



Urban planning and sustainable energy: theory and practice

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Modern cities are products of fossil fuel technology – most of the world's energy is used by cities themselves, and by the farming, industrial production and transport systems that supply them. Modern urban living crucially depends on uninterrupted energy supplies. The world's major transport systems start and end in cities. They are the nodes from which mobility emanates, with low transport costs having rendered distances irrelevant, plugging cities into an increasingly global hinterland.

Whilst people all over the world enjoy their dynamic and privileged urban lives, there are major downsides to be considered: in the developed world, urban dwellers are discharging anything between 9 and 25 tonnes of CO₂ per capita per year. Billions of tonnes of CO₂ released by urban energy users worldwide are building up in the earth's atmosphere every year, and as a direct result of this, global climate change is becoming an irrefutable reality. And in addition to the problem of air pollution there is the issue of depletion: in a world in which oil and gas reserves are rapidly being run down, we urgently need to find alternative ways of powering our gas-guzzling cities.

This issue is becoming particularly urgent as the rapidly growing cities in China and elsewhere in Asia are catching up with energy consumption patterns in Europe and America. In 2004 China will overtake Germany as the world's third largest car producer. With disposable incomes rapidly rising, China's city people will copy the profligate patterns of energy use in cities in the developed countries unless alternatives are on offer which prove that comfortable urban lives are possible with greatly reduced energy use.

Can large modern cities that are the product of fossil fuel technology power themselves by sustainable energy systems instead? A clever combination of energy efficiency, combined heat-and-power, wind power, solar energy systems, and fuel cell technology certainly holds the promise of a clean and secure urban energy future. But so far the introduction rate of these technologies has been much too slow to offset annual global increases in urban energy demands. A much more vigorous and deliberate phasing in of sustainable energy systems by the world's cities is now urgently called for.

Some European cities have taken significant initiatives in this direction – as a result of local as well as national policy: Vienna, Leipzig and several other European cities have made very substantial investments in insulating large numbers of buildings and substantially reducing their energy consumption. Cities in Scandinavia, such as Helsinki, Stockholm and Copenhagen, have also made very substantial investments in



combined-heat-and power technology, greatly improving the efficiency of their energy supply. In addition, 20 per cent of Copenhagen's electricity supply now comes from on-shore and off-shore windfarms in Denmark. The country greatly benefits from many years of active support for wind energy by previous Danish governments.

In 2000, the city of Barcelona introduced its mandatory 'Solar Ordinance'. All new housing, offices, restaurants and public buildings there have to install solar hot water systems if they use substantial amounts of hot water. Old buildings also have to be fitted with solar hot water systems when they are refurbished. Around the Mediterranean use of solar hot water systems has become commonplace. In some 'blue sky' countries such as Israel, most homes now have solar hot water systems for residential use. In Japan about 10 per cent of all dwellings have their own solar hot water systems.

In German cities solar PV panels are becoming commonplace, despite the country's relatively cloudy skies. This is primarily due to the German government's 'feed-in' legislation which has fixed both subsidies and favourable tariffs for owners of PV roofs. They are paid about 50 cents/kWh for selling their electricity back to the electricity grid, which is about four times the price paid to conventional electricity generators. The policy has led to a massive growth in demand for solar PV technology across the country. Similar policies have now been introduced in Austria, France and Spain.

However, the improved energy performance of cities from these kinds of initiatives is usually being outweighed by the increases in the use of fossil fuels by private transport that have occurred in recent years. This is the case all over the developed world, and particularly in the USA and Australia, where low-density urban sprawl has made it very difficult to introduce energy efficient public transport systems. In cities with low density sprawl where most people rely on private cars it will be particularly important to introduce new transport propulsion such as fuel cell technology to make both private transport and public transport both less polluting and more energy efficient.

Really significant breakthroughs in urban energy efficiency and introduction of sustainable energy systems in cities will emerge only as a result of major changes in national energy policy. In some countries we have seen some significant breakthroughs, but far more needs to be done to transform our cities from fossil fuel junkies to sustainable, future-proof systems.