

China Transportation Program Strategy

Overarching goal: Reduce carbon emissions and improve air quality from the transportation sector by promoting cleaner vehicles and transportation system reform.

Goal #1: Introduce advanced, electric-drive technology vehicles into China's fleet in significant, and increasing, volumes.

Means:

1. Work with the Ministry of Science and Technology (MOST) and the National Development and Reform Commission (NDRC) to identify technical, economic and institutional barriers for advanced technology vehicle commercialization, and to define a feasible policy roadmap for advanced technology development.
2. Work with MOST and NDRC to develop policies and standards to lay a groundwork for hybrid technology development and marketing.
3. Work with development agencies (such as the Asian Development Bank, the European Union, UNDP, and the World Bank) to ensure that China gets significant funding for advanced technology buses, trucks, and cars.
4. Encourage provincial and municipal policy pilots to encourage technical transfer and increase advanced technology vehicle sales.

Evaluation Criteria (Key Performance Indicators):

We support and evaluate projects based the ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. The amount of R&D funding allocated to advanced technology vehicle projects.
2. Whether China adopts a plan that promotes advanced technology vehicles.
3. Whether substantial funds are allocated to advanced technology vehicle development in China.
4. Whether provincial and municipal policy pilots launch advanced vehicle technology through incentive policies to promote and volume sales.

Goal #2: Increase the efficiency and reduce the emissions of conventional technology vehicles.

Means:

1. Work with the State Environmental Protection Administration (SEPA) and NDRC to develop strong vehicle emissions regulations and fuel quality standards.
2. Support regulatory efforts with technical analysis, including strengthening emissions and air quality modeling capabilities at premier Chinese research institutions and studying the cost implications of refining motor fuels to meet tighter specifications.

3. Work with NDRC, the Standardization Administration of China (SAC), and other concerned government agencies to develop and implement aggressive fuel economy standards and regulations to promote vehicle fuel efficiency.
4. Work with SDRC to develop national policies to encourage clean and alternative vehicle fuels and technologies.

Evaluation Criteria (Key Performance Indicators)

We support and evaluate projects based the ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. The extent to which SEPA is effective in bringing new conventional vehicles up to world-class emissions standards.
2. Whether vehicle emissions and fuel economy modeling analyses are considered credible and compelling both inside and outside of SEPA.
3. Whether tighter vehicle fuel specifications are advanced, adopted, and enforced.
4. Whether aggressive fuel economy requirements are adopted and enforced.

Goal #3: Promote sustainable transportation systems, especially Bus Rapid Transit (BRT) systems development.

Means:

1. Organize and educate central, provincial, and municipal authorities about the benefits of transportation system reform.
2. Work with the National Development and Reform Commission (NDRC) and Ministry of Construction (MOC) to develop policies and technical guidelines that stimulate the spread of BRT systems in major cities.
3. Support strategic studies to improve local transportation system efficiency.
4. Support BRT planning and demonstration in two-to-three cities in China.

Evaluation Criteria (Key Performance Indicators)

We support and evaluate projects based the ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. Whether BRT systems are successfully demonstrated in two or three Chinese cities.
2. Whether NDRC and MOC adopt and enforce policies to promote BRT systems.
3. Whether urban transportation plans and policies take into consideration the environment as well as transportation system efficiency.

China Sustainable Energy Program
PROJECT UPDATES
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Transportation

Goal #1: Introduce advanced, hybrid-electric drive technology vehicles into China's fleet in significant, and increasing, volumes.

Hybrid Vehicle Performance Standards Development

Based on previous work analyzing the policy barriers to introducing advanced technology vehicles, the China Automotive Technology and Research Center (CATARC) recommended developing technical regulations for commercializing hybrid technology. The regulations include performance standards—which are the preconditions for hybrid vehicle manufacturing. CATARC is working to develop hybrid vehicle performance standards and complementary policies for the National Development and Reform Commission (NDRC) and the Ministry of Science and Technology (MOST). The team is analyzing and identifying key performance standards elements, and developing standards and test procedures for certification—particularly emissions and fuel efficiency tests as well as complementary technical policies and certification management procedures.

Incentive Policies for Commercializing Hybrid Vehicles

In parallel with the development of hybrid vehicle performance standards, CATARC is assisting NDRC to develop a package of hybrid vehicle preference policies in order to speed up commercialization. These policies include (1) financial incentives for manufacturers, dealers, and consumers to buy and sell hybrid-electric vehicles, (2) preference policies for industrial development, investment, and international cooperation on hybrid vehicle technologies; for example, ease hybrid vehicle joint venture approval procedures, and (3) subsidies and incentives to apply hybrid technologies to specific fleets, including bus fleets, commercial fleets, government fleets, and taxis.

International Collaboration to Promote Hybrid-Electric Vehicles

The John F. Kennedy School of Government at Harvard University is assisting NDRC, MOST, and CATARC to develop hybrid vehicle promotion policies, including (1) surveying and summarizing international technical and economic policies that promote hybrid and other advanced technology vehicles, (2) tailoring such international practices to China's conditions, and (3) exploring opportunities for international cooperation and incentives to attract hybrid vehicle technologies to China.

Promoting the Commercialization of Advanced Clean Vehicles in Shanghai

In addition to the efforts made at the national level, grantees are also working at the municipal level to conduct policy pilot projects in promoting advanced vehicle technologies. Shanghai intends to lead China in putting advanced technology vehicles on the road. The Shanghai municipal government allocated \$45 million in matching funds to MOST's 863 Program to

develop advanced vehicle technologies (ATVs). Tongji University, the *863 Program's* coordinator, made significant progress by developing an electric power train system and a fuel cell car platform, which puts ATVs closer to commercialization. Yet, Shanghai lacks a comprehensive action plan. Tongji University is assisting the Shanghai municipal government with developing an action plan to introduce and demonstrate ATVs. Tongji is analyzing and recommending preferential policies and government incentive mechanisms, such as “zero-emissions vehicle” mandate programs modeled on that of the State of California, as well as an environmental grading system. Tongji is also developing an action plan to introduce hybrid vehicles for the 2010 World Expo.

Hybrid-Electric Vehicle Industrialization and Commercialization Strategies

Technical, commercial, and policy barriers must be addressed before the industrialization and commercialization of hybrid-electric vehicles can be realized. The Tianjin Electric Vehicle Research Center (TEVRC), using Japanese and US case studies, is analyzing Tianjin's potential for the industrialization and commercialization of HEVs and developing solutions to barriers. TEVRC is submitting its recommendations to the Tianjin municipal government.

Recommendations:

- Develop and implement technical regulations that provide hybrid vehicle technologies with access to the market as soon as possible.
- Require government-sponsored procurement of hybrid vehicle fleets, such as taxi and government ministry vehicle fleets, so that, through volume purchases, the costs of hybrids come down and hybrid technology enters the market more rapidly.
- Conduct local hybrid technology demonstration projects with preference policies and clear targets for hybrid introduction. For example, California catalyzed the development of hybrid-electric vehicles by requiring all manufacturers to sell 10 percent “zero-emissions vehicles” within the state, with partial credit for sales of hybrids. This policy has launched a global revolution in advanced vehicle technologies. China could be a leader in similar policies.

Goal #2: Increase the efficiency and reduce the emissions of conventional technology vehicles.

Fuel Efficiency Standards

Fuel Efficiency Implementation Policies

After a three-year effort, CATARC successfully worked with NDRC; NDRC adopted China's first fuel efficiency standards for light-duty passenger vehicles. These standards are the single most important precedent for China's future oil security. CATARC is now formulating enforcement recommendations, which include institutional and administrative structures, penalties for vehicle models that fail the standards, testing procedures, and government supervision mechanisms. These recommendations, if adopted by the government, will ensure that every vehicle manufactured will comply with the standards.

Light-Duty Truck Fuel Efficiency Standard

China currently has 700,000 light-duty trucks. According to international experience, if stringent fuel efficiency regulations fail to include light-duty trucks (LDT), auto manufacturers will shift production from passenger vehicles to the heavier, light-duty truck category (for example, sport utility vehicles), resulting in a decline in overall fleet fuel efficiency and increased national dependence on oil imports. CATARC is leading a research team to analyze the current fuel consumption and fuel efficiency potential of China's LDT fleet. CATARC is studying the improvement potential and overall relative benefits of advanced fuel efficiency technologies as well as analyzing the oil savings potential of LDT standards. CATARC will submit the LDT fuel efficiency standard to NDRC and the Standardization Administration of China (SAC).

Mandatory Labeling System

In parallel with fuel efficiency standards development and enforcement efforts, CATARC is assisting NDRC and SAC with developing a mandatory fuel efficiency labeling system requiring manufacturers to affix labels on their vehicles. This labeling system could encourage consumers to select highly efficient vehicles. CATARC is leading a group of experts to work closely with NDRC's Department of Industrial Policy and Department of Environment and Energy Comprehensive Utilization to survey international vehicle fuel economy labeling systems, analyze China's vehicle mix, design an appropriate labeling system, and analyze the barriers to implementing the labeling system.

Recommendations:

- Fully enforce the "Fuel Consumption Standard for Light-Duty Passenger Cars"; no exceptions to rigorous enforcement should be allowed. This more than any other measure will help to assure China's oil security.
- Establish a powerful enforcement body and implementation mechanism to supervise the implementation of fuel efficiency standards.
- Quickly adopt fuel efficiency standards for light-duty trucks and heavy-duty vehicles.
- Develop incentive policies (including financial incentives, fuel tax, and labeling systems) to promote rapid market adoption of fuel efficient vehicles.

Vehicle Emissions and Fuel Quality Improvement

National Vehicle Emissions Control Strategy Development

China requires vehicles to meet Euro-III emissions standards in 2007 and Euro IV in 2010. But with the rapid rise in the vehicle population, a comprehensive national control strategy is crucial to curbing deteriorating air quality. The Institute for Environmental Science and Engineering of Tsinghua University is supporting the State Environmental Protection Administration (SEPA) to (1) analyze the current status and trends of vehicle pollution in several Chinese cities, (2) determine vehicle emissions reduction targets that allow proposed air quality standards to be achieved in those cities, (3) analyze the technical feasibility and cost effectiveness of various

vehicle emission standards and their adoption scenarios, and (4) recommend achievable vehicle emission standards and implementation schedules.

Fuel Quality Improvement

China's poor fuel quality is a primary contributor to deteriorating urban air quality and is the main barrier to aggressive tailpipe emission standards as well as the introduction of advanced technology vehicles. The government is pushing the oil industry to improve fuel quality, but several factors hamper progress. Tsinghua University, the China Research Academy of Environmental Sciences, and the China Petroleum Development Planning Institute are working together to assist SEPA with developing a national strategy to reduce sulfur in China's gasoline and diesel fuels, and to encourage a schedule of fuel improvement that follows the national schedule of vehicle emissions control.

Vehicle Pollution Modeling

China needs state-of-the-art modeling tools that calculate the public costs of current and future vehicle emissions levels. The International Sustainable Systems Research Center (ISSRC), the Institute of Environmental Science and Engineering at Tsinghua University (IESETU), and Wuhan University of Technology are working to increase the sophistication of vehicle emissions and air quality models to bolster the case for stringent vehicle emissions standards and the introduction of low- and zero-emission vehicles.

Beijing Vehicle Emissions Controls

Facing increased pressure to improve its air quality for the 2008 Olympics, the Beijing municipal government is taking aggressive measures to address its deteriorating air quality, including developing stringent enforcement mechanisms for Euro-III emissions standards and corresponding fuel quality standards as well as diesel vehicle retrofits. The success of these two projects will speed up efforts throughout China. Grantees are working to assist the Beijing Environmental Protection Bureau (BEPB) to (1) design a roadmap for diesel vehicle retrofitting, including policy mechanisms and identifying available technology, (2) develop policies to ensure that only new Euro-III (and above) vehicles can be sold in Beijing, (3) develop fuel quality standards and enforcement policies, and (4) establish a labeling system that helps consumers identify vehicles with superior vehicle emissions and higher mileage.

Shanghai Vehicle Emissions Impacts and Controls

Shanghai, China's economic center, is struggling to balance economic development with environmental protection. Shanghai has adopted several policies that encourage cleaner vehicles, but these policies have made only marginal progress in controlling vehicle emissions. In the first phase of this project, the Shanghai Academy of Environmental Sciences (SAES) successfully demonstrated the relationship between air quality and vehicle emissions. SAES established a vehicle emissions and air quality simulation model that analyzed the benefits and costs of various vehicle emissions control policies. The second phase is now under way; SAES is submitting policy recommendations to the Shanghai municipal government that encourage the commercialization of advanced vehicle technologies through implementation of stringent vehicle emissions standards and heavy-duty vehicle emissions controls. This project is expected to

develop into a vehicle emissions control policy pilot in Shanghai. If successful, the pilot could become a model for national replication.

Shenzhen Public Vehicle Fleets (Buses and Taxicabs) Emissions Control

The Shenzhen Environmental Protection Bureau (EPB) is working to control its vehicle emissions, especially fleet emissions. The Shenzhen Research Center of Municipal Development is assisting the Shenzhen EPB with developing policies to manage and control vehicle emissions. Shenzhen is set on developing aggressive strategies, such as hybrid technologies, retrofitting, and vehicle emissions standards, to reduce vehicle emissions. Shenzhen is also eager to inject hybrid technologies into its taxi and bus fleets. Grantees have conducted a survey on Shenzhen's policies and available technology. They are now analyzing international experience in retrofitting bus and taxi fleets. Shenzhen EPB has also been in contact with hybrid vehicle manufacturers to analyze the feasibility of using hybrids in their taxi fleets.

Recommendations:

- Develop sophisticated enforcement systems for implementing vehicle emissions standards.
- Establish a financial mechanism—including a fuel tax and fuel pricing system—to require oil companies to improve fuel quality as soon as possible. Advanced technology vehicles must have clean fuels; without clean fuels immediately, China will fall further behind in advanced vehicle technology.
- Establish a schedule to adopt more stringent vehicle emissions standards; this schedule should reflect a similar schedule for cleaning up fuels.
- Develop economic policies to promote cleaner vehicles.
- Establish a schedule to adopt fuel quality standards to meet vehicle emissions control requirements.

Alternative Clean Fuels

National Alternative Fuel Development Strategy

Alternative fuels, if based on renewable and recyclable resources, together with advanced clean vehicle technologies, will significantly reduce petroleum usage as well as criteria pollutant and global warming emissions. This project supports NDRC's strategy to develop alternative fuels and clean vehicle technologies. The China National Petroleum and Chemical Planning Institute (NPCPI) and the China Society of Automobile Engineering (SAE) are conducting a survey on the supply and demand structure of China's fuels market and are projecting China's future oil demand. They are analyzing lifecycle environmental, energy, and economic ("Triple E") impacts from various fuel and vehicle options, as well as the technical and economic feasibility and barriers for fuels and vehicle technologies with the best Triple E. The team is submitting policy recommendations to NDRC that promote alternative fuels development in China.

Capacity Building

Tsinghua Fellowship Project

Tsinghua University has superb technical and analytical capacity and provides substantial support to government policy-making institutions. Tsinghua's scientific and technical support for transportation policy is particularly strong. The fellowship program at Tsinghua University enables graduate students and postdoctoral fellows to provide full-time analytical support to CSEP-funded transportation policy projects. Tsinghua graduate students select research projects that (1) encourage sustainable transportation, (2) address strategic issues that will affect the future environmental sustainability of China's transportation sector, and (3) identify comprehensive technical and policy options for central, provincial, and local government support for sustainable transportation development.

Fiscal policies for promoting cleaner and more efficient vehicle technologies

While China is just beginning to manage the tradeoffs associated with increased personal mobility, other nations have been working on solutions for some time. The EU, Japan, Canada, and the US have all developed public policies to mitigate the negative side effects of personal vehicle use and promote a more sustainable transportation sector. A critical challenge is to design an appropriate set of fiscal policies for the transportation sector. Fiscal policies generate revenue to cover investment costs. As importantly, fiscal policies can create mechanisms to capture the negative externalities of transportation use, thereby sending the proper signals to users. The Ministry of Finance (MOF) is currently considering reforming several vehicle tax and fiscal policies, which provides grantees with an immediate opportunity to promote clean and efficient vehicles. CATARC is assisting MOF in reforming the vehicle excise tax and consumption tax to reflect energy and environmental considerations. CATARC held an international conference on "Fiscal Policies for Promoting Cleaner and More Efficient Vehicle Technologies," in which Chinese government officials, domestic researchers, and international experts assessed fiscal policies that could promote sustainable transportation in China. Following up on this momentum, CATARC is working with international experts to (1) introduce international best fiscal policy practices in promoting clean and efficient vehicle technologies; (2) review and provide feedback on the current Chinese fiscal policy system for vehicle and transportation systems; and (3) recommend fiscal policies to MOF and NDRC to help promote sustainable transportation in China.

Goal #3: Promote sustainable transportation systems, especially Bus Rapid Transit (BRT) systems development.

Sustainable Transportation Strategy

China lacks a national transportation strategy. No high-level plan prioritizes sustainable transportation development, or recognizes the serious energy and environmental costs associated with *laissez-faire* transportation development. China's central government has multiple agencies overseeing various elements of transportation system development, giving rise to myriad inter-agency conflicts. The China Academy of Transportation Science (CATS) is establishing a task force under the China Council for International Cooperation on Environment and Development (CCICED) to formulate a comprehensive, national sustainable transportation plan that includes (1) an institutional framework for overseeing sustainable transportation development, (2) an

integrated, multi-modal transportation system, and (3) a roadmap for sustainable transportation policy development.

China Sustainable Transportation Center (CSTC)

Over the last two years, the bus rapid transit (BRT) program has developed rapidly. Pilots in Beijing, Kunming and Jinan are fully underway in both the adoption of promotion policies and pilot corridor development. Chengdu, Chongqing, Xi'an, and Shanghai have launched planning efforts and feasibility studies. The program's rapid expansion, however, is challenged by the lack of local technical capacity.

The Energy Foundation (EF) is supporting the establishment of a new non-governmental organization, CSTC, which could become China's premier "BRT Technical Center." CSTC's tasks include providing technical outreach and training to China's BRT cities in every detail of BRT development and management. With a growing staff, CSTC is open for business.

Policies for Promoting Bus Rapid Transit in China

China lacks a national policy to promote BRT development nationwide. The China Academy of Urban Planning & Design (CAUPD) is helping the Ministry of Construction (MOC) to develop policies to promote BRT in Chinese cities. CAUPD has organized a group of municipal and international experts to (1) survey the current status of BRT and other types of public transit systems, and analyze the barriers to BRT development, (2) analyze strategies for BRT development in various-sized Chinese cities, and (3) develop BRT policies on financing, urban planning, multi-modal integration, and operation and management.

Financial Structure and Fiscal Policies for Public Transit Development

BRT made great progress at the municipal level with pilots underway in Beijing, Kunming, and Jinan. Yet, the lack of sufficient financial support may be a potential barrier for BRT's long-term development. In Beijing, the municipal government and bus companies jointly funded BRT construction. Bus companies, in turn, invite private investors to fund construction around BRT stations. This public-private financial structure lacks clearly defined roles and responsibilities for its stakeholders, especially the financial responsibilities of the government in promoting public transit systems. The Institute for Transportation and Development Policy (ITDP) is currently analyzing the financial structure of both international and Chinese public transit development and will recommend financial policies to encourage public transit development in China.

Beijing BRT Development and Demonstration Strategy

With vigorous vehicle population growth since the late 1990s, Beijing's government has had to contend with exacerbated traffic jams; traffic congestion is a bottleneck to Beijing's sustainable development. Facing a crisis, the Beijing Transportation Development Research Center (BTDR) created a BRT development and demonstration strategy in Beijing and successfully convinced the Beijing municipal government to develop a BRT network plan of 300 kilometers by 2010. Phase I of the first BRT corridor (about 5 kilometers long) went into operation on December, 2004. Phase II (an additional 10.8 kilometers) is expected to be finished by the end of 2005. Currently, Beijing is planning its second and third BRT corridors.

Kunming BRT Development

Kunming is China's pioneer city in the development of BRT. Before 2003, it had three bus-dedicated lanes that need upgrades in design, facilities, and management in order to become a world-class BRT system. The Kunming Urban Traffic Research Institute (KUTRI) is leading a team to develop a comprehensive BRT network development plan and is outlining necessary upgrades. To date, the team has finished several studies including *Guidelines for the Planning and Design of Dedicated-Bus Lanes* and *Using BRT as a Backbone to Planning Bus Routes, Transportation Integration, and Operation*. The team also assisted the municipal government with elevating the status of BRT in the government's urban development work plan, and identified the necessary steps to adopting BRT systems. By July 2005, BRT upgrades on Beijing Road (4.5 km) will be complete as well as construction of a new dedicated bus lane. Ticketing system upgrades, signal adjustment and optimization, and routes integration and optimization are all underway.

Jinan BRT Development

Like many cities, Jinan is facing growing transportation pressure. But sensibly, it has realized that a rail system is too costly and less flexible than BRT. Jinan's municipal government is enthusiastic about BRT. The Jinan Urban Planning & Design Institute, Jinan Municipal Civil Engineering Design Institute, and the China Academy of Urban Planning & Design recently launched the BRT development project. Jinan is set to build its first BRT corridor of 12 kilometers. The planning and design will be finished by August 2005; construction will begin in October 2005 and completed by October 2006. BRT network development and design will also be finished by October 2006, with construction completed in the next 3 to 5 years.

Xi'an BRT Development

Because of its recent dramatic vehicle population growth, Xi'an has seen an increase in air pollution and traffic congestion. In line with the national "Develop the West" policy, Chang An University is leading a research team to formulate a BRT development strategy for Xi'an that is integrating public transit into Xi'an's transportation plans. The research team has successfully integrated BRT development principles into Xi'an's master urban plan and convinced the government to implement eight bus-priority corridors in the near future. Currently, the group is developing plans for these corridors. The World Bank has expressed interest in working with the Energy Foundation to support BRT development in Xi'an.

Chengdu's BRT Development

Chengdu's private vehicle fleet is second in size to Beijing. Chengdu had planned to establish a second ring road system, ignoring lessons learned from Beijing, until consultants introduced a Transit-Oriented Development (TOD) concept to Chengdu's municipal planners. The TOD concept makes public transportation the focus for urban planning; all roadways should incorporate public transit approaches. With massive road construction planned in the near term, Chengdu has a good opportunity to demonstrate the integration of the TOD concept with a BRT development plan. Chengdu could become a successful model of sustainable transportation system development for mid-size Chinese cities. The Chengdu Institute of Urban Planning and Design is leading a research team to develop a BRT development strategy, integrating the BRT

design concept into new roads, with a focus on integrating BRT into the new ring road system. The Institute will develop a BRT corridor connected to a re-designed second ring road in order to create a line to the city center and conduct a feasibility study for comprehensive BRT network development.

Chongqing's BRT Development

The southwestern municipality of Chongqing faces severe transportation challenges, including traffic congestion and increased vehicle emissions. Its problems are compounded by the city's lack of physical space. With an urban population of over seventeen million, the government wants to focus transportation planning on modern public transportation and clean vehicle technologies to alleviate environmental pressures. Chongqing is home to a major bus manufacturer interested in pursuing hybrid technology. In December 2003, CSEP met with the Chongqing municipal government, Chongqing Bus Company, and Chongqing Bus Manufacturer. All parties agreed to promote a BRT system and hybrid bus technologies. Chongqing could become China's leading pilot of a BRT system that uses hybrid bus technologies. To date, grantees have completed a preliminary BRT development feasibility study and a traffic flow study.

Shanghai's BRT Development

Due to the high investment and operational costs of rail systems, Shanghai's municipal government is seeking alternative ways to create an efficient and affordable public transportation system. The Energy Foundation and the World Resources Institute's EMBARQ Transportation Center (funded by the Shell Foundation) jointly supported the Shanghai Urban Transport Bureau and other local experts to develop a BRT development strategy. The project was completed in April 2005. The team finished the following studies: *BRT Network Planning & Design Study in Shanghai*; *Investigation Report of Public Traffic Flow & Road Service Level*; *BRT Planning for the Road from Pudong South Road to Yaohua Road*. Further collaborative projects are now under discussion.

Recommendation:

- The central government should elevate BRT as the main approach to China's sustainable urban transportation, provide financial support, and encourage BRT development in all cities.
- Demonstrate BRT systems in several cities so that they become the leading examples of sustainable transportation systems in China, and even globally.
- Develop incentive policies and technical guidance to promote BRT development across the country.