

# One Country, Two Systems, One Smog

## Cross-Boundary Air Pollution Policy Challenges for Hong Kong and Guangdong

By Lisa Hopkinson and Rachel Stern

*Rapid development of the Pearl River Delta has led to worsening regional air quality. In the last five years, the Hong Kong Special Administrative Region and Guangdong governments have taken some tentative, yet crucial steps, towards addressing regional air pollution. In 2002, the two governments published a landmark joint study on cross-boundary air pollution, which recommended a number of measures to meet target reductions in air pollutants. In another promising development, the two governments also are considering a pilot emissions trading scheme. However, the two sides remain reluctant to include the public in decision-making despite nongovernmental projects like the Hong Kong and Pearl River Delta Monitoring Study that show the value of collaboration among different stakeholders. Experiences from the U.S.-Mexico border, a region facing similar problems as the Pearl River Delta, help indicate possible paths forward. Addressing regional air pollution in the Hong Kong-Pearl River Delta region will require creating new institutions to provide funding, raise public awareness, and lobby for change. The public must be involved in the design and execution of these institutions. Greater opportunity for public support will both facilitate more rapid reduction of air pollution and lower the social costs of cuts in emissions*



In 2002, *Lonely Planet* changed the cover of its travel guide to Hong Kong and Macau from a brightly colored temple to the Bank of China building silhouetted against a hazy sky. Inside, the guide tells visitors with respiratory conditions to consider “dangerously high levels of particulate matter and nitrogen dioxide” when planning to stay “for a prolonged period, particularly in summer” (Button, 2002, p3). The *Lonely Planet* warning marks international recognition of a long-time environmental problem in Hong Kong—air pollution.

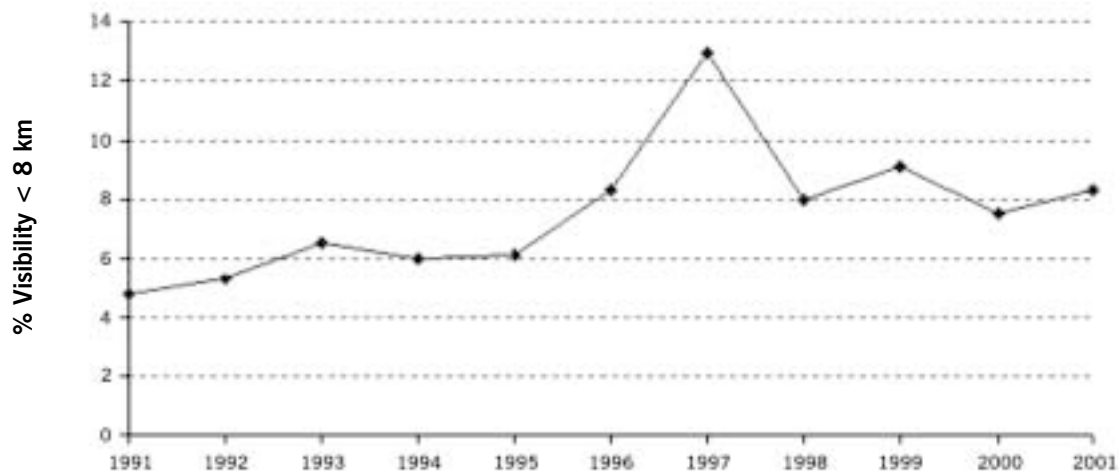
The air pollution problem reaches well beyond Hong Kong. The rapid development and urbanization in the Hong Kong Special Administrative Region (HKSAR) and Guangdong province have led to worsening air quality in the entire Pearl River Delta (PRD) region.<sup>1</sup>

The PRD covers 43,000 square kilometers and has a population of some 39 million people—904 persons per square kilometer (CH2M Hill, 2002). Over the last few decades, rapidly increasing emissions from motor vehicles, power stations, industry, and construction have resulted in deterioration of the PRD region’s air quality. Regional air pollution first became a significant public issue in Hong Kong during the 1990s because of a dramatic reduction in visibility due to regional ozone pollution

(see Figure 1), caused by an almost 50 percent increase in ozone levels over the decade (Environmental Protection Department, 1999).

While the Hong Kong government acknowledged this worrying increase in ozone, the Hong Kong Environmental Protection Department (EPD) largely focused on street-level pollution from diesel vehicles up until the 1997 handover (Director of Environmental Protection, 2000).<sup>2</sup> Street-level pollution was a serious problem both because of its acute health effects and because concentrations of particulates were so high. Levels of fine particulates<sup>3</sup> and nitrogen dioxide (NO<sub>2</sub>) regularly exceeded Hong Kong’s Air Quality Objectives (AQOs)<sup>4</sup> throughout the 1990s. In 1999 alone there were (CH2M Hill, 2002):

- 19 exceedances of 24-hour NO<sub>2</sub>;
- 16 exceedances of 24-hour respirable suspended particulates (RSPs);
- 18 exceedances of hourly ozone AQOs at 11 monitoring stations in Hong Kong;<sup>5</sup> and,
- One maximum hourly ozone concentration of 335 micrograms per cubic meter of air (µg/m<sup>3</sup>) at a site near Hong Kong’s new airport—40 percent above the local AQO emission standard.

**Figure 1. Visibility Trends in Hong Kong, 1991-2001**

Note: Y-Axis values by dividing the number of hours when Visibility < 8 km and Relative Humidity (RH) ≤ 80% by the total hours in the year when RH ≤ 80%

Source: Hong Kong Observatory, 2002

While Hong Kong has tracked city pollutants for years, up until 2002, there was no quantitative data on regional air pollution or the relative contribution from different sources. Knowledge about regional air pollution was limited to the observation that visibility in Hong Kong tended to be worse in the drier winter months when the prevailing winds come from the north and west (Cheng and Lam, 1998).

The rise of regional pollution was tied to Hong Kong's transition from a manufacturing to a service economy. In the late 1980s and early 1990s, much of Hong Kong's manufacturing base moved across the border to take advantage of lower labor costs. The number of manufacturing plants in Hong Kong declined from 48,000 in 1985 to 21,000 in 2000 (Hills, 2002).

As manufacturing plants moved across the border, air quality worsened in Guangdong. Visibility in Shenzhen was nine times worse in the late 1990s than in 1991 (CH2M Hill, 2002). In the period 1999 to 2000, an hourly concentration of ozone of 457  $\mu\text{g}/\text{m}^3$  was recorded in Foshan; and one-off 24-hour concentrations of  $\text{NO}_2$  and RSP were recorded in Guangzhou at 307  $\mu\text{g}/\text{m}^3$  and 608  $\mu\text{g}/\text{m}^3$ , respectively (CH2M Hill, 2002). These readings in Guangzhou were between two and four times greater than the mainland national air quality standards, levels that posed serious threats to human health.<sup>6</sup>

While the Hong Kong EPD was certainly aware of

the growing problem of regional air pollution in the 1990s, their hands were tied by lack of quantitative data, the political situation prior to the handover, and fears that concentrating on cross-boundary air pollution would reduce political support for measures to address Hong Kong's street-level sources.

#### THE HONG KONG GOVERNMENT RESPONSE

Before the 1997 handover, there was little dialogue and cooperation between Hong Kong and mainland China on environmental issues. The sole point of contact on this issue was the Hong Kong-Guangdong Environmental Protection Liaison Group (the Liaison Group), which was set up in 1990 to enhance cooperation and coordination on environmental management and pollution control. The Liaison Group, made up of senior officials from both sides, held annual joint meetings alternately in Hong Kong and Guangdong. While a Technical Sub-Group was formed to implement the annual work program, joint activities largely consisted of visits, workshops and seminars to share experience and exchange views. Environmental nongovernmental organizations (NGOs) and government advisors repeatedly chided the Hong Kong government for not taking bolder steps to discuss and implement cross-boundary cooperation projects with Guangdong (Lee, 2002).

A lack of transparency on both sides meant that meetings were held behind closed doors and minutes were not published, preventing dissemination of information and public discussion of the issue. While the mainland government publishes an environmental yearbook and 46 Chinese cities issue a weekly report on urban air quality, the quality of the information is poor. Environmental impact assessment (EIA) reports and some basic environmental monitoring data are still considered state secrets, especially emissions from state-owned factories. Lack of any concrete and common data on sources of regional air pollution hampered joint policy initiatives.

Furthermore, the pre-1997 British colonial administration, led by then-Governor Chris Patten, was preoccupied with the handover and impending constitutional changes that Beijing often opposed—thus, relations with the mainland Chinese government were decidedly frosty.<sup>7</sup> Sensitivities about Hong Kong's political autonomy and fears that the mainland would drain the city's financial reserves also strengthened resistance by pressure groups, legislators, and the government to any major cross-boundary initiatives (Lee, 2002).

Lastly, cross-boundary pollution was not high on the environmental agenda prior to the handover. Initiatives taken by the Hong Kong government in the early 1990s to address street-level air pollution had met with significant political opposition and had been withdrawn.<sup>8</sup> Since pushing this initiative had occupied much of EPD's time and resources, EPD was unwilling to tackle the more complicated issue of cross-boundary air pollution while significant domestic sources of street-level pollution remained. Overall, the bigger political picture prior to the handover, differences in government culture, and lack of transparency stymied efforts towards more active cross-boundary cooperation on air quality.

### *Post-Handover—Growing Concerns*

Following the handover, public concern in Hong Kong about the growing regional air pollution problem began to intensify, due in great part to a series of severe air pollution incidents and a marked deterioration in visibility during the winter of 1998-1999. For example, in September 1998 air pollution reached record levels in the urban areas of Hong Kong to the point where the government advised people with heart or breathing problems to stay indoors (EPD, 2002).<sup>9</sup> (See photos). The Hong Kong Legislative Council also held a non-binding debate on 25 November 1998 urging government action on air quality (Hansard, 1998). Since the winter winds tend to blow from the north, Guangdong was seen



*The same view of Hong Kong's famous skyline is markedly clearer in summer (top) than the winter (bottom) months.*

as the primary source of this worsening air quality, which highlighted the need for joint action.

Opportunely, both sides had agreed on the need to jointly study air quality in the PRD region at the eighth meeting of the Liaison Group in January 1998. An Expert Group comprised of technical professionals from both Hong Kong and Guangdong was set up to identify the scope of work required and put forward a proposal to the Liaison Group (Planning, Environment and Lands Bureau, 1998). The Liaison Group, at its ninth meeting in August 1998, endorsed the proposal of the Expert Group. The recommendations of the Expert Group included:

- 1) Collection of existing information on air quality and pollution sources;
- 2) Compilation of additional data on pollutant distribution;
- 3) Projection on socioeconomic growth and assessment of likely future air pollution scenarios; and,
- 4) Evaluation of the effectiveness of current pollution control measures.

While both governments agreed on the scope of study proposed by the Expert Group, the priorities of the two governments differed slightly. For Guangdong, the priority was to work out measures to combat acid rain in the region. The Hong Kong government focused on nitrogen dioxide, photochemical oxidants, and motor vehicles emissions (PELB, 1998).

The budget for the Hong Kong portion of the study was HK\$15 million (U.S.\$1.9 million) while Guangdong's budget was 6 million RMB (U.S.\$0.7 million) (PELB, 1998). In September 1999, a Hong Kong-based consultancy was commissioned to conduct a joint study in cooperation with partners in Guangdong. The objectives of the study were to: (1) identify the major sources of air pollution in the PRD region, (2) forecast trends, and (3) recommend long-term measures to improve regional air quality.

A NEW ERA OF COOPERATION—THE JOINT STUDY ON REGIONAL AIR QUALITY

*The Joint Working Group*

In October 1999, Hong Kong Chief Executive Mr. Tung Chee Hwa and Governor Lu Ruiha of Guangdong province announced cooperation between Hong Kong and Guangdong in six areas of environmental protection (HKSAR Government, 1999). The first goal was to complete the joint study on regional air quality by 2001 and to quickly formulate long-term preventive measures. To facilitate this new cooperation, the Joint Working

Group on Sustainable Development and Environmental Protection (the Joint Working Group)<sup>10</sup> was organized, led by the Director of the Environmental Protection Bureau of Guangdong and the-then Secretary for Environment and Food of the Hong Kong government.<sup>11</sup> This broad, interagency group replaced the Liaison Group.

At the first meeting of the Joint Working Group, held in June 2000 in Guangzhou, eight special environmental study panels were convened, including two on air pollution: (1) the Pearl River Delta Region Air Quality Special Panel, and (2) the Hong Kong-Guangdong Motor Diesel Fuel Specification Special Panel. The motor diesel panel was established to look into the feasibility of harmonizing motor diesel fuel standards between Hong Kong and Guangdong.<sup>12</sup> The Joint Working Group was also asked to explore short-term measures to reduce air pollution of cross boundary traffic.

At an April 2002 meeting, the Joint Working Group considered the completed *Study of Air Quality in the Pearl River Delta Region* (The Joint Study) and agreed to release the findings publicly (Environment and Food Bureau, 2002). As of early 2003, further initiatives by the Joint Working Group and its panels had not been announced.

*The Joint Study Findings*

The Joint Study showed that PRD air quality was deteriorating due to smog caused by complex chemical reactions among ozone, nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>) and volatile organic compounds (VOCs) (CH2M Hill, 2002). The report found that 80 to 95 percent of the pollutants were generated in Guangdong, although the per capita share for emissions was similar in the Hong Kong and Guangdong sides of the Pearl River Delta Economic Zone (PRDEZ). (See Table 1).

The study also revealed that approximately 90 percent of regional emissions are caused by energy production, motor vehicle emissions, industrial operations, and the use of consumer products containing VOCs (e.g., paints and aerosol sprays). The Joint Study predicted that regional economic growth, population growth, and increases in electricity consumption and traffic would lead to a significant deterioration in regional air quality. Specifically, by 2015, regional emissions of SO<sub>2</sub>, NO<sub>x</sub>, RSP and VOCs are forecasted to increase over 1997 levels by up

**Table 1. Pollutant Emissions in the Region in 1997, Total and Per Capita**

	VOC	RSP	NO <sub>x</sub>	SO <sub>2</sub>
<b>Emissions (kilo tons/year)</b>				
Hong Kong SAR	54	13	114	76
PRD Economic Zone	412	245	450	520
Region (Total)	466	258	564	596
<b>Emissions per capita (kg/person)</b>				
Hong Kong SAR	8	2	18	12
PRD Economic Zone	13	8	14	16
Region	12	7	15	15
Source: CH2M Hill (China), 2002				



to 53, 34, 34, and 25 percent, respectively (CH2M Hill, 2002). The Joint Study also predicted that visibility would become a more serious problem throughout the PRD region.

In addition to assessing emission levels, the Joint Study highlighted that existing and planned air pollution improvement measures are insufficient to improve regional air quality (CH2M Hill, 2002). A target was set for both sides to reduce emissions from 1997 levels by 2010, cutting NO<sub>x</sub> by 20 percent, SO<sub>2</sub> by 40 percent, VOCs by 55 percent, and RSP by 55 percent. A number of measures were recommended to forestall this growth in emissions:

*Hong Kong SAR government should:*

- Reduce VOC emissions from sources such as printing operations and consumer products (including paints and aerosol sprays); and,
- Lower SO<sub>2</sub>, NO<sub>x</sub>, and RSP emissions from power plants in Hong Kong.

*Guangdong provincial government should:*

- Reduce emissions from power plants by: (a) transmitting hydroelectricity from the west of China, (b) using cleaner fuels, and (c) upgrading existing plants;
- Lower vehicle emissions by hastening the tightening of motor fuel and vehicle emission standards; and,
- Decrease industrial emissions by requiring the most polluting industrial processes to upgrade or install control equipment.

If these recommendations are implemented, the study predicted Hong Kong could meet its current Air Quality Objectives (AQOs) and other cities in the PRD economic zone would meet the relevant national air quality standards for SO<sub>2</sub>, NO<sub>x</sub>, and RSP (CH2M Hill, 2002). The problem of ozone would remain, but be less serious.

In addition to the separate air quality initiatives, the study strongly recommended that a Regional Air Quality Monitoring Plan with distinct objectives for improving *regional* air quality be jointly established (CH2M Hill, 2002). A management team comprised of government officials was set up to identify specific control measures that would be needed to create such a regional plan. One of their first initiatives, a joint Hong Kong-Guangdong air quality monitoring network for the main air pollutants, is due to begin operation in early 2004 (Tse, personal communication, 2003).

*Benefits and Shortcomings of the Joint Study*

As the first cooperative effort by the two governments to tackle regional air quality and jointly formulate policy recommendations, the Joint Study was a landmark in cross-boundary relations and a significant step forward in regional cooperation on air pollution. The two governments reached a consensus on a scientific baseline for the different pollutants, their sources and predicted levels, set targets for reduction, and issued policy recommendations. However, implementing these measures will demand considerable work and discussion within and between the two jurisdictions. Since the Joint Study provides no mechanisms to ensure that the 2011 targets are met, it remains to be seen how fully the recommendations can be implemented.

The Joint Study contains many other shortcomings, most glaringly, a lack of specific data on sources of emissions, which makes it difficult to regulate individual polluting industries. In addition, future air quality levels were estimated using an emission-based approach that involves a number of uncertainties. However, no error margins or degrees of uncertainty were given in the report.

Perhaps most importantly, as a purely technical study, the Joint Study failed to address the social, economic, and political ramifications of the recommendations. Given the diffuse sources of PRD regional air pollution, wider public discussion, education, and participation in policymaking will be vital. For example, VOC content of consumer products can be controlled by legislation, but promoting the proper use of such paints and solvents by the population at large is more effectively tackled through education.

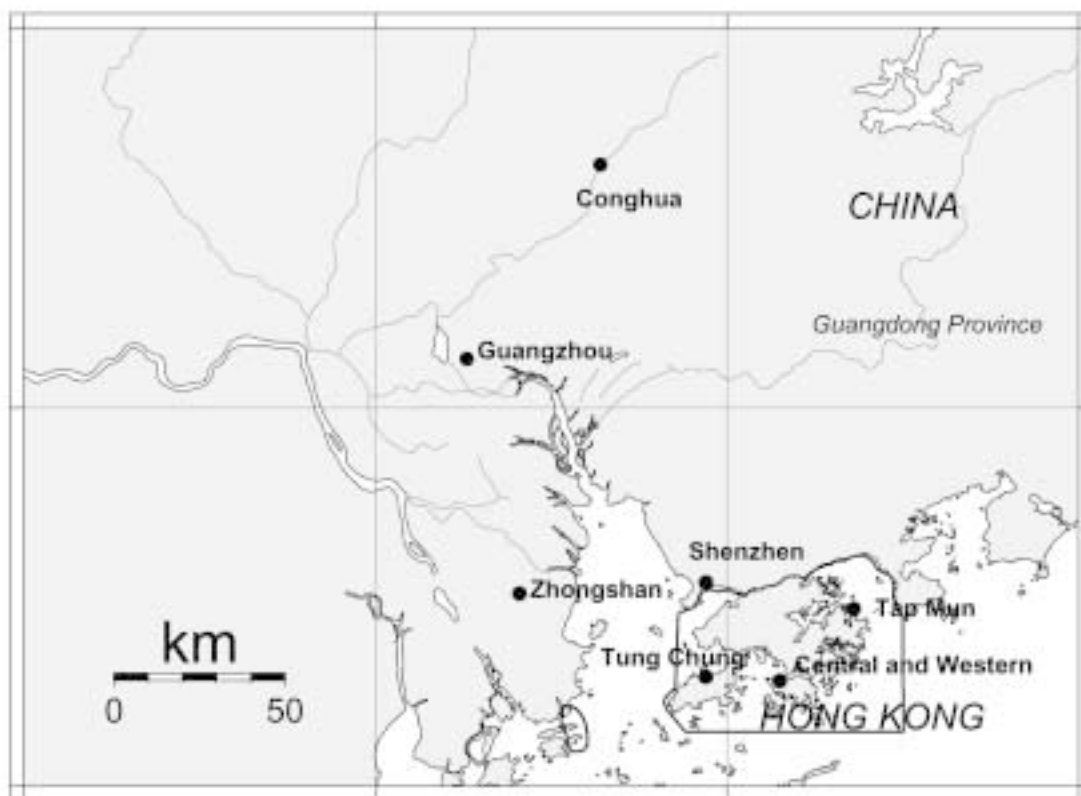
Both the Hong Kong and Guangdong governments lack the tools to involve the wider public in policymaking, as evidenced by the secrecy in which the Joint Study was conducted.<sup>13</sup> In contrast, the latest binational environmental management plan for the U.S.-Mexican border—Border 2012—calls for public representatives to participate in all levels of policymaking from local task forces to regional and border-wide workgroups (EPA, 2002).

Luckily, lack of public participation in the PRD regional government cooperation has not precluded NGOs from addressing the gap in cross-boundary relations by undertaking their own initiatives.

**NGO INITIATIVES: THE HONG KONG AND  
PRD AIR MONITORING STUDY**

During 2001, Civic Exchange, a Hong Kong nonprofit think tank that focuses on the environment and other

**Map 1. Map of PM<sub>2.5</sub> Monitoring Network Used for the PRD Air Quality Monitoring Study**



Source: Lynn G. Salmon

areas of public policy research, was the catalyst in pulling together a group of research institutes from Hong Kong, PRC, and the United States to create a proposal for a PRD air pollution collaborative study.<sup>14</sup>

This study will complement the scientific work of the Joint Study and increase air pollution monitoring and analysis capacity among the region's scientists. Funded by both the private sector and the Hong Kong government, the project also involves collaboration with the Guangzhou Environmental Protection Bureau and the Hong Kong EPD.

This \$1 million 28-month study aims to fill in knowledge gaps about smog and visibility problems in the PRD region, providing insight into policy questions regarding regional air quality. The study, which began in May 2002, involves pilot studies of ground-level ozone and fine particles (PM<sub>2.5</sub>). Alongside the scientific analysis, the project is designed to create an alliance among key stakeholders. Initial results from the study are expected

in 2003. The two main components of the study are:

1) *Measurements of ambient concentrations of ozone and precursors (NO<sub>x</sub> and VOCs) to develop an observation-based model for ground level ozone.* These measurements will be used to evaluate the accuracy of existing emissions inventories and also complement traditional emission-based models like those used in the Joint Study. In a traditional emission-based model, an inventory of emissions sources is compiled and used to create a model that simulates pollutant concentrations in the region. An observation-based model (OBM) reverses this process by first measuring the amount of pollutants in the atmosphere and then using this information to create a model determining the sources of the emissions. An OBM helps determine whether a NO<sub>x</sub> or VOC based strategy is needed to control smog.<sup>15</sup> History has shown that emission-based models can lead policymakers in the wrong direction.

For example, in Atlanta, more than a decade and millions of dollars were spent pursuing a VOC-based strategy for photochemical smog before it was recognized in early 1992 that NO<sub>x</sub> emission controls would be more effective. The Atlanta emission-based model had underestimated the contribution of natural sources of VOCs. Using an observational-based model clarifies whether NO<sub>x</sub> or VOCs are dominant in the atmosphere.

2) *Fine particle (PM<sub>2.5</sub>) analysis and monitoring.* The project involves the design, installation, and operation of a seven station fine particle monitoring network that spans the Hong Kong and Guangdong area. (See Map 1). Fine particles were not assessed in the Joint Study and neither Hong Kong nor Guangdong has a comprehensive PM<sub>2.5</sub> monitoring network.<sup>16</sup> The new monitoring equipment purchased for the project is similar to that used by the U.S. Environmental Protection Agency (EPA) and will be left in the region for permanent use. The study thus also serves as a prototype for transfer of air quality measurement and modeling technology and analytical expertise from the United States to the PRD region.

Three committees have been set up to oversee the Civic Exchange led project—a science team to analyze scientific information; an independent scientific advisory committee to advise and audit the science team; and a management committee for overall project management. Each committee includes representatives from the Hong Kong and Guangdong governments, the private sector, and academic institutions. These committees are designed to foster capacity building between Hong Kong and mainland scientists in regional air management, as well as establish a new collaborative network among the local, regional, and international scientific communities and between the public and private sectors in the PRD.

This type of setting, where academics, the private sector, and government officials can come together to discuss regional policies does not currently exist between Hong Kong and Guangdong. Social capital—trust, norms and networks among principal stakeholders—is significantly lacking in the Hong Kong-PRD border zone (Lee, 2001). This NGO initiative is making a significant step towards creating such social capital.

With the flexibility that private funding provides, these committees could provide the basis for future regional environmental collaboration. Building this kind of cooperation is essential for Hong Kong and PRD to both understand air issues and manage regional air quality.

Even the initial stages of the study—documentation of quality control/quality assurance procedures and external auditing by international scientific advisors—already have succeeded in transferring knowledge and building capacity in air monitoring.

## EMISSIONS TRADING

In addition to scientific cooperation on emission levels and monitoring, another promising development for regional cooperation is the recent proposal of emissions trading, which became a hot topic in Hong Kong with the appointment of a new Secretary for Environment, Transport and Works in July 2002. As policymakers and scientists explore this market mechanism to decrease air pollution in the region, they should examine emissions trading and other cooperative air initiatives along the U.S.-Mexico border for useful models.

### *Reorganization of the Hong Kong SAR Government*

Around the time the Joint Study was released, the Hong Kong government undertook a major reorganization of its administrative system. Most notable was the 1 July 2002 introduction of the Principal Officials Accountability System (POAS), which created a new layer of political appointees to serve as top policymakers (Civic Exchange and NDI, 2002). Essentially, POAS is a ministerial system that generates a new class of government officials appointed by the Chief Executive with the approval of the Central People's Government. One of the important changes is that these new principal officials also sit on the Executive Council (Hong Kong's highest executive body) and are thus in a better position to coordinate policy priorities, implementation, and resource allocation (Civic Exchange and NDI, 2002).

Chief Executive Tung Chee Hwa appointed fourteen principal officials to head the policy portfolios, including the newly amalgamated bureaus of environment, transport, and works. The new Secretary of Environment, Transport and Works, Dr. Sarah Liao, is a former environmental consultant whose company conducted the Joint Study on regional air pollution. Dr. Liao also helped the Beijing municipal government win the 2008 Olympic Games and, in the process, built up connections at the highest levels of the central government. She is thus in an ideal position to shepherd new initiatives on regional air pollution.

However, Dr. Liao created controversy within days of her appointment by proposing an emissions trading scheme between Hong Kong, Macau, and Guangdong before she formally took office and had time to speak to

colleagues responsible for energy (Cheung, 2002). Although the idea was initially treated with skepticism, she revealed in September 2002 that she had obtained permission from China's State Environmental Protection Administration to include Guangdong, Hong Kong and Macau in mainland emissions trading pilot schemes ("A Clear Framework," 2002). She also initiated discussions with Hong Kong's only two private electricity providers, CLP Power and Hong Kong Electric, to participate in mainland emissions trading (Cheung and Schloss, 2002).

### *Steps Taken Towards Emissions Trading*

In Hong Kong, emissions of SO<sub>2</sub> and NO<sub>x</sub> are dominated by the power sector. In 1999 (the latest statistics available), Hong Kong's two electricity providers accounted for 80 percent of SO<sub>2</sub> and 41 percent of NO<sub>2</sub> emissions (EPD, 2002).<sup>17</sup> While NO<sub>x</sub> and SO<sub>2</sub> emissions per unit of electricity generated in Hong Kong have halved since 1991, overall emissions have increased due to rising electricity consumption. Power emissions are projected to further increase in proportion to rises in power consumption (CH2M Hill, 2002).

To further reduce emissions of NO<sub>x</sub> and SO<sub>2</sub> per unit of electricity would be very costly. Furthermore, Hong Kong's power emissions are dwarfed by emissions from industry and power plants in Guangdong (CH2M Hill, 2002). Thus, reducing emissions from Hong Kong's power plants may not be the most cost-effective way of reducing regional emissions. Given Hong Kong's greater wealth, it makes sense to use Hong Kong's financial resources to upgrade technology across the border for the greatest overall benefit, hence the proposal for emissions trading, which the two electricity providers in Hong Kong appear prepared to consider (Cheung and Schloss, 2002).

Although emission trading is a relatively new concept, this market tool to control pollution emissions has been utilized throughout the world, mostly in the United States. It is thus not surprising that some pilot emissions trading projects in China have been products of Chinese partnerships with U.S. NGOs or EPA. The Asia Development Bank has partnered with the U.S. think-tank Resources for the Future to help Taiyuan, Shanxi set up a pilot SO<sub>2</sub> emissions trading system for 26 of the largest enterprises in the city (Morgenstern, et al., 2002).<sup>18</sup>

In recent years, several credit-trading initiatives have started in China based on a 'cap and trade' system.<sup>19</sup> For example, Environmental Defense (ED), a U.S.-based nonprofit environmental organization has developed a set of SO<sub>2</sub> emission trading demonstration projects focused in two cities (Benxi and Nantong) to identify practical implementation problems that must be

overcome (Dudek, 2001). As with the ADB project in Taiyuan, a major priority of the ED projects has been to improve the adequacy of emissions monitoring. In May 2002, SEPA announced that seven provinces and cities—Shandong, Shanxi, Jiangsu, and Henan provinces and the cities of Shanghai, Tianjin, and Liuzhou—would implement SO<sub>2</sub> emissions trading schemes (ETWB, 2003). This initiative led two power companies in Jiangsu province to sign an agreement in early 2003 on the first city-to-city SO<sub>2</sub> emissions trading scheme. While the trading project in Taiyuan may be the first to progress to a real market in emission credits, none of the other projects to date have extended beyond the pilot stage.

The PRD region could learn from the mainland's experimentation with emissions trading. In the first official document released on cross-boundary emissions trading in Hong Kong, it was confirmed that the SAR government had agreed with the Guangdong provincial government to study jointly the feasibility of setting up an emissions trading pilot scheme covering all of the power plants in Hong Kong and selected power plants in Guangdong by 2006 (ETWB, 2003). Through the Hong Kong and Macao Affairs Office of the State Council, SEPA had expressed support for the introduction of the pilot scheme. An expert interagency group of the two governments has been set up under the Hong Kong-Guangdong Joint Working Group on Sustainable Development and Environmental Protection to study the relevant experiences in mainland China and overseas, the steps and criteria required for introducing the pilot scheme, as well as the technical requirements to ensure success. The Hong Kong government further indicated that a 'cap and trade' scheme would be most relevant to cross-boundary emissions trading (ETWB, 2003).

It is an ideal time to consider introducing emissions trading as a means to reduce regional air pollution: the current regulatory agreement between the two power companies and the Hong Kong government is up for review in 2005 and due to expire in 2008; and the issue of power sector regulation is being publicly debated. Since the idea for emissions trading was first floated, it has generated considerable interest and discussion in policymaking circles in Hong Kong. However, analysts have warned that Hong Kong needs to overcome significant political and technical barriers if it wants to participate in the emerging mainland market for emissions trading (Schloss & Cheung, 2002).

### *Needed Groundwork for Emissions Trading*

Despite interest in the concept of emissions trading, much work remains to be done before a pilot scheme gets off



## Box 1. Issues to be Resolved in Setting up an Emissions Trading Scheme in PRD

For Hong Kong and mainland polluters to trade successfully, the following questions need to be answered (adapted from Dobridge, Tam, and So, 2001):

- What emission sources should be included in the scheme?
- What is the level of the cap?
- Who will oversee the scheme?
- How will permits be allocated?
- How will emissions and transactions be monitored?
- What penalties will be set to deter noncompliance?

the ground. First, experts will be needed to design the system, including air scientists to provide emissions data and financial experts to craft the market regulations. If a 'cap and trade' system is implemented, one critical political aspect will be the level of the cap. It will also be essential for the governments on both sides of the border to work closely with the market participants, such as power companies, to make sure they will participate.

When it comes time to design the emissions trading program, there is a general consensus, based on international experience with SO<sub>2</sub> trading, on the most important issues to address (Dobridge, Tam and So, 2001). (See Box 1). The need for accurate and reliable systems of emissions monitoring and permit accounting, as well as the need for participants to share information openly, are all potentially problematic requirements for mainland China.

To verify compliance with emissions limits, pollution emitted by each source must be measured accurately. However, many power plants in mainland China lack an internal emissions monitoring system and local government bureaus lack the funding and human resources to monitor emissions. Moreover, corruption in, and ineffective monitoring by, local environmental protection bureaus and governments are commonplace (Dobridge, Tam, and So, 2001). Because these political and capacity problems impede emissions monitoring in mainland China, PRD regional emissions trading should begin with SO<sub>2</sub>, for such trades are easy to measure and installing monitoring systems for large SO<sub>2</sub> point sources is relatively straightforward.

Hong Kong policymakers will need to design and test every aspect of the emissions trading system in a pilot scheme, which will require the establishment of clear and enforceable standards and guidelines, as well as an institutional body to monitor and verify emissions. Currently, the government has not clarified what form a crucial monitoring body might take.

In the interim, the Hong Kong designers could build support for emissions trading through education and outreach, drawing on experiences in North America. Along the U.S.-Mexico border EPA recently awarded a \$233,000 grant to a New Mexico State University economics professor to hold a series of workshops explaining the concept of emissions trading and developing backing for the idea (King, 2001). A similar series of workshops in Hong Kong could help expand support for what the public and many officials in government originally considered as an outlandish proposal.

### *Emissions Trading Governance Options*

One possible governance structure for a body to monitor emissions trading is a Joint Advisory Committee with representatives drawn from public, private, university, and NGO sectors. This committee could be modeled on a similar organization established to deal with environmental problems in the El Paso-Ciudad Juarez region on the U.S.-Mexico border. The El Paso-Ciudad Juarez region is a particularly good model because, like the PRD, it struggles with population growth, income inequality, and rapid industrialization.

In 1996, the United States and Mexico signed an agreement establishing an international air basin encompassing the regions of El Paso County (Texas), Dona Ana County (New Mexico), and the metropolitan area of Ciudad Juarez (Mexico) within 100 kilometers (km) of the border. Along with the shared air shed, the agreement created the Joint Advisory Committee (JAC), which served as an advisor to the governments, making recommendations to the Binational Working Group on Air Quality (similar to the technical committees of the Hong Kong-Guangdong Joint Working Group). The JAC also monitors air quality, fosters joint planning and conducts public education and outreach. The 20 JAC members are drawn from the United States and Mexico

## Box 2. U.S.-Mexico Cross-Border Pollutant Trades

In laws passed in 1999 and 2001, the Texas legislature created a legal framework for cross-border pollutant trades, which set a cap on state power plant emissions and allowed facilities that cannot meet emissions reductions to invest in pollution reduction in Mexico. In November 2002, the Texas Commission on Environmental Quality approved the first cross-border pollutant trade. In lieu of domestic NO<sub>x</sub> reductions, El Paso Electric planned to replace 60 brick-making kilns in Ciudad Juarez by May 2003 (Cappiello, 2002). This conversion will reduce emissions from each kiln by 80 percent (PR Newswire, 2002).

The El Paso Electric trade is controversial, however, because it involves two different sets of pollutants. Although El Paso Electric will get credit for reducing NO<sub>x</sub>, the new kilns will mostly reduce carbon monoxide and particulate matter. Some environmental groups, including Environmental Defense, have opposed the trade because of the lack of regulations governing cross-pollutant trades. The U.S. EPA has no mechanism to convert from, for example, particulate matter to NO<sub>x</sub>, leading to fears that the region will just trade off one health risk for another (Emerson, 2002).

and include representatives from business, NGOs, government, and academia (Stern, 2001).

While the United States and Mexico have yet to establish an emissions trading scheme, the JAC is well situated to serve as a “certifying agency” for future emissions trading (Emerson, et al., 1998). A Hong Kong-Guangdong JAC equivalent representing multiple stakeholders could similarly act as the certifying agency for emissions trading, as well as monitor compliance and oversee emissions transactions with caps on emissions set by the Binational Working Group on Air Quality. This potential model could help inform current debates on regional environmental institutions.

There have been a number of calls for improvements to PRD regional environmental governance structures (Lee, 2001). Some have argued for a strengthening of the existing institutional framework while a number of green groups and academics have called for the establishment of broader governance structures, based on geographic rather than political boundaries (Lee, 2001).

One of the major preconditions for an alternative institutional setup is that local jurisdictions within the PRD region have the capacity and political will to cooperate and coordinate their respective environmental improvement activities (Lee, 2001). Environmental governance is highly decentralized in mainland China and local environmental standards, especially in rural township enterprises, are often lower than national standards. Another problem is that a regional approach to governance would run contrary to the principle of “One country, two systems” that governs Hong Kong’s relations with the mainland. Any regional body would have to be sensitive to Hong Kong concerns about autonomy (Lee, 2001). In order to avoid intergovernmental conflict and private sector and public opposition, the regional environmental body should be transparent and inclusive of all stakeholders.

### ALTERNATIVES TO EMISSIONS TRADING: CROSS-BOUNDARY POLLUTANT TRADES

Clearly, setting up an emissions trading scheme will be a long, arduous, and detailed process. In the interim, a simpler alternative may be cross-boundary pollutant trades. This kind of trade would first require the Hong Kong government to introduce mandatory emission reductions for Hong Kong power plants. Instead of reducing emissions in Hong Kong, power plants would have the option of getting credit by reducing emissions in Guangdong. Similar to emissions trading, this kind of trade provides a cost-effective way to cut emissions in a region. Box 2 provides an example U.S.-Mexico of cross-border pollutant trades, which holds insights for the PRD region.

The overall advantage of pollutant trade is its relative simplicity. While cross-border trades still need to be approved by the two governments, there is no need to harmonize environmental standards. Each jurisdiction can set its own caps on pollutants. The main drawback is that the Hong Kong government has historically been reluctant to hold power plants to mandatory emissions cuts. Still, if emissions trading gets bogged down in bureaucracy, cross-border pollutant trades might be an excellent alternative and help lay the groundwork for more complex emission trading schemes. However, to avoid problems experienced with the El Paso Electric trade in the United States, the pollutant traded should be the same.

Emissions and cross-boundary pollution trading are potentially useful and innovative market solutions to regional air pollution. However, at least in the short term, both of these programs would likely be restricted to SO<sub>2</sub> and NO<sub>x</sub> emissions from the power sector. Other sources of air pollution, most notably the growing numbers of motor vehicles on both sides of the border, will require other solutions that will create new funding and governance structures.

The Hong Kong-Guangdong Joint Working Group Joint Study not only neglected strategies on creative funding for its regional initiatives, but also failed to address critical social, economic, and political issues impacted by the study's recommendations. To begin filling these gaps, Hong Kong and Guangdong could draw on some funding and governance strategies from the U.S.-Mexico

NADBank's sister institution, certifies environmental infrastructure projects for financing by the NADBank and other funding sources. Projects must meet environmental, health, and sustainable development standards before they are certified by a ten-member board of directors (Graves, 1999).<sup>21</sup>

As solely a certifying institution, BECC is isolated from financial pressures and can therefore veto projects that do not meet its criteria. Because NADBank only

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## **Aside from the Civic Exchange led study, there is no coalition of individuals, NGOs and businesses from both Hong Kong and Guangdong working towards the goal of regional air quality**

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experience, as well as expand the role for NGOs in the cross-boundary air policy initiatives.

### *Funding*

Many of the Joint Study recommendations called for adoption of cleaner vehicle technologies through the tightening of emission standards. Experience in Hong Kong has shown that it is difficult for the government to introduce tighter emission standards or new technologies without some form of clean energy subsidy or financial incentive to consumers or producers.<sup>20</sup> To date, government distribution of subsidies has been done on an ad hoc basis. In the future, a cross-boundary environmental fund could help distribute money more efficiently and on a larger scale.

The Hong Kong American Chamber of Commerce (AmCham), among others, has called for a fund to furnish low-interest loans for environmental technology (AmCham, 2000). AmCham suggested that polluting companies could be required to contribute to the fund in proportion to their emissions. These contributions could augment environmental technology funding from the Hong Kong and Guangdong governments. The Hong Kong-Guangdong environment fund could draw on two U.S.-Mexican institutions as a model. In 1993, the U.S. and Mexican governments created an innovative interlocking pair of institutions to provide funding for environmental initiatives along the border: The North American Development Bank (NADBank) and the Border Environment Cooperation Commission (BECC).

NADBank provides loans from a pool of money furnished equally by the two governments. It also distributes EPA grant money to needy communities through a subsidiary organization, the Border Environmental Infrastructure Fund (BEIF). The BECC,

finances projects certified by BECC, approved projects must meet sustainable development criteria. In contrast, other development banks, including the World Bank, conduct an environmental review only after assessing a project's financial viability (Spalding, 1999).

The BECC also places great emphasis on public participation. Plans for public feedback and community participation are essential parts of the criteria for approval. Community meetings are held preceding the BECC's quarterly meetings and the public is invited to give comments on proposed and ongoing projects. The public is viewed as a resource of expertise to help the commission gauge the impact of infrastructure projects on the community.

Overall, the NADBank/BECC structure has been reasonably successful. In a recent survey along the border, 83 percent of respondents said that NADBank/BECC have made either a moderately positive difference or a very positive difference in the region (BIOS, 2001). Most acknowledge that more environmental infrastructure is now operating or under construction along the border than ever before (BIOS, 2001). To date, BECC has certified 66 projects, totaling \$1.4 billion. NADBank has authorized \$458.8 million to partially finance 52 of these projects (BECC-NADBank Joint Status Report, 2002).

NADBank and BECC also have made some major mistakes along the way. The mismatch between BECC certified loans (\$1.4 billion) and NADBank actual loans (\$458.8 million) has led to complaints that NADBank's lending capacity is underutilized ("Finding Common Ground," 2001). The major problem with NADBank's loan is that the interest rate is typically 1 percent above the U.S. prime rate, making the loans too expensive for many communities. The state of Baja California, for example, opted for a \$100 million loan from Japan's

Overseas Economic Cooperation Fund at 3 percent interest rather than go through the NADBank/BECC process (BIOS, 2001).<sup>22</sup> Some potential borrowers have complained about excessive red tape and the limited scope of operations—both in terms of the type of projects financed and the geographic area covered. In response to these criticisms, U.S. President Bush and Mexican President Fox recently extended the geographic area eligible for loans, expanded the types of projects financed, and merged the two boards of directors into a single board to oversee both institutions (Laws, 2002). NADBank also started a Low Interest Rate Lending Facility (LIRF) to make more money accessible to poor communities (Abel, 2002).

Without a doubt, Hong Kong and Guangdong would benefit from a loan and grant making institution for environmental infrastructure projects. The interlocking structure of NADBank and BECC is appealing, as is BECC's emphasis on transparency and public involvement. A Hong Kong-Guangdong fund could also learn from NADBank/BECC's mistakes. Until the recent expansion of the NADBank/BECC scope of operations, NADBank loans focused exclusively on wastewater infrastructure. Given the NADBank/BECC's negative experience with such a narrow scope, as well as Hong Kong-Guangdong's wide ranging environmental infrastructure needs, a Hong Kong-Guangdong fund should take on a broader mandate. Moreover, a Hong Kong-Guangdong fund should also learn from NADBank's experience and provide low-interest loans, or even grants, as appropriate. To address cross-boundary

air pollution, the fund could, for example, provide low-interest loans for air pollution abatement technology like chimney scrubbers.

#### COMMUNITY INVOLVEMENT IN REGIONAL ENVIRONMENTAL GOVERNANCE

While the Hong Kong and Guangdong governments have initiated studies and dialogue within the Joint Working Group, aside from the Civic Exchange led study, there is no coalition of individuals, NGOs, and businesses from both Hong Kong and Guangdong working towards the goal of improving regional air quality. Such a group is badly needed, for implementing many of the recommendations of the Joint Study will require public education and support. Grassroots organizations and businesses are also important source of data and advice for the governments to understand the situation on-the-ground. A regional NGO-community working group could also serve as a watchdog for government and industry as well as lobbying parts of government that are not as supportive of measures to reduce air pollution.

The Hong Kong AmCham recently proposed a Commission on Regional Corporate Responsibility. This commission would include business leaders, environmental experts, and government representatives. Their mission would be to develop environmental standards based on international best practices and identify incentives and sanctions for achieving the standards in a short period of time (AmCham, 2002). While the commission is an excellent idea, the U.S.-

### Box 3. A Community Approach—Building on the Paso del Norte Task Force Model

The success of the Paso del Norte Task Force has spawned a number of similar working groups along the border. In the San Diego-Tijuana area, the Binational Air Quality Alliance (BAQA) operates similarly to the Paso del Norte Task Force, except it includes government officials. In addition to government employees, the 40 binational members of BAQA include academics and NGO and business representatives. The objectives of the alliance are: (1) raising public awareness of air pollution, and (2) putting pressure on government agencies to address the problem. Early projects include a survey on air quality issues and soliciting support from key government officials (Bimson, 2000).

Building on the success of the Paso del Norte Task Force, the Paso del Norte Water Initiative was established in 1999. Focused on water management instead of air quality, this initiative includes water experts, government representatives, and citizens. In an early statement the water initiative recognized the importance of the Paso del Norte Task Force as a model:

[The Paso del Norte Task Force] originally aimed at creating an institution for binational regional airshed management. This goal was rejected by the two federal governments who feared interference with their authority. [The Task Force] then pursued a more obtainable goal—to prepare action proposals that would be submitted to national agencies for implementation. This more modest model works well (Paso del Norte Task Force, 1999).



## Box 4: Top Challenges Facing a Hong Kong-Guangdong Working Group

**Membership:** Creating the strongest possible group is critical. Experiences of U.S.-Mexican working groups indicate the importance of getting the right people—those with the power to make things happen—involved. Any Hong Kong-Guangdong air quality working group must have equal participation from both sides. Interest in cross-boundary air pollution is far higher in Hong Kong than in Guangdong, so finding enough cross-boundary partners might initially be difficult.

**Language:** Linguistic parity is key. In the U.S.-Mexico group, low rates of Mexican participation were tied to the fact that English often has been the working language of bi-national groups. Meetings of a Hong Kong-Guangdong group may need to occur in three languages: Cantonese, Mandarin, and English.

**Participation:** Participation from businesses and NGOs is important too. There are far fewer NGOs dealing with cross-boundary issues in Hong Kong and Guangdong than along the U.S.-Mexico border, so finding NGO members could be difficult. The few existing Guangdong NGOs tend to be government-controlled and shy away from advocacy. Business leaders also will have to be convinced to participate, possibly by emphasizing the lower cost of cross-boundary pollution management.

**Leadership:** Any effective Hong Kong-Guangdong working group would need a charismatic leader committed to cross-boundary pollution abatement. This leader will need a good relationship both the Guangdong and Hong Kong governments.

**Funding:** A Hong Kong-Guangdong air quality working group will need financial support from both governments, as well as regional businesses and foundations. Long-term funding over 5 to 10 years will be important because of the time necessary to set up an effective group. Sustained funding also ensures that NGOs will be able to participate for the life of the project. The Paso del Norte Task Force, for example, received six years of funding from the Ford Foundation. Participants feel that this money was critical to the success of the group (Emerson, 2002).

Mexico experience with the Paso del Norte Air Quality Task Force shows that regional NGOs can play an even larger role in cross-border pollution issues.

### THE PASO DEL NORTE AIR QUALITY TASK FORCE

Concerned about air pollution in the Paso del Norte region, an area encompassing the sister cities of Ciudad Juarez (Mexico), El Paso (Texas) and Sunland Park (New Mexico), a binational group of citizens formed the Paso del Norte Air Quality Task Force in 1993. In addition to implementing pollution reduction projects, the Task Force quickly began lobbying for an International Air Quality Management District (IAQMD), which would cover the entire air shed, coordinate binational air quality monitoring, and develop programs to improve air quality. Partly as a result of these lobbying efforts, an IAQMD was established in 1996.

The Task Force hoped IAQMD would eventually have the power to set caps on emissions and begin emissions trading. However, emissions trading has not yet occurred in IAQMD. The U.S.-Mexico border is in a similar situation to Hong Kong-Guangdong. Though there is considerable interest in emissions trading, establishing a program will require additional data on

emissions and greater public support. In Paso del Norte, government officials are still developing baseline data for VOCs and  $\text{NO}_x$  as part of a study on the feasibility of emissions trading.

Even though emission trading has not yet taken place, the Paso del Norte Task Force experience shows that working groups can be effective without government involvement. The Task Force independently launched a number of innovative programs to reduce air pollution. In one program, the Task Force initiated an education campaign targeted at 400 brick-making factories in Ciudad Juarez, some of the worst polluters in the region.<sup>23</sup> Task Force members went into the community and spoke to brick-makers' wives, highlighting the increased health risks to children caused by pollution. As a result, about 80 percent of the brick-makers switched to liquid petroleum or sawdust fuels, reducing emissions by up to 40 percent (Barta, 1999). Programs like this are directly applicable to Hong Kong-Guangdong. To take one example, a group of citizens and businesses in Hong Kong and Guangdong areas of the Pearl River Delta could work with Guangdong officials to develop a program to reduce vehicle emissions in Guangdong.

Moreover, the Paso del Norte Task Force made government accountable and created momentum on air

quality, accelerating change—El Paso is the only large city in Texas where the air has improved in recent years (Gonzalez, 2002). As a result, the Paso del Norte Task Force is seen as a model for other working groups in the region. (See Box 3). Perhaps the greatest measure of the Task Force success is that it no longer needs to exist. The Joint Advisory Committee has taken over many of the former functions of the Task Force, leaving the Environmental Defense, the NGO behind the Task Force, free to pursue other initiatives (Emerson, 2002).

### *Building a Community Approach in the PRD Region*

A Hong Kong-Guangdong working group could be a powerful force for improving air quality, provided key businesses, government officials, and NGOs on both sides of the border are willing to participate. (See Box 4). A Hong Kong-Guangdong NGO-community working group should have a threefold mission: analysis, education, and advocacy. Through these three areas, the working group could provide expertise to government and build public will to address cross-boundary air pollution. The ad hoc nature of the Paso del Norte Task Force should be seen as a model; a Hong Kong-Guangdong working group should not be a permanent institution, but a group of committed individuals convened to solve a specific problem.

### CONCLUSION

While the release of the Joint Study on Regional Air Quality and the proposal for a pilot emissions trading scheme are significant steps forward in cooperation and collaboration on cross-boundary environmental policy, much work remains to be done. The Joint Study failed to address critical social, economic, and political issues that result from such far-reaching recommendations as the switch to alternative power sources and a more rapid tightening of motor fuel standards.

While emissions trading is a promising area, many contentious issues remain to be resolved, most importantly the level of required emissions reductions. Thus, it will be essential to work closely with the market participants, such as regional power companies, as well as other stakeholders, to reach consensus on this and other key aspects of the scheme such as the form of the institutional body to monitor and verify emissions.

Currently, the biggest challenge to these regional air quality initiatives is the lack of public involvement in policymaking in Hong Kong and Guangdong. There is room for a much wider level of participation from business, industry, NGOs, and academia—both to

participate in government-led institutions and to set up their own ad hoc working groups. In particular, a Hong Kong-Guangdong NGO working group could be a powerful force for improving air quality, provided key people are willing to participate.

The experience of the Civic Exchange led air quality monitoring initiative involving academic and private sector organizations from Hong Kong, Guangdong, and the United States demonstrates the value of such collaborative efforts in building social capital. The two governments need to capitalize on the many benefits of facilitating wider public participation and initiatives on air pollution policy. Not only could this speed up public acceptance and implementation of policies, but could result in lower social costs when policies that are acceptable to key stakeholders are developed.

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#### ENDNOTES

<sup>1</sup> The PRD includes the HKSAR and the following cities in Guangdong province: Guangzhou, Shenzhen, Zhuhai, Dongguan, Zhongshan, Foshan, Jiangmen, Huishou, and Zhaoqing. Politically demarcated as the Pearl River Delta Economic Zone (PRDEZ), the geographical area it covers is commonly referred to as the Pearl River Delta.

<sup>2</sup> Diesel vehicles are the primary cause of street-level pollution and acute pollution in Hong Kong's urban areas. Diesel emissions account for nearly 98 percent of respirable suspended particulates and 80 percent of nitrogen dioxide emitted by all vehicles.

<sup>3</sup> Fine particulates are known in Hong Kong as respirable suspended particulates (RSPs) and in the United States as PM<sub>10</sub>.

<sup>4</sup> The Air Quality Objectives (AQOs), Hong Kong's health standards, set maximum limits for exposure to seven pollutants (sulfur dioxide, total suspended particulates, respirable suspended particulates, nitrogen dioxide, carbon monoxide, ozone and lead) in both the short and long term. Compliance with AQOs is not mandatory. The standards are largely comparable to the U.S. National Ambient Air Quality Standards and levels of air pollution exceeding the AQOs represent a significant threat to health, particularly vulnerable are the elderly and children.

<sup>5</sup> The 24-hour AQOs for NO<sub>2</sub> and RSP are 150 µg/m<sup>3</sup> and 180 µg/m<sup>3</sup> respectively. The hourly AQO for ozone is 240 µg/m<sup>3</sup> (not to be exceeded more than three times per year).

<sup>6</sup> The PRC Class 2 National Ambient Air Quality Standard (NAAQS) is applicable to residential, urban, commercial, industrial and village areas.

<sup>7</sup> At various points, Patten was denounced by Chinese officials as "a criminal who would be condemned for a thousand generations" "the whore of the east" and a "serpent" (Patten, 1998).

<sup>8</sup> In 1994, EPD proposed subsidizing the replacement of diesel light engine (<4 tons) vehicles (mostly privately operated taxis and minibuses) with unleaded petrol engine vehicles. The scheme was strongly opposed by the taxi and minibus operators. The reason behind their opposition was a fear that the scheme would expose illegal practices, such as the use of smuggled diesel (Law, 1999). The proposal was eventually replaced by a plan to replace diesel taxis with LPG taxis.

<sup>9</sup> The API reached 167 in Causeway Bay on September 22,

1998. An API of 101-200 is classed as "very high" air pollution; with adverse acute health effects to humans (EPD, 2002).

<sup>10</sup> The terms of reference for the Joint Working Group are to: (1) deliberate on issues pertinent to environmental quality, natural resources, ecological environment and sustainable development; (2) review potential impact of existing and planned work programs on the environment and ecology of Hong Kong and Guangdong and taking proactive measures to improve the environmental quality; (3) exchange information on the quantitative change of pollutants, environmental quality, waste disposal, ecological changes, protection of natural resources and environment, natural and ecological conservation; (4) regularly review the implementation of the Joint Working Group's programs.

<sup>11</sup> Current membership of the group includes representatives from the following Guangdong government departments: Environmental Protection Bureau; Foreign Affairs Office; Office of the Guangdong Provincial People's Government; Development Planning Commission; Construction Department; Economic and Trade Commission; Water Resources Department; Bureau of Ocean and Fisheries; Forestry Bureau; Shenzhen Municipal Government. Representatives from the Hong Kong SAR government include: Environment, Transport and Works Bureau; Housing, Planning and Lands Bureau; Constitutional Affairs Bureau; Environmental Protection Department; Agriculture, Fisheries & Conservation Department, Planning Department; and Water Supplies Department.

<sup>12</sup> The mainland has been progressively tightening motor fuel standards. It lowered the sulfur limit of motor diesel from 0.5 to 0.2 percent in 2002 and is now considering plans for to reduce sulfur content to 0.05 percent.

<sup>13</sup> Slowly, however, the Hong Kong SAR government is beginning to appreciate the benefit of a more inclusive approach. For example, EPD commissioned a socioeconomic impact assessment to study sewage treatment for Hong Kong's harbor, which will involve interviews with stakeholders and the development of social and economic criteria.

<sup>14</sup> The partners in the study include Argonne National Laboratory, California Institute of Technology, Georgia Institute of Technology, Hong Kong EPD, Guangzhou Research Section of Environmental Sciences, Hong Kong Observatory, Hong Kong Polytechnic University, Hong Kong University of Science & Technology, and Peking University.

<sup>15</sup> Ozone is formed by the reaction of NO<sub>x</sub> and VOCs. Limiting whichever precursor is less dominant can effectively control smog.

<sup>16</sup> Fine particle samples collected by the Hong Kong government in a recent 12-month aerosol study also will be analyzed using

state-of-the-art equipment to determine the sources of emission.

<sup>17</sup> Hong Kong has four power stations: the main ones at Castle Peak and Lamma Island are coal-fired while the new Black Point power station is gas-fired.

<sup>18</sup> By March 2003 trading had not yet started, although it is anticipated to begin in the coming months. Over the long term, one of the main stumbling blocks is that the penalty for violations is capped at 30,000 RMB (less than \$4,000) per enterprise, which severely limits the incentive for emissions trading, especially for large firms. Local officials have indicated if the initial trading program is successful it might be appropriate to open discussions at various levels of government, including in the Provincial People's Congress, about the possibility of raising the penalty cap (Morgenstern, Personal Communication, 2003).

<sup>19</sup> In these initiatives regulators determine an acceptable level of pollution, thus establishing a cap on pollution that firms are required to meet. Rather than make all polluters reduce their

emission levels to a fixed amount, pollution permits for the total amount of the 'cap' are either sold or granted.

<sup>20</sup> In 1999, the Hong Kong government announced HK\$1.4 billion (U.S.\$179 million) in subsidies for owners of taxis, light buses and other pre-Euro standard diesel vehicles to switch to liquefied petroleum gas (LPG), install particulate traps and/or fit catalytic converters (Tung Chee Hwa, 1999). The scheme was delayed for light buses partly due to calls for higher subsidies.

<sup>21</sup> Before making decisions, the Board of Directors is required to consult with a binational eighteen-member advisory council. The members of both the board and the council come from a variety of backgrounds, including government, academia, and environmental activists.

<sup>22</sup> In 2001 U.S. prime rate ranged from 4.75 to 9 percent.

<sup>23</sup> Brick-makers traditionally burn tires and wood, fuels, which generates considerable air pollution.

## Call for Papers

Feature Articles and Commentaries for the  
Woodrow Wilson Center's China Environment Series Issue 7

The editor of the *China Environment Series* invites submissions for feature articles (20-25 double-spaced pages) and commentaries/notes from the field (2-5 double-spaced pages) for the 2004 issue. Issue 7 will be the first peer-reviewed issue of the *China Environment Series*—a free journal mailed to nearly 2,000 policymakers, scholars, and environmental activists in China, the United States and Europe.

I. Feature article themes of particular interest include:

- Solving China's Water Problems (especially related to river basins)
- Environment and Health Nexus
- Energy (e.g., oil issues, energy efficiency, or policy)
- Greening Business (green consumerism, environmental technology transfer, international business environmental initiatives)
- Provincial Environmental Challenges and Innovations (of particular interest are Xinjiang and Guangdong)

Authors wishing to propose feature articles focusing on other topics relating to environmental and energy issues in China or how these issues impact U.S.-China relations should not hesitate to submit a proposal.

II. For the commentaries/notes from the field section of the *China Environment Series* we welcome any topic relating to environmental or energy issues in mainland China, Taiwan, or Hong Kong (See issues 4, 5 and 6 for examples of previous commentaries at [www.wilsoncenter.org/cef](http://www.wilsoncenter.org/cef)). Commentaries based on current field research are of particular interest.

Proposal abstracts for feature articles and commentaries of not more than 250 words are due before **1 September 2003**. Please email abstracts to Jennifer Turner at [chinaenv@erols.com](mailto:chinaenv@erols.com) or fax to 202-691-4184.

Authors will be given guidelines after proposals are accepted. Final drafts will be due **3 November 2003**.