

## OVERVIEW AND SUMMARY

### STRATEGIES AND TOOLS WORKSHOPS Track 3: Urban Air Quality and Sustainable Energy

#### Session 1: Energy Efficiency Opportunities in Municipal Operations

Session Chair: Mayor Richard Murphy, San Diego, California

Facilitator: Bebet Gozun, Consultant, National Program Coordinator, Metropolitan Environmental Improvement Programme, Manila, Philippines

Case Study Presenters: A.V. Deshpande, Additional Commissioner of Pune Municipal Corporation, Pune, India

Mr. Kailash Vijayvargya – Mayor, Indore Municipal Corporation, India, and president of Mayors Association of India

Respondents:

K. Kailashnathan, Municipal Commissioner, Ahmedabad Municipal Corporation, India

Rich Hays, Director of Environmental Services, City of San Diego, California

Kevin James, Director, Sustainable Cities Program, Alliance to Save Energy, Washington DC

This session addressed practical ways that municipalities can reduce costs through energy and other resource efficiency investments in municipal operations. In addition to saving money, such actions can generate local employment and reduce air pollution. Key issues discussed included the identification of efficiency opportunities, structuring and financing energy efficiency projects, and barriers to implementation.

The session began with a case study from the waste collection and water distribution systems in Pune and Indore, India.

Highlights from discussion by respondents and audience:

Hays: Public involvement and education are key – these two cities are on the right track. San Diego is looking at energy conservation, partnering with local utility in a green building project that puts off-the shelf energy technology in place in public building creating a 60 percent reduction in energy use. This is critical given the California energy crisis. Typically in government, we build the cheaper product as fast as possible instead of looking at life-cycle cost. Landfills are a source of greenhouse gas emissions – methane. It is a source of energy that could be tapped worldwide.

James: Pune and Indore are models to follow in India. It makes sense that there should be a planning process and management structure to deal with the issues that arise. Although this is intuitively obvious, it is not pervasive, not only in Asia but worldwide. For example, there is no energy manager in San Diego, and yet energy is one of the highest costs around the world. You need to develop the management infrastructures and processes for municipalities to manage energy. It is clear that in many areas there are water and energy shortages. San Diego is now better prepared for the energy crisis than it would be if it had not set up an energy management program. I look forward to hearing your comments and input on this issue.

Hays: It is important to have public involvement, do audits, check your bills. Get the citizens involved in the action plan. It is going to continue to get worse unless we look at conservation. Also watch the price of solar energy – it is coming down. Paint your roofs white. Find out where

the money is going and go after the biggest savings first. Pune and Indore could be leaders for the world.

Ed Alabastro, AWMA, Manila: The lesson is that it can be done. We had many ideas including demand side management, now we are facing a crisis again. Could there be an exchange of ideas with San Diego on demand-side conservation? The problem we have with landfills is siting – I will take it from your experience (in Pune) that you were able to do it. How can we convince a community to house waste from another locality?

Hays: In San Diego and other places in the United States, setting up a landfill usually starts a war. It is important to get the environmental community involved in making landfills environmentally friendly. If you have an opportunity to take something that is seen as negative and return native plants and wildlife – it has the potential to be something positive for the community.

Gozun: NIMBY is really a major constraint. It is being discussed in another session. It would be interesting to know how other cities have dealt with this. Note that being more energy efficient and using less energy is one way of thinking globally while acting locally.

Margaret Evans, Hamilton, New Zealand: Some designers forget that there are beautiful views out there, like in this building. This is energy wasteful – why do we have air conditioning? Let's try and make sure that buildings are designed to be energy friendly – to use as little external energy as possible.

James: As Richard mentioned earlier, there is a perception that doing it the right way costs more, we need to do it the right way up front. The initial investment cost can pay itself back in as little as 4 to 5 months.

Member of audience: The way I see it, early education for children is key. For example, my daughter goes around the house turning off all the lights.

Jim Dorian, State of Hawaii: We are working with a number of countries with Asia. We are working with the Philippines government. Financing is extremely important – this is where public-private partnerships help out. We are working on performance contracting. This is where a private company, for example, Honeywell Controls would make almost the entire investment. I suggest this as a way to effectively combat the issue of costs.

Deshpande: High rise buildings are "in". Provide initiative to use solar heating for water. For the new buildings, investment can already be part of the cost of the buildings. A private firm has come up with the idea. About 4000 societies in India are already doing this.

Peter Kimm, USAEP: Most of the ideas I have heard are very sound. What is also true is that most good ideas have been around for a while and have not been adopted because of vested interests. I would suggest two things: 1) the crisis is an opportunity to make a change that you couldn't make all along 2) public participation and public education are key to changing the political atmosphere.

Murphy: Designing energy efficient buildings is something that we have not done historically in the world. It takes not only tax incentives but political courage to say that energy efficiency should be a criteria that we use in approving buildings. If we in local government can understand that if we can do something to conserve energy, that gives us money for other

needs. We represent the cities – we are the mayors, we are the city council people. If we wait for our states to solve the problem, they may never be solved.

## Session 2: Public Outreach and Mobilization

Session Chair: I.R. Budihardjo Soekmadi, Vice Governor of Development Affairs, Jakarta, Indonesia

Facilitator: Bebet Gozun, Consultant, National Program Coordinator, Metropolitan Environmental Improvement Programme, Manila, Philippines

Case Study Presenters:

Khun Nathanon Thavisin, Deputy Permanent Secretary, Bangkok Metropolitan Administration (BMA), Thailand

Oscar Escobar, President, Concerned Citizens Against Pollution, Quezon City, Philippines

Respondents:

Edgardo Alabastro, Chair, Air and Waste Management Association (AWMA), Quezon City, Philippines

Sarita Hoyt, International Technology Program Manager, US Environmental Protection Agency, Washington, DC

Kristy Miller, Public Affairs Officer, US Environmental Protection Agency, Washington DC

In most cities there is usually no shortage of good ideas on how to reduce air pollution, but often the "political will" is missing. In addition, a significant part of urban air pollution comes from individual vehicles and household-level activities. This session addressed the role of public education, participation and behavior change in efforts to reduce harmful air pollutants, focusing on vehicle and lead emissions. It explored the role of public mobilization in support of necessary national policy changes and investments. The session began with two case studies of cities that successfully built political support for tough air pollution policies: Bangkok and Metro Manila.

Highlights from discussion by respondents and audience:

Edgar Alabastro: Air quality management must be a soundly planned holistic approach. I have a problem with some components of our Clean Air Act. The message can only be convincing if the government and policy-makers are convinced. It will take time, but you have to go through the process. While conventional wisdom may dictate that air quality will improve, for example, with good fuel, that's not easily doable and will infringe on the question of poverty since dirty diesel is used for public transport. What measures can be effective? Improve law enforcement, backed by political will. Manage or influence behavior of people, for example bicycles, carpools.

It is difficult to share responsibilities unless you know what the relative contributions are of various sources. Measures can be developed and should be focused first on implementing measures that will not result in economic hardship before going into measures that will cost money like changes in the formulation of fuels.

Miller: Thank you for your fine, persuasive and entertaining speeches. It takes a variety of different strategies and tools. It's more than just the technologies that are important – and laws to back them up – we're also talking about social change – we are asking millions of individuals to make choices – a behavior change that will have a beneficial impact on society. These voluntary decisions can be influenced – using information, incentives, as well as laws and mandates. Public education is only effective as long as the benefit is understood. What we have seen is that people need to hear information from the people that they trust at the neighborhood level – doctors, teachers. Having a clear call to action and a clear action. For example, what kind of baby do you want? I'd like to congratulate Mr. Escobar in starting a

coalition – involving NGOs and evolving it. It is a tough task. Public change can happen, but it doesn't happen overnight.

Member of audience, Atlanta, Georgia: Our city is an award-winner in its smog-free program. We have subsidized bus passes on smog alert days. We introduced an ordinance in the city requiring no smoking in restaurants – for families with small children and for employees. We offer an incentive of 25% off of license fees if they go voluntarily smoke-free.

Member of audience, Micronesia: The fuel that goes to Micronesia has led in it. I don't know what can be done regarding this problem of dirty fuel being sent to developing countries.

Gozun: One critical issue is that the costing that we are doing is not complete. We usually do not account for the cost of the adverse impacts of air pollution on health, productivity losses and material damage.

Hoyt: EPA has been doing a lot to help countries phase lead out of gasoline, including the Philippines and Vietnam. The political will must be there. In Vietnam, the concern was about the Russian fleet, so we brought in Russian experts to help address that issue. You must bring all your stakeholders together before you can reach out to the public.

Karla Boreri: Think broadly when you think about stakeholders – we worked with mothers who were breastfeeding. Also think about the benefits that you are selling – people will want to come to Indonesia.

Escobar: Two points regarding national policies: 1) the conflicting policies of national government – sometimes there are conflicts, for example, in the Philippines– before the DENR could approve the implementing rules of the Clean Air Act– 5 other government departments said “not yet”. And 2) turf issues between and among departments – not considering integration of various government programs.

Gozun: That highlights the importance of a major public awareness campaign – public pressure can be the force to get government to act.

Hoyt: The importance of an action plan cannot be overemphasized. Make sure that at an individual level, every person knows how they can make a difference. Have clear messages, consistent. So people understand what is expected of them. Identify local champions who are credible and can serve as models. It is important to have different tools, for example, press kits so people do not have to reinvent the wheel. Reinforcement, and messages from different sources – television, teachers – constant reinforcement of the same message.

Member of audience: We are converting many of the buses to natural gas which is cleaner exhaust. The city has a public-private partnership to complete building energy audits. We are gradually replacing some city vehicles with electric vehicles – this will take some time.

Edgardo Alabastro: Let me reiterate that policy government should know the implications of any action plan on poverty. For example, if the price of fuel needs to be raised, then you need a different action plan.

Member of audience, Bangkok: We need law enforcement, we need mass media, public relations, education to change behavior – for the older generation it is too late, but for our young generation, join with the ministry of education, change the attitude of children – I hope that for

our new generation it will be better than for our generation.

Gozun: It is very important to know the exact concerns of the stakeholders involved. In the Philippines, we thought that health would be a major concern, but through our hotlines and process of consultation we learned that technical concerns were the major issue – we geared our messages accordingly.

Member of audience, Micronesia: I think the lesson I have learned is the value of carpools – the state of Hawaii has a carpool system. Some keep on saying that this campaign is a waste of money. But it eliminates traffic and it also eliminates air pollution.

Member of audience: The city of Atlanta has established HOV (high occupancy vehicle) lanes, as a result of the centennial Olympics. This can help motivate people to get out of their single occupancy cars.

Gozun: Yes, don't just provide a message for people to carpool, also provide incentives as shown by other city experiences. Also be careful to control misuse of the incentive (e.g. paying people to ride in the car with them as experienced by some cities).

### Session 3: Comprehensive Air Quality Plans

Session Chair: Peter Kimm, Executive Director, US-Asia Environmental Partnership, Washington DC

Facilitator: Alma Madrazo, Director of the Office of Technology Representatives, US-AEP, Makati City, Philippines

Case Study Presenter: Xian Xie, Environmental Specialist, World Bank, Washington, DC

Respondents:

I.R. Budihardjo Soekmadi, Vice Governor of Development Affairs, Jakarta, Indonesia

Khun Nathanon Thavisin, Deputy Permanent Secretary, Bangkok Metropolitan Administration (BMA), Thailand

Hong Hao, Director, Environmental Protection Bureau, Shanghai Municipal Government, China

Adi Liberman, Vice President, Board of Directors, Heal the Bay, Los Angeles, USA

Individual air pollution control measures are not always effective in achieving long-term, city-wide air quality improvements. Efforts to reduce emissions from some sources sometimes can even increase emissions and pollution loadings from other sources. For this reason, leading cities have established Comprehensive Air Quality (CAQ) Plans and action programs. This session will discuss the development and implementation of CAQ Plans. This can be a daunting task because of the complex interplay of different air emission sources and competing, overlapping jurisdictions. The session began with a presentation by Xian Xie on the World Bank's Clean Air Initiative.

Highlights from discussion by respondents and audience:

Budihardjo Soekmadi: The Clean Air Initiative for Asia was established in February in Bangkok. Air pollution in Jakarta has increased significantly since 1990. The major source has been motorized vehicles and underlying causes have been inadequate infrastructure, poor engine maintenance and leaded gasoline. We are undertaking five major activities: 1) promoting unleaded gasoline (aiming at 0% leaded gasoline in 2001) and use of CNG; 2) preparing air quality standards; 3) raise public awareness (e.g., lead testing of school children); 4) preparing inspection and maintenance program for private cars starting in 2002; and 5) urban greening

and parks. The Clean Air Initiative could be helpful as would partnering with other cities, networking through the website, knowledge sharing, studies about integrated transport management, technical support. Some studies that Jakarta has done could be useful to other cities. I invite other cities to join the Clean Air Initiative.

Nathanon: Clean Air Initiative is also active in Bangkok where an air quality management unit was established. A vehicle emission reduction program being implemented. We are piloting 14 "air pollution free" streets. This year, you will see a big change in air pollution in Bangkok as compared to 3 years ago. Bangkok will work with the World Bank and ADB to address vehicular emissions especially those of 2-stroke engine three-wheelers. It is important that we are now taking action by joining hands and working together through this Regional Initiative.

Hong Hao: Sulfur dioxide emissions in China are a key problem. Our responses:

1] We are restructuring the enterprises and industrial framework, removing secondary industries from the city proper. We have removed 50 percent of them from Central Shanghai. We have to control general industrial growth and at the same time, develop tertiary industries. We are promoting economic development while at the same time improving the environment.

2] Coal burning furnaces will be removed. In the next 50 years, we are going to increase the consumption of natural gas over 7 times its current level.

3] We are striving for effective control of traffic. In the last five years, we have built 3 expressways and a monorail rapid transit system in Shanghai.

4] At the same time, we have adopted the clean air car initiative. We adopted unleaded gas in Shanghai and have promoted the implementation of emission standards. What we have been doing is to control emissions to have better air quality.

Asian cities are great driving forces, but they face huge challenges of overpopulation and bad air quality, especially Shanghai, with its 16 million people. I think we have to learn from each other and share experience, knowledge and information. Shanghai will play an active role in this Clean Air Initiative.

Adi Liberman: Los Angeles has long been known as the smog capital of the United States. Recently that distinction went to the city of Houston, the home of our new president, but we just learned that Los Angeles is now the number one city of traffic congestion in the US. Each year it is known that many people die due to smog. Our children in Los Angeles develop 10 to 15 percent less lung capacity than children in places with cleaner air. Every night, in the weather report, they include a smog report, so you will know what the smog condition will be the next day -- you know whether we will be breathing healthful air, unhealthful air or very unhealthful air. Let me describe what our response has been. Under the national Clean Air Act, the federal government sets requirements for various pollutants. It is then left to the state and local governments to decide how to implement those standards. It is a contentious battle. Our strategy has three components:

1] a sector by sector strategy – first we took on cars, then stationary sources like power plants, now we are setting standards for bus fleets.

2] a technology approach – we give 2 to 3 years to find the technology to meet standards before the standards come into place.

3] a ratchet down approach – every 2 to 3 years, we continue to set tighter and tighter standards. As a result, we emit the same amount of ozone today as we did in 1955 even though we have many more cars.

The energy crisis in California has posed a difficult situation because many policy makers are saying that maybe we should reduce air quality standards to allow more production of energy. This is a process that is measured in decades. As we all work together to reduce these

emissions, I hope we will not only have an impact on cities but also on global warming throughout the world.

Gozun: Metro Manila is keen to participate in this regional initiative. As we try to address our air pollution problem, we have certainly seen the importance of having a comprehensive air quality management plan. It is easier to convince people to support if they see that plan is comprehensive. We have seen the need for an information center. For example, in lowering the sulfur content of our diesel, some people were saying that fuel meeting those standards was not available in the region. It is therefore useful to find out what the standards are throughout the region. We are looking for alternative cleaner fuel such as CNG. What are the technical and financial requirements to make this successful in developing countries? We need to know the actual experience of other cities already using CNG like Dhaka. There is a need to document not only successes but also failures. There is an even bigger need for a knowledge management center, not just an information center. We know from the EPA experience in California that MTBE has been found to be a pollutant. On the other hand, we also know that the EU in Germany is going to issue a finding that MTBE is not harmful. Who do we believe? A regional center could play the role of knowledge management.

We also want to know what economic incentives have worked. We need to expose the private sector as well as civil society to all these. Major barriers/constraints are the lack of information, lack of expertise and lack of political will. Raising public awareness is one way of pressuring the decision makers and also getting stakeholders to support any program or project. Our experience and those of Jakarta and Bangkok have proven this. Encouraging more voluntary action to lessen enforcement requirement. Lastly, building coalitions with all concerned is key - local and national governments, NGOs, academia, media, the private sector, etc.

Alabastro, AWMA Philippines: The most important lesson we have learned is that there is a formidable force – partnership – which can be an instrument in shaping a rational policy. Within the scope of the Clean Air Initiative, we might insert the word “sustainable development” and “poverty reduction.” Through this partnership, we hope that this could catalyze an immediate activity in the Philippines whereby we can rationalize some of the proposed policies. We need to use innovative holistic solutions – including cleaner technologies – that are cost effective. We need proper framing of policies that manage air quality, rather than restricting a technology, for example, incineration in the Philippines (which is banned under the Clean Air Act). We in the Philippines will greatly benefit from your endorsement of good policies.

Vyas, Vadodara, India: Private motor cars will probably replace public transportation, but replacement will be at what cost for pollution? When we upgrade technologies, we should know all possible impacts.

Sung Yung Kim, Seoul, Korea. Some air quality management problems cannot be addressed only within the country. For example, from China, we have a problem in the yellow sand and because of industrialized areas, polluted air is moving around our region, so long-range transport of pollutants is causing an international problem. So in order to solve this problem, we would need a kind of a regional body to solve this problem.

Audience member, China: Today our topic is clean air. China has been paying great attention to clean air quality. China TV has been broadcasting air quality information. Total suspended particulates (TSP) is the key problem in China. We have to solve this TSP problem and then the sulfur dioxide and other problems. First of all, we have to seek scientific technologies to solve the TSP problem. For us, because of the layers of the soil which have been destroyed, so we

have sand storming in China. Second, coal burning has caused poor air quality. Because of the industrial and economic development of the last decade, industries have adversely affected air quality. We have to apply law enforcement to force industries to comply with the necessary standards. We have to use good quality coal, e.g., for heating in winter. We have to install a central heating system for the city. We have an initiative called coal free zones.

In the city proper, we have to stick to the coal burning standards and accelerate the development of good infrastructure in the city, i.e., we have to make better pedestrian pavements and cover the soil exposure to the air. Another thing we have been doing is to build a green belt around the city and in the suburban areas. We are improving solid waste management. We have been managing construction sites. We have been building a rapid transit system and other means of public transportation. All of these measures have produced very good results in China.

Kimm: We have seen here the experience of a very large number of cities. We have seen that there is no magic formula – you have to break it up into its component parts. Motor vehicles are not the only problem. The World Bank program allows cities to work on an incremental planning process. We hope that the best practices shared will make your problems more solvable.

#### Session 4: Vehicle Emissions

Session Chair: Khun Nathanon Thavisin, Deputy Permanent Secretary, Bangkok Metropolitan Administration (BMA), Thailand

Facilitator: Bebet Gozun, Consultant, National Program Coordinator, Metropolitan Environmental Improvement Programme, Manila, Philippines

Case Study Presenter: Dr. Prasanna K. Mohanty, Commissioner and Special Officer, Municipal Corporation of Hyderabad, India

Respondents:

The Honorable Ruth Galanter, Council member, Los Angeles, California

Seung Kyu Kim, Assistant Manager of Environment, Seoul, South Korea

Amory Lovins, CEO and Executive Director, Rocky Mountain Institute, Snowmass, Colorado

Kiyotoshi Noda, Director of Office of International Environment Cooperation, Kitakyushu, Japan

Vehicle emissions remain an intractable problem in both developed and developing countries. Multi-pronged approaches are needed that affect new vehicles, maintenance of existing vehicles, fuel quality, etc. Technological breakthroughs may help in the area of electric or fuel cell vehicles. This session began with a presentation by Dr. Mohanty on the steps that Hyderabad is taking.

Highlights from discussion by respondents and audience:

Galanter: We have made important strides. The State of California requires higher standards to be met by new vehicles than the rest of the United States. We have programs for retiring older vehicles, but some of them end up in Asia. We have banned the burning of garbage. As we continue to grow and people are buying larger vehicles, as our traffic congestion worsens, the amount of time that cars spend operating inefficiently and the amount of fuel burned per car are going up. It is important for our city and others to work with neighboring districts. We have a special air quality management district that covers a region of about 15 million people. We are able to implement standards region-wide. We are also working to convert our municipal vehicle fleet to alternative fuels.

One problem we have not been able to solve relates to airports. There is great pressure from the business community to expand the existing airport. Over 100 local communities have joined with me to propose that instead of expanding the airport at one side of the metropolis that we expand other airports in outlying areas of the metropolis to reduce the concentration of air pollutants in the metropolitan area.

Seung Kyu Kim: Seoul City is the capital of Korea with a population of about 10 million. Seoul is surrounded by mountains, so we don't have much air circulation, plus we have the problem of the yellow sand from China. Sulfur dioxide, carbon dioxide and PM10 are all higher than our air standards. We have big smog problem in Seoul, and we are taking steps similar to those in Hyderabad. We are implementing a project with an end date of 2007. We have set the standard for air quality in Seoul City higher than the rest of Korea, especially for emissions from cars. We are trying to change diesel vehicles to CNG. In Korea, the gasoline cost is higher than other countries. The central government is subsidizing costs for vehicles using CNG. We have a campaign of citizens and employees to recognize the pollution problem. We are trying to work with neighboring cities and other cities. By working with these cities, we are trying to manage air pollution together. We have Citizen Commissions which help with monitoring and education. We are promoting carpooling, especially at peak traffic hours in the morning.

Amory Lovins, CEO and Executive Director, Rocky Mountain Institute, Snowmass, Colorado: In addition to the kinds of measures that have been mentioned, I'd like to mention a few others. First is that urban congestion can be reduced very dramatically by taking a small number of vehicles off the road. For example, the Swiss model I mentioned this morning, where you integrate with modern informatics a regional public transit pass and a backup cab service. You end up sharing a large fleet of vehicles (private cars have only 4% asset utilization). If you give up your car by subscribing to the mobility service, you pay less and still can get where you want to. It is being applied in Leiden, Holland. This removes the conflict between automakers and those who need to breathe air – often a conflict with ourselves. Every automaker in the world is considering this as an alternative business model. This could also lower cost and strengthen equity, such as those too old or too young to drive. Singapore has no car congestion because Singapore charges the full social cost of driving.

We can get radically cleaner vehicles as well, by applying superior engineering. The "hypercar" will sell because it is better. The RMI has published on its website a paper showing how to accelerate adoption of fuel cells. As a first step, put fuel cells in buildings. As we build the market for stationary fuel cells, they become cheaper. Lease cars to people who live in buildings where fuel cells are installed. The hydrogen in the car can replenish energy in the building. We can build up a hydrogen infrastructure starting now. Taipei will start to deploy electric and fuel cell vehicles.

Kiyotoshi Noda: In Kitakyushu, we have over 100 anti-pollution strategies. We deal with how to maintain and regulate each car, traffic, physical strategies to lessen the amount of cars, improve the roads where cars are traveling, dealing with property around the roads. We have a monorail. We have an ocean next to our city, and we are digging a tunnel around this sea. We are trying to create specific bus-only lanes during rush hour. We also transfer wastes into suburban areas. Instead of using a truck, we are using a boat to transfer waste – and we are able to cut down on traffic and save on fuel. We have a master plan which we distribute to the citizens and we are all aware of the roles we must play to carry this out.

Oscar Escobar: Right now, we also have some measures in support of vehicular reduction. For example trucks are not allowed in the city from 5 am to 9 am and 4 pm to 9 pm in the evening.

We have instituted carpooling, but sometimes it is not strictly enforced. We have an “off the road day”, based on vehicle plate numbers – e.g. those ending in 1 and 2 are not allowed on the streets on Mondays - effectively reducing vehicles the road by 20% daily. We have improved our electric rail system. We still have the slash and burn method of farmers, and the practice of burning to smoke trees that bear fruits (to kill insects).

Gozun: Some countries are encouraging voluntary action by citizens and businesses, for example voluntary testing of vehicles that lessens the burden on enforcement.

Lovins: Do Asian countries have the same experience as US with “neo-urbanist design”? Do property values go up when homes are designed within a 5 minute walk from business centers?

Gozun: Asians are still generally using traditional land use planning which designates specific land uses and has allowed for urban sprawl. This encourages a lot of movement of goods and people to carry out day-to-day activities. The value of having compact cities with multiple uses is only slowly being adopted. This is not only good for the air quality but actually makes for more cost –effective delivery of basic services like water, energy, telephone and roads. I understand from an NGO in Singapore that there was a time when the government required new businesses to hire 30% of their staff from within walking distance. This immediately cut back commuting by 30 %.

Lovins: There has been a tendency to over-provide roads and parking. If companies ask their employees to pay the fair market value for parking vs. giving employees public transportation passes, the employer can save money. There are many examples of creative public policy so that parking is not a free good.

Audience member: In Seoul City, we tried to change to CNG. We had to build a new CNG station, even though the CNG is very safe, the citizens got the wrong impression about CNG. We had trouble finding land space, so we used an existing gas station. But until CNG is used widely, it is not cost-effective. We need new CNG stations. How can you solve this siting problem due to concerns of safety in this initial stage?

Lovins: You may want to consider hydrogen. Hydrogen is safer than other fuels because it is buoyant and has a flame that does not radiate heat at a distance.

Khun Nathanon: Air pollution is made by humans and must be solved by humans. Babies start life by breathing dirty air - babies who may be the next prime ministers. We must highlight this to get support to improve air quality.