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Leapfrogging to a New Lifestyle for Sustainable Prosperity: A Blessing, not a Burden

Leapfrogging to a New Lifestyle for Sustainable Prosperity: A Blessing, not a Burden

By

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Note: This paper uses interchangeably the words "Developed countries", "OECD High Income Countries", "HICs", and "the North" as well as the words, "Developing countries", "Emerging Markets", "Emerging Market Economies", "EMEs", "Emerging and Developing Economies (EDEs)", "Low and Middle Income Countries" and "The South". The countries included in each of these categories are as per the definitions of "Low and Middle Income Countries" and "OECD: High Income Countries" in World Development Indicators, 2015, The World Bank.

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Abstract

- By mid-century (2050), per capita incomes of the majority of developing countries could conceivably have “converged” with those of the advanced (G-7) economies. By the end of the century, there will be nearly 7 billion people in emerging economies with average per capita income conceivably equal to that of the developed countries today.
- The present population in emerging economies, in particular the middle class, is largely seeking to replicate the same lifestyle that characterizes the advanced economies. Such replication will be unhealthy and place immense pressure on natural resources including land, water and environment.
- This paper argues that emerging economies should not aim at where the advanced economies are or have been but should leapfrog to sustainable lifestyles that the more enlightened countries are trying to adopt. Such leapfrogging would be in the interests of the developing countries while contributing to global wellbeing.
- Governments can play a key role in promoting sustainable lifestyles by promoting clean energy, checking the car population explosion, promoting healthy diets, avoiding urban sprawl and promoting smart, compact cities through appropriate pricing, regulations, and public investments.
- Several government, inter-government and civil society organizations are trying to achieve the transformation, but their efforts have been grossly inadequate. The constraints on the leapfrog strategy imposed by old values and mindsets as well as the vested interests that have developed over the last two centuries of industrial civilization are very powerful. Concerted social marketing in developed and developing economies is needed to overcome these constraints.

I. International Income Convergence during the Century

A sharp distinction between developed and developing countries has been at the core of post-World War II discussions on aid, trade, investment, and even climate change. However, that distinction is getting increasingly blurred. An important step toward eliminating that distinction was taken with the formation of G-20, which is widely regarded as the premier forum for global economic management and which is based on membership of all countries on an equal footing. In its communiqué at the Pittsburgh Summit of 2009, the G-20 called for acceleration in the process of income convergence between developed and developing countries, and that process has been gathering momentum since then.

The various scenarios generated by the Centennial Group's model of the world economy suggest that the ongoing shift in relative economic power is likely to continue and emerging markets as a group will continue their convergence with the advanced, richer economies through 2050. The outlook has been summarized in the latest paper from the Centennial Group:²

Convergence is alive and well but by no means guaranteed. The various scenarios generated by the Centennial's model of the world economy suggest that, all said and done, prospects are good that the ongoing shift in relative economic power will likely continue and emerging markets as a group will continue their convergence with the advanced, richer economies through 2050.

This convergence process will be associated with a massive increase in the size of the middle class in emerging economies with their aspirations for good life often defined with reference to the lifestyle in developed countries. According to the Centennial Group:

Based on the current trends, by 2050, as much as over 95 percent of Latin American and almost all of the East Asian population would be classified as either middle class or upper income. There will be almost no absolute poor by today's standards in these two regions. The total number of middle and upper income persons could approach 2.3 billion in East Asia and 730 million in Latin America. This will be truly transformational, compared to the situation only a generation ago. In other words, by 2050, Latin America and Asia will be the regions predominantly populated by the middle or upper income citizens.

For emerging markets as a whole, the middle class population will approach 4 billion by 2050.

² Harinder S. Kohli (2015). Global Emerging Market Economies in 2050: Is rapid convergence dead or alive? Introduction and Overview, *Emerging Markets Forum*, November 3-5, Tokyo, Japan.

If we extend the time horizon to the end of the century as is typical for climate change discussions, and define convergence in terms of achieving the current per capita income levels of developed countries,³ it is highly probable (though of course not pre-ordained) that most developing countries will achieve convergence some time during this century. During 2000–2014, the per capita incomes (defined in terms of 2011 purchasing power parity) of HICs grew at 1.1% per year and that of EMEs at 5.1% per year. Going forward, we consider four scenarios: annual growth rates in per capita income of EMEs at 5.1%, 4.1%, 3.1% and 2.1%. As noted in Table 1, even with a low rate of growth of per capita income of 2.1% per year, EMEs can be expected to catch up with the income levels of HICs in 2014 by the year 2090.

Table 1: Per Capita Income of Developed and Developing Countries (in 2011 PPP dollars)

	2000	2014	CAGR (%) 2000–2014	Year of catching up to Northern per capita income of 2014 With CAGR of			
				5.1%	4.1%	3.1%	2.1%
Developing Countries	4451	8474	5.1	2046	2054	2066	2090
HICs	35655	40992	1.1				

Source: World Development Indicators, 2015.

The process of income convergence will be associated with continued divergence in the population of HICs and EMEs. In 2008, HICs had a population of about 1 billion and EMEs about 5 billion. By 2100, these numbers are likely to be about 1 billion and 7 billion, respectively. Thus, if per capita use of natural resources such as CO₂ emission, land and water of EMEs at the point of convergence is the same as that of the HICs in or around 2014, the total use of these resources would be about seven times that figure. Even if we focus only on the middle class population that aspires to a Northern lifestyle, the aspirants would be 4–5 billion, which is 4–5 times the current aspirants in HICs. The question is: Does the earth have the natural resources to allow the replication of the Northern lifestyle for 4–7 billion people?

II. Non-replicability of the Current Northern Lifestyle

One way or another, the number of people aspiring to replicate the Northern lifestyle will be 4–7 billion in the EMEs as against about 1 billion in the developed countries. The problem of the pressure on natural resources will come largely from

³ The rationale for using the current income levels of HICs as the level for convergence is two-fold. First, there is a serious possibility that developed countries are facing a secular stagnation and their per capita incomes may not increase much even over the long term. Second, at the current level of per capita incomes of the developed countries, “total needs” and not just basic needs can be satisfied for all in these countries and the marginal utility of additional per capita income is low from the perspective of human development. Thus, for sustainable prosperity, the current levels of per capita income of HICs provide a good benchmark.

the EMEs as will the solution to the problem. The developed countries can play a crucial role in helping EMEs travel the path of sustainable prosperity, but they cannot do much to relieve the pressure on natural resources.

To illustrate the problem of unsustainable resource pressure coming from EMEs, we use the round figure of 7 billion of EME population trying to replicate the per capita consumption levels of current Northern lifestyle.

- **Carbon space.** In 2011, HICs had a CO₂ emission level of 11.6 billion tons. If developing countries were to replicate the per capita emission of CO₂, the total emission on income convergence will be about 81 billion tons, which is ecologically unacceptable because the climate change target for total emission in 2050 is about 12 billion tons. Even if we have 4–5 billion middle class in EMEs trying to replicate the current Northern lifestyle, the basic impossibility theorem remains.
- **Land space for motorization.** In 2008, HICs had 647.9 million motor vehicles. According to the Victoria Transport Planning Institute (2011) the land required for road and parking facilities for a motor vehicle in HICs was 565.5 square meters, with total land required as 36.6 million hectares which is 3.4% of their agricultural land. If EMEs replicate the motorization intensity of developed countries, they would have 4.5 billion vehicles that will need 256 million hectares of land, using up about 7.7% of their agricultural land with its consequences for food security.
- **Land space for urbanization.** At the time of convergence, 80% of the population of EMEs can be expected to be in urban areas. According to Demographia,⁴ in 2006 the average population per square kilometer of urban area (defined as towns of over 50,000 people) was 3,050 in Europe and 1,150 in the US, with a simple average of 2,100. If EMEs were to replicate the average pattern of urban density in Europe and the US, at the time of convergence the land required for urban areas would be another 2.7 million sq km or 8.2% of agricultural land, with its consequences for food security.
- **Food Security.** Cereal production in HICs in 2013 was 832.6 million tons. If the EMEs were to replicate this pattern of cereal use, at the point of income convergence they would need some 5,828 million tons of cereal production, which is 3.3 times the production of 1,784.8 million tons in 2013. With the land required for motorization and urbanization, as well as the possible adverse effects of climate change on cereal production, such an increase in cereal production would not be feasible.
- **Water.** In 2013, HICs had annual freshwater withdrawal of 928 billion cubic meters, which was about 9% of their internal resources. If EMEs were to replicate this pattern, their annual freshwater withdrawal at convergence would be 6,496 billion cubic meters or about 24% of their internal resources as against the current level of 10%. Considering that several EMEs are already water stressed, such an increase in water usage would not be feasible.

⁴ www.demographia.com

The above numbers show the impossibility of replicating the developed country pattern of per capita consumption on energy, use of motor vehicles, urban space, cereals and water usage. What is unsustainable will, as is well said, not be sustained. *There is no way the EME middle class can replicate the current Northern lifestyle. The only choice is between prevention and cure.* Either the EMEs continue trying to replicate the Northern lifestyle and create problems of pollution, congestion, food shortage and water stress and then adopt costly corrective devices, or they can have the foresight to leapfrog to a sustainable lifestyle.

Many features of the current Northern lifestyle are unhealthy not only for the Earth, but also for human beings. And many HICs realize the non-sustainability and unhealthiness of the present consumption patterns and are trying to change to a more sustainable and healthier lifestyle. EMEs should thus aim not at where the HICs have been or are today but where the more enlightened of them are trying to go. In what follows we note in some detail what a more sustainable lifestyle could be in five areas: (a) Energy consumption and carbon emission, (b) Motorization, (c) Dietary habits, (d) Water usage, and (e) Urban pattern.

In each of these areas, the research and practice show that a more sustainable lifestyle is not only feasible but also economically viable and healthier. The instruments for the required changes are also familiar to the emerging economies in their pursuit of development and are eminently do-able. Thus, leapfrogging to sustainable lifestyle is a blessing and not a burden. The chief constraints on transformation are traditional mindsets and vested interests.

III. Contours of a Leapfrog Strategy to Sustainable Prosperity for All

Toward Decarbonization of Energy

The major HICs are aiming at about 80% reduction in CO₂ emission by 2050 although the base year varies.⁵ They are generally also assuming a near doubling of GDP by 2050. If we assume that all HICs will achieve 80% reduction in CO₂ emissions between 2008 and 2050, this will mean that HICs would have per capita emission of 2.35 tons per year in 2050 and the carbon intensity of GDP would decline by 90% between 2008 and 2050. If we further assume that the EMEs are prepared to make the same efforts as the developed countries, the reduction in their carbon intensity of GDP compared with the replication scenario would also be 90%. Thus, for the world as a whole, even with the doubling of GDP in HICs and the income convergence of developing countries, CO₂ emission would be reduced from 29 billion tons in 2008 to 21 billion tons in 2050, which is well short of the IPCC targets but is significant progress toward the decarbonization of energy.

⁵ The EU has made an explicit commitment to that effect. In the US, the Waxman-Markey Bill has a similar objective even though the Bill is stalled in the US Congress at present.

Research in HICs show that such decarbonization is technically feasible. In this connection, it is worth referring to three studies.

a. EU Roadmap 2050

Roadmap 2050: A practical guide to a prosperous, low-carbon Europe is a report prepared by the European Climate Foundation (ECF), an institution funded solely by private philanthropic organizations, in collaboration with a consortium of experts (including McKinsey & Company, KEMA, Energy Futures Lab at Imperial College London, Oxford Economics, and the Energy Research Centre of the Netherlands) and in consultation with EU institutions including the European Parliament and the Council of Ministers. It discusses the feasibility and challenges of realizing the 80% GHG reduction objective (between 1990 and 2050) for Europe (defined as EU-27 plus Norway and Switzerland), including urgent policy imperatives over the next five years.

The study concludes:

By 2050, Europe could achieve an economy-wide reduction of GHG emissions of at least 80% compared to 1990 levels. Realizing this radical transformation requires fundamental changes to the energy system. This level of reduction is only possible with a nearly zero-carbon power supply. Such a power supply could be realized by further developing and deploying technologies that today are already commercially available or in late stage development, and by expanding the trans-European transmission grid (p.9).

In EU Roadmap 2050 scenario,

...the cost of electricity and overall economic growth in the decarbonized pathways would be comparable to the baseline over the period 2010-2050. In the shorter term, the cost of electricity in the decarbonized pathways is higher than the baseline, more so in the pathways with higher shares of renewable supply. Over the medium and longer term these differences disappear (p.9).

The two main instruments for achieving these results are improvement in energy efficiency, which is assumed to increase by 2% per year, and almost total decarbonization of the power sector. In the most benign scenario, 80% of power is generated by renewables, 10% by fossil fuels with carbon capture and storage and 10% from nuclear. It is interesting to note that in the 80% renewable energy scenario, solar power is the biggest contributor with 815 GW installed in 2050 (about half of which is on rooftops).

b. IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation

The Special Report on Renewable Energy Sources and Climate Change Mitigation, published by the IPCC in 2011, is based on an assessment by more than 120 experts from all over the world for the IPCC's Working Group III. The major findings are:

- While in 2008 renewable energy accounted for only 12.9% of global primary energy supply, in 2008 and 2009 nearly half of the new electricity generation capacity that was added globally (140 GW out of about 300 GW) came from renewable energy. EMEs host more than 50% of the global renewable energy power generation capacity.
- Under the scenarios analyzed in depth, less than 2.5% of the globally available technical potential for renewables is used—in other words, more than 97% is untapped, which underlines the fact that availability of renewable sources will not be a limiting factor. Solar power has the highest technical potential.
- Wind and solar power are among the six renewable energy options that have the potential to outstrip total world energy needs and may grow as much as 20-fold over the next four decades.

c. Stanford Report on 100% Renewable Energy⁶

This study presents roadmaps for each of the 50 states in the U.S. to convert their all-purpose energy systems (for electricity, transportation, heating/cooling, and industry) to ones powered entirely by wind, water, and sunlight (WWS). By the year 2050, all-purpose energy needs in the U.S. would be met, with about 50% from wind, 45% from solar, and 3% from hydroelectric power. The additional jobs provided would be 5.9 million, with 40-year jobs outweighing the 3.9 million jobs lost in the conventional energy sector. Converting would also eliminate air pollution premature mortalities, which today number 62,000 per year in the U.S. These plans would result in each person in the U.S. in 2050 saving \$260 per year in energy costs. The new footprint over the land required would be 0.42% of U.S. land. The spacing area between wind turbines, which can be used for multiple purposes, would be 1.6% of U.S. land. Thus, 100% conversions are technically and economically feasible with little downside. These roadmaps may therefore reduce social and political barriers to implementing clean-energy policies.

Similar studies have not been done for developing countries. But it stands to reason that these economies, which are mainly in the tropics, have plenty of sunshine and wind to do what has been proposed by, for example, the Stanford Study. Thus the first element of leapfrogging to a sustainable lifestyle for developing countries will

⁶ Mark Z. Jacobson, Mark A. Delucchi, Guillaume Bazouin, Zack A. F. Bauer, Christa C. Heavey, Emma Fisher, Sean B. Morris, Diniana J. Y. Piekutowski, Taylor A. Vencill, and Tim W. Yeskoo (2015). 100% clean and renewable wind, water, and sunlight (WWS) all-sector energy roadmaps for the 50 United States. *Energy & Environmental Science*, 8, 2093-2117. Available at <http://web.stanford.edu/group/efmh/jacobson/Articles/I/USStatesWWS.pdf>

be: nearly 100% renewable energy before the end of the century. The side-benefits would be in terms of energy security, clean air and cost-effectiveness over the long term. The role models in this area could be Germany and the Nordic countries along with what is on the drawing board of the EU and places like Stanford University.

Checking the Car Population Explosion

EMEs, by and large, just do not have the land space to replicate the current motorization rate of developed countries. Thus, it is not only necessary but also desirable to reduce the level of motorization.

In developed countries, particularly in North America, much research has gone into studying the adverse side-effects of car dependency particularly by doctors from the angle of effects on health, both physical and psychological. The *Report on Public Health and Urban Sprawl in Ontario: A review of the pertinent literature* (2005)⁷.notes that many people move to the suburbs to escape the perceived “ills of the city”. Although there appear to be several benefits in suburban life (less exposure to noise pollution, less overcrowding, decreased stigma and fear of crime) and a greater experience of nature, a growing body of evidence suggests that the negative health impacts are enormous and far outweigh these benefits. Among these health effects are:

- Lack of physical activity, leading to diabetes, obesity, and hypertension
- Driver stress and road rage
- Post-traumatic stress from accidents
- Loss of sense of community
- Loss of social capital

The report also points out that the *most adversely affected groups are children, elderly, and women* who are also the most vulnerable.

Singapore, a high-income country, has strict control on the ownership and usage of motor vehicles. In 2009, the country had only 156 motor vehicles per 1,000 people as against 633 in HICs and 802 in the US. In the sustainable prosperity scenario, EMEs can aim at replicating the Singapore practice of keeping motor vehicle population to no more than 150 per thousand people.

This does not mean depriving the public of the necessary mobility. Singapore has introduced a dual strategy of restricting car population explosion while facilitating the supply of public transport and taxi services. Two major forms of car ownership restraints were adopted to suppress the growth of vehicles to within a tolerable level:

⁷ Bray, R. Vakil, C., Elliott, D., and Abelsohn, A. (2005). *Report on Public Health and Urban Sprawl in Ontario: A review of the pertinent literature*. Environment Health Committee, Ontario College of Family Physicians. Available at: <http://ocfp.on.ca/docs/publications/urbansprawl.pdf>

- a) Fiscal measures to increase the costs of owning, operating and maintenance of motor vehicles. These costs include import duties, vehicle registration fees, fuel and road taxes, and compulsory vehicle inspection fees.
- b) The Vehicle Quota System (VQS) that requires anyone intending to purchase a car to first acquire a Certificate of Entitlement (COE) through an open bidding system. The system was introduced in 1990 and in 1994 it was calculated that the quota premium could be as much as 2.5 times the price of a mid-size vehicle such as Mazda 323.

In 1996, Singapore also introduced the GPS taxi dispatch system. Passengers can place a booking through one of the following:

- a) Taxi order terminals located in shopping centers, hotels and cinemas, etc.
- b) Computer modems from offices and hotels
- c) Portable taxi order terminals
- d) A call to an operator-assisted system

This GPS system has brought about a major change in taxi control and dispatch. It has increased productivity by reducing empty travelling and response time and increasing ridership.⁸ In 2010, Singapore had about 40,000 rental cars/taxis, which is about 5% of the total number of cars.

In addition, Singapore introduced measures to increase the usage of buses. These include priority to buses at more traffic light junctions by fitting traffic lights with a special bus signal, installing intelligent traffic lights to detect approaching buses so the lights turn green automatically, and introducing more bus lanes. The bus signal comes on before the green light for other vehicles, which gives buses a head start and allows bus drivers to filter across lanes. In terms of travel cost, bus fares are low in Singapore, and have had small increases. Thus Singapore provides a good model for controlling the car population and achieving sustainable urban transport system with side-benefits in saving land, reducing pollution, and being cost-effective.

Most European countries have high ownership of private vehicles. However, most of them are realizing the high costs of an automobile-dominated transport system and are trying to design transport policies to discourage the use of cars for private transport. Box 1 describes an anti-car policy that is being developed in several European cities.

⁸ Sustainable Urban Transportation Planning and Development-- Issues and Challenges for Singapore, T. F. Fwa Center for Transportation Research Dept of Civil Engineering National University of Singapore, Republic of Singapore.

Box 1: European Cities Adopt Anti-Car Policy

While American cities are trying to facilitate higher speed for motorists, several European cities are creating environments that are openly hostile to cars. Among the instruments for making it difficult for cars are:

- Closing vast swaths of streets to car traffic.
- Removing pedestrian underpasses that allowed traffic to flow freely across major intersections.
- Eroding car lanes by popular bike-sharing programs.
- Charging hefty congestion charges for entering the heart of the city.
- Limiting entry in certain city centers to cars with low carbon dioxide emissions.
- Making it more difficult and expensive to park.
- Adding closely spaced red lights on roads into town, causing delays for commuters.
- Allowing trams to turn traffic lights in their favor as they approach, forcing cars to halt.

These measures are beginning to have some favorable effects. Carless households have increased from 40% to 45% in the past decade, and car owners use their vehicles less. Today 91% of the delegates to the Swiss Parliament take the tram to work.

Source: Based on report by Elisabeth Rosenthal, The New York Times, June 27, 2011.

Leaner and Healthier Diets

As noted above, EMEs cannot meet their food needs in 2050, if these needs are defined as replicating the consumption levels of HICs today. Fortunately, avoiding the dietary habits of HICs will be a “blessing in disguise.” Table 2 based on FAOSTAT shows that HICs consume on average 3,365 kcal per day, which is significantly higher than the medically prescribed⁹ level of around 2400–3000 kcal per day for an adult male. The level of calorie consumption in the U.S. is particularly high. This excess intake of calories often leads to a high incidence of obesity and other lifestyle disorders,¹⁰ such as coronary heart disease, type 2 diabetes, osteoporosis, high blood cholesterol and hypertension. Fast food and junk food, which are encouraged by retail chains and vending machines, have been contributing to the proliferation of these unhealthy food habits.

Table 2: Calorie Consumption in 2007 (kcal/capita/day)

Country/Region	kcal/capita/day
HIC	3364.7
US	3748.4
Japan	2812.1
India	2351.9
China	2980.5

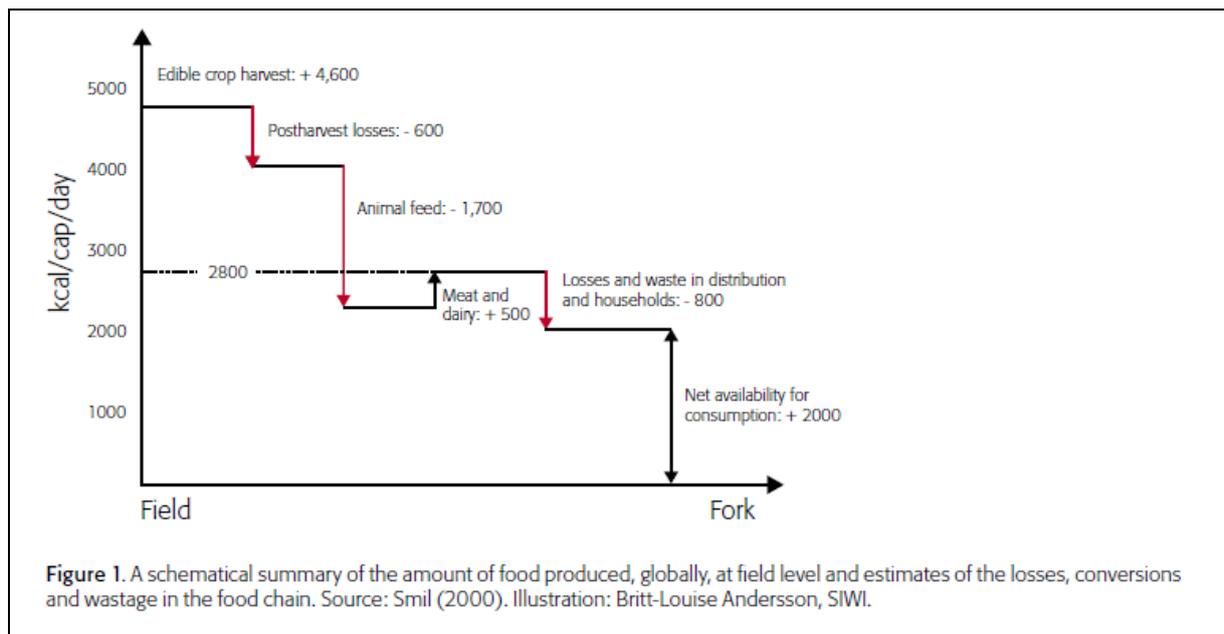
Source: FAOSTAT.

⁹ <http://www.cnpp.usda.gov/DGAs2010-PolicyDocument.htm>

¹⁰ <http://www.cnpp.usda.gov/DGAs2010-PolicyDocument.htm>

Not only is the level of calorie consumption high in HICs, but also its composition is wasteful and unhealthy. The Stockholm International Water Institute¹¹ estimated that nearly 50% of food is wasted globally in the process of food moving from “farm to fork” (Figure 1). One element of this wastage is the reliance on a meat-intensive diet. Globally, for every 1,700 calories fed to animals, only 500 calories are generated as meat and dairy products, resulting in a wastage rate of about 70% $[(1700-500)/1700]$ in calorie terms. In developed countries, 60–70% of the cereal crop produced is fed to livestock,¹² which leads to about 50% wastage of cereals so far as calorie consumption is concerned.

Figure 1. Food Production, Losses and Wastes in Food Chain



Source: Stockholm International Water Institute (SIWI).

Within livestock products, the reliance on red meat is particularly wasteful and unhealthy. The conversion ratio of cereals to calories is lower for red meat than for other meats, and a study reported in *The Washington Post* in 2009 found that red meat increases the risk of early death.¹³ The risks of excessive and unhealthy food consumption are well documented in the US. *The 2010 Dietary Guidelines for the Americans* published by the US Department of Agriculture notes that in the US “the majority of adults and one in three children is overweight or obese and this is a crisis that we can no longer ignore”. The *Guidelines* elaborate on the heavy toll of diet-related chronic diseases in the US:

¹¹ http://www.siwi.org/documents/Resources/Papers/Paper_13_Field_to_Fork.pdf

¹² <http://www/fao.org/docrep/x2184e03.htm>

¹³ Rob Stein, Daily red meat raises chances of dying early, *The Washington Post*, March 24, 2009. “The study of more than 500,000 middle-aged and elderly Americans found that those who consumed about four ounces of red meat a day (the equivalent of about a small hamburger) were more than 30% more likely to die during the 10 years they were followed, mostly from heart disease and cancer.”

- 37% of the population has cardiovascular disease.
- 34% of US adults have hypertension.
- About 11% of the population aged 20 years and older has diabetes and 35% have pre-diabetes.
- About 41% of the population will be diagnosed with cancer during their lifetime.
- One out of every two women and one in four men aged 50 years and older will have an osteoporosis-related fracture in their lifetime.

On the principle that prevention is better than a cure, EMEs must try to avoid the mistakes of the dietary habits of the US and most other developed countries. With healthier levels of calorie consumption and reduced levels of meat consumption, the demand for cereals in affluent EMEs can be reduced by about 60% from the replication scenario. This would require only about 30% increase in cereal production, which should be eminently achievable.

There are no clear role models of healthy diets in the developed countries, though there are several isolated examples in emerging economies. The traditional dietary habits of India with its emphasis on vegetarianism clearly deserve attention in this area.

Improving efficiency in water use

Developing countries, many of which are located in the tropics, may have an image of being drenched in monsoon rains and floods of mighty rivers. But in fact, most of the heavily populated EMEs, particularly in East, South and West Asia, suffer from water scarcity. As Table 3 shows, the annual freshwater withdrawal in EMEs is close to that in developed countries, but it is very unevenly distributed. In China, India, Pakistan, Egypt and the Arab world, freshwater withdrawal as a percentage of reserves is very high. While the withdrawal rate is only about 9.1% in developed countries and 15.6% in the US, it is as high as 119% in Egypt, 84% in the Arab world including Egypt, 79.5% in Pakistan, 39.8% in India, and 19.5% in China. As development proceeds, the water needs of industries and the urban population will make further demands on water supply. Unless water use per unit of GDP can be increased dramatically in these countries, water stress can thwart development.

Table 3. Freshwater Withdrawal and Availability

	Annual Freshwater Withdrawal (‘000 cubic meters)	Withdrawal as % of resources
Arab World	0.75	84
China	0.42	19.5
Egypt	0.87	119
India	0.63	39.8
Pakistan	1.10	79.5
United States	1.57	15.6
HICs	0.88	9.1

Source: WDI, 2015.

Fortunately, there are examples around the world of how water scarcity can be combined with affluence if the proper policies are followed. Below we describe two examples from developed regions: Israel and California (Boxes 2 and 3). These involve changes in lifestyle and economic policies but are eminently do-able.

Box 2. Israel: A Model of Water-Use Efficiency

The foundational law for water governance in the state of Israel is the Water Law, passed in 1955. It stipulates that all water resources are the property of the public; there is no private ownership of water resources and virtually all water consumption is metered.

Measures for Efficient Water Use in Agriculture

Irrigation takes place either through a drip system (water dripping slowly through a perforated pipe laid on or under the ground), or by sprinklers.

Measures for Efficient Domestic and Tourism-Related Water Use

- Compulsory water metering per customer
- Large-scale wastewater treatment programs; around 84% of Israel's domestic wastewater is re-claimed for irrigation in agriculture
- Dramatically increased tariffs
- Effective multimedia awareness-raising campaigns to promote conservation
- Increased volume of reclaimed domestic wastewater provided for irrigation
- Installation of a series of large-scale desalination plants

Measures for Efficient Water Use in Industry

- Compulsory metering for all customers
- Policies to encourage the use of brackish water and effluents
- Increased tariffs with the ultimate goal of charging the true cost of water

Source: The State of Israel: National Water Efficiency Report, Ministry of National Infrastructures, Planning Department, April 2011.

Box 3. California deals with water stress

In 2015, California was about to enter the fifth year of a drought. Yet California is flourishing.

One secret of its success in managing water scarcity is drip irrigation. When tomatoes are grown using drip hoses that squirt water right below where the plants emerge from the ground, about 35% less water per acre is used but production is at least 70% more tomatoes per 1,000 gallons of water. Since 1980, the amount of California farmland watered by drip- or micro-irrigation has gone from almost nothing to nearly three million acres, which is 39% of the state's irrigated fields.

The California Legislature has passed a sweeping groundwater law. No community will be allowed to pump more water from the underground aquifers than can refill those aquifers – either naturally, or with human help. San Francisco just passed an ordinance that requires buildings of a certain size to have on-site water recycling systems, and to reuse their own wastewater. Southern California has a large program that gives rebates to homeowners who replace their lawns with desert-appropriate landscaping with rocks and cactus instead of turf.

Source: Based on Charles Fishman, "How California is Winning the Drought", The New York Times, August 14, 2015.

Israel is clearly a role model for EMEs facing water stress. Improving productivity of agriculture while economizing on water through drip irrigation is a good example of the side-benefits of addressing the sustainability problem.

From Urban Sprawl to Compact Sustainable Cities

An iron law of economics without a single exception is that as countries get richer, the share of agriculture in GDP, employment and land declines over time. That, in turn, is the outcome of two other iron laws: Engel's law which predicts a decline in the share of agricultural products in total consumption as a country gets richer and the inability of productivity in agriculture to keep up with that in the non-agricultural sector as a country gets richer. In light of these laws and global experience we can expect that as the South moves toward high-income status, an increasing share of the population will live in cities. Based on the past relationship between per capita income and agricultural employment and non-farm rural employment, we predict that an affluent South would have about 80% of its population in urban areas where nearly 90% of its GDP would be generated. Currently, the urbanization ratio in the South is only about 45%, implying that much of its urbanization is in the future and offers a chance to get on the right footing from the beginning.

Can the affluent South accommodate about 6 billion people in a livable urban environment? Not if EMEs remain on the current tendency to unplanned and uncontrolled urban sprawl, which has high costs in economic, social and environmental terms as noted in, for example, The New Climate Economy (NCE) Report:¹⁴

1. Urban sprawl often results in inefficient use of land, capital and energy resources, with a lock-in period of generations if not centuries.¹⁵ Land used per housing unit may be doubled, the cost of providing utilities and public services increased by 10–30% and the costs of travel by 20–50%.
2. Traffic congestion costs are estimated to be as high as 3.4% of GDP in Buenos Aires and 2.6% in Mexico City.
3. Escalating economic and social costs due to air pollution. In Beijing, which was forced to declare a red alert on pollution on December 8, 2015, the total social costs of motorized transport, including air pollution and congestion, are estimated at 7.5–15% of GDP. In India, urban pollution caused 620,000 premature deaths in 2010, up more than six-fold from 2001 and the costs of environmental degradation, largely driven by sprawling

¹⁴ Better Growth, Better Climate: The New Climate Economy Report, The Global Commission on the Economy and Climate, Resources for the Future, Washington D.C., 2014

¹⁵ A recent study by Resources for the Future puts the external costs of sprawl at about US\$400 billion (about 2.6% of US GDP) per year in the US alone. These additional costs are due to the increased cost of providing public services such as water and waste, increased capital investment needs for infrastructure such as roads, and the costs of increased congestion, accidents and pollution not borne directly by private individuals.

cities, is estimated to be 5.7% of GDP. China and India are no exception. In many cities in developing countries, pollution-related health costs are as high as 5% of GDP, most of which is due to vehicle emissions.

4. Urban road accidents in developing country cities can cost as much as 2% of GDP.

Fortunately, there are some success stories of building sustainable cities in the North as well as the South (Box 4).

Box 4: Success Stories in Building Sustainable Cities

Tampines, Singapore

Construction of Tampines New Town, located in the east region of Singapore, began in 1990. In 1992, the new town received the World Habitat Award by the Building and Social Housing Foundation (BSHF) of the United Nations in recognition of the new town's "high quality, high density and affordable housing for its citizens as well as on how to retain socially cohesive communities".

Some of the distinguishing features of the city relevant for our search for norms for new cities are as follows:

- Tampines has 61,000 residential units that offer accommodation to more than 250,000 people on just 12 km².
- Through incineration of waste, Singapore recovers 938 million kWh per year and reduces waste volume by 90%. The National Recycling Program provides door-to-door collection of paper, metal, plastics, glass, and clothing every two weeks as well as public recycling bins and "recycling corners" in school classrooms.
- Promotes the use of bicycles by investing \$43 million in the construction of bike lanes throughout Singapore. In Tampines, cycling on footpaths has been legalized.
- Planning and construction of Tampines was a heavily top-down undertaking. But after finishing the new town in 1991, the management was handed over to the Tampines Town Council, a body of local residents.

Portland, Oregon, USA

Portland, with 580,000 inhabitants, is often cited as a model of urban planning in the United States. Some interesting features of the Portland experience are:

- Legislation to stop urban sprawl. As early as 1973, the Oregon Legislature authorized regional planning authorities to establish an urban growth boundary (UGB) to stop urban sprawl and to encourage densification in the city.
- A light rail system and extensive bicycle lanes.
- High density and a strong mass transit system have reduced car driving substantially.
- More than half of waste is recycled.
- More than average consumption of local food, encouraged by the city's support for local farmers and farmers' markets.
- Cooperation between business, higher education, non-profit and municipal leaders is systematically organized through the Portland Sustainability Institute.

Copenhagen, Denmark

Copenhagen had 519,000 residents in 2009 in an area of 88.25 km², thus having a population density of about 5,900 persons per km². The metropolitan region is home to nearly 1.2 million people. The city scores high on low-carbon, smart-city development. Among the features of interest are:

- Clear priority to public transport, cycling and walking. 60% of Copenhageners are able to walk to a park, beach or a sea swimming pool in less than 15 minutes and the municipality wants to raise it to 90%.
- The city derives 97% of its heating needs from waste.
- Coming together of top-down and bottom-up approaches through architects and other specialists acting as mediators and many residents delivering valuable inputs for city renewal.
- Nordhavn, a new city of Copenhagen, is to produce more renewable energy than it consumes. It aims at making it easier to walk, cycle or travel by metro than to take the car.

Freiburg, Germany

Freiburg scores high on sustainable urban development, which it largely owes to an historical factor. In the 1970s, Germany planned to build a nuclear plant near Freiburg. There were major protests, and in 1975 the plans were cancelled. This created an energy gap in the region but also contributed to the citizens' search for a green solution. Among the features of interest are the following:

- **Solar energy.** Freiburg is one of the sunniest places in Germany with 1,800 sun-hours per year and the city uses this resource to the full. Over 400 photovoltaic panels for electricity are installed next to solar thermal installations for heating water. Some houses are based on a passive solar design. Houses are equipped with solar sunrooms for winter gardens, solar cooling and transparent solar insulation, which converts the solar heat of a wall into useable thermal energy. In the new neighborhood of Vauban, there is a housing community with 59 homes that produces more renewable energy than it uses, with the surplus being sold to a regional energy company.
- **Water, sewerage and waste.** In some 80% of the residential area, rainwater from roofs and streets is redirected to the urban soil via natural (reed) filters. The model house is equipped with an innovative, ecological sewage system. Vacuum pipes transport feces into a biogas plant where it is co-digested with organic wastes from the household, producing biogas for the household and organic fertilizer for local gardens. The remaining wastewater (grey water) is sanitized by plants (reed) and recycled to the natural water system. All kitchen and garden wastes are composted.
- **Cycle-friendly and anti-car urban transport.** The city has 500 km of bicycle paths and a third of all urban journeys are by bicycle. There are more than 5,000 bicycle parking spaces in the city with concentrations at tram stops for 'bike and ride' commuters. The old town center has been car-free since 1973 and in 1990 a 30-km/h zone was introduced for almost all residential streets, except main roads. In Vauban, all districts are connected to the city center by a tramway. All homes are within walking distance of a tram stop. Transport is primarily by foot or bicycle, with 70% of households having chosen to do without a private car.

- **People participation.** The involvement of the community in urban development is high, facilitated by an NGO financed through membership fees, donations, public grants, and a moderate own income.

Curitiba, Brazil

Curitiba has a spider's web road structure that ensures everyone in Curitiba has easy access to public transport.

- The entire system is designed to provide efficiency, comfort and affordable access to public transport. Bus passengers need to buy only one ticket at a low price, regardless of the length of the journey or the number of times they change buses.
- Bi-articulated buses with three compartments have been specially designed for Curitiba to provide room for more passengers, up to 270 per bus.
- There are tube-shaped bus stops where passengers buy their ticket in advance and enter the buses through doors that are at the same level as the platform. Exiting passengers use the doors at the other end of the bus.
- 75% of all commuters in Curitiba make use of the public transport system.
- Earlier, 28% of all bus passengers commuted by car. Due to this modal shift, fuel consumption for commuting has decreased by 25%.
- Compared to conventional bus systems, the Curitiba system is 3.2 times more efficient. This efficiency saves lots of time and money.

An innovative example of mobilizing dormant urban capital is the Curitiba market of "sol criado" or "created surface".

- If investors, such as hotel owners, wants to add floors to a hotel beyond the maximum height in the area, they can buy the needed square meters on the market for 'sol criado'. These square meters are provided by entities that are able to sell a virtual surplus of square meters because they do not need to build any additional floors.
- The revenues of these sales of virtual surplus surface can be used to (co-) finance sustainable developments such as the restoration of a monument or the development and maintenance of a city park.

Curitiba has 26 urban parks and woodland areas and some 1.5 million trees that promote the quality of the urban living environment. The access of Curitibaanos to open, green landscape has risen from about 0.5 m² in 1970 to around 54 m² per inhabitant, which is well over the WHO standard of 16 m² per inhabitant.

Source: Urban Development: The State of the Sustainable Art: An international Benchmark of sustainable urban development. Dutch Research Institute for Transitions (DRIFT), Erasmus University, Rotterdam, May 2011.

Drawing on this experience, we can define some clear parameters for sustainable cities in the affluent South.

Physical Facilities

- High density: In view of the land shortage in Asia, urban areas should aim to provide for about 100 persons per hectare, which is close to the current population density of Singapore.
- Mixed-use planning: Instead of sharp segregation between residential and work/ shopping, these services should be integrated as far as possible.. In particular, shopping centers and schools within walking or cycling distance from residential areas should be the typical pattern.
- Public transport: Public transport through dedicated bus/tram lanes should be a priority that aims at covering a large percentage of vehicular trips.
- Pedestrian-friendly: Pedestrian pathways should be kept free of encroachments and should allow access to all major facilities.
- Bicycle-friendly: For medium distances, bicycles should be made an attractive alternative with dedicated bicycle paths.
- Anti-car: The number of private cars should be kept low (below 100 per thousand) and the car population kept in check by charging the full cost of space used for parking and of fossil fuel used by cars. Regulatory restraints may be introduced on the number of cars registered, if necessary.
- Plentiful taxi service: In order to economize on parking space and to provide employment, taxi service should be available in plenty and in real time through the use of modern communication devices.
- Parking systems: Automated car parking systems that reduce parking time and are less expensive per parking slot.
- Energy-efficient buildings: Building codes should ensure energy-efficient buildings.
- Rooftop solar power: Rooftop solar power should be made mandatory.
- Recycling and conservation of water: Treating flushed water for reuse after treatment.
- Use of pipe sensors. No new bore wells in the metropolitan cities to be done without permission from the concerned authority.
- Sewerage and sanitation: Replacing traditional gravity drain with cost-efficient pressure sewerage system (PSS) to handle wastewater. Urban catchment modeling to be carried out in India. Decentralized infiltration and discharge into combined sewers for storm water.
- Waste disposal and waste to energy: Ban on land filling of waste suitable for incineration. Using waste for energy generation.

Social Facilities

- Housing for all: No slums.
- Schooling for all.
- Health facilities for all.
- Popular participation through NGOs, etc.
- Flexible labor laws for new jobs.
- Flexible rental laws for new rental contracts.

In the preferred scenario, cities will be smart, productive, inclusive and sustainable. ICT will provide a high level of connectivity for education, health, entertainment, trade, finance, employment, mobility, and governance. Agglomeration effect along with connectivity will induce innovation, talent retention, and productivity. Decent facilities for housing, education, health, and employment for all will ensure inclusiveness. And low carbon consumption, production, and infrastructure patterns along with connectivity will contribute to sustainability.

Fortunately for EMEs, most of their urbanization lies in the future and they have an opportunity to leapfrog to the latest and best design of urban development without going through the expensive retrofitting process that most HICs have to go through. Also, most features of the preferred scenario are less expensive in economic terms than the usual pattern of urban sprawl that most EMEs are still following at a substantial economic and social cost. Land is extremely expensive in most EME cities and vertical growth is often a money-spinner. By allowing high-rise buildings, which are often restricted by outdated building codes, greater living space can be created for urban residents while reducing costs. Slums, which are generally single floor tenements, are wasteful of precious land and can be replaced by high-rise buildings. Investments in low-carbon development strategies in cities also have good pay-off in economic terms. The New Climate Economy (NCE) report notes that for five cities (Leeds, UK; Kolkata, India; Lima, Peru; Johor Bahru, Malaysia; and Palembang, Indonesia) it was found that 13–26% savings in energy use and GHG emissions were possible through investments in more efficient building, transport system and vehicles, with payback periods of less than five years. It also refers to a study by the Intergovernmental Panel on Climate Change (IPCC), which found that recent developments in technology made it possible to build or retrofit very low- and zero-energy buildings, often at little marginal investment cost. Efficiency measures typically paid back well within the building's lifetime and generated significant energy savings in both new (50–90% savings) and existing buildings (50–75% savings). The NCE Report refers to a Siemens study that identified high pay-offs from 30 market-ready, low-carbon technologies such as light-emitting diode (LED) street lighting, new building technologies and electric buses and a McKinsey & Company study that documented huge benefits in developing new green technologies including efficient building design and lighting, energy-efficient street lighting, efficient waste management, and rooftop solar power.

IV. Instruments for a Leapfrog Strategy

If the political will is there, the instruments are available for implementing the leapfrog strategy in the above five dimensions to sustainable prosperity for all. The most important instrument is, of course, technological progress. To harness new technologies for a sustainable lifestyle, we can use the typical instruments of getting prices right, introducing regulations where necessary, and using public investment where private investment is not forthcoming.

Technological Progress

Technological progress has been the key instrument in achieving the unprecedented economic progress over the past two hundred years and will no doubt be the key for sustained growth in EMEs. For the leapfrog strategy too, technological progress will be the key. For the development of renewable energy and smart transport systems, to increase productivity of water and for smart urban planning, and for healthier diets with low meat content, technology is and will continue to play the lead role. As elaborated in the paper by Mashelkar,¹⁶ the specifics of these technological breakthroughs are impossible to foresee. But pay-offs from efforts in this area are likely to be high and R&D expenditures supported by public and private sources deserve the highest priority.

Getting Prices Right

Getting prices right is one of the most important ways of changing the behavior of individuals in the desired direction without any persuasion, regulation or surveillance by the public authorities. The invisible hand of price (not the market) will silently influence millions of decisions made by individuals. This will be true for reducing the carbon intensity of GDP as well as for controlling the car population.

Reducing carbon intensity

The most efficient way for reducing CO₂ emissions is to provide economic incentives to businesses and households to reduce the production and consumption of CO₂-intensive products and services. This can be done either by managing prices or by managing quantities. In the former, the government imposes a tax on emission of carbon, thus internalizing the negative externality, or provides a subsidy for carbon sequestration, thus internalizing the positive externality of carbon absorption. Thus, the tax/subsidy regime only articulates the hidden costs and hidden benefits of particular activities from the point of view of climate change. In the latter, the government provides a cap on carbon emission by various industries and allows a trade in emissions rights among those who have surpluses or deficits in emissions in relation to the caps.

Theoretically, both instruments are equivalent. The difference emerges in terms of the uncertainty associated with outcomes and the ease of administration. When price is managed, it is not sure *ex ante* what the outcome will be in terms of reduction in emissions, which is what matters when managing climate change. When the quantity is managed, it is not sure *ex ante* what the price of emission will be and thus it does not provide a stable signal for business and household behavior for reducing the use of carbon-intensive products and services. In addition, defining caps and enforcing adherence to them on a large number of business units is an administratively difficult process with much room for leakage and fraud.

¹⁶ R. A. Mashelkar. "Technology 2050: A Potential Landscape" Background Paper, Emerging Markets Forum, Global Meeting, November 3-5, 2015, Tokyo.,

Certification of carbon reduction activity for trading is a difficult process because, unlike in a typical market process, neither the buyer nor the seller is interested in the veracity of the carbon reduction activity in which they are trading. By comparison, carbon tax is easier to administer because: (a) the carbon content of every form of fossil fuel can be calculated relatively easily as is the amount of CO₂ released into the atmosphere when the fuel is burned and (b) it can be imposed on a limited number of easily identifiable entities with limited scope for evasion. To tackle the problem of uncertainty about the outcome, one can do iterations in the tax rate until the desired impact on emissions is obtained. Typically, one can begin with a low rate of tax and increase it over time in light of the outcomes on emissions.

The debate on the relative merits of carbon tax and the cap-and-trade system has been going on for a long time (see, for example, www.carbontax.org/). In our judgment, the case for carbon tax is winning. Even in the US, where the political system is allergic to the word “tax” and where the cap-and-trade system has been popular, there is a gradual shift in favor of carbon tax (though some prefer to call it a carbon charge). The report by the Congressional Budget Office¹⁷ of the US provides an authoritative account of the case for carbon tax.

Analysts generally conclude that a tax would be a more efficient method of reducing CO₂ emissions than an inflexible cap ... Specifically, available research suggests that in the near term, the net benefits (benefits minus costs) of a tax could be roughly five times greater than the net benefits of an inflexible cap. Put another way, a given long-term emission-reduction target could be met by a tax at a fraction of the cost of an inflexible cap-and-trade program (p.ix).

Controlling car population

There has not been much research in the South on estimating the full costs of automobile use. However, in North America, there has been some research and the findings are relevant to India. In what follows we draw upon the massive study done by the Victoria Transport Policy Institute entitled *Transportation Cost and Benefit Analysis Techniques, Estimates and Implications* (2009). The study lists 23 transportation costs and categorizes them as either internal cost to the car user or external cost to society. The study tries to monetize these 23 costs and concludes that, on average, *each dollar spent on vehicle operating expenses imposes about \$2.55 in total costs to society*. With a proper system of making car owners pay for off-street parking space as well as other external costs, the costs of car ownership and operation may become 3–4 times the present levels. Imposing the true cost of cars on their owners may thus contribute to controlling the car population while providing a budgetary boost to cash-starved local and state governments.

¹⁷ *Policy Options for Reducing CO₂ Emissions*: Congressional Budget Office, Congress of the United States, February 2008.

Regulations

Carbon emission

Prices, while a powerful instrument for changing business and household behavior in the desired direction, have their limitations, particularly in changing the behavior of higher income groups. In a critical area such as energy use where long-standing lifestyles and behavior patterns are to be changed, the power of prices needs to be supplemented by the power of regulations. Such regulations are necessary for the entire spectrum of economic activity covering electricity generation, transport, industry, agriculture, forestry, urban habitat, and buildings. In our vision of an affluent South, the majority of people will live in urban areas and buildings will be venues for generating most of the employment and income in the economy. Thus, proper regulations will be crucial for improving energy efficiency and reducing the carbon intensity of energy in the area of urban planning and building design.

Urban planning and regulations should aim at keeping cities dense and keeping travel distances short. Urban planning guidelines should also be developed to discourage sprawl, rationalize parking policies and charges, and mandate public transport accessibility indicators for large developments.

Regulations would need to be introduced to keep car density of the cities low while increasing energy efficiency and reducing the carbon intensity of vehicles operating in cities. Periodically, tightened fleet efficiency standards for commercial vehicles may be imposed with mechanisms to penalize non-conformance.

Buildings can be made more energy-efficient by designs that reduce the need for lighting, heating, ventilation, and air conditioning. Codes and standards as determined by policy can play a significant role in the process.

Progress made on rooftop solar power, particularly in Spain and Germany, suggest interesting possibilities for promoting the use of solar power in buildings in the South. In Spain, building regulations make it mandatory to have rooftop solar power in commercial as well residential buildings. In India, making solar power installation mandatory for new buildings can help reduce the carbon intensity of energy use in buildings. This regulation, if effectively implemented, can transform the disadvantage of heat in the tropical South into an advantage for cheap electricity over the long term.

Controlling the car population

To control the car population explosion too, the power of prices needs to be supplemented by regulations. One obvious area is in regulations about the mileage and emission efficiency of vehicles.

As discussed above, urban planning will play an important role in moving toward sustainable transport. Urban governance will play a key role in designing and implementing sustainable transport. In the spirit of decentralized governance, municipalities with elected representatives should have increased powers vis-à-vis officials appointed by higher level governments. The sources of finance of municipalities would, of course, also need a complete overhaul. For one, the municipalities should greatly increase taxes on houses as well as vehicles and their usage of municipal land for parking on-road and off-road.

Traffic regulations and road design will obviously be the key to encouraging public transit as well as pedestrian and bicycle traffic, as noted in Box 8.2 on Europe's recent anti-car policy.

There should be tighter restrictions on personal car ownership (with auctions for vehicles as in Singapore) and a more liberal policy for permitting commercial vehicles.

Investment funding

Investment for reducing carbon intensity

Measures for increasing energy efficiency and reducing the carbon intensity of energy will require enormous expenditures, particularly in the early period. As indicators of additional investments required, we note the estimates made by EU Roadmap 2050 and IPCC report on renewables. The IPCC report puts additional investments required as "less than 1% of GDP", and the EU report estimates additional investments required in the power sector as 0.33% of GDP. A large part of this expenditure should come out of carbon tax, which is intended to make carbon emitters pay the full price of the emission and subsidize those who help reduce emissions. Another large source of funding is reduced subsidy for the use of fossil fuel.

The funds mobilized domestically by EMEs should be supplemented by international assistance for reducing emissions. The North should cooperate more fully with the South in trying to move toward sustainable prosperity. If the argument of carbon debt is not acceptable to the North, the argument based on greater capacity for helping a global cause should be accepted and more generous financial and technical assistance should be provided for the South.

In addition, consideration should be given for using the seigniorage generated by the international financial system for global public goods such as mitigation and adaptation to climate change. As in the domestic economy, in the international economy additional money is needed to finance the growing trade and investment. In the domestic economy, the privilege of issuing new money goes to the government, which as the sovereign can use it for meeting the expenses of providing national public goods without creating inflation. At an international level also, there

is a need for continuously growing global currency where the increments can be used to finance global public goods, of which managing climate change is a pre-eminent one. The UN Report (2009)¹⁸ has made the case for a major reform of the international financial architecture. EMEs should put their weight behind the reform of the global currency system and the allocation of a significant part of the new currency creation to funding measures for mitigation and adaptation to climate change.

V. Limited Progress in Move to Sustainable Prosperity for All

The pressure to develop sustainable lifestyle may be a “blessing in disguise” since it will force us to develop healthier lifestyles, both for ourselves and for the Earth. Several government, intergovernment and civil society organizations are trying to achieve the transformation. The UN Secretary-General has been a strong champion of green growth and the Sustainable Development Goals recently approved by the UN is a landmark event. The Paris Agreement on climate change and Intended Nationally Determined Contributions (INDC) are presented as advancing the cause of mitigation and adaptations in a big way. But these are unlikely to achieve the target of keeping temperature rise to 2 C much less the target of 1.5 C by 2100. The inadequacy of the current agreement is well illustrated by the limitations of the much touted agreement on climate change by the US and China. China has become the biggest emitter of CO₂, burning nearly 4 billion tons of coal every year. Agreeing to peaking by 2030 does not say anything about what the additional stock of CO₂ that will come from China between now and 2030 and for climate change it is the stock of CO₂ that matters. For the US too, the opposition to even mild forms of mitigation measures proposed by the President are facing opposition. The powerful lobbies of coal, oil and gas, not to mention those of automobiles, are sure to threaten any meaningful action on climate change by the US. Nor is the public sufficiently vocal on measures for sustainable growth. The dangers seem remote while the costs seem imminent. India’s heart is not in green growth and its commitment under the INDC envisages the rate of reduction in the carbon intensity of GDP at 1.7% per year during 2005–30, which is slower than the trend rate during 1994–2007 (2.2% per year). Much of the elite middle class in the South looks to the US as its role model and shares its attitude on consumerism.¹⁹

¹⁸ United Nations (2009). Report of the Commission of Experts of the President of the United Nations General Assembly on Reforms of the International Monetary and Financial System.

¹⁹ See for example what Sunita Narain, Director of the Centre for Science and Environment in India says in her article in *The Business Standard* (October 11, 2015) which is based on a report: *Capitan America: US climate goals: A reckoning*. “US lifestyle and consumption patterns are aspirational and addictive. Quite simply, everybody wants to be an American. Every citizen of the developing world wants to either live in America or live like an American. If it were possible to attain such a lifestyle and yet combat climate change, our concern would be unfounded. But that is not possible. If Americans continue to guzzle, it is not possible to expect that the rest will not follow in their footsteps. The world - the US and us - cannot combat climate change without changing the way people drive, build homes or consume goods. The C-word is the C-word.”

The Kyoto Protocol mode of thinking has thankfully been buried in Paris. The developed countries are responsible for a large part of the accumulated CO₂ in the atmosphere. But going forward, the main source of carbon emission will be the EMEs and it is change of behavior on their part that will determine the success or failure of keeping carbon emissions within acceptable limits.²⁰ As with GDP, the share of the developed countries in carbon emission is going to be small. Moreover, Pfeiffer and Hepburn ²¹ point out that it is in the self-interest of EMEs to adopt carbon-saving measures. Their paper emphasizes that leapfrogging to sustainable lifestyle will be a “blessing in disguise” for the EMEs and the costs of the transition are manageable. The developed countries have an important role through their demonstration effect and through the provision of technology and finance. Lifestyle issues should not be non-negotiable because they are crucial for sustainability. But in a complete reversal of the Kyoto mode, it is the EMEs that have to take the lead role in developing a sustainable lifestyle among the elite middle-class that is largely bent on copying the Northern lifestyle.

In order to change the current mindset on lifestyles, intensive social marketing is necessary. This is no easy task as illustrated by the history of trying to change smoking habits. Despite the well-known adverse effects of smoking, old habits and the vested interests of the tobacco industry have prevented a substantial change in smoking habits. On the other hand, the history of population control in EMEs provides an example of what effective social marketing can achieve. Fifty years ago, the population explosion seemed to be a danger to economic prosperity in developing countries. But with concerted social marketing the case for family planning was effectively sold. By now it appears that the world population is stabilizing and may even decline toward the end of the century. Similar efforts are now necessary to convince the public that the high-carbon, consumerist, throwaway culture developed over the last two hundred years is not sustainable. We can and must leapfrog to a sustainable lifestyle that is healthier for Mother Earth as well as her children. Pope Francis has taken a giant step in this direction through the publication and dissemination of his encyclical, Laudato Si. Other religious leaders as well as NGOs and government agencies need to join hands to change the mindsets about lifestyle and facilitate a leap to sustainable lifestyles in EMEs as well as HICs.

²⁰ Sunita Narain’s statement, “Every citizen of the developing world wants to either live in America or live like an American” illustrates dramatically what is wrong with the EME mindset. There is no way every citizen of developing countries can either live in America or live like an American. They must stop aping it and design their own sustainable lifestyles.

²¹ Emerging Markets and Climate Change by Alexander Pfeiffer and Cameron Hepburn, Background Paper, Emerging Markets Forum, Global Meeting, November 3-5, 2015, Tokyo.