009.

8 Desal in China: Trends & Opportunities, by China Water Risk, November 10, 2011. <http://chinawaterisk.org/resources/analysis-reviews/desal-in-china-trends-opportunities/>

9 China's Desalination Market, TechSci, March 2012. <http://www.techsciresearch.com/1680>

**The Persian Gulf currently accounts for 60% of the global desalination market**, says Felber, but he expects China to eclipse the Gulf market within two decades. Still, nobody would suggest that it's an easy place to break in. IDE entered China in 1995, yet its breakthrough only came in 2005, with the award of the coveted contract for the Tianjin plant. After completing the first stage in 2007, IDE won a second contract in 2010 to double the plant's production capacity. "China is very centralized and political," says Felber. "A large project like this is only possible with approvals from all levels of the municipal and federal government." It was a powerful lesson on the need for a long-term perspective. "You have to be very patient and open-minded about changes that keep occurring," he says. "It's not a simple way forward."

China's government is so vast that it was difficult even to figure out who was authorized to make decisions, let alone meet with them. "It's very hard to be competitive if you don't understand what moves things, why certain decisions are taken," says Felber. "A lot of things are based on personal trust. People go with who they know.

People work with their classmates. They won't do business with a person they don't like... So the biggest challenge was first to understand how they interact, how decisions are taken. This is a big issue in any country. But in China, with the language barrier, it was even harder. It's hard to understand what you're up against there, what to expect and what you can trust."

**Faced with these cultural hurdles**, IDE committed to become as localized as possible. All of its employees in China are Chinese. The company also joined forces with Chinese partners who understand the nuances of the local business environment. "We don't want the Chinese to play our game, or to teach them what we think is the right way to do things," says Felber. "We're trying to become Chinese ourselves."

**Founded in the 1960s**, IDE has built over 400 desalination plants in 40 countries as far afield as India, the U.S. and Australia. So it had a long record of innovation — and the advantage of being technologically flexible. Most of the world's desalination plants now use "membrane" technology, which typically involves a process known as reverse osmosis. This entails forcing seawater or brackish water through a

semi-permeable membrane, which filters out salt crystals and other impurities. Reverse osmosis is widely viewed as the most cost-effective technology for seawater desalination. In Israel, IDE operates the world's largest reverse osmosis plants. But IDE also specializes in "thermal" desalination, which involves heating impure water and condensing the evaporated water to produce freshwater. IDE could offer both technologies to its Chinese clients, lending credibility to its advice on the best solution for Tianjin.

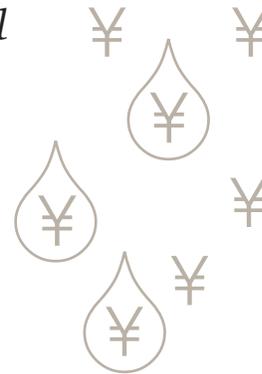
In the end, IDE created a version of its thermal technology for Tianjin. The city's bay is "quite highly contaminated because of the discharge of chemicals" by the industrial sector, explains Felber. "It would be very expensive and energy intensive to treat this water with membrane technology." IDE's design also incorporated an electricity plant that works in tandem with the desalination plant: the electricity plant generates waste heat, which IDE uses to power its desalination process. This cuts the energy costs of desalination, while minimizing the harmful discharge of waste heat into the atmosphere. IDE's state-of-the-art process also takes post-desalination

*"We don't want the Chinese to play our game, or to teach them what we think is the right way to do things. We're trying to become Chinese ourselves," says the CEO of IDE Technologies.*



Most desalination plants use reverse osmosis, a process that filters sea or brackish water through a membrane.

*China's desalination industry faces a fundamental economic issue: the unfeasibly low market price of desalinated water. Tech-savvy companies keep driving down the cost of producing this water, but it still remains an expensive process.*



waste brine and recycles it to produce pure table salt. China's government has become "very environmentally aware," says Felber, and "insisted" upon a sophisticated green solution.

**While Felber sees great opportunities** to bring this kind of innovative technology to China, he acknowledges that it won't be easy for foreign companies to maintain their lead in the desalination industry: "The biggest challenge will be the amount of local competition. Looking from the outside, it seems too simple, so every Chinese company is asking 'Why don't we do it ourselves?' So the only way to grow in China is just to keep getting better."

In the meantime, China's desalination industry faces a fundamental economic issue: the unfeasibly low market price of desalinated water. Tech-savvy companies like IDE keep driving down the cost of producing this water, but it still remains an expensive process. The prices currently paid for desalinated water in China don't come close to reflecting the production cost. Consumers in Israel pay nearly \$2 per cubic meter, says Felber, whereas Chinese consumers pay less than \$1 — and sometimes less than 50 cents.

**China's government is eventually expected to create a more rational pricing system** that better reflects the cost of desalinating water. Until then, desalination plants like IDE's project in Tianjin operate at a significant loss. The New York Times praised the Tianjin plant

in October 2011 as a "technical marvel," but added that its "desalted water costs twice as much to produce as it sells for."<sup>10</sup>

China's state-owned companies can afford to operate this way, since they're not motivated solely by profits. Their strategic priority in a city like Tianjin is to advance the government's interest in alleviating water shortages, while also nurturing the domestic desalination industry. Foreign companies must adjust to these market dynamics. In Israel, IDE has long-term concessions to sell desalinated water to consumers; in China, its focus is exclusively on supplying desalination equipment, since the business of selling water to companies and households will remain financially unviable until the government raises water tariffs. Many argue that China's nascent desalination industry will require government subsidies until it reaches economic maturity.

While pricing may be the greatest challenge facing China's desalination sector, there's also a lingering concern that desalination may be environmentally unsound. Critics contend that the energy required in the desalination process makes it unsustainable. For China, this is a serious consideration, since most of the country's power is generated by burning coal, which emits greenhouse gases that exacerbate climate change. A carefully balanced perspective on this complex issue comes from a major study published in *Science* in 2011, entitled *The Future of Seawater Desalination: Energy, Technology, and the Environment*. While

recognizing that "the carbon footprint of large-scale desalination plants can be substantial," this study notes that "continual technological improvements" have made desalination plants much more energy-efficient.

**These environmental concerns** — along with the relatively high cost of desalination — mean that countries suffering from water shortages must also thoroughly explore other solutions such as water conservation, water recycling and regional water transfers. But "these options alone will not be enough," concludes the report in *Science*. "For water-scarce countries that already implement all other measures for freshwater generation, desalination may serve as the only viable means to provide the water supply necessary to sustain agriculture, support population, and promote economic development."

**China's leaders have clearly reached the same conclusion** — that desalination is an indispensable weapon in their war on water scarcity. As Felber says, the Chinese government has no choice but to invest aggressively in desalination: "The scarcity is really so bad in China now that I don't see any way around it."

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<sup>10</sup> "China Takes a Loss to Get Ahead in the Business of Fresh Water", *New York Times*, October 25, 2011. <http://www.nytimes.com/2011/10/26/world/asia/china-takes-loss-to-get-ahead-in-desalination-industry.html?pagewanted=all&r=0>

## Building a new Asia



The global engineering company Arup Group has helped to construct many of Asia's most important infrastructure projects. Nobody has played a more central role than Andrew Chan, Arup's deputy chairman and head of its East Asia region between 1996 and 2007. The Hong Kong-based engineer has worked on skyscrapers, subways, airports, bridges, highways, railways, and countless other projects that have sprung to life amid Asia's economic transformation. He's been particularly active in China, working on everything from power plants to the Beijing National Stadium for the 2008 Olympics. Chan speaks here about sustainability, corruption, and the challenges of creating China's extraordinary infrastructure.

*The Western perception is that the global balance of economic power has shifted to Asia. China, in particular, seems to have an incredible ability to get infrastructure projects done, while cities like London, Paris and New York move more slowly and inefficiently. Do you see any truth in this?*

It's certainly correct that China can get these vast, ambitious infrastructure projects done. The policy comes down from the central government: "We need this high-speed rail network." And it happens. I recently spoke to the chief engineer for China's Ministry of Railways and told him: "I want to trade jobs with you because you wake up every morning and say, 'Today, I will complete 100 kilometers of high-speed rail!'" When the Chinese government wants a piece of infrastructure done by whatever date, thou shalt do it. That's the way things get done in China, and it's very good because a lot of the infrastructure is being built in cities

that are in a "need" stage, rather than a "want" stage. They need more sustainability, so they have to cut down on aviation and embrace high-speed rail.

*What kind of thought process does the Chinese government go through in deciding whether to invest in infrastructure projects — and how is this different from in the West?*

In the West, people typically look at the viability of a piece of infrastructure — a railway line, say — in isolation. They analyze the project's financial viability, calculate its internal rate of return, but don't look at it within the context of the whole economy. In China, they look at these projects as part of the development of the entire economy. For example, China sees its high-speed rail network as one element in an overall grand plan: the country also has factories that are manufacturing trains, which they ultimately aim to export to places like California and Britain. So, these projects are looked at in this

broader economic context from a very high level. That's something the West is missing.

*China suffered a high-speed rail crash in 2011 in which 40 people died. Does that raise questions about its ability to handle these huge, technologically complex projects?*

They have the best technology, so I don't think it's really a technology problem. It's a management problem. It's an operating problem. It's a people problem.

*Is quality control still a challenge when it comes to infrastructure projects in China?*

I started taking Arup into China in 1984 and was deeply engaged in very early and successful infrastructure schemes there. In my experience, when we talk about quality in China, they still look at infrastructure very much from the viewpoint of "Is it good enough?" If it works, that's good enough for them. We've worked on many projects there — from

the iconic Olympic venues to the Beijing South High-Speed Rail Station. The station is a good example of what happens in China because it's very typical with major works like this that they want to do the detail themselves. And so you ended up having finishes where the quality is poor. Still, it works — and, in China, that's good enough. Quality that's beyond "good enough" is lacking, so the end product is often unsatisfactory.

*Does China still struggle to innovate when it comes to infrastructure?*

Yes and no. Innovative solutions aren't appreciated in the same way as in the West: in China, there has to be a reason to innovate, whether it's doing a project at a lower cost or very quickly. But if you look at some of the big, tricky projects being built in western China

now, some of the construction is exceptionally innovative. They're doing these major civil works like constructing a big bridge across a deep valley, and the difficulties in access and machinery are forcing them to innovate. China is still going through a learning process when it comes to very high-tech control systems, and some would say they did steal or copy from the West. But I wouldn't discount them on innovation. China is going through pretty much what Japan went through in the '60s and '70s: They're learning and modifying.

*How does urban development compare in China and India?*

I see a great parallel between Mumbai and Shanghai in their stages of development. But China has an advantage in that it builds infrastructure with state money, whereas it's often

done with the help of private investment in cities like Mumbai and New Delhi. When China decides that it needs a ring road, it gets built in 10 months, no questions asked. It's just done. It might be that India would be growing even faster than China, if not for the corruption.

*Transparency International has said that corruption is more of a problem in infrastructure than any other industry. How challenging is this in developing countries?*

In some developing countries, corruption is so rampant that it's all almost written down: "To do this, it's this price; to do that, it's that price. And, if you don't deliver on time, it'll be refunded." It's part of the system. At Arup, we try to stay away from places where corruption is known to be rampant, so our involvement in big projects

in certain countries is very limited. For that reason, we're less successful than we ought to be. I've been engaged with this issue because I was appointed by the government to sit on the corruption prevention advisory committee of Hong Kong's very successful Independent Commission Against Corruption; I've also been at high-level conferences in China and Macau on preventing corruption. There were presentations in China saying that their system is even better than ours, since they have huge books laying out rules that are even more stringent than in Hong Kong. I almost chuckled, because it's not about the system you set up. You also need to create total transparency and a level playing field in the marketplace itself. They don't have that yet. That's something Asia still needs to work very hard at. I could see that China has all these anti-corruption measures,

*"I'd like to create a true eco city. You need to plan infrastructure that works together in a holistic way, so that the energy, water, transport and waste are all integrated."*



View from the International Commerce Centre, completed in 2010, the tallest building in Hong Kong, with Victoria Harbour and the central district of the city in the background.

*“The policy comes down from China’s central government: ‘We need this high-speed rail network.’ And it happens. When the government wants a piece of infrastructure done by whatever date, thou shalt do it.”*

but somehow it hasn’t helped them. Part of the problem comes from civil servants being low-paid. It’s important to solve bigger issues like this, or all these stringent measures won’t exempt them from the hazards of corruption.

*Cities across Asia are growing at an explosive rate. How do you balance the economic benefits of this growth with the threat it poses to environmental sustainability?*

The economies driving this urban growth can’t afford to stop — because then you have social problems if your factories close down or even slow down. When your GDP growth targets are so high, you do things that are less than satisfactory, so sustainability is under threat. But cities around Asia often have a certain life cycle: in Taiwan, for example, cities would develop industry, pollute the environment — then they’d spend billions of dollars fixing it. Unfortunately, that’s being

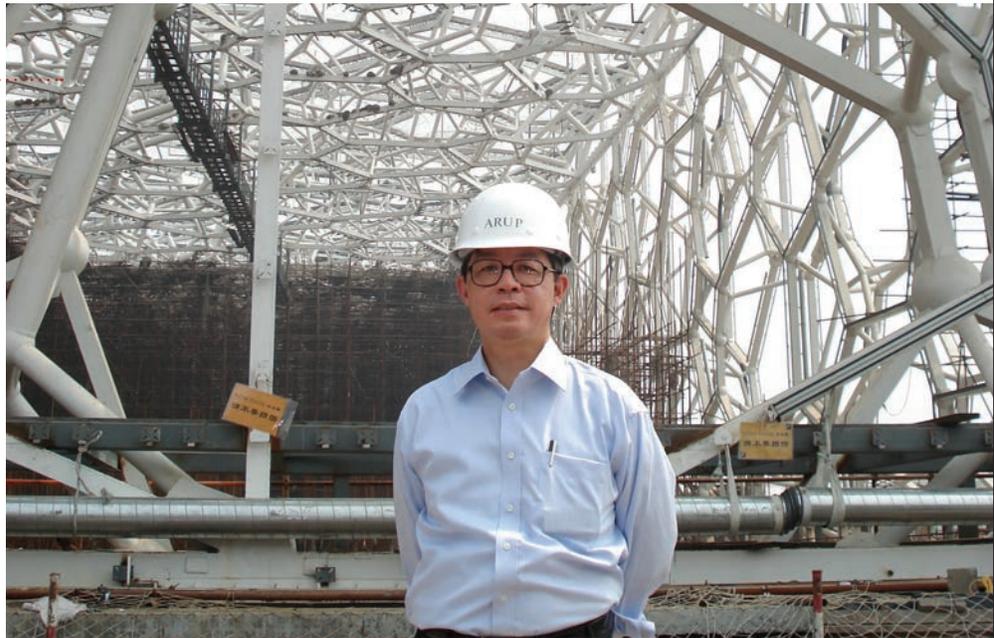
repeated in China. When you look at the millions of cars being produced there, clogging up roads and producing pollution, you might say, “Surely, you should ban the cars.” But you can’t ban them because then the industry would collapse; then you’d have a labor problem and a social problem.

*You often warn that cities must be made more “resilient.” What’s driving this concern?*

In Hong Kong, we pride ourselves on the fact that everything works and is efficient. But one major issue is that we don’t talk in terms of “just in case.” We rely heavily on everything working in the whole supply chain. However, what if one element fails or becomes less efficient, and then a whole chain reaction occurs? It’s wise to consider this kind of “just in case” scenario, which could result from a threat like climate change. For example, many Chinese cities

upstream — from which we pump our water — will need more water themselves as they continue to develop. And this is further complicated by climate change and its effect on rainfall patterns. China has a water problem, so now it has a policy of looking to secure an alternate water supply system for its major urban centers. So I ask, “What alternative will Hong Kong have?” That’s what I mean by the need for resilience. We need a holistic approach, and what I call “integrated infrastructure.” That can’t just happen on its own. It has to be by design. This applies to other cities, too: when you look at climate change as a driver, you see that flooding risks, energy risks, and natural hazards apply to many cities, including developing cities built beside riverbanks or coasts around Asia. They’re very susceptible to rising sea levels, extreme weather patterns, and natural disasters resulting from climate change.

*“When we talk about quality in China, they still look at infrastructure very much from the viewpoint of ‘Is it good enough?’ If it works, that’s good enough for them. Quality that is beyond ‘good enough’ is lacking, so the end product is often unsatisfactory.”*



At the Beijing National Aquatics Centre, also known as “Watercube”, completed in 2008.

*You’ve also stressed the environmental importance of retrofitting old buildings. How effective is this in reducing cities’ carbon emissions?*

Retrofitting existing buildings is a very big opportunity: if we can improve their performance and save energy, it will help a lot. You can easily cut 30 percent of a building’s energy use by retrofitting, so this really is low-hanging fruit.

*When people look at the factors that make a city attractive, they typically focus on things like economic clout; transportation; cultural assets; sustainability; ease of doing business; safety, health and security; and cost of living. What matters most to people living in developing cities?*

For the average person in a developing city, the most

important factor is safety, health and security. Efficiency is also important — and that relates to transport or connectivity and how you lay things out through good urban planning. This ability to get around efficiently is probably second in importance only to safety. In new cities, we now fairly often see what’s known as a “Transit-Orientated Development,” which is designed to resemble what planners describe as a “string of pearls.” You have a rail-based network, then you evolve a community around each station. Then you add in a low-carbon transport mode like light rail or buses. So the development of the city is really based on the transport system. It’s the ideal model in my view, and it’s very fashionable.

*What kind of urban infrastructure project would you most like to work on in the future?*

I’d like to create a true eco city. We started doing that with Chongming Dongtan in China. It didn’t happen for various reasons. But we developed the framework, setting out what an eco city is, what needs to be there, and how you integrate the infrastructure. You need to plan infrastructure that works together in a holistic way, so that the energy, water, transport and waste are all integrated. We’ve planned these projects and provided the thought leadership, but it’s very difficult to make them happen. People do their sums, and say: “The IRR is this, so why should I pay more for a district cooling system that would require longer to pay

back our investment?” And that tends to stop it. If one element hits that problem, the rest fall apart, and you don’t make the integration happen. I’d be ambitious enough to aim for a new city with a population of 50,000 to 60,000. At that scale, you can make the sums work and start realizing these concepts. That’s my dream project. ■

## **To discuss the issues**

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