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Multi-stakeholder dialogue on sustainable energy and transport

Note by the Secretary-General

Addendum

Discussion paper contributed by business/industry*

Contents

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The material presented in this discussion paper for the 9th UNCSD Session, Multi-Stakeholder Dialogue Segment on Sustainable Energy and Transport, draws from a diverse range of views, positions and ideas contributed by the global business community. It provides a broad perspective addressing policy and resource challenges throughout the world, and demonstrates the commitment of the business and industry sector to identify and implement energy and transportation solutions for a sustainable future.

This paper is intended to contribute to a constructive dialogue, and does not necessarily represent all of the views of the partner organisations and/or their constituents. The ***International Chamber of Commerce*** *(www.iccwbo.org), the* ***World Business Council for Sustainable Development*** *(www.wbscd.org) and the* ***World Energy Council*** *(www.worldenergy.org) acknowledge the input and assistance provided by their members and other co-operating institutes and associations.*

Introduction

1. Energy has deep and broad relationships with each of the three pillars of sustainable development — the economy, the environment and social welfare. As energy literally fuels the economy, economic growth is the main factor driving energy demand. Between 1970 and 1993 world gross domestic product (GDP) roughly doubled. Though not directly proportional, during the same period, the 2.3 percent per year growth in energy consumption closely matched the 2.8 percent annual world GDP growth rate. By 2015, GDP is expected to have almost doubled again

2. A key question concerning energy and sustainability is whether the world's economies can use less energy, and diversify and expand energy production, while maintaining economic growth and prosperity. With respect to the environment, energy production and use (including transport) accounts for 80% of anthropogenic greenhouse gas emissions. Social welfare in the future will depend on the ability to deliver commercial energy supplies to the nearly 2 billion people who are currently doing without. Right now, about 20% of the world's population,

slightly more than one billion people living in industrialized countries, consume nearly 60% of the total energy supply. In addition, motor vehicle emissions are a primary source of local urban air pollution.

3. The intricate relationship between energy and sustainability is most pronounced in the transportation sector. Transport occupies a vital socio-economic position by linking supply to demand. Market forces will continue to increase the demand for transport that is indispensable to trade, tourism, employment, economic development and the well being of any economy. Efficient transport systems are a necessity for economic development and social welfare and also reduce the scope for an adverse impact on the environment.

4. Currently, transportation energy accounts for over half of world oil demand and will account for two-thirds of the projected growth in oil demand over the next two decades. In developed countries, oil demand growth is driven entirely by the transportation sector—the only consumption sector unable to diversify away from its dependency on petroleum. In developing regions, oil demand growth will also be led by transportation – although household, industry and power generation sectors substantially contribute to the increase. On a percentage basis, the increase in transportation energy consumption is more than double the projected rise in world population, with developing countries accounting for 55 percent of the expected growth in transportation energy demand.

5. The common feature underlying these scenarios is the prediction that economic growth will continue to fuel strong energy demand on the part of developing countries. This emphasises the importance of ensuring that such growth is met in as sustainable fashion as possible.

6. For the policy-maker, planning for a sustainable energy and transport future is a major priority. Choosing a path towards sustainable development will require broad societal consensus around the strategic choices of economic, environmental and social development. Transparency, stakeholder involvement and institutional flexibility will be key ingredients of any set of decisions. Different countries have the freedom to pursue different paths towards a variety of sustainable development options and they will require different policy mixes, likely

incorporating fiscal, regulatory and research and development efforts to overcome barriers to the adoption of new approaches.

7. Governments throughout the world have made clear the need to follow a sustainable growth path. The business and industry sector, as a part of society as a whole, is prepared to play a leading role in meeting this goal. Over the next century, business and industry will be the source of innovation, commercialisation and global distribution of new technologies that will enable society to aim for the target of sustainable growth whilst continuing to satisfy people's hopes and aspirations for a more prosperous future. Together business and industry, with its managerial, financial and technical expertise, and governments, which must create stable and predictable investment conditions, can stimulate investment programmes that will achieve the common goal of sustainable access to energy and transport services.

Topic 1: Achieving equitable access to sustainable energy

8. The recent '*World Energy Assessment*' – a joint project by UNDP, the World Energy Council and UNDESA (www.undp.org/seed/eap/activities/wea/) - indicates that targeted strategies are needed to address the needs of the 2 billion people with inadequate access to energy services, most of whom live in rural areas of developing countries. The lives and productivity of this large group could be enormously improved over the short term with relatively small inputs of energy. For instance, the cooking needs of those not served by modern fuels correspond to just 1 percent of global commercial energy consumption, or 3 percent of global oil consumption. Where extension of electricity grids is not economically feasible, decentralized solutions, including diesel and biomass systems, wind and solar power, are viable options that also offer opportunity for local control. Innovative approaches and financing mechanisms, tailored to local conditions, will be needed to bring modern forms of energy to rural areas, just as the rural electrification programme in many now-industrialized countries was accomplished with government support in order to achieve social and economic objectives.

9. In this context, the World Energy Council, in its recent study *'Energy for Tomorrow's World - Acting Now'*, (www.worldenergy.org) has defined three broad goals for energy sustainability: (a) a*ccessibility* to modern, affordable energy for all; (b) a*vailability* in terms of continuity of supply and quality of service; and (c) a*cceptability* in terms of social and environmental goals.

10. ***Accessibility*** to modern energy will mean that energy must be available at prices which are both affordable (low enough for the poorest people) and sustainable (prices which reflect the real costs of energy production, transmission and distribution to support the financial ability of companies to maintain and develop energy services). The best way to ensure that a growing number of people will be able to afford commercial energy in line with their needs is to accelerate economic growth and pursue more equitable income distribution. This requires increasing reliance on the market, while addressing cases of market 'failure' with special policies. An energy tariff reflecting all costs, including external costs such as emissions or waste management, could be necessary to secure adequate investment and encourage energy efficiency and environmentally preferred technologies -- but such a tariff would be unaffordable for many people. At the same time, a tariff subsidised down to a socially affordable price would not attract sufficient investment, consequently in the long-run working against the interests of those who are in need of commercial energy infrastructure. There may be a need, in some cases, to subsidise energy technology and delivery for a period of time without creating price distortions or at least by keeping them to a minimum. Variable, maintenance and infrastructure extension costs need to be reflected in the price paid for energy.

11. ***Availability*** covers both quality and reliability of delivered energy. The continuity of energy supply, particularly electricity, will be essential in the 21st Century. While short-term interruptible supply may be feasible in certain circumstances, unexpected power cuts bear a high cost for society that cannot be ignored. The world's growing reliance on information technologies makes reliability even more critical. Energy availability requires a **diversified** energy portfolio consistent with particular national circumstances together with the means to harness potential new energy sources. It is generally agreed that various mixes of all currently available energy resources will be needed over the next fifty years and there is no case for the arbitrary exclusion of any source of energy.

12. ***Acceptability*** addresses environmental goals and public attitudes. Local pollution is a cause of harm to billions of people, especially in developing countries. Global climate change has become an important concern. Mindful of these two facts, developing countries are concerned about both the potential impact of climate-change-related response measures on their economies, and the rising levels of consumer-based household emissions which create local (urban) and regional pollution (e.g. such as the impact of acid rain on crops and forests). The energy sector is one area in which new and readily available technologies have already reduced emissions and hold out prospects for future improvement. Of course, environmentally friendly technologies have to be developed, diffused, maintained and expanded in all parts of the world. Hence, there is a need to foster adequate local capacity to ensure that the technologies can be used and maintained by local people. Energy resources must be produced and used in a manner that protects and preserves the local and global environment now and in the future.

13. Addressing these three goals of energy accessibility, availability and acceptability is fundamental to political stability worldwide, to energy business strategy in the 21st century, and to achieving a sustainable future. ***Investment*** is the direct path toward tackling the global resource challenges for energy as accessibility and affordability will be dependent upon investment in new infrastructure, introduction of new technologies, and maintenance of deteriorated systems.

14. The energy industry is the key provider of wider accessibility to commercial energy services, of the availability of uninterrupted supply, and of more socially and environmentally acceptable energy products. The speed, scale and nature of these developments depends in part on enabling frameworks, the wishes and support of social actors, and the deployment of the required technologies and financing.

15. Measures needed to secure additional and more effective private investment include:

(a) **Continued market reforms** (liberalization, trade, privatization) open up energy services (within effective regulatory frameworks) to undistorted price signals, international trade and

investment. Substantial and lasting benefits will result if national and regional markets are stabilized through basic public rules which respect specific local, national and regional circumstances and apply to all the players involved in them. These rules should be set and overseen by independent regulators with minimal political interference.

(b) Ultimately, market criteria must prevail in the development of all energy resources. As such, it will be necessary to **keep all energy options open** in order to balance the development of new and renewable energy sources with, for example fossil fuels, large hydro, and nuclear energy -- which will remain important components of the near to mid-term energy mix.

16. As the scale of continuing rural energy poverty makes clear, very limited progress has resulted from all the well-intended efforts made to date. A better way forward must be found for the effective use of scarce development resources, in particular:

(a) Energy development must be accorded **higher priority by policy makers**. Hoping that improvement will 'trickle down' from more advanced sectors of the economy or that rural energy poverty can be solved by a 'technical fix' is untenable.

(b) **Energy development must be decentralized** to place rural people themselves at the heart of planning and implementation. Biomass supply and demand, for example, is inherently local in nature and is best understood by the local people. The 'bottom-up', community-development approach shows the best promise of achieving sustainable development.

17. Three energy strategies:

(a) **Reduce the political risk of key energy project investments.** Capital investment in energy has two important components:

(i) A first component (without foreign technology) is the mobilization of national savings for the investment in energy infrastructure (e.g. electricity). Domestic financial markets, bonds and shares should be developed and guaranteed by strong regulations.

(ii) A second component (requiring the transfer of technology) depends on Foreign Direct Investment. There is a need to protect FDI against 'political' risk. It is more expensive to develop and invest in projects located in poorer countries. Schemes to lower this risk and/or to increase the resources of developing countries need to be created.

(b) **Price energy to cover costs and ensure payment.** End-user prices are the most important determinant of the level of energy supply and quality of service. Unless such prices reflect all costs (variable, maintenance and infrastructure extension costs), they will distort individual behavior to the point that the whole economy in which they occur may be unsustainable. The gradual removal of all hidden subsidies, which artificially depress fuel prices, and removal of cross-subsidies, should be a priority together with the establishment of a consistent energy taxation system. Within the context of taxes, policy makers would benefit from a World Travel and Tourism Council--WTTC (www.wttc.org) study of taxation policy by the London School of Economics, which included five basic economic principles to be applied to any design of 'intelligent' taxes and user charges for all industries.

(i) *Equity* -- All economic sectors should be treated fairly in regards to taxation. Even-handed treatment reduces imbalances that can result in political, social and economic difficulties.

(ii) *Efficiency* -- Taxes must generate revenue without a significant impact on the demand for a good or service.

(iii)*Simplicity* -- Complicated taxing schemes eat up revenues through administrative costs. Governments should ensure the tax rates are clear and how the revenues are to be used.

(iv)*Fair Revenue Generation* -- In the even-handed capturing of tax revenue, it is unreasonable to assess special fees or levies on specific goods or services. These types of taxes are often cloaked by terminology to hide their real intent. For example, taxes collected to fund renewable energy technology R&D should be used for that purpose only

— not recycled through the general treasury. Although special charges and fees may appear on face value to be modest, they can quickly accumulate and become an unreasonable burden to a sector.

(v) *Effective Stimulus to Growth* -- Tax incentives and disincentives should be imposed with the underlying goal of stimulating growth. Taxes that support infrastructure will ideally result in the attraction of investment and new employment. However, when taxes become excessive, economic growth often grinds to a halt.

(c) **Promote greater energy efficiency.** Energy efficiency programmes are an important component of strategies to reduce the consumption of existing natural resources, while also allowing the economy to grow. Industry and government can work together to implement energy efficiency programs that save energy and money and improve air quality by increasing customer awareness of how to use energy wisely. Another major element of achieving improved energy efficiency depends on the development and diffusion of cost-effective technologies – which might require the introduction of minimum standards in energy equipment and service. Energy efficiency policies that use direct or indirect price mechanisms (e.g. removing subsidies, incorporating externalities) are the most effective in lowering energy consumption trends. However, even without changing the overall price environment, energy efficiency policies should be pursued to correct market failures. Finally, to assist the poor, governments should accept responsibility to:

(i) Absorb part or all of the investment costs of energy infrastructures needed to serve the poor;

(ii) Design cost-reflective price signals for base-load power at low cost for essential service;

(iii)Favour decentralized renewable energy systems for rural areas where the cost is comparable to or lower than the extension of the grid; and

(iv)Build the capacity of local energy enterprises by training managers and other personnel, technically and commercially, to run the different aspects of the business, including local maintenance.

Topic 2: Choices for producing, distributing and consuming energy

18. Studies conducted by the International Energy Agency (www.iea.org) on sustainable energy development demonstrate that over the past several decades, issues related to secure, low-cost availability of energy have dominated the international energy-related discussions in industrialized countries. Additionally, these countries have significantly diversified supply and invested significant resources in new energy technologies and efficiency improvements. In the coming decades, continued diversification, energy conservation through efficiency, new technology development and solutions respecting both the local environment (e.g., air and water pollution) and the global environment (e.g., climate change) will need to play an increasingly important role.

19. In developing countries, it will be critical to overcome energy poverty wherever it occurs, to enhance the quality and reliability of delivered energy, and to minimize the negative environmental and health impacts of energy development. Economic growth, together with national and international institutional reforms, is essential to energy accessibility. Diversification provides a key element of supply security. This means fuels used within and across sectors and the sources of those fuels should be as diverse as practicable. Non-fossil fuels, particularly nuclear and hydropower can make a substantial contribution to global energy supply diversity.

Renewables

20. The *World Energy Assessment* (www.undp.org/seed/eap/activities/wea/) notes, "although renewable energy flows to earth are three orders of magnitude higher than total energy consumption, harnessing these flows to useful forms of energy is complicated." 'New renewables' contribute about 2 percent of global primary energy supply (mostly from modern biomass), while large hydro projects account for another 2 percent. If one were to include traditional biomass at another 10 percent, the total share of all renewables in the world's primary energy mix is about 14 percent. And, while solar photovoltaics and wind energy capacity are growing at about 30 percent per year, it may be decades before they represent a large

contribution to the energy mix. Future prospects for renewables are dependent upon an enabling policy environment, where today the ability of renewables to compete is somewhat hampered by subsidies to fossil energy. Factoring in some of the environmental costs borne by society at large into the price of energy could provide stimulus for the renewables market. The fundamental issue, however, is that renewable energy sources are largely intermittent and sparse — requiring backup base-load supply. As such, the approach toward the development of renewables is best defined as an integration of renewable sources with more efficient and clean conventional fuels. In the end, this development could result in expanded energy services with relatively low environmental impacts.

21. Meanwhile, a position paper by the International Association of Oil and Gas Producers (www.ogp.org.uk) indicates that in the long term, renewables have the potential to supplement and ultimately replace fossil fuels. In the near term and medium term, however, fossil fuels will continue to meet approximately 80 percent of the world's energy needs. Although fossil fuels are finite sources, there is no immediate danger to security of supply, as reserves are currently being replaced at least as quickly as they are being depleted. In the short and medium term, adequate substitutes for fossil fuels are not available at the right price and in the right quantity so that the world will to a large extent continue to rely on fossil fuels. Whilst the demand for gas to generate electricity is rising, oil products will remain essential, particularly in the transport sector. With regard to mitigation technologies in reducing greenhouse gas emissions, no single technology or renewable-based solution appears capable of providing the whole solution, and a competitive evolution of multiple technologies over time appears the more sensible route.

22. For over a century, the oil and gas industry has worked with people and institutions around the world to discover develop, process and market oil and gas resources. While the industry has been an engine for economic development, wealth creation, and a source for extensive societal investments and endowments, it also has the potential of having a high impact on the environment. The International Petroleum Industry Environmental Conservation Association is comprised of petroleum companies and industry associations from around the world (www.ipieca.org). IPIECA and its member companies have demonstrated that with careful planning, management and consultation, energy resources can be developed without causing

lasting damage to the environment, while maximizing economic and social benefits to the local communities. The industry has been a pioneer in developing and using new technologies at ensuring impact minimization. For instance, technological advances have enabled the industry to find and produce energy resources while reducing the "environmental footprint". Advanced geophysical techniques like 3-Dimensional imaging and horizontal drilling techniques have increased operational efficiency and reduced substantially the number of wells that need to be drilled to find and assess any hydrocarbon deposit. Fewer wells means, quite simply, less emissions and waste production per barrel of oil (or MCF of gas) produced.

23. An increase in the market share of energy from renewables much depends on technological progress and the ability of the producers to reduce unit costs through market growth. In free market economies new, renewables technology and markets should in principle emerge freely where commercial enterprises respond to an increase in demand.

24. Addressing these challenges is a key component of a recent report *'Energy and sustainable development: Options and strategies for action on key issues'* by the UN-led Intergovernmental Group of Experts on Energy (www.un.org/esa/sustdev/enrexpert.htm). While renewable energy may be widely accepted as part of the sustainability solution, the main challenge lies in their large-scale development. The group of experts laid out a number of obstacles confronting the ability of renewables to contribute significantly to the world energy supply mix:

(a) Low priority given to renewable energy development in national energy planning and policy development.

(b) Uneven playing field due to subsidies for conventional energy systems (including direct and indirect fuel subsidies).

(c) Lack of awareness of technologies, as well as their economic and social benefits.

(d) Market uncertainties and constraints regarding access to technologies.

(e) Non-uniform and discouraging levels of import duties and other levies.

(f) High upfront cost of renewable energy systems.

(g) High transaction costs of smaller scale projects.

(h) Lack of financing and credit arrangements.

(i) Paucity of skilled human resources.

25. Most of these obstacles can be overcome with the right combination of government investment in R&D, public sector institutional reform, rationalization of pricing and subsidies, and the establishment of stable and predictable legal and financial frameworks — particularly in developing countries. Moreover, the transfer of energy technology to developing countries – which has often been associated with large-scale power projects financed by multilateral banks or investments by international oil and gas companies in the extraction of crude oil – should be strengthened to enable the transfer of appropriate technologies and operational expertise to these countries. For this reason, current models of technology transfer need to be reassessed. Perhaps most important is the issue of financing. The problem of increasing developing countries' level of sustainability is not primarily related to development of new technologies but to financing in these countries of investments relating to technologies already established in the developed part of the world. The capacity of capital markets and governments to galvanize capital resources to meet the growing needs of developing countries, whose energy demand is expected to overtake and surpass developed countries very shortly, is in question and will also require new regimes for generating capital.

Energy efficiency

26. The potential for consumer energy savings through energy efficiency increases is astonishingly high, even in the developed countries. Large office buildings represent a good example. More often than not, the total energy demand can be reduced by 50% or more by means of 'intelligent' systems for ventilation, heating and cooling, or the systematic adoption of variable speed drives. Another far from fully exploited area concerns Combined Heat and Power (CHP). The calorific efficiency when burning fossil fuels (and biomass) can roughly be doubled if one moves from the condensing mode to the CHP mode. This potential is still under-utilized in most OECD countries. Significant energy efficiencies can be achieved in industry as well. As a rule of thumb, some two-thirds of industrial electricity consumption is for drive motors of various kinds. If today's population of inefficient motors were replaced by state-of-the-art motors, and variable speed control of drives was introduced more systematically, corresponding energy savings would be substantial. As for developing countries, the transfer of state-of-the-art

technology and corresponding financial resources should be a high priority. Although financing, rather than technology, will remain the true bottleneck in this context, the climate change issue could quite considerably help increase the financing that could be made available.

27. Addressing another area of energy efficiency, the UN Economic Commission for Europe (www.unece.org) has pointed out that the importance of coal use in small and medium-sized boilers cannot be overestimated. Some 200 million tonnes are used in commercial, municipal, industrial and residential boilers in central and eastern Europe. In Poland and the Czech Republic where progress in clean coal combustion in power generation is fastest, pollution from small boilers exceeds pollution from power stations. The problem is even bigger in developing countries: in China, there are some 500,000 small industrial and residential boilers mostly using coal. These boilers, often located in densely populated areas, consume around 400 million tonnes of coal and account for most of China's ground-level air pollution. The ECE is working on a programme to upgrade thousands of small and medium-sized coal-fired boilers in the 0.5 to 50 MW range. The replacement of small coal boilers in central and eastern Europe, and inefficient wood and coal-burning stoves in China or India have, for example, the potential to reduce significantly greenhouse gases and local pollution.

28. In the case of aviation, global passenger air travel is projected to grow by 5% on average per year between 1990 and 2015. However, as a result of improved efficiency measures, total aviation fuel use is only projected to increase by 3% a year during the same period. While several potential alternative fuels have been examined, technology, infrastructure and safety factors prevent the introduction of their use in the near term. That is why, for air transport, the environmental challenge faced is a challenge of maximising efficiency. The industry is continuing to focus on ensuring that the current fuel sources are used more cleanly and efficiently. For example, in June 2000, member companies of the International Air Transport Association (www.iata.org) adopted a fuel efficiency goal which would reduce the total release of aviation CO_2 emission into the atmosphere by almost 350 million tonnes. This effort builds on the industry's record of continuous improvement whereby today's world fleet is 65% more efficient per passenger kilometre than in 1970. In the last 10 years, fuel efficiency has improved by 17%. This initiative has been designed to eventually serve as a basis for adopting industry-

wide voluntary measures and is indicative of the potential contribution energy efficiency can make to sustainable energy and transportation solutions.

Topic 3: Public-private partnerships to achieve sustainable energy for transport

29. A recent study by the World Energy Council (www.worldenergy.org) *'Global Transport and Energy Development'*, indicates that the most likely trend for the next 25 years is that transportation energy use will continue to increase rapidly – a trend which some see as presenting challenges for environmental protection objectives in the long term. The analysis shows that total transportation energy use will increase by over 55% between 1995 and 2020, or 1.8% per year—in a high case scenario, energy use for transport increases at a rate of 2.5% per year.

30. Such a rate of growth in transport energy use has serious implications for the quality of the environment, and possibly for global climate change. Given that transport mobility is essential to economic development and social welfare, the challenge for policy makers is to find solutions to curb the negative effects of transport use without reducing its positive contributions. Improvements are under way as a result of the deployment of technologies that control the emission of conventional pollutants, but CO_2 emissions remain a difficult issue to address. Moreover, most of these technological solutions are still only being implemented in industrialised countries and are yet to be adopted in most developing countries. In developing countries, transport demand is likely to increase even faster than GDP because population movements from rural areas and increasing movement of goods within and between countries.

31. Growth in energy demand is strongest for road freight and air transport -- increasing at a rate of 2.1% per year for truck energy use and 3.8% per year for passenger air travel. For maritime and rail transport, energy demand is increasing at a rate of 1.5% and 0.3% respectively. Light duty vehicle (LDV) use accounted for almost half of world transport energy demand in 1995 and its share is only expected to decline modestly by 2020. If trends toward lower energy intensity continue, this share could decrease significantly — but there are enormous behavioural and

institutional barriers to overcome. Alternative fuels and propulsion systems are not expected to make much of a contribution within the near term — although at a local level they could prove significant. In the longer run it will be necessary to focus on technological and fuel change possibilities.

32. Although their share has fallen in a number of regions, rail and waterborne modes of freight transportation are very significant in many parts of the world and are expected to remain so. Ocean freight transportation demand is expected to increase at the rate of world GDP growth. Maritime and rail transport are also energy-efficient relative to motor freight -- and World Energy Council projections show that more efficiency improvements are expected for these modes. However, the share of freight carried by rail and inland waterways is projected to decline in some regions of the world, which will put pressure for enhanced efficiency on road and air cargo transport.

33. Transportation energy consumption is determined in equal measure by two factors: (1) the volume of transportation services being provided; and (2) the energy intensity of the transport system. Energy intensity, in turn, depends on the pattern of utilization and turnover of the existing stock of vehicles and craft, and the rate of deployment of new technology is one factor influencing transportation energy consumption.

34. Today's transportation systems and their patterns of energy use evolved in small steps over a long period of time. To change their energy use in a major way will also take many small steps and, perhaps, an equally long period of time. But profound change *can* occur. And it can occur without depriving society of the mobility on which it has come so much to depend.

35. In terms of vehicle energy, longer-term sustainability in energy is particularly difficult to predict for the use of liquid fossil fuels in transport. Alternatives for surface transport are the subject of research, field testing programmes, and legislation in many parts of the world. Viable near term solutions are in electric and hybrid-electric vehicles. The hybrid vehicle promises dramatic increases in liquid fuel efficiency (factors of at least 2), at a currently projected increase

in cost of 30% for the vehicle. It could be expected, however, that with the twin drivers of volume production and competition this premium would fall quickly.

36. Much of the discussion and debate about future transportation energy use has focused on some of these 'breakthrough' technologies such as 'supercars' with an energy intensity of less than one liter of fuel per hundred kilometres, ultra-efficient jet transport aircraft, and high-speed, magnetically-levitated passenger trains. These 'breakthrough' technologies are eventually likely to prove important, but their impact will not be felt until well beyond the first quarter of the 21st century.

37. The International Aluminium Institute (www.world-aluminium.org) emphasises the practical importance of reducing the unnecessary weight of vehicles to minimize transport's environmental impact. It is important that every effort should be made to monitor and reduce the movement of unproductive 'dead-weight' or excess mass in transportation as a measure of efficiency. The potential benefits of reduced mass and intelligent design to improve safety and enhance dismantling and recycling opportunities, needs to be fully incorporated into future strategies. For example, today most of the fuel consumed by automobiles is required to move the mass of the vehicle and less than 20% is consumed to move the mass of occupants, the primary objective of passenger vehicles. Aluminium-intensive transport vehicles and craft offer the potential for substantial positive long-term benefits in reducing net energy consumption and greenhouse gas emissions.

38. Technological improvements, whether achievable in the near or long-term, inevitably need to be complemented by more conventional initiatives. Environmentally rational energy use should be encouraged and may be implemented through a variety of instruments, including economic incentives, tradable permits and voluntary projects. Enabling transport to operate in a market-based manner, facilitates the rationalization of operations, and therefore enhanced energy efficiency.

Sustainable mobility partnerships

39. In order to address the challenge of sustainable transport, the World Business Council for Sustainable Development (www.wbcsd.org) has initiated a worldwide partnership effort to define the leadership needed from business and industry to deliver mobility solutions that make economic and business sense, whilst ensuring a sustainable environment. The approach involves a global collection of international corporations with the mission of encouraging successful interaction (e.g. between governments), unifying international, regional and national approaches, and assisting parallel technology developments. The initiative will look at a wide range of relevant issues such as technological advances, emissions, fuel efficiency, climate change, urban planning, roads, public transportation, resource use and conservation, safety, public health, employment, knowledge management and government policies.

40. The objectives of the WBCSD Sustainable Mobility Project are to:

(a) Develop a vision of sustainable mobility that will ensure better and continued – ideally improved 'access needs' for people, goods and services.

(b) Build world-wide support in achieving sustainable mobility in both developed and developing economies.

(c) Facilitate a timely technical development of transportation systems that:

(i) Are commercially competitive

(ii) Are affordable and acceptable to consumers and society

(iii)Protect the environment

(iv)Ensure a balanced input from all parties during the dialogue process with policymakers, the consumers and other relevant stakeholders in proposing options or solutions to mobility issues.

(v) Develop a framework for achieving the vision i.e. how to do things practically taking into account stakeholder objectives.

41. The project will provide a strategic direction for the many industries associated with mobility, and create ideas for next-generation systems that will address social, environmental and economic concerns about the transport sector. The issue of sustainable transportation will be

approached from a global perspective because the challenges are global and solutions will depend on cooperation between government, business and civil society.

42. The WBCSD partnership initiative will build on the transport industry's lead in making the most efficient use of energy and reducing the environmental impact of their activities. Throughout the world, transport users and transport operators are working with governments in creating tools and programmes to ensure that the distribution of products through the supply chain is as environmentally sound as possible.

43. In the Netherlands, the Ministry of Transport and Public Works, the Dutch Shippers' Association and the national associations of hauliers set up a programme in 1999 with two aims:

(a) to make business conscious of transport costs and improving efficiency mostly in road transport employed, and

(b) to encourage shifts for road to rail and/or inland waterway transport.

44. A team of employees from the company examine, among other parameters: whether the most suitable transport technology is being used; which transport flows could be combined; whether the consignment and trip planning leads to an optimum load ratio per vehicle; and how packaging could be better adapted to transport. The review then results in a two-year efficiency plan, in which the kilometre reduction per trip and cost savings are quantified.

45. Another successful example of a public-private partnership for sustainable energy and development in transport comes from Denmark. Starting in 1995, the Danish Shippers' Council (DSC) (www.etu.dk), International Transport Denmark (ITD), and the Association of Danish International Road Hauliers, initiated a partnership with the Government of Denmark to create a number of projects for sustainable management of the road transport industry. One goal was to create operational tools for measuring emissions from transport as a prerequisite to managing environment in transport. Based on specific enquiries from member companies, DSC and ITD developed a set of documentation tools and published it in a handbook entitled '*Environment and Safety- Handbook for Road Transport*' (www.transit.dk). The handbook comprises:

(a) A set of check lists that help transport buyers as well as operators to build environmental and safety aspects into their strategies and operational measures;

(b) A set of emission tables that enable transport companies to record their environmental performance according to various parameters (e.g. type of vehicle and engine);

(c) A model account which serves as a guideline for transport companies preparing green accounts. The basis for environmental accounting is the surveying and recording of the company's most significant environmental parameters.

46. In partnership with the Danish Ministry of Transport, DSC, ITD and the Institute for Transport Studies initiated the TransECO2 project in 1998 for hauliers and transport users to jointly implement methods to reduce CO_2 emissions through tools described in the Handbook.

47. Energy producers are also working with policy-makers to reduce the environmental impact of energy use by transport. Since 1995 the petroleum industry, through the International Petroleum Industry Environmental Conservation Association (IPIECA) Urban Air Quality Management programme, has been actively promoting scientifically sound, objective and cost-effective policies and practices to improve air quality in rapidly developing cities around the world. The industry has developed a framework and set of principles that serve as a foundation for these policies, which are derived from the extensive experience gained through the Auto-Oil programmes in OECD countries. These are communicated through the use of an Urban Air Quality 'Toolkit' (www.ipieca.org) and regional workshops to promote a responsible approach to the management and improvement of urban air quality associated with vehicle emissions. To assist policy makers, the petroleum industry has funded the development of an emission-forecasting model that encapsulates a participatory, objective and cost-effective approach to air quality management. The model can be used to test the effect of alternative emission reduction strategies to meet air quality targets and then rank the strategies in terms of their cost-effectiveness.

Topic 4: Sustainable transport planning-- choices and models

48. Transport users and transport providers are well aware of their fundamental economic role and their social responsibilities regarding safety, labour conditions, the environment, energy efficiency and, consequently, sustainable development. They are prepared to take the lead in finding sustainable solutions for future transport challenges. With respect to the environment, commercial transport users and transport providers recognize that there is a common goal, not a conflict, between the development of transport and environmental protection, both now and for future generations. The road, air, maritime and rail transport industries have a common interest in achieving the objectives of sustainable development, taking into account the characteristics and context in which different transport modes operate.

49. The International Chamber of Commerce (www.iccwbo.org) has defined four critical guidelines for conducting effective sustainable transport planning: (i) Cost-effectiveness is essential to achieve sustainable development; (ii) Policies must be based on economic, social and environmental realities; (iii) Cost-effective 'at the source' measures can reduce environmental problems from transport; and (iv) Effective instruments are needed to achieve desired economic, social and environmental goals.

50. Five prerequisites for a genuine pursuit of cost-effectiveness include:

(a) Policies should be guided by economic reasoning.

(b) The environment can benefit from the application of the principle to reward, for example, the use of cleaner craft or vehicles through economic incentives.

(c) Fair competition should be given to users and passengers to choose the mode of transport and the transport operator they judge most likely to meet their expectations and requirements. Market forces stimulate innovation and, given incentives aimed at protecting the environment, they will stimulate environmentally friendly innovation.

(d) Any allocation of environment-related costs to transport should be transparent. Equitable and sensible cost attribution will favour and encourage effective environmental policies.

(e) Lack of adequate infrastructure and efficient transport services is a major economic, social and environmental handicap. Priority for commercial transport and investment in infrastructure development are essential to attain the common goals and principles of UNCED Agenda 21.

51. **Policies must be based on economic, social and environmental realities.** A sound sustainable development policy for transport has to recognize that:

(a) Efficiency in transport systems, essential for economic development and social welfare, will also reduce adverse effects of transport on the environment.

(b) Discriminatory tax measures are seldom environmentally effective and more often counter-productive.

(c) Environment and safety improvements are generally more efficiently met by stringent enforcement of existing rules and regulations than by additional legislation.

(d) Economic and operational incentives, rather than penalties, can encourage development and use of clean technology.

52. Cost-effective 'at the source' measures can reduce environmental problems from transport. For example, they can:

(a) Improve transport flow.

(b) Improve logistics.

(c) Develop cleaner, quieter and more fuel-efficient craft and vehicles through further technical improvements.

(d) Adopt technical measures to reduce polluting gaseous emissions.

(e) Increase intermodal transport where economically and environmentally cost-effective.

53. Effective instruments are needed to achieve desired economic, social and environmental goals. Complementary policy instruments can help apply the principles, prerequisites, policies and practices cited above. These instruments include:

(a) *Legislation:* A level playing field needs binding regulations, laws and standards. Whenever possible these should be negotiated and applied globally. They should recognize economic realities and be accompanied by effective, uniform mechanisms for implementation, and they should not be market distortive.

(b) *Economic incentives:* Due to the diversity of the transport industry, economic incentives are preferred over legal measures. Entrepreneurs should be free to decide for themselves if and when they will make certain investments, depending on their financial situation and

prevailing legal limitations. Transparent, cost-related charges are better than taxes as incentives to support sustainable development.

(c) *Voluntary codes of conduct:* Beyond policy frameworks provided by governments, much can be, and is being, achieved through observance of voluntary codes of conduct that enhance 'best industry practice' in environmental and ethical management. These are effective practical tools to communicate the objectives contained in UNCED Agenda 21 to transport users and providers, who can then adopt recommended, effective practices to improve their economic and environmental efficiency.

New paradigms for sustainable surface passenger transport

54. While transport energy policy is often more directly concerned with vehicle technology, especially energy storage, drive and control systems, it must be recognized that an integrated approach to a sustainable energy policy for the transport sector will have to address other issues. The Environmental Defense Fund transportation project *'Integrated Transport Strategies for Sustainable Development'* (**www.bts.gov/tmip/papers/policy/itss/itss.htm**) offers a number of new paradigms for sustainable transportation, suggesting that developing integrated transport planning and management systems will require new ways of thinking about community and national circulatory systems.

55. Much can be gained by investing in improved information and monitoring to assess system performance and to increase the rationality of pricing, investment, and street space allocation policies. The latter can also be harmonized with new vehicle types more tailored to end uses, such as small neighbourhood electric vehicles. New analytic tools offer promise for developing long-term, least-cost evaluation and planning approaches, similar to those developed for the electric utility sector in the 1980s. The potential payoffs in more productive investments and more efficient use of resources are far greater than the cost of blindly expanding highway capacity to meet unconstrained projected demand.

56. In passenger transport, technology innovation will improve the compatibility of motor vehicles with environmental protection and sustainable development, but needs to be

complemented by strategies to manage travel demand. Possible actions to promote sustainable development in transport, include:

(a) Preserve and protect modal diversity, recognizing that different modes are needed to most efficiently serve different travel markets with their varying requirements for distance, speed, and payload.

(b) Understand the underlying activity basis of travel demand and travel choices and use this to explore opportunities for developing long-term least-cost strategies for shaping both travel demand and supply characteristics.

(c) Move towards fuller cost pricing of transport, removing hidden subsidies, pricing distortions, and incentive/disincentive structures which prevent fair competition between modes and reduce modal diversity as well as overall transport efficiency.

(d) Promote institutional and pricing system reforms to ensure better coordination of policies for long-term least-cost community development. These could include harmonizing transportation policy with land use, communications, tax policy, education, financing, housing, and economic development strategies. This will favour non-motorized transport, substitution of telecommunications for travel, and use of intelligent technologies in surface transportation management.

57. Recognizing the problems of over-dependence on the automobile, transportation demand management (TDM) has won increasing attention in the United States. However, reviews of TDM strategies have frequently indicated that traditional strategies -- such as construction of new capacity for high occupancy vehicle lanes (HOV), park-and-ride-lots, and the modest expansion of public transportation -- have met with limited effect in reducing vehicle travel demand.

58. To be effective, demand side management cannot be just an add-on to conventional supply-side highway capacity strategies -- it must be translated into a framework for integrated transport planning and system management. In this new framework, supply-side technology fixes and demand-side approaches should be designed to work together for goal-directed management of surface transport and community systems. For example:

(a) *Intelligent Transportation and Smart Communities.* Recent advances in information and communications systems make it possible to introduce "smart" systems into surface transportation at relatively low cost compared to potential benefits. These could include: (a) automated electronic road and parking pricing, using smart card technology; (b) cashing out subsidies and unbundling prices (insurance, smog "feebates", parking).

(b) *Intelligent Intermodal and Public Transport Management.* There are many opportunities for making public transport more efficient and attractive. Curitiba, Brazil, has shown how bus ways can deliver very high productivity, with 25,000 passengers an hour or more.

(c) *Street Space Management.* Reallocating street space to pedestrians, bicycles, and public transport has been a key element in strengthening many urban centres.