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Win-Win Solutions to Climate Change and Transport

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February 2009
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Cover photo: Cheonggyecheong stream restoration in Seoul. Photo courtesy of the City of Seoul.

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Preface

A perfect storm of events has fallen come upon us. The planet's climatic system is undergoing unprecedented changes that hold the potential to severely diminish quality of life for today and for future generations. At the same time, economic changes mean that car ownership and usage is growing at alarming rates, especially in the developing nations of Asia. And at the same time, a global economic crisis is unfolding which will reduce the ability of governments to address either climate change or human development.

It is often said, though, that where there is danger, there is opportunity. A range of pathways exist before us to address both the challenges of global climate change and urban transport. Which pathways we choose will do much to shape quality of life for both the current generation as well as that of our children.

We must do more than business-as-usual approaches that only make token progress towards reducing carbon dioxide emissions. There are options that simultaneously can dramatically improve the goals of economic, environmental, and social sustainability. Such "win-win" solutions indicate that the co-benefits of certain climate change mitigation measures can readily justify the required investment.

This document, "Win-Win Solutions for Climate Change and Transport", seeks to assist decision-makers with options for reaping the benefits of sustainable urban transport while addressing national economic development, environmental management, and social equity.

This effort is part of the UNCRD's Asian Environmentally Sustainable Transport (EST) Initiative, which since 2004 has sought to offer Asian decision-makers the opportunity to reshape urban transport systems to better meet the needs and realities of today's world.

A key development in this process has been the delivery of the "Aichi Statement". In 2005, under the direction of the United Nations Centre for Regional Development (UNCRD) and with the support of the Ministry of the Environment of the Government of Japan, teams of international transport experts and government partners came together to produce a definitive statement of intent on achieving progress across 12 major focus areas of Environmentally Sustainable Transport. These same 12 thematic areas represent the core of this document's efforts to cultivate actions towards win-win solutions for both climate change and transport.

Subsequently, the UNCRD has gained local government commitment to EST objectives through the Kyoto Declaration, which was initially signed by twenty-two Asian mayors and senior government officials from fourteen Asian countries in Kyoto, Japan in April 2007, at the first "Asian Mayors' Policy Dialogue for the Promotion of EST in Cities". An additional 12 Asian cities signed the Kyoto Declaration during the 2008 Better Air Quality conference in Bangkok, Thailand.

This document has been developed in preparation for the Fourth Regional Environmentally Sustainable Transport Forum, being held in Seoul, Republic of Korea, from 24 through 26 February 2009. This event is being hosted by the Ministry of Land, Transport, and Maritime Affairs of the Government of Korea, the United Nations Centre for Regional Development, and the Ministry of the Environment of Government of Japan in order to highlight the opportunities for co-benefit approaches.

The time to leap-frog previous approaches is now, before our cities and communities are more home to motorised vehicles than they are to people. There is no single easy solution to economic uncertainty, social inequity, and global and local environmental degradation, but there are options that can do much to reverse our current unsustainable path.

Kazunobu Onogawa
Director, UNCRD

Acknowledgements

In the past decade, the level of understanding of both global climate change and sustainable urban transport has advanced greatly. The concept of co-benefits has thus evolved through the dedicated efforts of many organisations and individuals. This document, Win-Win Solutions for Climate Change and Transport, has benefitted from this emerging work.

Amongst the leading organisations seeking to raise awareness of co-benefit approaches to climate change and transport include the ASEAN Working Group on Environmentally Sustainable Cities (AWGESC), Asian Development Bank (ADB), Clean Air Initiative for Asian Cities (CAI-Asia), EMBARQ - the World Resources Institute Centre for Sustainable Transport, German Agency for Technical Cooperation (GTZ), Global Transport Knowledge Partnership (gTKP), Institute for Transportation & Development Policy (ITDP), Japan International Cooperation Agency (JICA), Swedish International Development Cooperation Agency (Sida), Victoria Transport Policy Institute (VTPI), and the World Health Organization (WHO).

This document has been particularly made possible by the efforts of the staff of the UNCRD, who have turned the Asian Environmentally Sustainable Transport (EST) Initiative into a regional source of information and inspiration for improving urban transport.

The Asian EST Initiative project particularly depends on the sincere involvement and efforts of the participating countries, including members of the Association of South-East Asian Nations (ASEAN), South Asian countries, Mongolia, People's Republic of China, Korea, and Japan. Additionally, the expert members of the Regional EST Forum have provided much of the technical knowledge and strategic feedback that has supported the Initiative.

UNCRD would also like to express gratitude to the Ministry of the Environment of the Government of Japan for providing the financial support to the critical issue of Environmentally Sustainable Transport in Asia. In addition, appreciation is expressed to the Ministry of Land, Transport, and Maritime Affairs of the Government of Korea for its hosting of the Fourth Regional Environmentally Sustainable Transport Forum in Seoul.

I. Background

1. Climate Change and Urban Transport

"Given the nature and magnitude of the challenge, national action alone is insufficient. No nation can address this challenge on its own. No region can insulate itself from these climate changes. That is why we need to confront climate change within a global framework, one that guarantees the highest level of international cooperation."

• Ban Ki-Moon, Secretary General of the United Nations, 24 September, 2007

For those on the front lines of climate change, the realities are already apparent. Small island nations, low-lying nations in south Asia, and those experiencing increased frequencies of typhoons and other severe weather, understand the risks carried by such changes. The debate on climate change has moved from if it is a problem to what can be done to mitigate its most severe effects.

Urban transport represents one of the fastest-growing sources of greenhouse gas emissions that contribute to global climate change. Any serious effort to mitigate greenhouse gas emissions will have to address the transport sector, and in particular, this effort will have to include a means to reduce the growth in private motorised vehicles.

Figure 1. The threat of global climate change has become a worldwide concern. Photo: iStockPhoto.

Climate change science

With increasing scientific attention being given to the issue of climate change, more is known now on both the extent of the problem and the causes behind it. The ability of greenhouse gas emissions to entrap heat has led many to raise concern over the increasing concentration of such gases.

Greenhouse gases, such as carbon dioxide and methane, represent a common waste product from most of our energy and industrial processes of today. The burning of fossil fuels, such as coal and petroleum, are amongst the principal contributors to human-induced greenhouse gas emissions.

In 1750, at the start of the industrial revolution, there was approximately 280 ppm of carbon dioxide (CO_2) in the atmosphere. Today this amount exceeds 390 ppm of CO_2, and is growing at a rate of 1.5-2 ppm each year (UNEP, 2008).

In turn, global temperatures are seen to have risen over this period. As noted in the Fourth Assessment of the Intergovernmental Panel on Climate Change (IPCC):

"Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level... of the last twelve years (1995-2006) rank among the eleven warmest years in the instrumental record of global surface temperature (since 1850)." (IPCC, 2007)

The link between these documented climatic changes and human activity is becoming increasingly clear. The IPCC's Fourth Assessment has been the most direct to date on this linkage:

"Anthropogenic warming over the last three decades has likely had a discernible influence at the global scale on observed changes in many physical and biological systems....Human influences have:

- very likely contributed to sea level rise during the latter half of the 20th century
- likely contributed to changes in wind patterns, affecting extra-tropical storm tracks and temperature patterns
- likely increased temperatures of extreme hot nights, cold nights and cold days
- more likely than not increased risk of heat waves, area affected by drought since the 1970s and frequency of heavy precipitation events." (IPCC, 2007)

The facts on climate change and its causes are reaching a level of certainty in which few if any governments can ignore the problem.

Climate change impacts

Early indications of the impacts of climate change are already apparent. While no one single event can be attributed to long-term climate change, the trends are nevertheless a concern.

Some of the projected impacts from increases in global mean temperatures include:

1. Ice cap melting and sea level rise

Ice sheet losses from Greenland and Antarctica could lead to substantial sea level rise. Low-lying parts of Asia, such as Bangladesh and Myanmar, would be particularly at risk. As water rises, there will also be further salinisation of estuaries and coastal areas.

2. Ocean warming

As the oceans warm, plant and animal sea life can be disrupted. For example, the loss of phytoplankton can ultimately disrupt the food chain for many species of sea life.

Ocean warming has also meant that coral reefs are more likely to undergo the process of bleaching, which ultimately results in the coral's death.

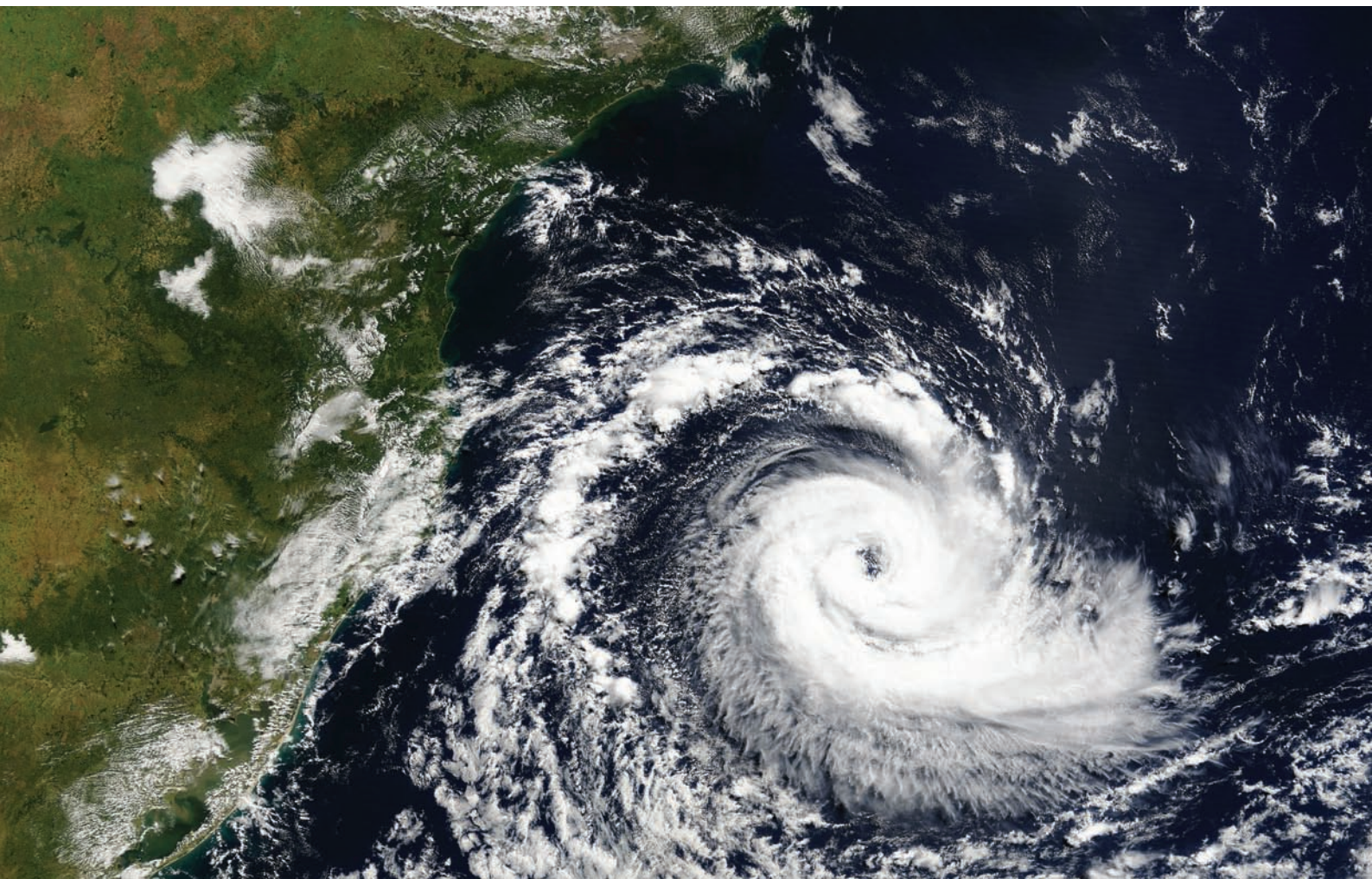
3. Ocean acidification

As additional carbon dioxide is absorbed by the oceans, acidity levels will increase. Acidification will likely have a negative impact on shellfish and other marine species.

4. Severe storms

The link between climate change and severe storms, such as typhoons and cyclones, is not conclusively proven. Nevertheless, the frequency and severity of such storms are determined by many of the same factors that are an expected result of climate change.

Figure 2. Global climate change may bring with it an increased frequency and strength of typhoons and cyclones in Asia. Photo courtesy of the National Aeronautic and Space Administration.



5. Drought and desertification

Many areas that already are stressed by low rainfall may be rendered uninhabitable; especially as freshwater supplies are exhausted.

6. Fires

Increased temperatures and longer dry seasons can stoke fires that affect large-scale areas, including towns and suburbs. Fires raging in parts of Indonesia in recent years have produced untold damage on local livelihoods and habitats.

7. Species and habitat loss

Many plant and animal species may be unable to adapt to abrupt climatic changes, especially as food sources and habitat changes will be occurring at the same time. The current plight of the Arctic polar bear is a dramatic example of habitat loss from climate change affecting the survivability of a species.

Figure 3. Rapidly warming temperatures may mean that many species do not survive. Photo: iStockPhotos.

8. Disease

Changing climatic conditions also ferment the possibility of diseases entering into new geographical areas. Already, tropical diseases, such as malaria and dengue fever, are making inroads into new areas.

The Intergovernmental Panel on Climate Change has particularly highlighted some of the expected impacts to be experienced in the Asian region:

- "Coastal areas, especially heavily-populated megadelta regions in South, East and South-East Asia, will be at greatest risk due to increased flooding from the sea and, in some megadeltas, flooding from the rivers;

- By the 2050s, freshwater availability in Central, South, East and South-East Asiazzz, particularly in large river basins, is projected to decrease;

- Climate change is projected to compound the pressures on natural resources and the environment, associated with rapid urbanization, industrialization and economic development;

- Endemic morbidity and mortality due to diarrhoeal disease primarily associated with floods and droughts are expected to rise in East, South and South-East Asia due to projected changes in the hydrological cycle." (IPCC, 2007)

Perhaps the most dangerous impacts from climate change are those yet unknown. As the climate changes, chain events occur within biological processes that can ultimately affect food supplies, disease vectors, and other critical life parameters.

Greenhouse gas emissions from transport

The world is now home to over six billion inhabitants and over one billion motorised vehicles. As incomes rise in the developing nations of Asia, and especially in China and India, the hunger for car and motorcycle ownership will continue at an ever greater rate. By 2030, it is estimated that developing nation car ownership and usage will surpass that of the developed OECD nations (IEA, 2004).

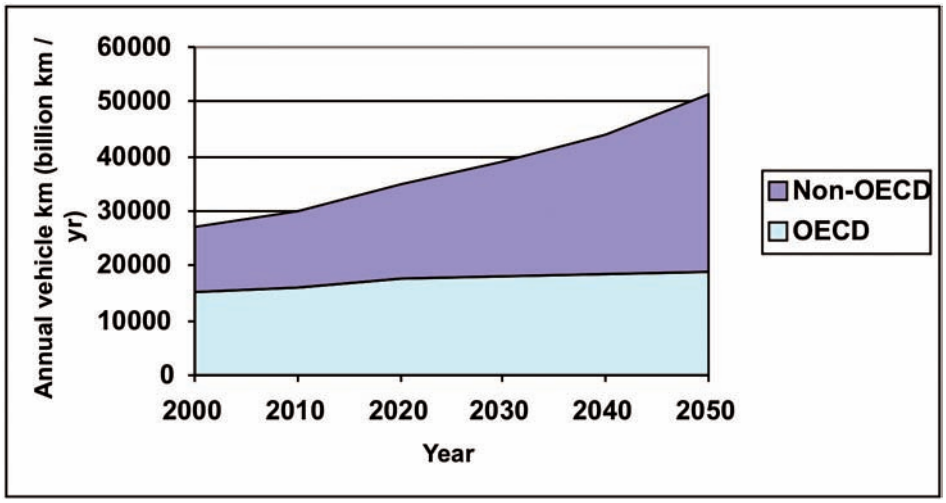


Figure 4. Vehicle usage by region (vehicle-kilometres travelled)

Source: IEA, 2004

For this reason, transport, and particularly urban transport, represents the fastest growing source of greenhouse gas emissions from fossil fuel sources. Globally, from 1970 to 2004 transport emissions grew 120 percent to 6.4 giga-tonnes of CO2-equivalents. (Sanchez, 2008).

Figure 5. The rapid growth in vehicle ownership and usage has brought cities such as Beijing to a virtual standstill and has formed the basis of spiraling increases in greenhouse gas emissions. Photo: iStockPhotos.

Transport greenhouse gas emissions are rising at an annual growth rate of 2.1 percent worldwide and at an annual growth rate of 3.5 percent for developing nations (IEA, 2002). The International Energy Agency projects that this growth will become particularly evident in Asia with significant emissions increases by 2020: China (143%), Indonesia (122%), and India (91%) (Sanchez, 2008). Clearly, if these projections are realised, then the climate change mitigation objectives of the global community are in serious jeopardy.

2. Environmentally Sustainable Transport

"Recognising the need for both national and local level governments to develop and adopt integrated policies, strategies and programs incorporating key elements of environmentally sustainable transport..."

• Aichi Statement, 2005[1]

"Environmentally Sustainable Transport" represents a paradigm shift away from existing practices that have placed private motorised vehicles ahead of people. The UNCRD has sought to define Environmentally Sustainable Transport through a set of technologies and practices that encompasses world best practice in accessibility and mobility.

Figure 6 illustrates the 12 thematic areas of the UNCRD's Environmentally Sustainable Transport (EST) Initiative.

Figure 6. The 12 thematic areas of Environmentally Sustainable Transport.

The 12 thematic areas of the EST Initiative include knowledge-building, emissions monitoring, and air quality assessments as mechanisms for cities to understand their options and to understand current conditions. The thematic areas also include attention to the social and health dimensions that underscore so many policy decisions in the transport field. And finally, the EST Initiative highlights the various practices and options with regard to sustainable transport infrastructure, public transport, non-motorised transport, clean fuels, land-use planning, and transportation demand management.

Most Asian nations and cities have largely not followed a path of EST. Instead, private motorised vehicles in the form of motorcycles and cars have increasingly dominated the streets. Investments that cater for private motorcycles and cars are often at the expense of better public transport and facilities for pedestrians and cyclists.

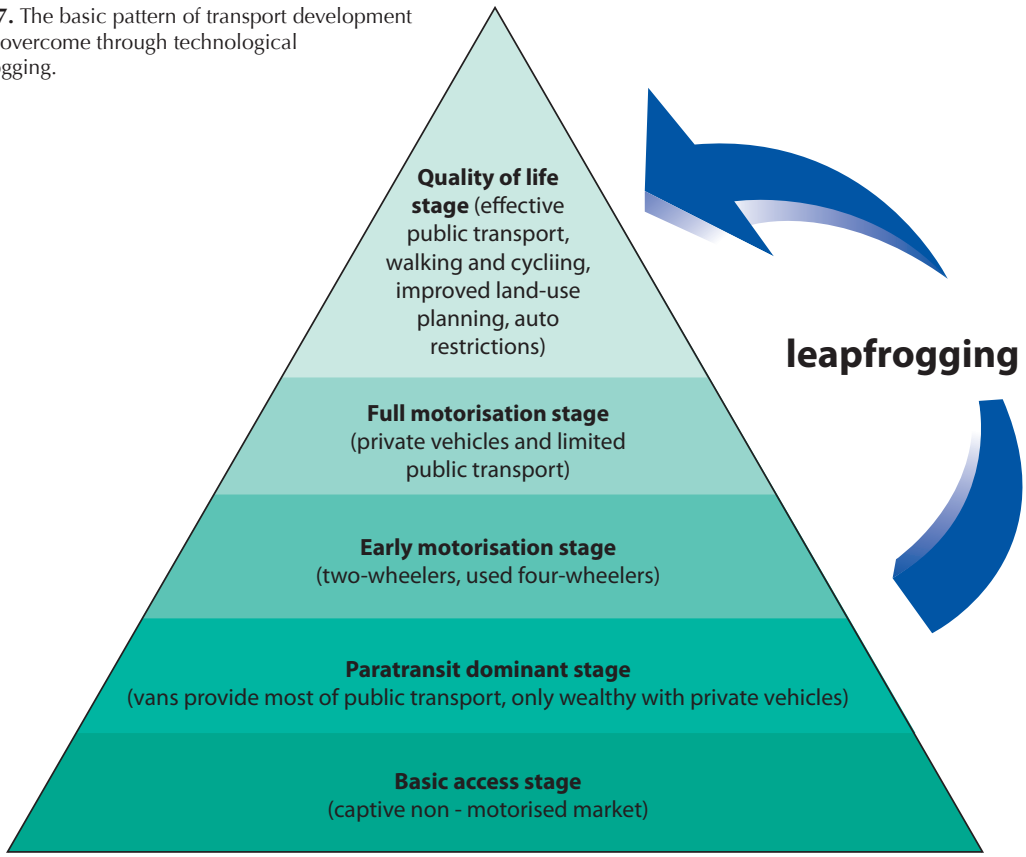
There are some international cities, such as Amsterdam, Curitiba, and Copenhagen, where these priorities are reversed so that mass transit and non-motorised transport takes precedence. It is often assumed that developing-nation cities must pass through a difficult phase before moving towards a path of Environmentally Sustainable Transport.

However, the concept of technological leapfrogging exists, in which developing cities move directly to more sustainable forms. Figure 7 highlights the vision of technological leapfrogging.

Asian cities do not have to merely follow the path towards full motorisation with individual transport. Instead, these cities can leapfrog past unsustainable transport forms directly into policies and practices that lead to a higher quality of life.

In summary, the EST Initiative seeks to encourage Asian nations and cities to adopt approaches that address the urban transport needs of today without compromising the ability of future generations to meet their own needs.

Figure 7. The basic pattern of transport development can be overcome through technological Leapfrogging.



[1]Aichi Statement was adopted by participating countries of the First Regional EST Forum held on 1-2 August 2005 at Aichi Prefecture of Japan, and the Statement can be seen at UNCRD website http://www.uncrd.or.jp/

3. Co-Benefits

"Efforts to promote environmentally sustainable transport will result not only in the improvement of human health through the reduction of urban air pollution but will also have important complimentary benefits, including the reduction of greenhouse gas (GHG) missions, the reduction of deaths and injuries from road accidents, the reduction of harmful noise levels, and the reduction of traffic congestion levels."

- Aichi Statement, 2005

Reducing greenhouse gases from transport can take many forms. A government and/or private sector partners can invest in improving roadways, vehicle inspection and maintenance, cleaner fuels, public transport, non-motorised transport, land-use changes, fuel pricing strategies, parking policies, etc. Determining which investment or set of investments to make depends on the priorities being made.

One useful guide is to target investments that simultaneously address multiple sustainability objectives. "Co-benefits" refer to the realisation of multiple objectives within a strategy that targets the reduction of greenhouse gas emissions. Co-benefits are also sometimes known as "ancillary benefits", "complementary benefits", or "win-win solutions".

For example, a climate change mitigation strategy with co-benefits might also result in small business development, technology transfer, reductions in other air contaminants, and gender equity. Such a strategy would likely be superior to an alternative that for a given cost only reduces greenhouse gases without other benefits.

In effect, the consideration of co-benefits can improve the overall benefit-to-cost ratio of a project. Developing a framework for comparing and analysing the benefits and costs of different mitigation projects permits national and local governments to maximise the input investment.

A successful co-benefits approach can prove to be a "win" for economic development, a "win" for environmental sustainability, and a "win" for social equity. Figure 8 illustrates the potential synergies of a co-benefits approach.

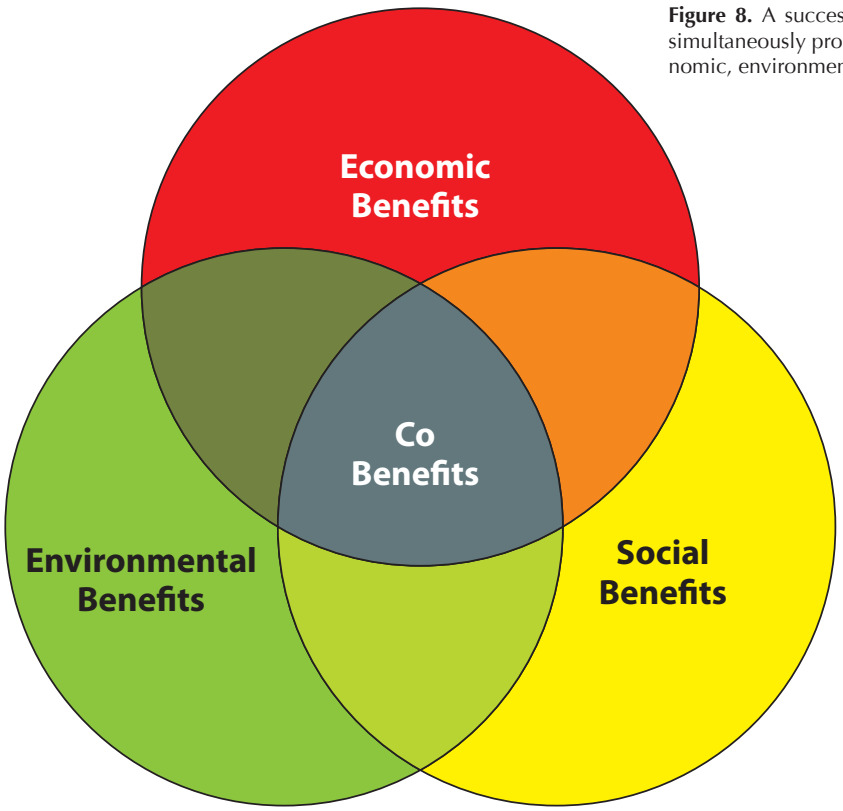


Figure 8. A successful co-benefits approach simultaneously produces benefits across economic, environmental, and social measures.

Litman (2009) has devised a simple matrix methodology for comparing the co-benefit aspects of different climate change strategies. By understanding the array of potential impacts from a specific project, decision-makers can begin to focus efforts in particular areas. Some of the parameters used to measure co-benefit potential are illustrated in the following table.

Table 1. Examples of co-benefits

Economic benefits

- Congestion reduction
- Consumer spending savings
- Employment creation
- Small- and medium-sized enterprise development
- Traffic accident reduction
- Technology transfer
- Reduced dependence on imports / energy security
- Economic productivity / efficiency improvements

Figure 9. Certain measures, such as pedestrian facility upgrades, can be effective in employment generation. Photo courtesy of Lloyd Wright.

Environmental benefits

- Greenhouse gas reductions
- Particulate matter reduction
- Sulphur oxides reduction
- Nitrogen oxides reduction
- Carbon monoxide reduction
- Volatile organic compounds (VOC) reduction
- Noise reduction
- Solid waste reduction
- Water contaminant reduction

Figure 10. Non-motorised transport options can effectively eliminate all forms of air emissions. Photo courtesy of Lloyd Wright.

Social benefits

- Health improvements (obesity reduction, fitness, etc.)
- Crime reduction / security enhancement
- Gender equity promotion
- Universal access for physically disabled
- Scholar access improvement
- Convenience and comfort
- Community sociability
- Reduction in community severance

Figure 11. The choice of local transport can shape community sociability, as this example from Jinan (China) indicates. Photo courtesy of Karl Fjellstrom, ITDP.

The Aichi Statement (2005) has specifically noted co-benefit objectives as part of an integrated strategy:

- *"Acknowledging road safety as a primary guiding principle for transport planning*

- *Acknowledging the need for, and contribution of, safe and affordable urban transport systems to the alleviation of poverty and the promotion of social development*

- *Recognizing that public transport has to address the conditions of women and the need to build the institutional capacity to better include gender aspects in urban transport planning*

- *Providing infrastructure that particularly caters to the needs of the most vulnerable users, including children, the elderly, and the physically disabled*

- *Promoting integrated transport policies that mitigate the negative human health impacts of motorized transport."*

The explicit inclusion of co-benefits within the Aichi Statement has been done to encourage decision-makers to include these objectives at the forefront of their planning processes. Co-benefit analysis of different investment options should become a standard practice with all transport initiatives.

II. Evaluating EST Co-Benefits

1. Vehicle Efficiency Improvements

- *"Improving road side air quality monitoring in urban city centres to better understand the impacts of road side pollution on people travelling on the roads and people working or living close to the roads*

- *Acknowledging the need for standards on noise levels and the enforcement of such standards by establishing management mechanisms*

- *Phasing out leaded gasoline as rapidly as possible, and phasing down sulphur levels in gasoline and diesel as required to achieve advanced vehicle emission standards*

- *Planning for an eventual transition to renewable fuels*

- *Rapidly phasing-in strict emission standards for new vehicles, with due regard to manufacturing lead times and to the provision of compatible fuels*

- *Adopting and enforcing vehicle inspection and maintenance programmes for vehicle emissions and safety, based on high-volume, test-only inspection centres with stringent quality control."*

  • Aichi Statement, 2005

Road construction

New infrastructure development is often touted as a solution to congestion and transport inefficiency. A new roadway or a roadway widening provides the additional capacity to regain free-flow conditions, which can lead to reduced emissions from vehicles that would normally be idling in congestion.

However, the benefits from such an approach may be quite short-lived. New roadway infrastructure can lead to what is known as "induced traffic". While additional road construction may temporarily reduce traffic levels, this free road space eventually attracts additional traffic, especially when there is latent demand for private vehicle usage. Therefore, very frequently, road construction leads to an increase in greenhouse gases and other pollutants over the medium term.

The employment benefits of road construction may also not be as great as many may think. A 1999 Texas (USA) study evaluated the regional economic activity and employment generated from expenditures on automobile use, transit use, and general consumer expenditures (Miller et al., 1999 in Litman, 2005). By far, the greatest income and employment benefits stemmed from the investments in public transport (Table 2).

Figure 12. Interchange in Tokyo; the co-benefits of additional roadway construction can be quite limited. Photo: iStockPhoto.

Table 2. Regional economic impacts of US $1 Million investment

Category	Increase in income	Increase in jobs
Automobile investment	$307,000	8.4
Non-automotive consumer expenditures	$526,000	17.0
Transit investment	$1,200,000	62.2

Source: Miller et al. (1999) in Litman (2005)

Vehicle maintenance and testing

Many developing nations lack rigorous vehicle maintenance and testing regimes. The result is often an old and poorly maintained vehicle fleet that generates very high levels of greenhouse gases and other pollutants.

In any given city, it is quite possible that a small percentage of very poorly maintained vehicles are responsible for a large percentage of the air contaminants. Establishing a testing system and subsequent enforcement is essential to getting the worst offenders off the streets.

Random street tests can also be an effective mechanism for ensuring that vehicles continue to perform outside the regularly scheduled inspections.

Fuel economy standards

Fuel economy standards for all motorised vehicles help to establish a minimum efficiency level (i.e. minimum fleet average of kilometres per litre of fuel). Without such a standard in place, there may be a trend towards heavier and more polluting vehicles. In addition to ensuring the vehicle fleet remains at a minimum technological level of excellence, the fuel economy standard also works to slow vehicle ownership and thus encourage alternative modes.

As a policy measure, such standards entail relatively few direct costs on governments. Such measures, though, can bring with them substantial technology transfer gains. A progressive fuel economy standard will ensure that only the most technologically advanced models are introduced within a market. The tendency then is for local vehicle manufacturing to remain at a state-of-the-art level, which helps to promote the export potential of local firms.

Clean fuels

Much recent attention has been given to the advent of alternative fuels to the petrol or diesel-driven internal combustion engine. With concerns over dwindling fossil fuel supplies, price pressures will naturally drive innovation towards alternative fuels and new propulsion systems.

There is no shortage of potential alternatives:

- Clean diesel
- Compressed natural gas (CNG)
- Liquid petroleum gas (LPG)
- Electric
- Bio-diesel
- Ethanol
- Hybrid electric
- Hydrogen (fuel cell technology).

The availability of these alternative fuels very much depends on local circumstances. The success of converting public transport vehicles to CNG in Delhi and other south Asian cities has demonstrated that clean fuels can definitely succeed in the developing nation context.

From a co-benefits standpoint, alternative fuels do hold the promise to strengthen national energy security while at the same time introducing new jobs and technologies to a nation.

However, there is no truly clean fuel that has zero environmental impacts, excluding the development of a closed-loop system based entirely on renewable energy. In some cases, the direct and indirect impacts of alternative

Figure 13. The conversion of three-wheeler fleets to alternative fuels, such as CNG, has led to cleaner air quality in many Asian cities. Photo: iStockPhoto.

fuel production can detract significantly from the purported benefits of the fuel.

The promise of biofuels is sometimes contrasted to the negative consequences associated with converting production systems towards options such as ethanol and bio-diesel. Some of the issues that have transpired in the rush to meet new biofuel markets include:

- Displacement of food crops to energy production
- Increases in food prices
- More intense usage of fertilizers and pesticides on crops
- Creation of ocean "dead zones" resulting from intensified pollutant run-offs
- Heightened levels of mono-culture crop production, leading to biodiversity depletion
- Increased greenhouse gas emissions from nitrous oxide, as a result of using nitrogen fertilizers
- Reduction in tropical forests from both legal and illegal agricultural conversions
- Water table losses from increased irrigation demands.

To evaluate the full potential of a co-benefit approach, one must fully account for such leakage of greenhouse gas benefits and other negative impacts.

Figure 14. The upsurge in biofuel production has led to a rush of agricultural development in biodiverse regions such as the tropical rainforests of Indonesia. Photo: iStockPhoto

Nevertheless, cleaner fuels will undoubtedly play a role in a complete package of sustainable transport measures. There is hope that the new generation of cellulosic ethanol fuels will be superior in performance to existing blends.

Summary

The following table summarises the co-benefit potential of vehicle efficiency improvements.

Table 3. Summary of co-benefit impacts from vehicle efficiency improvements
√=Co-benefit, d=depends on circumstances

Economic benefits	Road construction	Vehicle maintenance and testing	Fuel economy standards	Clean fuels
Congestion reduction				
Consumer spending savings		√		
Employment creation	√	√		
Small-enterprise development				
Traffic accident reduction		√		
Technology transfer				√
Energy security		√		
Economic productivity		√		
Environmental benefits				
Greenhouse gas reductions		√	√	d
Particulate matter reduction		√	√	√
Sulphur oxides reduction		√	√	d
Nitrogen oxides reduction		√	√	d
Carbon monoxide reduction		√	√	d
VOC reduction		√	√	d
Noise reduction		√	√	d
Solid waste reduction		√	√	d
Water contaminant reduction		√	√	
Social benefits				
Health (e.g. obesity reduction)				
Crime reduction				
Gender equity promotion				
Universal access for disabled				
Scholar access improvement				
Convenience and comfort				
Community sociability				
Reduction in severance				

2. Public Transport

"Public transport planning...

• Maintaining or increasing the share of public transport by improving the quality of such services

• Recognizing Bus Rapid Transit (BRT) as a low-cost mass transit option which can be implemented quickly to meet the growing demand for mobility

• Recognizing Mass Rapid Transit (MRT) as a mass transit option which can be implemented to meet the growing demand for mobility, where appropriate."

• Aichi Statement, 2005

Bus Rapid Transit (BRT)

For too long, a high-quality, world-class public transport system was beyond the reach of most Asian cities. The plethora of informal and poorly-maintained formal public transport vehicles plying the streets did little to service the needs of the customer. Such services ultimately led to a downward spiral in which more commuters opted for motorcycles and cars as soon as it was economically viable to do so.

Figure 15. Seoul's BRT system has become a benchmark of excellence for other cities in the region. Photo courtesy of Karl Fjellstrom (ITDP).

A recent innovation, though, known as Bus Rapid Transit (BRT) has changed what is possible with public transport.

Bus Rapid Transit (BRT) is a "high-quality bus-based transit system that delivers fast, comfortable, and cost-effective urban mobility through the provision of segregated right-of-way infrastructure, rapid and frequent operations, and excellence in marketing and customer service". BRT essentially emulates the performance and amenity characteristics of a modern rail-based transit system but at a fraction of the cost.

Today, cities throughout the region have been able to deliver world class public transport systems and begin to turn back the trend of increasing private vehicle ownership. Cities such as Beijing, Changzhou, Dalian, Delhi, Hangzhou, Jakarta, Kunming, Nagoya, Seoul, and Taipei have given new life to the public transport sector through BRT.

Figure 16. The new Changzhozu BRT system has re-prioritised public transport for the city. Photo courtesy of Karl Fjellstrom (ITDP).

BRT systems deliver greenhouse gas emission reductions through several mechanisms, including larger vehicles, more fuel efficient vehicles, mode shifting from private cars, and efficiency gains due to operating on exclusive infrastructure. Likewise, these systems generate various forms of co-benefits, including technology transfer, local manufacturing and job creation, and improved mobility and access for previously disadvantaged groups.

System integration

Public transport systems should not be implemented in isolation. Integration with a full array of modal types gives commuters a greater opportunity to access the system.

Park-and-ride facilities, bicycle parking, pedestrian access ways, and metered taxi ranks at stations all contribute to a more usable system for all. Integration between different public transport systems, including both road and rail systems, helps provide customers with a full range of destination options.

There are at least four dimensions to effective modal integration:

1. Physical integration – Ease of transfers
2. Fare integration – Ease of payment
3. Branding integration – Effective customer identity with system
4. Institutional integration – Effective co-ordination of services.

Integrating the entire transport system across each of these factors does much to build customer goodwill.

Fare-free service

A relatively new approach to attract new ridership to public transport has been the introduction of free services. Various cities in Europe and North America have found it advantageous to not charge a fare for public transport services. Instead, the system is funded through other means.

In Hasselt (Belgium), bus patronage jumped 23,000 passengers per month to 300,000 passengers per month with the elimination of fares. About 25 percent of car users have switched to public transport since the introduction of the scheme.

Few mechanisms can produce such a significant emission reduction benefit in a short amount of time as fare-free public transport. Of course, the key to make this service possible is the development of a robust business plan based on a sustainable revenue source.

Figure 17. The provision of fare-free services can lead to dramatic increases in ridership. Photo courtesy of Lloyd Wright.

Summary

The following table summarises the co-benefit potential of public transport projects.

Table 4. Summary of co-benefit impacts from public transport
√=Co-benefit

Economic benefits	Bus Rapid Transit	System Integration	Fare - free service
Congestion reduction	√	√	√
Consumer spending savings	√	√	√
Employment creation	√		
Small-enterprise development			
Traffic accident reduction	√	√	√
Technology transfer	√		
Energy security	√	√	√
Economic productivity	√	√	√
Environmental benefits			
Greenhouse gas reductions	√	√	√
Particulate matter reduction	√	√	√
Sulphur oxides reduction	√	√	√
Nitrogen oxides reduction	√	√	√
Carbon monoxide reduction	√	√	√
VOC reduction	√	√	√
Noise reduction	√	√	√
Solid waste reduction	√		
Water contaminant reduction	√		
Social benefits			
Health (e.g. obesity reduction)		√	
Crime reduction	√	√	√
Gender equity promotion	√	√	√
Universal access for disabled	√	√	√
Scholar access improvement	√	√	√
Convenience and comfort	√	√	√
Community sociability			√
Reduction in severance			

3. Non-Motorised Transport

"Non-motorized transport (NMT)

- *Acknowledging the dependence of all-income groups on non-motorized transport and its importance as an environmentally sustainable mode of transport*
- *Aiming to maintain or enhance the existing role of non-motorized transport, especially in dense urban areas, especially for short trips*
- *Encouraging the provision of higher-quality infrastructure and the development of city-level master plans for footpaths and cycle ways*
- *Increasing safety for non-motorized transport."*

• Aichi Statement, 2005

At some point in any journey, non-motorised transport is essential, even if it involves just walking from the parking garage to the office. For many user groups, such as low-income individuals, walking and cycling may be the only option available to access services, jobs, and leisure.

Non-motorised transport (NMT) is perhaps the most cost-effective climate change mitigation strategy for the transport sector, and it is amongst the strongest in terms of the co-benefits generated. Upgrades to pedestrian infrastructure, bicycle initiatives, and car-free development projects all hold much potential to transform a city and mobility patterns at its most fundamental level.

Unfortunately, NMT is too often ignored as a serious investment priority by those more interested in the allure of high technology and the continuation of the motorised transport paradigm. Quality NMT projects, though, can actually be quite technologically sophisticated despite being achievable at an affordable cost.

Pedestrian facilities

A successful sidewalk is more than just a surface for pedestrians. Quality pedestrian facilities create an environment for exchange and sociability. Achieving a streetscape that attracts all ages, encourages social interaction, and discourages crime does not happen by accident. Such designs require a concerted NMT strategy by the city officials.

Figure 18. Walking and cycling help form the social and economic fabric of many Asian cities, as this example from Rajasthan, India shows. Photo: iStockPhoto.

Fortunately, in comparison to other forms of transport interventions, pedestrian facilities are far less costly to deliver. Despite the modest costs, though, the rewards can be significant in terms of greenhouse gas reductions and co-benefits.

Figure 19. The conversion of a former rail line to a pedestrian corridor in Yokohama achieves an aesthetically-pleasing design with appropriate surface materials and landscaping. Photo courtesy of Lloyd Wright.

Figure 20. Kobe creates a highly legible central area with clear maps and signage. Photo courtesy of Lloyd Wright.

Figure 21. Pedestrian lighting in Nagoya invokes a festive atmosphere while also providing security. Photo courtesy of Lloyd Wright.

Table 5 summarises some of the design elements that constitute a successful pedestrian area.

Table 5. Infrastructure improvement measures for pedestrian areas

Category	Measure
Art	Sculptures
	Chalk drawings on pedestrian areas and on street area
	Banners, streamers, balloons, flags hanging from posts
Aesthetics	Entryway over street introducing the community
	Water fountains
	Water channels
	Tent-like structure over street and pedestrian area
	Special tiling of pavement area
	Stepping stones
	Patterns in pavement
	Trees, flowers, and other vegetation
	Community notice board
	Commemorative plaques, historical markings, monuments
Commerce	Markets for food and goods
	Outdoor cafes
	Bike maintenance shop on street
Public services	Public restrooms
Street furniture/infrastructure	Benches and other permanent seating
	Loose chairs
	Bollards, moveable and permanent
	Bicycle parking facilities
	Street lighting
	Street signage

Bicycles and pedicabs

Bicycles are also a relatively simple and low-cost technology that has benefited from considerable technical innovation. Bicycles permit the user to access a wide range of intermediate-distance destinations throughout the city. In comparison to the cost of operating a car or motorcycle, a bicycle produces considerable savings when factors such as fuel, parking, insurance, and maintenance of a car or motorcycle are fully considered.

The provision of dedicated cycle ways can do much to encourage bicycle use in a city. Bicycle safety increases significantly as the number cyclists increase and general awareness by motorists builds.

Figure 22. A non-motorised delivery vehicle in London. Photo courtesy of ITDP.

Figure 23. A bicycle rental facility in Seoul. Photo courtesy of Lloyd Wright.

In order to make cycling a viable option, the provision of the following support features is useful:

- *Secure bicycle parking*
- *Lighting along cycle ways*
- *Shower facilities at work places*
- *Ability to board public transport vehicles with a bicycle.*

Internationally, pedicabs (also known as bicycle taxis) have undergone a technological revolution with modern and attractive vehicles now frequenting the streets across cities in Europe and North America. Formal stations, skilled drivers, customer service, and support infrastructure can all lead to the appropriate formalisation of the pedicab industry. To counter rising fuel costs, many delivery firms have likewise turned to technologically advanced work bikes as a practical solution.

Through a collaboration of international organisations and local entrepreneurs, the Indian cycle rickshaw has received a transformation with lighter and more robust vehicles taking to the streets. Despite these advances with the technology and the clear social and environmental benefits of pedicabs, some cities, such as Delhi and Dhaka, have begun a process to ban the operations of pedicabs. It is possible that with a closer understanding of the full co-benefits from pedicabs that such bans can hopefully be reversed.

Bicycle rentals

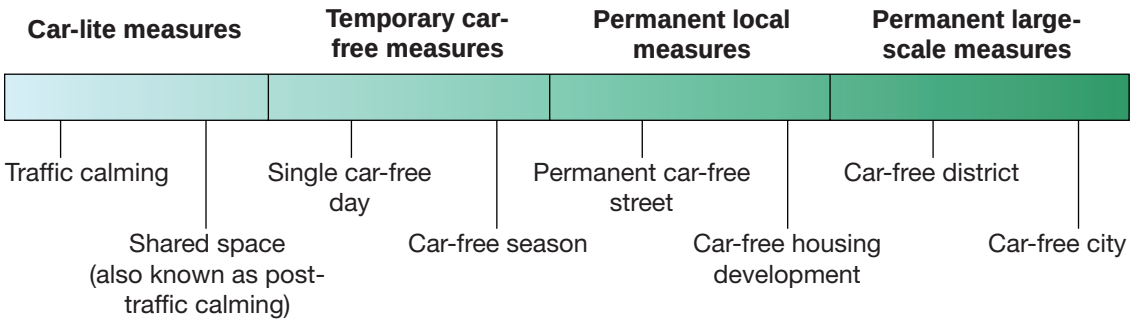
One of the most exciting new EST innovations is the rise in bicycle rental facilities across cities of the world. The Paris Velib project has been a catalyst for similar initiatives elsewhere. In Paris, Velib bicycle rental stations are provided throughout the city. Approximately 20,000 bicycles are distributed amongst some 1,400 stations in Paris.

Similar initiatives have begun in Asia, including the cities of Seoul (Korea) and Hangzhou (China). Bicycle rental facilities provide the convenience of bicycle use to both visitors and local residents. By introducing cycling to residents through the rental option, many persons go on to become regular users.

Car-free development

For many communities, the congestion, accidents, pollution, and social severance caused by the onslaught of motorcycles and cars has become too much. As a response, there are now examples of motorised vehicles being banned either temporarily or permanently from portions of some cities. The re-taking of the streets by local residents represents a bold move away from the old transport paradigm.

"Car-free development" can take many different forms. Figure 24 summarises the different types of car-free interventions.



Source: Wright, 2005

Figure 24. Types of car-free options

In the absolute case, a "car-free city" would imply the complete absence of any motorised vehicle travel at all times. Cities that are completely free of any motorised vehicle transport are quite rare. However, in Asia there are many historical areas of cities as well as commercial zones that are completely pedestrianised.

The creation of car-free zones in Asia and elsewhere has produced impressive financial results in terms of shop turnover, sales, and employment. Shanghai's Nanjing Road is considered the world's most successful pedestrian mall in terms of customer volumes.

Beyond permanent car-free conversions, there are also options to temporarily close roadways, either for a single festive event or on a seasonal basis.

Car-free days are increasingly high profile events that can be useful in awakening a city and its residents to the possibilities of a different urban environment. The principal premise behind such days is the idea of creating a "pattern break" in which awareness of transport alternatives is promoted.

"By creating a break in the normal pattern of behaviour, CFDs [Car-Free Days] can provide an opportunity for the citizens and the municipality to take a step back and reconsider the development path of the transport sector and whether it takes into account and meets the needs of all people…On an even broader scale, CFDs can serve to spark a dialogue about the future of the city and allow citizens to ask what exactly they envision their city to become in say, 20, 50, and 70 years" (UN-CFD, 2005).

Figure 25. As this example from Seoul demonstrates, pedestrianised streets with commercial and entertainment venues can be quite lucrative. Photo courtesy of Lloyd Wright.

Internationally, 22 September has been designated a global car-free day. Over 1,000 cities currently participate in the annual car-free day. During the car-free day the participating cities experiment with selective road closings and therefore evaluate the feasibility of longer-term conversions.

The UNCRD's EST Initiative is developing a Car-Free Day initiative to encourage Asian cities to participate in substantive car-free events.

Figure 26. Car-free day event in Jakarta. Photo courtesy of Karl Fjellstrom (ITDP).

Summary

The following table summarises the co-benefit potential of non-motorised transport initiatives.

Table 6. Summary of co-benefit impacts from non-motorised transport
√=Co-benefit

Economic benefits	Pedestrian upgrades	Pedicabs	Bicycle rentals	Car-free day
Congestion reduction	√	√	√	√
Consumer spending savings	√	√	√	√
Employment creation	√	√	√	√
Small-enterprise development	√	√	√	√
Traffic accident reduction	√	√	√	√
Technology transfer		√		
Energy security	√	√	√	√
Economic productivity	√	√	√	√
Environmental benefits				
Greenhouse gas reductions	√	√	√	√
Particulate matter reduction	√	√	√	√
Sulphur oxides reduction	√	√	√	√
Nitrogen oxides reduction	√	√	√	√
Carbon monoxide reduction	√	√	√	√
VOC reduction	√	√	√	√
Noise reduction	√	√	√	√
Solid waste reduction	√	√	√	
Water contaminant reduction	√	√	√	
Social benefits				
Health (e.g. obesity reduction)	√		√	√
Crime reduction	√	√	√	√
Gender equity promotion	√	√	√	√
Universal access for disabled	√			√
Scholar access improvement	√	√	√	√
Convenience and comfort	√	√	√	√
Community sociability	√		√	√
Reduction in severance	√			

4. Transportation Demand Management

"Controlling the demand for private motorized travel through a combination of policies, such as regulatory measures (manage demand for road space), fiscal policies (such as parking fees, vehicle taxes, road or congestion charging, and fuel taxes, etc.), and infrastructure design measures."

• Aichi Statement, 2005

Transportation Demand Management (TDM) represents a broad set of policies and measures that instil incentives away from private vehicle usage. TDM is also referred to as "mobility management" (VTPI, 2009).

There is a long list of TDM mechanisms available to any city: Congestion charging, road pricing, vehicle use restrictions by plate numbers, fuel taxes, vehicle ownership fees, parking restrictions, and parking levies. Cities can employ a synergistic package of TDM measures in order to create the right incentive structure away from car and motorcycle use.

Vehicle use restrictions

From the original development of congestion charging in Singapore, this concept has gained favour in cities world-wide, including London, Oslo, and Stockholm. By applying an additional fee to drive a private car during peak periods, these cities have substantially discouraged car use.

The Singapore scheme, known as Electronic Road Pricing (ERP), works through the electronic tagging of each vehicle. When passing below an ERP gantry, a fee is assessed to the vehicle's account.

The revenues generated from congestion pricing can be directly channelled to other sustainable transport measures, including NMT and public transport.

Figure 27. Singapore's Electronic Road Pricing (ERP) system. Photo courtesy of Lloyd Wright.

Fuel taxes

Few measures affect car usage more than the price of petrol. The dramatic increases in fuel costs in 2008 resulted in one of the most significant mode shifts away from private vehicles over the past three decades. While there is often a lag between a fuel price increase and a change in commuter behaviour, there is an undeniable link between the two factors.

Fuel prices, though, are a highly politicised issue. Implementing a fuel tax is often considered a risk for any government. Nevertheless, the rewards for doing so include shifts away from motorcycles and cars and a lucrative revenue source that can fund EST projects.

A survey of Asian fuel taxes indicates that many nations only lightly tax petrol and diesel. The message sent by such a policy decision is to encourage consumer behaviour away from EST options.

With the spectre of peak oil now upon the world, there will clearly be dramatic swings in petrol prices for the foreseeable future. There is much that governments can do to soften these price swings through a progressive tax policy.

When fuel prices reach a peak point, a fuel tax should be imposed to maintain the peak. In other words, as fuel prices drop from the peak point, the price level is maintained by a fuel tax. Through such a mechanism, consumers will not be subjected to a roller coaster ride of price changes, and the government will have created a substantial fund for sustainable transport projects. This mechanism also softens any political fall-out from the tax since the prices will have naturally climbed to the peak price level through market forces.

Parking levies

Parking represents one of the most heavily subsidised aspects of the modern automobile age. Without free parking, many big box type developments would substantially lose their appeal to consumers.

However, "free parking" is a misnomer since it brings with it substantial costs to society. Uncontrolled parking carries with it considerable externality costs, including the loss of public space, severance, and visual intrusion.

By pricing parking, cities can both discourage private vehicle usage while at the same time gain important revenues for sustainable transport measures.

Applying a standard parking fee based on an hourly rate, though, can be ineffective as a revenue generator since there are high administrative costs. By contrast, a "parking levy" works by charging a set fee for a parking space, regardless of whether the space is actually used or not. Several cities in Australia, including Sydney and Perth, have implemented parking levies.

Figure 28. In Kathmandu, Nepal, parking has taken over much of the public realm. Photo: iStockPhoto.

Table 7. Summary of co-benefit impacts from transportation demand management (TDM)
√=Co-benefit

Economic benefits	Vehicle use restrictions	Fuel taxes	Parking levies
Congestion reduction	√	√	√
Consumer spending savings	√		
Employment creation			
Small-enterprise development	√	√	√
Traffic accident reduction			
Technology transfer	√	√	√
Energy security	√	√	√
Economic productivity			
Environmental benefits			
Greenhouse gas reductions	√	√	√
Particulate matter reduction	√	√	√
Sulphur oxides reduction	√	√	√
Nitrogen oxides reduction	√	√	√
Carbon monoxide reduction	√	√	√
VOC reduction	√	√	√
Noise reduction	√	√	√
Solid waste reduction	√	√	√
Water contaminant reduction	√	√	√
Social benefits			
Health (e.g. obesity reduction)	√	√	
Crime reduction	√	√	√
Gender equity promotion		√	√
Universal access for disabled	√	√	√
Scholar access improvement			
Convenience and comfort	√	√	√
Community sociability	√		√
Reduction in severance			

5. Land-Use

"Land-use planning

- *Accepting a vision of cities for people rather than for cars, with a focus on the movement of people and goods rather than vehicles*
- *Supporting urban planning with a particular emphasis on public transport, non-motorized transport, traffic safety and environmental control*
- *Encouraging the integration of both land-use and transport planning to reduce the unplanned, low-density expansion of urban areas*
- *Promoting urban revitalization through mixed-use development, favouring concentrated development around public transport nodes."*

• Aichi Statement, 2005

By locating work, education, shops, and residential areas within an easy distance, effective land-use planning can help reduce the need for motorised transport in the first place. Land-use and zoning policies that permit medium-density and mixed-use development can do much to make NMT and public transport viable options. Likewise, a strategy of transit-oriented development (TOD) will focus investment priorities around nodes that support the minimisation of trip requirements.
All of these measures carry with them co-benefits in terms of consumer cost savings from reduced reliance on motorised vehicles, emission reductions, and greater community cohesion and sociability.

Smart growth

"Smart growth" refers to a set of policies that promote more accessible land-use policies. Smart growth policies include the mixed-use development patterns that allow the close proximity of residential areas to shopping, work, and services.

Smart growth development places first priority on people rather than cars. Such communities tend to possess the sufficient population density to sustain a cost-effective public transport system. Smart growth communities also tend to include plazas, squares, and pedestrianised areas that encourage interaction amongst the community members.

Smart growth communities are noted for design at the human scale. While smart growth areas may not be completely car-free, these neighbourhoods typically include traffic calming measures that greatly reduce the speeds of motorised vehicles.

Figure 29. Oyumino (Chiba, Japan) is a smart growth community that inter-connects residential and commercial areas with a large network of NMT routes. Photo courtesy of Lloyd Wright.

Figure 30. Singapore's LRT system has been developed around purpose-built communities in which residential, shopping, education, public services, and work places are all co-located. Photo courtesy of Lloyd Wright.

Transit-oriented development

Integrating development and public transport along high-density corridors and at key nodal points brings benefits to all. Such planning focuses the largest number of destinations (work, residential, public services, schools, etc.) near public transport stations, and thus encouraging both non-motorised transport as well as public transport usage.

Asian cities such as Bangkok, Beijing, Delhi, Hong Kong, Jakarta, Seoul, Singapore, and Taipei have successfully implemented mass transit corridors that have helped to concentrate development and public services. However, even in these cities, there exists the on-going threat of sprawl due to car-based development.

Transit-oriented development (TOD) can ultimately create a more human-friendly city through the promotion of reduced private vehicle usage.

Table 8. Summary of co-benefit impacts from land-use planning measures
√=Co-benefit

Economic benefits	Smart growth polices	Transit-oriented development
Congestion reduction	√	√
Consumer spending savings	√	√
Employment creation	√	√
Small-enterprise development	√	√
Traffic accident reduction		
Technology transfer	√	√
Energy security	√	√
Economic productivity		
Environmental benefits		
Greenhouse gas reductions	√	√
Particulate matter reduction	√	√
Sulphur oxides reduction	√	√
Nitrogen oxides reduction	√	√
Carbon monoxide reduction	√	√
VOC reduction	√	√
Noise reduction	√	√
Solid waste reduction	√	√
Water contaminant reduction	√	√
Social benefits		
Health (e.g. obesity reduction)	√	√
Crime reduction	√	√
Gender equity promotion	√	√
Universal access for disabled	√	√
Scholar access improvement	√	√
Convenience and comfort	√	√
Community sociability	√	√
Reduction in severance	√	√

III. Carbon Markets

1. Calculating Emission Benefits

"We can't negotiate the facts. We can't negotiate the truth about the situation. And for those who are too fearful to finish, it can be done and must be done... It is wrong for this generation to destroy the habitability of our planet and ruin the prospects of every future generation."

• Al Gore, former Vice-President of the United States, December, 2008

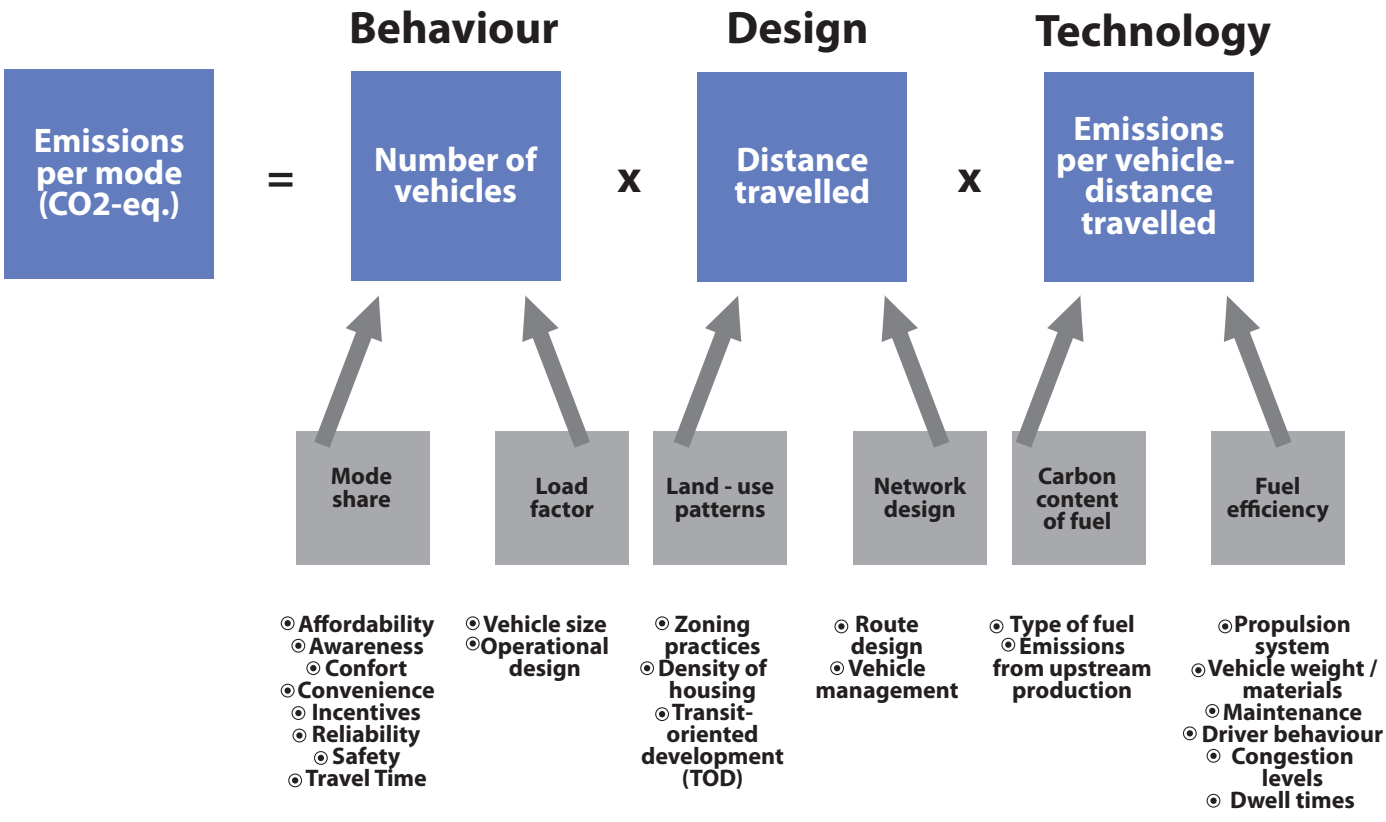
Emission reductions can be achieved through improvements across three general factors: 1. Number of vehicles; 2. Distance travelled; or 3. Emissions per vehicle kilometre. Figure 31 summarises this relationship as well as indicates some of the components that affect these three factors.

The number of vehicles required for a city's mobility is affected by user behaviour. Policies that encourage individuals to use public transport or non-motorised transport help to reduce the number of cars and motorcycles. By matching demand to the vehicle size, the most efficient outcome can be achieved.

The distance travelled depends on the city's spatial design and population density. Land-use policies that encourage smart growth along transport corridors tend to produce fewer transport-related emissions than low-density cities that sprawl over the suburban landscape.

Finally, the choice of fuel and vehicle technology also plays a role. The carbon content of the particular fuel utilised receives a great deal of attention in emission reduction efforts. However, other system characteristics such as vehicle weight and maintenance practices are also of importance to overall vehicle emissions.

Figure 31. Calculation of transport emissions



Source: Wright and Fulton, 2005

2. Clean Development Mechanism

"We, the Mayors, thus hereby declare our intention to:

1. resolve to demonstrate leadership and ownership in promoting EST and setting the vision in Asian cities in motion in close collaboration with the national government, the private sector, civil society, and regional and international communities,

2. commit to implementing integrated policies, strategies, and programmes addressing key elements of EST such as public health; land-use planning; environment- and people-friendly urban transport infrastructure; public transport planning and transport demand management (TDM); non-motorized transport (NMT); social equity and gender perspectives; road safety and maintenance; strengthening road side air quality monitoring and assessment; traffic noise man agement; reduction of pollutants and greenhouse gas emission; and strengthening the knowledge base, awareness, and public participation,

3. dedicate ourselves to specifically addressing priorities that are often under-emphasized but are nevertheless vital and central to EST, such as the provision of exclusive pedestrian and bicycle lanes, and ensuring safe and comfortable movement of women, children, the elderly, and the physically impaired..."

• Kyoto Declaration, 2007

In response to the threat of global climate change, the international community has developed legal frameworks to begin the process of reducing global emissions.

Figure 32. The venue for the December 2008 Conference of the Parties to the Kyoto Protocol in Poznan, Poland. Photo courtesy of Drozdi-Pn.

Framework conventions and protocols

At the 1992 United Nations Conference on Environment and Development (UNCED), member nations developed the United Nations Framework Convention on Climate Change (UNFCCC). By 1994, a sufficient number of countries had ratified the convention to put the document into force.

Subsequently, in 1997, the Kyoto Protocol was drafted. The protocol called for developed nations to reduce emissions by an average of 5.2% from a 1990 baseline by 2012. Despite the absence of a major emitting nation, the United States, the agreement came into force on 16 February 2005.

The Kyoto Protocol offers a mechanism, known at the "Clean Development Mechanism" (CDM) that allows mitigation projects in developing nations to earn "Certified Emission Reductions" (CERs), which have a monetary value. Thus, although developing nations do not have reduction requirements under the Kyoto Protocol, these nations can sell credits gained through CDM to other nations that do have Kyoto emission reduction requirements.

However, to date, the transport sector has not played a major role in CDM. As of 1 February 2009, there was a total of 4,474 CDM projects. Of this amount, there are only two registered CDM projects from the transport sector (UNEP Riso Centre, 2009). These registered projects include the Bogota TransMilenio (BRT) project and a project involving regenerative braking for rail coaches.

There are many reasons for the lack of transport CDM initiatives, but perhaps most prominently is the difficulty in modelling a robust baseline that accounts for the modal growth dynamics of the transport sector. Also, given the required size of transport investments, there can be difficulty in passing "additionality" requirements, which mandate emission reductions to be greater than they would be without the CDM financial contribution.

In addition to the CDM, sustainable transport initiatives can receive funding from the Global Environment Facility (GEF), which is amongst the world's largest grant-making facilities for environmental initiatives. The GEF's resources of over US$ 2 billion are intended to catalyse demonstration initiatives that eventually lead to replication globally. The fund is managed by a central secretariat along with its implementing agencies which include the World Bank, United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), and regional development banks.

Currently, nations are devising a post-Kyoto agreement that would define reduction objectives beyond 2012. The Bali Action Plan, adopted in December 2007, set out the parameters for a post-2012 regime: "Various approaches, including opportunities for using markets, in order to enhance the cost-effectiveness of, and to promote, mitigation actions, bearing in mind different circumstances of developed and developing countries" (UNFCCC, 2007). The new mechanism is known as the "Market-Mechanism for Sustainable Development (MMSD).

The Poznan Conference of the Parties (COP-14) that took place in December 2008 has set the stage for the actual negotiations on a post-2012 agreement on emission reductions. The next Conference of the Parties is COP-15, which is scheduled for December 2009 in Copenhagen. The Copenhagen event is set to be a critical point in reaching a meaningful and mandatory emission reduction framework for the future.

IV. Resources

1. Technical assistance

"Strengthening knowledge base, awareness, and public participation

- Promoting coordination and cooperation among groups collecting or managing information on EST through a decentralized network of knowledge providers

- Developing and disseminating best practice on EST

- Increasing the understanding and awareness of the civil society and decision-makers on the beneficial aspects of EST with the aim to accomplish changes in policies, investment decisions, and personal behaviour."

    • Aichi Statement, 2005

For nations and cities committed to the path of Environmentally Sustainable Transport, there are many organisations prepared to provide technical and financial support. These organisations include United Nations agencies, bi-lateral assistance agencies, regional development banks, and non-governmental organisations.

The UNCRD has created the EST Initiative to expressly establish regional information sharing mechanism and strategic platform for policy dialogue on the topic of sustainable transport. The Regional EST Forum is a mechanism to promote exchange and dialogue amongst the policy makers in transport and environment sectors in the Asian region.

Figure 33. The EST Forum is a regional meeting place to share experiences on sustainable transport options. Photo courtesy of Lloyd Wright.

Decision makers interested in pursuing EST should utilise the following resources to achieve their sustainable objectives:

Asian Development Bank
www.adb.org/transport

Clean Air Initiative for Asian Cities
www.cleanairnet.org/caiasia

EMBARQ - the World Resources Institute Centre for Sustainable Transport
www.embarg.wri.org

Global Environment Facility
www.gefweb.org

Institute for Transportation & Development Policy
www.itdp.org

Ministry of the Environment, Government of Japan
www.env.go.jp/en/air

Sustainable Urban Transport Project of GTZ
www.sutp.org

UNCRD EST Initiative
www.uncrd.or.jp/env/est

Victoria Transport Policy Institute
www.vtpi.org

World Health Organisation
www.who.int

Figure 34. In April 2007, representatives from 22 cities signed the Kyoto Declaration, which pledged support to EST principles. Photo courtesy of UNCRD.

Figure 35. In November 2008, a further 12 cities signed the Kyoto Declaration during the Better Air Quality Conference in Bangkok. Photo courtesy of UNCRD.

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About the Asian EST Initiative

The Asian Environmentally Sustainable Transport (EST) Initiative seeks to encourage the strategic adoption of integrated and sustainable transport solutions for Asian nations. This initiative is conducted in conjunction with ministries of environment, transport, and health throughout the region, as well as other relevant local, national, and international stakeholders. The EST Initiative aims to set in motion a regional mechanism and consultative process for knowledge transfer through Regional EST Forums. These Forums are designed to encourage debate, share best practices and policy instruments, and promote collaborative and participatory efforts towards addressing emerging and common issues of concern in the environment and the transport sector.

Annex 1

SEOUL STATEMENT

~ Towards the Promotion of Environmentally Sustainable Transport (EST) for a Low-Carbon Society and Green Growth in Asia ~

The participants, having met in Seoul, the Republic of Korea from 24 to 26 February 2009, for the Fourth Regional EST Forum, to draw up and adopt a statement for the promotion of environmentally sustainable transport in Asia,

Noting that Asia is experiencing the fastest economic growth and by mid of this century, and at the current growth rate there might be more motorized vehicles in Asia than there would be in Europe and North America combined, and that the profound impact of this trend on quality of human life and environment can not be underestimated,

Reaffirming and building upon the integrated EST measures defined under the *Aichi Statement* adopted at the First Regional EST Forum in Asia, held in Nagoya, Japan, on 1-2 August 2005, and considering that efforts to promote environmentally sustainable transport will not only result in the improvement of human health through the reduction of urban air pollution, but will also have important complementary (co-)benefits, including the reduction of greenhouse gas (GHG) emissions,

Recognizing the outcome of the Fifth Ministerial Conference on Environment and Development in Asia and the Pacific held in Seoul in 2005, which endorsed environmentally sustainable economic growth, *Green Growth,* as a policy focus and important strategy for achieving the Millennium Development Goals (MDGs) as well as decoupling environmental degradation from development,

Noting the commitment made by the Ministries of Health in Member States in the resolution of the WHO Regional Committee for the Western Pacific in September 2008 to assess the health implications of the decisions made on climate change by the transport sector and advocate for the decision that provide opportunities for improving health,

Realizing that transport services affect all aspects of sustainability - social, economic, and environmental - and that there is a need for safe, clean, and energy-efficient transport in order to achieve green growth through low-carbon transport in Asia, the participants are thus called upon to:

1. address transport issues with the broader environmental aims of green growth to encompass the transport-energy-carbon emission nexus, from energy consumption to the emissions and climate

change perspectives;

2. develop strategies for low-carbon transport including the increasing shift to energy-efficient and low carbon modes to mitigate the effects of transport on climate, and the effects of climate change on transport services and other socioeconomic sectors;

3. focus on sustainable mobility and transport demand management (TDM) tools and measures [such as – parking controls (including parking charges and pricing), road pricing and congestion charging, fuel and vehicle taxation, low and zero emission zones, car-free day, city centre pedestrianization, public transport priority and improvement measures, transit oriented development, appropriate road- space allocation to high-occupancy vehicles, efficient and affordable mass transit systems (such as BRT), and measures to help and develop non-motorized transport (walking and cycling)], etc. with stakeholder consultation and participation rather than relying only on end-of-pipe solutions, so that local air pollutants and GHG emissions from transport sector can be addressed concurrently and effectively, thereby contributing to materializing a Low Carbon Asian Society;

4. as far as possible exploit benefits of adopting intelligent transport system (ITS), and of utilizing market mechanisms such as tax credits for environmentally friendly technologies, to make the transport services environment and people friendly, cost effective as well as energy efficient;

5. develop city partnerships and collaboration across national boundaries within Asia and between Asian cities and cities from other regions for mutual technical assistance and cooperation on implementing environmentally sound practices in transport sector, including recognition of the special needs of the post conflict countries;

6. strengthen regional cooperation, in particular among the international organizations and donors active in the region and member countries, to further improve and deepen the transport agenda at energy efficiency and climate change-related fora, including the Conference of Parties (COP), for achieving low-carbon society and green growth bearing in mind the ultimate objective of reducing global emissions under the UN Framework Convention on Climate Change (UNFCCC); and

7. request international organizations and donor communities to mobilize necessary capacity building services and financial support to the developing member countries to enable them to overcome the complex technical barriers involved in developing transport projects for taking full benefit of the GHG market under the Clean Development Mechanism (CDM) stipulated by Kyoto Protocol.

Participants of the Fourth Regional EST Forum in Seoul, Republic of Korea (24-26 Feb, 2009)

About UNCRD

United Nations Centre for Regional Development
Nagoya, Japan

The United Nations Centre for Regional Development (UNCRD) was founded in 1971 as part of the United Nations (UN) system of organisations. It was set up in pursuance of the terms of the UN Economic and Social Council UN/ECOSOC) resolutions 1086 C (XXX1X) and 1141 (XLI) which called for global action to promote regional development, and resolution 1582 (L) which provided guidelines for its operations.

UNCRD was created by an agreement between the UN and the Government of Japan. Under Article III of the agreement, UNCRD has four distinct but interrelated responsibilities:

(1)To serve as a training and research centre in regional development and planning and related fields for developing countries which may wish to avail themselves of its services;

(2)To provide advisory services in regional development and planning and related fields at the request of developing countries;

(3)To assist developing countries in promoting the exchanges of data on research, practical experience, teaching, and other relevant subjects in regional development and planning and related fields; and

(4)To assist and cooperate with other organisations, national or international, concerned with regional development and planning and related fields.

To meet the goals, the Centre targets its programmes towards socially and environmentally sustainable development. The three multidisciplinary themes of human security, environment and disaster management serve as a guide to the Centre's training and research activities.

The Centre's operations have benefited greatly from the co-operative relationship with UN/DESA and its valuable and consistent support.

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