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## Foreword

The World Future Council is concerned with creating a highly effective international lobby for building a world safe for future generations, and for creating a stable relationship between humanity and our host planet. In recent years not nearly enough has happened to convince us that the international community is taking the necessary steps towards creating a sustainable and equitable world.

However, some policies have been implemented that are beginning to show the way. The one notable global initiative is the Montreal Protocol on Substances that Deplete the Ozone Layer, originally signed in 1987 and substantially amended in 1990 and 1992. This landmark international agreement has gone a long way towards addressing a major threat to the global environment. Kofi Annan, Secretary General of the United Nations, has described it as “perhaps the single most successful international agreement to date”. But there are few other agreements at the international level that can match its success.

As will be evident from Miguel Mendonça’s text presented here, most other “policies to change the world” have originated in one country and then spread to other countries, or even from one region to whole nations, and from there to other nations. It will be clear from this text that there are a great variety of ways in which policy change can be initiated and spread to other places.

When first searching for publications to describe effective policies to fill major “actions gaps” we were surprised to find that no other organisation seems to have initiated research to list the processes of positive change through legislation that have occurred in recent years. This text, therefore, fills a significant gap.

This is the first in a series of reports to be published by the World Future Council that will deal with important policy initiatives. We will follow this with other texts on “breakthrough policies” that have had significant national and international impacts. We will then publish further reports on proposals that have been put forward by NGO’s or political parties around the world that have yet to be adopted, but that appear to have great merit as tools for positive change.

This report is being published to coincide with the meeting of the first 20 founding councillors of the World Future Council (WFC) in Geneva. After many endorsements for this ambitious project by eminent people, and after consultations with thousands of organisations and individuals from around the world, we are proud to be able to take an important step to making the WFC a reality. In the next few months we will significantly expand the Council to assure effective representation from all over the world. For more detailed information please look at our website - [www.worldfuturecouncil.org](http://www.worldfuturecouncil.org).

This text was produced for the WFC Initiative, with the newly created Schumacher Institute for Sustainable Systems in Bristol as our base. Miguel Mendonça has produced a remarkable and diligent piece of work in a very short period of time and we wish to thank and congratulate him for that. This report is being printed as a document, but it can also be downloaded from our website. I commend it is an important text for “change makers” anxious to accelerate policy initiatives that can make a real difference in this increasingly unstable world.

Herbert Girardet  
Director of Research  
World Future Council Initiative  
15<sup>th</sup> May 2006

# The Montreal Protocol

## Introduction

The Montreal Protocol has been hailed by Kofi Annan, Secretary General of the United Nations, as “perhaps the single most successful international agreement to date”. It is evidence of the capabilities of a combined will to identify and deal with a problem that is global in magnitude and reach. It demonstrates that when faced with a common threat, nations around the world can come together to successfully design and implement legislation that is timely, flexible and effective.

The issue of the hole in the ozone layer did take some time to filter through to the general global consciousness, particularly in view of its complicated, scientific nature, but once accepted and understood as scientific fact, action was taken.

The key issue was the phasing out and substitution of a group of harmful substances. This was not new to the international community, following such cases as DDT and asbestos, and did not require enormous capital investment or social and infrastructural change to address, as many of our greatest environmental challenges do.

It has proven that international cooperation over a shared problem can achieve concrete results, and it has set a precedent that may be referred to when considering the vast array of social and environmental issues yet to be comprehensively tackled.

## Background

Chlorofluorocarbons (CFCs) are non-toxic, non-flammable chemicals containing atoms of carbon, chlorine, and fluorine. They are used in the manufacture of aerosol sprays, blowing agents for foams and packing materials, as solvents, and as refrigerants. CFCs are classified as halocarbons, a class of compounds that contain atoms of carbon and halogen atoms.

Refrigerators in the late 1800s and early 1900s used the toxic gases ammonia, methyl chloride and sulfur dioxide as refrigerants. After a series of fatal accidents in the 1920s when methyl chloride leaked out of refrigerators, a search for a less toxic replacement began as a collaborative effort by three American corporations - Frigidaire, General Motors, and Du Pont. CFCs were first synthesized in 1928 by Thomas Midgley, Jr. of General Motors, as safer chemicals for refrigerators used in large commercial applications. Frigidaire was issued the first patent on December 31, 1928.

In 1930, General Motors and Du Pont formed the Kinetic Chemical Company to produce Freon (a Du Pont tradename for CFCs) in large quantities. Because of the CFC safety record for non-toxicity, Freon became the preferred coolant in large air-conditioning systems. Public health codes in many American cities were revised to designate Freon as the only coolant that could be used in public buildings. After World War II, CFCs were used as propellants for insect sprays, paints, hair conditioners, and other health care products. During the late 1950s and early 1960s the CFCs made possible an inexpensive solution to the desire for air conditioning in many automobiles, homes, and office buildings. Later, the growth in CFC use took off worldwide with peak annual sales of about \$1 billion and more than one million metric tonnes of CFCs produced.

Whereas CFCs are safe to use in most applications and are inert in the lower atmosphere, they do undergo significant reaction in the upper atmosphere or stratosphere. In 1974, two University of California chemists, Professor F. Sherwood Rowland and Dr. Mario Molina, showed that the CFCs could be a major source of inorganic chlorine in the stratosphere following their photolytic decomposition by UV radiation. In addition, some of the released chlorine would become active in destroying ozone in the stratosphere. Ozone is a trace gas located primarily in the stratosphere. Ozone absorbs harmful ultraviolet radiation in the wavelengths between 280 and 320 nm of the UV-B band which can cause skin cancer as well as biological damage in plants and animals. A loss of stratospheric ozone results in more harmful UV-B radiation reaching the Earth's surface.

After publishing their pivotal paper in June 1974, Rowland and Molina testified at a hearing before the U.S. House of Representatives in December, 1974. As a result, significant funding was made available to study various aspects of the problem and to confirm the initial

findings. In 1976 the U.S. National Academy of Sciences (NAS) released a report that confirmed the scientific credibility of the ozone depletion hypothesis.<sup>1</sup>

A large springtime depletion of stratospheric ozone was getting worse each year. This ozone loss was described in 1985 by British researcher Joe Farman and his colleagues. It was called the Antarctic Ozone Hole. This was different from ozone loss in the mid latitudes. The loss was greater over the Antarctic than the mid latitudes because of many factors: the unusually cold temperatures of the region, the dynamic isolation of the hole, and the synergistic reactions of chlorine and bromine. Ozone loss is also enhanced in polar regions as a result of reactions involving polar stratospheric clouds and in mid-latitudes following volcanic eruptions. Since the discovery of ozone holes became irrefutable after 1985, the need to control CFCs became increasingly urgent.<sup>2</sup>

## Policy development

In 1985 the Vienna Convention established mechanisms for international co-operation in research into the ozone layer and the effects of ozone depleting chemicals (ODCs). On the basis of the Vienna Convention, the Montreal Protocol on Substances that Deplete the Ozone Layer was negotiated and signed by 24 countries and by the European Economic Community in September 1987. The Protocol called for the Parties to phase down the use of CFCs, halons and other man-made ODCs.

After a series of rigorous meetings and negotiations, the protocol was finally agreed upon on 16 September 1987 at the Headquarters of the International Civil Aviation Organization in Montreal. The Montreal Protocol stipulated that the production and consumption of compounds that deplete ozone in the stratosphere - CFCs, halons, carbon tetrachloride, and methyl chloroform - was to be phased out by 2000 (2005 for methyl chloroform).<sup>3</sup>

The treaty is structured around several groups of halogenated hydrocarbons that have been shown to play a role in ozone depletion. For each group, the treaty provides a timetable on which the production of those substances must be phased out and eventually eliminated.<sup>4</sup>

**CFC Phase-out Schedules: Allowed Production and Consumption for Developed Countries**  
(percent of baseline)

	1987 Original Montreal Protocol	1990 London Montreal Protocol	1992 Copenhagen Montreal Protocol	1990 U.S. Clean Air Act Amendments	1994 European Community Schedule
1990	100%				
1991	100%	100%		85%	
1992	100%	100%		80%	
1993	80%	80%		75%	50%
1994	80%	80%	25%	25%	15%
1995	80%	50%	25%	25%	0%
1996	80%	50%	0%	0%	
1997	80%	15%			
1998	80%	15%			
1999	50%	15%			
2000	50%	0%			

Source: [http://www.afeas.org/montreal\\_protocol.html](http://www.afeas.org/montreal_protocol.html)

There are a few exceptions for 'essential uses', where no acceptable substitutes have been found (for example, in the metered dose inhalers commonly used to treat asthma and other respiratory problems).<sup>5</sup>

## **Enforcement**

The Montreal Protocol is one of the first international environmental agreements that includes trade sanctions to achieve the stated goals of a treaty. It also offers major incentives for non-signatory nations to sign the agreement. The treaty negotiators justified the sanctions because depletion of the ozone layer is an environmental problem that is most effectively addressed on the global level. Furthermore, without the trade sanctions, there would be economic incentives for non-signatories to increase production, damaging the competitiveness of the industries in the signatory nations as well as decreasing the search for less damaging CFC alternatives.<sup>6</sup>

## **Developing Countries**

In order to deal with the special difficulties experienced by developing countries, it was agreed that they would be given an extended period of grace, on condition that their use of CFCs did not grow significantly. China and India, for example, are strongly increasing the use of air conditioning and other cooling devices. Using CFC compounds in these devices would be cheaper than using replacement compounds harmless to ozone. An international fund was therefore established to help these countries introduce new and more environmentally friendly technologies and chemicals. The depletion of the ozone layer is a worldwide problem that does not respect the frontiers between different countries. It can only be affected by determined international co-operation.<sup>7</sup>

The Multilateral Fund for the Implementation of the Montreal Protocol provides funds to help developing countries to phase out the use of ODCs. The fund was the first financial mechanism to be created under an international treaty. It embodies the principle agreed at the United Nations Conference on Environment and Development in 1992 that countries have a common but differentiated responsibility to protect and manage the global commons.

The Fund is replenished on a three-year basis by the donors. Pledges amount to \$2.1 billion over the period 1991 to 2005. Funds are used, for example, to finance the conversion of existing manufacturing processes, train personnel, pay royalties and patent rights on new technologies, and establish national Ozone Offices.<sup>8</sup>

In China, one of the few countries still using CFCs, the government has recently pledged to alter policy on CFC exports, restricting them only to manufacturers, and forbidding exports from brokers and traders. This is due to the exposure of illegal CFC exports from the country.<sup>9</sup> Monitoring and enforcement is essential for the maintenance and success of this kind of phasing out policy.

## **Outcomes**

Until about a decade ago, the lack of knowledge about atmospheric chemistry and processes led to a significant depletion of stratospheric ozone levels by ODCs. Moreover, by enhancing the process of climate change they disturb food chains and so have an effect on agriculture, fisheries and biological diversity. Without the Montreal Protocol, the levels of ozone-depleting substances would have been five times higher than they are today, and surface ultraviolet-B radiation levels would have doubled at mid-latitudes in the northern hemisphere. On current estimates the CFC concentration in the ozone layer is expected to decline to pre-1980 levels by 2050.

Since the Montreal Protocol came into effect, the atmospheric concentrations of the most important CFCs and related chlorinated hydrocarbons have either levelled off or decreased. Halon concentrations have continued to increase, as the halons presently stored in fire extinguishers are released, but their rate of increase has slowed and their abundances are expected to begin to decline by about 2020. While there have been reports of attempts by individuals to circumvent the ban, e.g. by smuggling CFCs from undeveloped to developed nations, the overall level of compliance has been high. This explains why the Montreal Protocol is widely regarded as the most successful international environmental agreement to date.<sup>10</sup>

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- <sup>1</sup> Wikipedia, *Montreal Protocol*, [http://en.wikipedia.org/wiki/Montreal\\_Protocol](http://en.wikipedia.org/wiki/Montreal_Protocol). Viewed 25 February.
- <sup>2</sup> NOAA.gov, *Chlorofluorocarbons (CFCs)*, [www.cmdl.noaa.gov/noah/publicctn/elkins/cfcs.html](http://www.cmdl.noaa.gov/noah/publicctn/elkins/cfcs.html). Viewed 26 February 2006.
- <sup>3</sup> The Ozone Hole, *The Montreal Protocol on Substances that Deplete the Ozone Layer*, [www.theozonehole.com/montreal.htm](http://www.theozonehole.com/montreal.htm). Viewed 25 February 2006.
- <sup>4</sup> Wikipedia.
- <sup>5</sup> Ibid.
- <sup>6</sup> The Ozone Hole.
- <sup>7</sup> Atmosphere, Climate and Environment Information Programme, *Montreal Protocol*, [www.ace.mmu.ac.uk/eae/Ozone\\_Depletion/Older/Montreal\\_Protocol.html](http://www.ace.mmu.ac.uk/eae/Ozone_Depletion/Older/Montreal_Protocol.html). Viewed 26 February 2006.
- <sup>8</sup> Ibid.
- <sup>9</sup> Environmental Investigation Agency, 16 January 2006, *China's Export Policy for Ozone Depleting Substances to be Changed After EIA Report Reveals Rampant Smuggling in the Country*. [www.oneworld.net/external/?url=http%3A%2F%2Fwww.eia-international.org%2Fcgi%2Fnews%2Fnews.cgi%3Ft%3Dtemplate%26a%3D288](http://www.oneworld.net/external/?url=http%3A%2F%2Fwww.eia-international.org%2Fcgi%2Fnews%2Fnews.cgi%3Ft%3Dtemplate%26a%3D288)
- <sup>10</sup> United Nations Industrial Development Organisation, *Service Module 7: Montreal Protocol – Overview*, [www.unido.org/doc/5072](http://www.unido.org/doc/5072). Viewed 26 February 2006.

# Danish Wind Cooperatives

## Introduction

Denmark is considered to be the world's leader in Wind Energy technology. In terms of installed capacity (3.1GW in 2004<sup>1</sup>), reduction of CO<sub>2</sub> emissions (5.2m tonnes<sup>2</sup>), percentage of national energy supply (>20%), hardware exports (40% of world market share in 2004), jobs in the sector (20,000) and contribution to GDP (€3 billion), the figures are impressive.<sup>3</sup>

This world-beating situation arose largely through the efforts of the wind cooperatives or guilds, which helped shift policy to aid investment and growth in the sector. An account of the development of the wind industry in Denmark may be useful, because it demonstrates, among other things, what committed public action can achieve for renewable energy. In addition, the policies that have supported and grown out of this development will be outlined.

## Background

The generation of electricity from wind turbines in Denmark has its roots in the work of several pioneering designers and supporters, notably Christian Riisager in the 1970s and Poul la Cour in the 1890s. After a slow start, the technology improved greatly over time, dramatically bringing down costs and raising efficiency.

In 1971 Denmark became the first country in the world to establish a ministry for the environment,<sup>4</sup> which aided the receptiveness of government to renewable options. Later, their decision to avoid the nuclear route further supported the renewable energy sector. The wind industry expanded after the oil crisis, despite being slowed for a period after the initial effects diminished and cheap oil, gas and coal were again the fuels of choice.

In this situation, the Danish wind cooperatives, backed by the national regulatory framework which grew up alongside them, were a tremendous boost to the wind industry. The Danish proclivity towards cooperatives, seeded by the 19<sup>th</sup> century Danish theologian N.F.S. Gruntvig, has also underpinned the success of the industry.

## Birth of the wind co-operatives

Following the 1973 energy crisis, Christian Riisager, a carpenter from west Jutland, developed a 22 kW turbine, which was adopted by a number of idealistic visionaries. In 1978, twelve owners of Riisager's turbines formed themselves into the Association of Wind Turbine Owners, the Danske Vindkraftvaerker (DV), to advance their mutual interests and to spread information about wind energy.<sup>5</sup> This group grew to incorporate not just individuals, but NGOs, wind associations, consultants and local administration, helping to generate more knowledge and experience. Due to the mistrust and resistance they had met at first, it was not by chance that DV chose the 4th of May as the day of foundation, as it was on the 4th of May 1945 that Denmark was liberated from German occupation.<sup>6</sup>

In the 1970s the Lauritsens, a pioneering couple, encouraged another two neighbouring families to co-operatively buy a turbine to supply their own energy, and sell the surplus back to the grid. Their 55 kW turbine cost the families £12,000 each to purchase, but the electric utility refused to buy their electricity. A two-year legal battle resulted in an agreement that the co-operative would be paid 85% of the price of electricity for their power, and that they would buy the power they needed back from the grid at the full price, with the other 15% covering the cost of distribution. As soon as the agreement had been made, the Lauritsens were inundated with requests to help in setting up similar co-operatives. A total of 377 wind turbines were erected in 1979-1980, and co-ops proliferated.<sup>7</sup>

Asbjørn Bjerre of DV says cooperative wind development is a natural outgrowth of Danish cultural and agricultural interests. "The objective of the Folketing [the Danish Parliament], in providing incentives for wind cooperatives, was to encourage individual action toward meeting Danish energy and environmental policy." Through this program, nearly any Danish household could effectively generate its own electricity without necessarily putting the wind turbine in their backyard. The concept spread to Germany and the Netherlands, and is also alive in the US.

These cooperatives were actually assembled as limited liability companies, or investment co-ops, due to issues with Danish law and tax policy. Danish law did, however, provide for mutual ownership of wind turbines (fællesmølle) by exempting owners from taxes on the portion of the wind generation that offset a household's domestic electricity consumption.<sup>8</sup>

## **The market grows**

This burgeoning market in wind turbines was appealing to potential manufacturers, and in 1980-81 several major companies took up their industrial production. From there, wind turbine manufacturing developed to become a fully-fledged industry during the 1980s. Accelerating this process was the fast-growing Californian market, where Danish manufacturers had acquired a 50% market share by 1986.<sup>9</sup>

At this time, competition between the manufacturing companies led to rapid development of the technology. The size of the wind turbines grew steadily, decreasing the relative production costs, and the costs per kWh. Also, the manufacturers gained more knowledge about the dynamics related to the impacts from wind and other climate factors in the landscape. The turbines thereby became more reliable, efficient and also quieter.<sup>10</sup>

In the late 1970s, when the development started, the only limitation was that all members of the guild should live within the same electricity supply area, or no more than 3 km from the turbine. This was termed 'the criterion of residence'. The idea was that those bearing any inconvenience from the turbines should be the ones to profit from them.

Much has changed in the last 30 years. By 2000 wind energy had become a massive global market and more and more turbines started to be erected offshore. In 2003, 492 MW out of the 530 MW of offshore wind turbines produced worldwide were of Danish origin. The largest offshore wind farm in the world was at Nysted, a joint Danish-Swedish venture built near Lolland, with 72 turbines and a total capacity of 166 MW. Annual production from this is around 595 million kWh, the equivalent to the electricity consumption of 145,000 Danish homes, which could save the emission of 500,000 tonnes of CO<sub>2</sub>.<sup>11</sup>

## **Policy development**

DV's key legislative successes brought wind energy into the mainstream, starting with the 1978 ruling setting the agreement on 'net metering', which enabled wind turbine owners to sell their energy into the grid. There have also been changes in the laws which allow owners to live further away from the wind turbines and to have shares in a wind turbine corresponding to 30,000 kWh, which have enabled city dwellers to become members of the guilds.<sup>12</sup>

In 1980, the Social Democratic government offered a 30% subsidy for new wind energy installations. In the mid-1980s, the criterion of residence rule was adapted so that guild members could live within the same borough + 10 km (There are from 3-4 to 15-20 boroughs in an area of electricity supply). At the same time a consumption criterion was introduced. All guild members could only have shares in the wind turbine production corresponding to his own consumption + 35%; however, always with a minimum of 6,000 kWh. This was introduced after pressure from the power utilities, which wanted to prevent individual, often well-off people, from buying big wind turbines and becoming private electricity producers.<sup>13</sup>

The favourable purchase terms which DV negotiated have been critical to the success of the wind turbine guilds. After 1984, wind turbine producers were given a subsidy of 1.5p for every kilowatt-hour supplied to the grid, which brought the effective sale price of wind energy to 6.5p per kWh, allowing a 15% return on capital invested, which opened the floodgates for many new investors.<sup>14</sup>

In 1985, responding to public pressure, the Folketing vowed not to build any nuclear reactors. The following year, this decision was cemented by the meltdown at Chernobyl.

In 1988, a newly elected Liberal-Conservative government cut the pre-existing wind subsidy in half. However, the return on investment in wind energy continued at 15-25% because of three key aspects of the Social Democratic policy for community-owned wind energy: the right to connect to the electrical grid, a legal obligation for electrical utilities to purchase wind energy and a guaranteed fair price.

In addition to the many political problems which the guilds faced, some electric utility companies charged unreasonable amounts for connecting the turbines to their grids, and found ways to cut the payments they should have been making to the guilds for their energy.<sup>15</sup> In 1992, a new breakdown in the negotiations between DV and the utilities led to the introduction of the Wind Turbine Law, which ordered the utilities alone to pay for the strengthening of the high voltage grid, and to pay 50% of the consumer's price for electricity from wind turbines. In addition, the utilities were obliged not just to deliver electricity, but to receive electricity generated by alternative producers such as wind turbines.<sup>16</sup>

Under this law, the criterion of consumption was also extended so that you could subscribe for electricity from a turbine corresponding to your own consumption + 50% and always 9,000 kWh, irrespective of consumption.

In November 1996 new rules came into force, which meant that every person was allowed to have shares in a wind turbine corresponding to 30,000 kWh, and that there would be some slackening in the criterion of residence. The result was that a person, who works in a firm or owns a house or real estate in a borough, has a right to take part in a wind turbine project there, even if they live elsewhere.<sup>17</sup>

In 1993, the Social Democrats were again elected, and this is considered the golden age for wind energy in Denmark, with production more than tripling from 1,200 to 4,100 GWh. This of course followed the Rio Earth Summit the previous year.

However, when the Liberal-Conservative coalition government was re-elected in 2001, they pulled the plug on wind energy by saying that it had to stand on its own in the market.<sup>18</sup> The effects won't set in fully until 2010, when current fixed-price contracts for wind power expire and turbine owners are then exposed to the free market.<sup>19</sup>

At present, there is a system of subsidy reduction in place, wherein age and year of connection to the grid are the major factors on what will be paid, with newer turbines receiving less money.<sup>20</sup>

## **Cooperative successes**

Danish wind turbine cooperatives have had a profound effect on the development of wind energy. Until 1995, most wind turbines in Denmark were installed cooperatively. About 5% of the population now own a stake in a windmill guild.<sup>21</sup>

The success of Danish coops and risk-taking farmers can best be seen in the township of Sydthy in northwest Jutland where winds sweeping from the North Sea across the great Limfjord produce 130% of the electricity consumed by the township's 12,000 inhabitants. The area's wind turbines, all cooperatively or individually owned by local residents, are net exporters of wind energy. During blustery spring months, the turbines produce three to four times the amount of electricity consumed locally.<sup>22</sup>

Despite changes in Danish policy toward renewable energy, cooperative action remains an important avenue toward local ownership. Half of the twenty 2MW turbines installed just offshore from Copenhagen, at the Middelgrunden wind farm, were developed cooperatively. The remaining ten turbines are owned by the municipal utility. Organizers believe the project would not have been built without the public support engendered by local ownership. Despite numerous obstacles, the cooperative sold 40,500 shares for €570 each, a price set as low as possible to enable broad participation. All together, 8,500 investors bought shares.<sup>23</sup>

DV's strengths have been the persistence of its members, the flow of quality information about wind power, and the support of the 'Green Majority' (left wing socialists and centre parties) in the Danish Parliament, which has persistently supported the growth of the wind turbine industry. This support came because of concerns about the environment and the impacts of global climate change, and the realization that wind energy had good prospects for job creation and exports, earning valuable foreign exchange for Denmark.<sup>24</sup>

By September 1999, DV had 12,000 personal members and 67,000 members through the guilds, who jointly owned 3,200 wind turbines. Half of DV's turbines are owned by the guilds, and half by individual owners. Supported by a strong domestic market, Danish manufacturers sold 1,216 MW of capacity in 1998, a 26% increase over 1997. In 1998, 55% of all wind turbines operating globally had their origin in Denmark. The country's goal is to produce 50% of its electricity by wind by 2030. Encouraged by this progress, the Danish Parliament has voted to reduce Denmark's CO<sub>2</sub> emissions by 20% by 2005 (compared to

1988), four times more than is required by the Kyoto treaty agreement, which calls for an average 5.2% reduction by 2010 - 2012.<sup>25</sup>

## Outcomes

Wind energy offers citizens the opportunity to build, own, operate and profit from their own renewable source of electricity, and hence it can provide communities with a more secure energy supply.<sup>26</sup> Most of the employment created by the Danish wind industry is primarily situated in sparsely populated areas of the country, contributing importantly to the welfare of some rural economies.<sup>27</sup>

The wind industry has succeeded in no small part due to public support. According to public opinion polls, 86% of Danes support wind energy when compared with existing fuel sources. The polls also show that direct involvement of the general public in wind farm projects has helped to increase local approval.<sup>28</sup>

The industry also benefits from the proximity and close cooperation with world-class researchers. Danish research institutions established the Danish Research Consortium for Wind Energy in 2002. The consortium comprises approximately 150 researchers working with meteorology, fatigue loads, aero- and structural dynamics, grid interaction and so on. The research and business sectors have cooperated closely for 25 years creating an unrivalled cluster of knowledge. Integrating still larger amounts of wind energy in the grid is a major future challenge. Danish system operators are becoming experts in handling very high wind penetration levels. The proportion is 100% in West Denmark on windy days with low consumption. In cooperation with Danish researchers, system operators are developing flexible system solutions that will make wind power even more attractive.<sup>29</sup>

Wind turbines cause virtually no emissions during their operation. The EU Commission's ExternE Research Project calculates that wind power has the lowest external costs of all energy technologies – 0.1 eurocent/kWh compared to 4 and 7 eurocent/kWh for coal and brown coal in Denmark. Denmark's use of clean wind energy is saving our atmosphere from about 5.2 million tonnes of CO<sub>2</sub>, and saving the Danish economy a bill of some 2.3 million tonnes of coal worth more than €100 million.<sup>30</sup>

Utility companies have discovered that wind is a safe investment. The fuel used in wind power production is free, whereas fossil fuel prices are increasingly volatile. Over the last 25 years, the cost of producing one kWh from wind has been reduced by 80%, and cost reductions continue.<sup>31</sup> Wind turbines on very good sites can already compete with new coal or gas-fired power plants. Estimations show that wind turbines can compete on market terms in 7-10 years.<sup>32</sup>

In terms of job creation, the wind industry in Europe as a whole can look forward to huge growth, as a result of pioneering efforts to establish the sector, and also the opportunities created by the Kyoto protocol and the European Emissions Trading System. Job numbers could rise to 200,000 people employed directly in the sector by 2020.<sup>33</sup>

## Conclusion

Wind power has clearly had enormously beneficial effects in Denmark, in social, economic and environmental terms. Fossil fuels, although they have afforded humanity the opportunity for great technological advancement, have had their time. The costs are now outweighing the benefits greatly, resulting in not just environmental degradation and climate change, but contributing to fresh religious and international rifts through direct conflict over resources.

From Denmark, wind power is now spreading across the planet, with enabling legislation in countries like Germany, Spain, Britain and India causing the rapid spread of this technology. Turbines are becoming ever larger, with 3-megawatt machines now becoming the norm. In countries like Britain, where popular resistance against the cluttering of rural landscapes is a major concern, the development of offshore wind farms is an obvious choice.

Renewable energy is not subject to such deadly squabbling. It is very unlikely that there will ever be a war over energy from wind, water or sun, and Denmark has instead shown people coming together over energy issues, replying intelligently to the demands of the age and setting an example to the rest of the world.

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- <sup>1</sup> New Zealand Wind Industry Association, *Global wind turbine total installed capacity per capita by country at end of 2004*, [www.windenergy.org.nz/FAQ/globaltotalpercap.htm](http://www.windenergy.org.nz/FAQ/globaltotalpercap.htm). Viewed 13 March 2006.
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- <sup>3</sup> Ibid.
- <sup>4</sup> [www.denmark.dk](http://www.denmark.dk), *Nature & Environment*, [http://denmark.dk/portal/page?\\_pageid=374,520337&\\_dad=portal&\\_schema=PORTAL](http://denmark.dk/portal/page?_pageid=374,520337&_dad=portal&_schema=PORTAL). Viewed 11 March 2006.
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- <sup>6</sup> Tranaes, F., *Danish Wind Power*, p.2.
- <sup>7</sup> Dauncey.
- <sup>8</sup> Energicenter Danmark, 2001, *Wind Energy in Denmark*, [www.opet.dk/windsector/wind-intro.html](http://www.opet.dk/windsector/wind-intro.html). Viewed 11 March 2006.
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- <sup>10</sup> Energicenter Danmark.
- <sup>11</sup> Akselsson.
- <sup>12</sup> Dauncey.
- <sup>13</sup> Tranaes, p6.
- <sup>14</sup> Dauncey.
- <sup>15</sup> Ibid.
- <sup>16</sup> Ibid.
- <sup>17</sup> Tranaes, p.7.
- <sup>18</sup> Christianson, R., *Danish Wind Co-ops Can Show Us the Way*, [www.wind-works.org/articles/Russ%20Christianson%20NOW%20Article%201.pdf](http://www.wind-works.org/articles/Russ%20Christianson%20NOW%20Article%201.pdf). Viewed 12 March 2006.
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- <sup>23</sup> Ibid.
- <sup>24</sup> Dauncey.
- <sup>25</sup> Ibid.
- <sup>26</sup> Gipe, P., 2004, *Community Wind: The Third Way*, Ontario Sustainable Energy Association, [www.ontario-sea.org/CommunityWind/CommunityWind.html](http://www.ontario-sea.org/CommunityWind/CommunityWind.html). Viewed 11 March 2006.
- <sup>27</sup> Akselsson.
- <sup>28</sup> Ibid.
- <sup>29</sup> Danish Wind Industry Association, 2004, *Denmark – Wind Power Hub*, [www.windpower.org/media\(207,1033\)/wind\\_power\\_hub\\_pamphlet.pdf](http://www.windpower.org/media(207,1033)/wind_power_hub_pamphlet.pdf). Viewed 11 March 2006.
- <sup>30</sup> Akselsson.
- <sup>31</sup> DWIA.
- <sup>32</sup> Ibid.
- <sup>33</sup> TVLink.org, 2006, *Windpower Gale Force 25*, [www.tvlink.org/vnr.cfm?vidID=134](http://www.tvlink.org/vnr.cfm?vidID=134). Viewed 12 March 2006.

# German Renewable Energy Law

## Introduction

The United States was the first country to enact a national feed-in law in 1978,<sup>1</sup> but probably the world's most successful renewable energy policy has been the German adoption and development of the feed-in law in 2000, which was revised in 2004. It has created a booming internal and external market, for wind and solar technology in particular, and has simultaneously helped Germany towards meeting its carbon reduction targets. This type of legislation has now spread to 16 of the 25 EU Member States, and almost 40 countries worldwide.<sup>2</sup> China is the latest country to adopt its own version of feed-in legislation in January 2006. Wherever it has been applied, this timely, creative legislation has triggered incredible growth in the renewable energy sector, and represents a milestone in both environmental and economic policy. This text discusses how the legislation works in theory and in practice.

## Feed-in Law

A feed-in law is a legal obligation on utilities to purchase electricity from renewable sources<sup>3</sup> at a preferential purchase price. Producers of renewable energy are guaranteed the sales price and the market through an obligation from utility companies to purchase the green electricity on an annual fixed-rate basis.<sup>4</sup> The price paid is subject to periodic adjustments by regulators. The price and the duration of the contract is set at levels that maintain confidence, allowing investors to help grow the sector in a low-risk environment.

## Germany's EEG legislation

Germany's Renewable Energy Law (EEG) was adopted by the social democrat/green government of Chancellor Schroeder in April 2000. It applied to power generated from wind, solar, or geothermal sources, as well as from hydro, landfill, sewage or mine gas plants. In 2004 biomass energy was added to the portfolio for installations.

The aims of the EEG were to facilitate a doubling of renewable energy's 1997 share in the power generation fuel mix by 2010, to a minimum of 12.5%. Its remuneration system is not based on average utility revenue per kWh sold, but rather on a fixed, regressive feed-in tariff. Grid operators are obligated to purchase power from local producers; a nation-wide equalization scheme has been implemented to reduce the cost differentials paid by grid operators in different parts of the country for the purchase of renewably-generated electricity.<sup>5</sup> Under the EEG, energy from renewable sources commands premium prices, but the additional costs are not covered through taxation but are included in household electricity bills. The total costs are currently estimated to cost only about €1 per month per household.

The EEG obliges grid operators to buy electricity from renewable generators in accordance with specified feed-in tariffs. For solar PV, each year the price paid for electricity from new installations is reduced by 5%, giving solar manufacturers a strong incentive to reduce prices as the size of their market expands and cost reductions in PV technology are achieved. But since the premium prices are guaranteed for 20 years, the confidence of investors is assured.<sup>6</sup>

In Germany the amount of energy from renewables is distributed equally among all electricity suppliers via a flexible quota system, according to the total amount of electricity supplied to customers. The tariffs are set for each individual technology, based on their actual generation cost:

- Hydro, landfill gas, mine gas or sewage gas - at least 6,65€-cent/kWh.
- Biomass - from 8,70 €-cent/kWh to 10,23 €-cent/kWh, depending on the capacity, with a degression of 1% for new installations starting in 2002.

- Geothermal energy – from 7,16 €-cent/kWh up to 8,95 €-cent/kWh.
- Wind - 9,10 €-cent/kWh for at least the first 5 years of operation. Thereafter, the rate is reduced depending on the quality of the site down to 6,19 €-cent/kWh. These rates are subject to a degression of 1,5 % for new installations (starting in 2002).
- Solar energy is 50,62 €-cent/kWh, with a degression of 5% for new installations starting in 2002.

Every two years the German parliament re-evaluates the law on the basis of a report which is prepared by the Ministries of Economics and Technology, in close consultation with the ministries of Environment and Agriculture.<sup>7</sup>

In no other field is the introduction of a pricing regime at the expense of polluters more legitimate and more justifiable than in the field of energy supply because of the ecological damage associated with conventional electricity generation. The legislation provides for consistent and equal burden sharing among all power suppliers. This is in keeping with the 'polluter pays' principle established in environmental protection.<sup>8</sup>

### **Related energy policies**

A 1997 Directive on Renewable Energy Sources adopted by the European Union, which applies to all EU countries, has also contributed to the growth of renewable energy by aiming to boost the renewable share of the electricity generating fuel mix to 22% by 2010. Similarly, the EU's ratification of the Kyoto Protocol has given all EU member states additional legal incentives to reduce their domestic greenhouse gas emissions through the use of renewable energy.

In Germany renewable energy technologies are part of a broader long-term strategy to reduce greenhouse gas emissions and other environmental impacts of energy use, to curtail dependence on the oil and gas imports that now satisfy some 62% of German energy demand, and to contribute to German economic growth via high technology exports.<sup>9</sup>

The election of Germany's Red-Green coalition government in 1998 brought with it additional policies and legislation promoting renewable energy. For example, the 1999 Ecological Tax Reform (ETR) initially increased the taxes on motor fuels, fuel oils, and natural gas, and also levied an electricity tax across all sectors. These taxes have been increased in subsequent years. The ETR has helped to increase the use of biofuels, which are exempt from taxation under the law, but has had a neutral effect on wind, solar, and other sources of renewable electricity, since all electricity providers are subject to the ETR power levy.

Incentives for combined heat and power generation were introduced, as were increasingly stringent regulations on the energy performance of buildings. The German government has also been working to secure the participation of German industry in climate change mitigation efforts. For example, in 1996, after three years of intensive negotiations, the government reached agreement with industry regarding voluntary emissions reduction commitments.

In 1999 the coalition government also introduced the 100,000 Solar Roofs Program (HTDP). This aimed to increase solar PV electricity generation by subsidizing the installation of new solar panels with capacity of 3kWp or higher. With a €510m grant, HTDP helped installed PV capacity to grow from 50 MW in 1998 to 350 MW in 2003. The programme was expected to generate €1.3 billion in private investment, and also served a key industrial policy goal. HTDP was designed to enhance the competitiveness of German PV manufacturers and place them at the leading edge of a burgeoning global solar market.

A further key driver behind this aggressive policy direction has been the nuclear phase-out law, which was passed by both the Bundestag and the Bundesrat and signed by President Rau on April 26, 2002. This committed Germany to replacing nuclear power's contribution of 30% of its energy production in the medium term.

## Outcomes

These laws, in particular the EEG, have achieved the successes that any nation would ideally aim for in a policy, in terms of environmental, social and economic gains. In particular, they have provided a sensible instrument to force growth of renewables, which, by 2003 saw a 98.7% increase in energy production from sources including hydro, geothermal, solar, wind, combustible renewables and waste.<sup>10</sup>

As stated above, Germany's renewable electricity targets are 12.5% by 2010 and 20% by 2020. But it also aims to achieve a 10% contribution of renewables to *primary* energy by 2010: this includes heat and transport fuels as well as electricity. Germany's Kyoto target is for a 21% cut in greenhouse gas emissions: by 2004, it had reached 19%.<sup>11</sup>

Though the feed-in law was vigorously protested by electric utilities, and has seen revisions over the years, it has successfully launched the largest wind power programme worldwide, and Germany is now one of the largest solar markets as well. A sizable wind and solar manufacturing base has also developed in the country.<sup>12</sup>

The EEG has been essential in further boosting the viability, and hence value, of the renewable energy industry in Germany. In 2003, German manufacturers and suppliers achieved total profits of around €3.8 billion. This was more than half of the global turnover for the wind industry.<sup>13</sup> In 2004, the photovoltaic industry achieved an annual turnover of €1.5 billion.<sup>14</sup> The renewables industry in general has seen major growth, with 450,000 jobs being created,<sup>15</sup> and CO<sub>2</sub> emissions totalling 70 million tonnes were saved in 2004.<sup>16</sup>

One of the greatest measures of success, however, is the reproduction of these approaches around the world, in effect exporting the same benefits nationally, regionally and globally. In order to further optimise feed-in systems, the Feed-In Cooperation, initiated by Spain and Germany at the Renewables 2004 conference in Bonn, was initiated. The goals include promoting experience exchange between countries with feed-in systems and supporting other countries in the introduction and improvement of such systems.<sup>17</sup>

It must be borne in mind, however, that despite the substantial growth in renewable energy production, it has not kept pace with a 6% increase in Germany's total electricity consumption since 1993. Thus, the substantial increases in renewable energy use have not reduced conventional electricity demand.<sup>18</sup> This is the challenge of the age for policy makers - to create integrated policies which combine instruments that result in increased energy efficiency, reduced emissions of greenhouse gases, and increased support for further development of the renewables sector.

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<sup>1</sup> REN21, Global Status Report, [www.ren21.net/globalstatusreport/gsr4b.asp](http://www.ren21.net/globalstatusreport/gsr4b.asp), viewed 7 February 2006.

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<sup>3</sup> EEA, [http://glossary.eea.eu.int/EEAGlossary/F/feed-in\\_law](http://glossary.eea.eu.int/EEAGlossary/F/feed-in_law), viewed 6 February 2006.

<sup>4</sup> Boyle, G, Out with Nuclear, in *with Renewables: Germany Leads the Way*, Resurgence, 2005.

<sup>5</sup> JGCRI, *Renewable Energy Policy in Germany: An Overview and Assessment*, [www.globalchange.umd.edu/?energytrends&page=germany](http://www.globalchange.umd.edu/?energytrends&page=germany), viewed 6 February 2006.

<sup>6</sup> Boyle.

<sup>7</sup> International Energy Agency, *Global Renewable Energies and Policies Database*, [www.iea.org/textbase/pamsdb/detail.aspx?mode=gr&id=31](http://www.iea.org/textbase/pamsdb/detail.aspx?mode=gr&id=31), viewed 7 Feb 2006.

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<sup>9</sup> Wisner, R, *Renewable Energy Policy Options for China: A Comparison of Renewable Portfolio Standards, Feed-in Tariffs and Tendering Policies*, Wisner Consulting, 2002.

<sup>10</sup> OECD, *Energy Balances of OECD Countries, 2002-2003*, IEA/OECD, Paris, 2005.

<sup>11</sup> Boyle.

<sup>12</sup> Wisner.

<sup>13</sup> Renewables-made-in-Germany.com, *The German Wind Energy Industry*, [www.renewables-made-in-germany.com/index.cfm?cid=1461](http://www.renewables-made-in-germany.com/index.cfm?cid=1461), viewed 8 February 2006.

<sup>14</sup> Renewables-made-in-Germany.com, *The German Photovoltaic Industry*, [www.renewables-made-in-germany.com/index.cfm?cid=1437](http://www.renewables-made-in-germany.com/index.cfm?cid=1437), viewed 8 February 2006.

<sup>15</sup> Oyuela, R E, quoted in Rolling Stone, *The Elder Statesman*, [www.rollingstone.com/politics/story/8742365/the\\_elder\\_statesman/](http://www.rollingstone.com/politics/story/8742365/the_elder_statesman/), viewed 4 February 2006.

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<sup>16</sup> Mez, L, *Directions of European and German Energy Policy*, [www.ine-isd.org.pl/rozne/subsydia11.pdf](http://www.ine-isd.org.pl/rozne/subsydia11.pdf), viewed 3 February.

<sup>17</sup> Klug.

<sup>18</sup> JGCRI.

# Solar Thermal Ordinance - Barcelona

## Introduction

In response to the passing of the age of cheap oil, renewable energy would seem to be the only sustainable and safe path for us to follow towards meeting our energy needs. Certain nations and municipalities are taking a pioneering attitude to this issue, and introducing policies that not only save CO<sub>2</sub> emissions as well as money over time, but also boost domestic industry and create jobs, thereby contributing to GDP, the favoured indicator of traditional economists.

In Barcelona, a by-law was introduced in 2000 that has successfully achieved all of the above, so much so that it has been replicated across Spain, and is likely to be copied far and wide, especially in those regions which receive high levels of solar insolation (the total energy per unit area received from the sun). It demonstrates a bold yet rational attitude to the natural renewable energy endowment of an area.

For all that, it may well be just the start of a solar revolution across the nation, with policy makers drawing on this successful formula for inspiration in designing even broader plans for a country wealthy in solar energy. This would complement their similarly proactive attitude towards biomass and hydropower, as well as wind power, the uptake of which is also growing rapidly.

## Background

The statistics related to Barcelona's receipt of solar energy quickly illuminate why it is essential to harness it. The city enjoys around 2,350<sup>1</sup> - 2,475<sup>2</sup> hours of sunshine per year, and a solar radiation equivalent of 15 MJ/ m<sup>2</sup> per day or 1,521 kWh/ m<sup>2</sup> per year. It means that the surface of the Barcelona municipality receives from the sun 542.43 PJ per year or 150.67 TWh of energy per year. This energy is equivalent to 11 times the energy consumption of the city and 28 times the electricity consumption.

The starting point for the Barcelona Solar Ordinance was in September 1995, when the Berlin Parliament authorised the Senate by an almost unanimous vote to enact an ordinance on the use of solar energy. The Berlin Solar Collector Ordinance Draft was presented at the 4th European Conference on Architecture in March 1996, after detailed discussions within the administration and following a public hearing.<sup>3</sup>

After a first draft in 1998, then further redrafting, the Ordinance was approved in 1999, entering into force in August 2000 after a one-year moratorium to allow builders time to adjust.<sup>4</sup> The stated aim was to regulate, through local legislation, the implementation of low-temperature systems for collecting and using active solar energy for the production of hot water for buildings.<sup>5</sup>

## The Ordinance

The Barcelona Solar Thermal Ordinance, or 'Ordenanza Solar', represents a major milestone in urban energy policy. The ordinance requires all new buildings above a certain size category (292 MJ per day hot water energy consumption) to provide at least 60% of their domestic hot water energy demand from solar thermal collectors. Swimming pool heating must be 100% solar. Buildings undergoing major refurbishment are also included. The size category means that in general, all commercial buildings and residential buildings of 16 or more households are subject to the ordinance.

There was no specific project budget for the ordinance as it involved the approval of a legal text. The funds for Barcelona's Plan for Energy Improvement are negotiated each year. The plan is financed mainly from public administration funds.<sup>6</sup>

The policy is part of a broader energy improvement plan to the year 2010 for renewable energy and energy efficiency, which includes management instruments, legal frameworks, education, and information and communication. City subsidies are available for solar hot water systems (SHW) for new buildings below the size requirement for compulsory

installation. There have also been solar PV demonstration projects as part of this plan, including solar PV installations at city schools.<sup>7</sup>

The project tries to promote a spirit of co-operation between all sectors of society with the ultimate aim of demonstrating the concept of the sustainable city. At first the decision to impose the ordinance provoked substantial comment from all professionals involved. This was addressed through a series of meetings. An inquiry revealed that 80% of the inhabitants of Barcelona are willing to pay 10% more for renewable energy. After the acceptance of the Solar Bylaw, visits by citizens to the local Renewable Energy Information centre doubled.

In order to promote the ordinance and its acceptance, the City of Barcelona implemented a broad communications programme. It published an explanatory guide to the ordinance in several languages, held periodic round tables and meetings with stakeholders (contractors' associations, engineers, architects, environmental organizations, neighbourhood associations, citizens), promoted the ordinance in neighbouring cities, implemented demonstration projects (such as solar thermal installations at swimming pools), and organized a 'Solar Day' in Barcelona.<sup>8</sup>

Now, a campaign is organised to replicate the project, this time aimed at involving all municipalities of the Catalan region and supported by the Regional Government. For successful implementation of the campaign it was necessary first to define the local characteristics as housing typologies, energy consumption, solar radiation, legal framework, defining costs, estimated production and savings. After this, answers were sought as to how to provide the necessary complementary services: e.g., suppliers, installers, training promoters, architects, installers, municipal technicians. Finally, appropriate financial schemes like conventional and green bank loans, leasing and so on had to be found. All these data were gathered to create a campaign proposal for municipalities and regional governments.

A rapidly growing number of other municipalities approved a solar ordinance based on that of Barcelona, adapting it to their own characteristics. Also a number of other parties including UNESCO became involved in this initiative.<sup>9</sup>

## **Enforcement**

In practice, adherence to the ordinance is confirmed from the building design at the time a construction permit is approved. Building inspectors are then responsible for ensuring that actual performance meets the 60% criteria. Thus the ordinance is subject to the normal problems of building inspection, including tampering with the equipment (for example, there have been stories of SHW installations being removed after inspection for use elsewhere). But, according to the Barcelona Energy Agency, adherence to the ordinance appears to be satisfactory.<sup>10</sup> Any infringements are met with fines, and building work can be halted until compliance is achieved.<sup>11</sup>

## **Other Countries**

Israel appears to be the only country with a national-level policy mandating solar hot water in new construction. Since 1980, most buildings in Israel have been required to have solar hot water collectors. The technical requirements vary by size and type of building.<sup>12</sup>

Many countries now provide capital grants, rebates, or investment tax credits for solar hot water/heating investments, including Australia, Austria, Belgium, some Canadian provinces, China, Cyprus, Finland, France, Germany, Greece, Hungary, Japan, the Netherlands, New Zealand, Portugal, Spain, Sweden, the United Kingdom, many U.S. states, and the U.S. federal government. Capital grants are typically 20–40% of system cost. Investment tax credits may allow deduction of all or part of the investment cost from tax liability. Italy's renewable energy certificates also apply to solar hot water, so-called 'white certificates.'<sup>13</sup>

More than one-half million solar hot water systems have been installed in the United States, mostly on single-family homes. The majority of these systems are used to heat swimming pools. In September 2000, California introduced a bill that provided funding for solar water heating systems as well as distributed generation systems. The Solar and Distributed Generation Grant Program is being administered by the California Energy Commission. The Program has funded up to \$750 per solar water heating system.<sup>14</sup>

## Outcomes

After the Barcelona bylaw became active in August 2000, within one year the total amount of square meters of solar thermal applications quadrupled. This equates to savings of around 3000 tonnes of CO<sub>2</sub>. Over five km<sup>2</sup> of Mediterranean forest would require one year to convert this amount of carbon dioxide into oxygen.<sup>15</sup> Another interesting outcome has been that houses equipped with solar thermal appliances became relatively more valuable.<sup>16</sup>

Before the ordinance, Barcelona had 1,650m<sup>2</sup> of solar thermal collectors installed, or 1.1m<sup>2</sup> per 1000 people. By October 2004, after four years with the ordinance, Barcelona had 21,500 m<sup>2</sup> installed, or 16.5m<sup>2</sup> per 1000 people, an increase of 1,400%. But these levels are still well below SHW penetration in some of the leading European countries like Greece and Austria, which have 200-300m<sup>2</sup> per1000 people. As the building stock is added, this indicator should rise substantially in Barcelona, as 41% of all new buildings now include SHW. The city's objective is 96,000m<sup>2</sup> of SHW by 2010.<sup>17</sup>

By December 2004, 327 projects of buildings affected by the rules were processed, with a total of 24,531 m<sup>2</sup> of new solar heat-capture surface in the city, producing estimated annual energy savings of 19,625 MWh. In comparative terms, the energy production in the form of hot water of the 19,625 MWh p.a. saved by the application of the Ordinance is equivalent to the consumption of a town with a population of some 37,560 inhabitants during one year.

Other Spanish cities with solar ordinance (April 2004)	
City	Date of Approval
Barcelona	July 1999
Sant Joan Despí	November 1999
Montcada i Reixac	October 2000
Esplugues de Llobregat	November 2001
Terrassa	February 2002
Cardedeu	June 2002
Sevilla	June 2002
Pamplona	October 2002
Sant Cugat del Vallés	November 2002
L'Hospitalet del Llobregat	April 2003
Sabadell	January 2003
Madrid	November 2003

Source: Pujol, [http://www.energie-cites.org/documents/martigny/pujol\\_gt2.pdf](http://www.energie-cites.org/documents/martigny/pujol_gt2.pdf)

Following Barcelona's lead, other cities and towns in Spain adopted solar thermal ordinances. The strong interest by municipalities prompted the Spanish Institute for Energy Diversification and Saving (IDAE) in 2003 to elaborate a solar ordinance template, largely based on Barcelona's solar ordinance, which could be used by cities and towns as a basis for their own such rules. By November 2004, 34 municipalities and one region had adopted solar ordinances, with additional ordinances in the pipeline for 10 more regions (out of a total of 17). Results have been significant. For example, Pamplona's solar ordinance, which entered into force in mid-2004, caused a 50% increase in solar thermal collectors in one year. A nationwide solar ordinance was under consideration and expected to be enacted in 2005.<sup>18</sup>

Building on the success of the ordinance, a new renewable energy plan was drawn up. The goals of Barcelona City Council's Plan for Energy Improvement in Barcelona (2002-2010) are to increase the use of renewable energy (especially solar energy), reduce the use of non-renewable energy sources, and lower the emissions produced by energy consumption in order to meet Barcelona City Council's international climate protection commitments.

This integrated plan includes a quantification of the energy used and emissions produced in the city and provides scope for municipal action to promote an environmentally sustainable city, reducing air pollution and the consumption of fossil fuels in the process.

Specifically, by 2010 Barcelona aims to: reduce CO<sub>2</sub> emissions by 20% compared to 1999 levels; maximize the use of the city's renewable energy sources (up to 188,848,440 kilowatt hours/year of renewable energy, which represents 1.1% of the city's total energy consumption); emit less than 3.15 tonnes of equivalent CO<sub>2</sub> (eCO<sub>2</sub>) per capita.

In the future, the ordinance needs greater public and professional awareness, quality verifications to ensure adequate technical performance of installed systems, architectural integration, and product certification (which is properly the responsibility of the national government, requiring the integration of local and national policy-making). One problem so far has been a lack of qualified contractors. Other problems have occurred where buildings have limited roof space or are not south facing, but such issues can be addressed in the future. Future revisions might address space heating as well, as the current ordinance only covers hot water.<sup>19</sup>

## Conclusion

Overall, the ordinance has shown that an enlightened attitude towards the natural renewable energy resources of a region can achieve the goals of sustainable development, if approached in the right way.

The inclusivity and open nature of the programme has allowed public and commercial involvement, and kept communication flowing between parties. Stakeholders can make or break a policy, and respecting the voices of all concerned, as well as keeping them informed, can yield the success that both society and the environment demand.

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<sup>1</sup> Puig, J, *The Barcelona Solar Ordinance*, [www.eurosolar.org/solarzeitalter/solarzeit\\_3\\_01-3.html](http://www.eurosolar.org/solarzeitalter/solarzeit_3_01-3.html). Viewed 1 March 2006.

<sup>2</sup> Pujol, T, April 2004, *The Barcelona Solar Thermal Ordinance: evaluation and results*, Barcelona Energy Agency, [www.energie-cites.org/documents/martigny/pujol\\_gt2.pdf](http://www.energie-cites.org/documents/martigny/pujol_gt2.pdf). Viewed 1 March 2006.

<sup>3</sup> Puig.

<sup>4</sup> Renewable Energy Policy Network for the 21<sup>st</sup> Century (REN21), *Global Status Report: Policy Landscape / Solar Hot Water/Heating Promotion Policies*, [www.ren21.net/globalstatusreport/gsr4c.asp](http://www.ren21.net/globalstatusreport/gsr4c.asp). Viewed 1 March 2006.

<sup>5</sup> ICLEI, *City of Barcelona, Spain*, [www.iclei.org/index.php?id=1156](http://www.iclei.org/index.php?id=1156). Viewed 1 March 2006.

<sup>6</sup> Ibid.

<sup>7</sup> Martinot, E, Page updated 2004, *Solar City Case Study: Barcelona, Spain*, Renewable Energy Information, [www.martinot.info/solarcities/barcelona.htm](http://www.martinot.info/solarcities/barcelona.htm). Viewed 1 March 2006.

<sup>8</sup> ICLEI.

<sup>9</sup> SolTherm Europe, *The Solar Bylaw: A success story from Barcelona, Spain*, [www.soltherm.org/solarordinance.htm](http://www.soltherm.org/solarordinance.htm). Viewed 1 March 2006.

<sup>10</sup> REN21.

<sup>11</sup> United Nations International Sustainable Energy Organisation (UNISEO), *Barcelona Ordinance on Application of Solar Thermal Energy Systems into Buildings*.

<sup>12</sup> REN21.

<sup>13</sup> Ibid.

<sup>14</sup> California Energy Commission, *Solar Hot Water Systems*, [www.consumerenergycenter.org/renewable/basics/solarthermal/water.html](http://www.consumerenergycenter.org/renewable/basics/solarthermal/water.html). Viewed 3 March 2006.

<sup>15</sup> Barcelona Energy Agency, *Monitoring of the Solar Thermal Ordinance*, [www.barcelonaenergia.com/eng/observatory/ost/ost.htm](http://www.barcelonaenergia.com/eng/observatory/ost/ost.htm). Viewed 1 March 2006.

<sup>16</sup> SolTherm.

<sup>17</sup> REN21.

<sup>18</sup> REN21.

<sup>19</sup> Ibid.

# Congestion Charging

## Introduction

One of the most pressing socio-environmental issues of our time is traffic congestion. Unpredictable journey times, pollution, environmental damage, property damage, lost time, lost money, stress, noise and higher CO<sub>2</sub> emissions are some of the major problems arising. Although it is still widely quoted as costing Britain £20 million per year, that figure could be as high as £30 million by 2010.<sup>1</sup>

While Britain is often referred to as having the worst traffic congestion in Europe, it is by no means the only country suffering from gridlock. The Texas Transportation Institute estimated that congestion 'wasted' \$67.5 billion dollars in seventy-five metropolitan areas during 2000 due to fuel consumption and lost time.<sup>2</sup> In OECD countries alone, the cost of gridlock to national productivity equals nearly three percent of GDP, or about \$810 billion. In Asia, the situation is even worse. In Korea, for example, the cost of congestion is now about 4.4% of GDP.<sup>3</sup>

Despite the major problems that occur as a result of motorway congestion around the world, it is in our cities in particular that congestion is most intense and costly. As the Director General of the 1992 Rio Earth Summit, Maurice Strong stated: "The battle to ensure that our planet remains a hospitable and sustainable home for the human species will be won or lost in the major urban areas".<sup>4</sup>

While the problems increase, some solutions have been forthcoming. What began over thirty years ago in Asia as a low-tech fix for congestion has now been reinvented in several other cities globally, with a generally high level of success and acceptance. Congestion charging has been spreading across continents as a means to reduce pollution, journey times and parking space requirements, while increasing revenue for investment in other projects such as sustainable transport schemes. This paper will look at the pioneer scheme in Singapore, its descendents, and other innovations in urban traffic measures.

## Singapore

Singaporeans were the pioneers of the congestion charge/ area scheme, also referred to as a zone, ring, or toll cordon. In 1975, Singapore introduced a scheme that levied a charge for the right to enter a six sq km (2.3 sq mile) restricted zone (RZ) covering the city's busiest central area during morning peak hours - unless the vehicle had four or more occupants.

The system was based on a paper license displayed on the windscreen that drivers could buy for S\$3 (about US\$1) a day or S\$60 (about US\$20) per month. Observers at 22 roads leading into the central area enforced the scheme by noting the plate numbers of violators. The Singapore scheme reduced total peak period traffic by 45% and the number of cars by 70%. Average speeds in the charging zone increased from 18 kph to 35 kph (11 mph to 21 mph). The scheme well exceeded its initial goal of a 25-30 % reduction in traffic.

In April 1998, Singapore converted its pricing to a per-trip or pay-as-you-use arrangement, with a gantry-based electronic setup, called an Electronic Road Pricing (ERP) system. It also began tolling major expressways with the Road Pricing Scheme (RPS). In September 1999, ERP was extended to arterial roads beyond the RZ.<sup>5</sup>

The scheme uses a short-range radio communication system to deduct ERP charges from CashCards, which are inserted in the In-vehicle Units (IUs) before each journey. To discourage motorists from speeding up or slowing down to avoid higher charges, the Land Transport Authority (LTA) has made ERP changes more gradual in the immediate run up to a time/charge change point. The LTA reviews the traffic conditions on the expressways and roads, where the ERP system is in operation, on a quarterly basis and during the June and December school holidays.

All of the city's tolls are highest in peak hours and lower or not in force off-peak. Charges are based on usage, so those who contribute more to the congestion pay more. Those who use the roads less frequently or who travel during non-ERP hours will pay less or not need to pay at all.<sup>6</sup>

Graduated ERP rates have been introduced for the first five minutes of the time slot with a higher rate. If the next period has a lower ERP rate, the new rate is introduced for the

last five minutes. This applies to cases where the change in the rate is at least \$0.50, depending on vehicle type. For car drivers, the graduated ERP rate applies where the change in rate is at least \$1. Because the graduated rate is introduced in the more expensive band, it means overall lower ERP charges for motorists.<sup>7</sup>

The electronic system's managers have become quite innovative in adjusting toll rates and relativities - as frequently as three times per month. They now have a punitively high toll for only about 30 minutes each day. What started as a somewhat crude idea to simply reduce traffic has been turned into a sophisticated system that manages traffic for optimum results.<sup>8</sup>

The stated aims of the scheme are: Through a pay-as you-use system, to optimise road usage by making motorists more aware of the true cost of making a journey by car; to encourage use of public transport or car pooling; to encourage use of alternative routes and times of travel; to provide a smoother ride with more assured journey times for drivers who choose to pay the charge.<sup>9</sup>

### **Outcomes**

There has been a reduction of nearly 25,000 cars during peak times and an increase in average traffic speed of approximately 20%. Traffic in the zone reduced by 13% during charging periods. Total vehicles using the roads in the RZ has reduced from 270,000 to approximately 235,000. Car pooling has increased and fewer solo motorists drove in the RZ. Many vehicle trips have shifted from peak to non-peak times. ERP has been effective in maintaining a speed range of 45 to 65 km/h for expressways and 20 to 30 km/h for major roads.<sup>10</sup> Since the introduction of the scheme in 1975, traffic levels have fallen by nearly half. The Singapore scheme also demonstrates that improvements in technology can allow more accurate pricing. The next generation of road pricing will use global positioning satellites. Cars fitted with on-board receivers can easily be charged via digitised onboard maps according to time, place and distance.<sup>11</sup>

### **Norway**

In Norway, road users are charged whenever they enter the city - a 'cordon' system. The purpose is to raise revenue to finance environmental and traffic-management improvements.

Trondheim is the third largest city in Norway, with a population of 140,000. Its city centre is approximately 1.5 km<sup>2</sup>. As 50% of the traffic in the city used to be 'through traffic', the tolls were initially introduced to fund the building of new ring roads so that the heaviest traffic would not have to pass through the city centre. Motorists are charged entering the city between 06:00 and 18:00 on regular working days. No tolls are charged when leaving the city. A fully automatic 'toll ring' was introduced in 1991 and subsequently divided into sectors. Toll rings were established earlier in Oslo and Bergen, but Trondheim's was the world's first toll ring with automated toll collection, using 'electronic tags' (transponders). About 90% of vehicles entering the city during rush hour use the tag.

The use of the electronic tag is strongly encouraged: it is available free and there is a discount for using it. There are 20 charging points around Trondheim. Charges apply only Monday to Friday (06:00-18:00) for all inbound zone border crossings. Unmanned electronic toll booths deduct a fee from a windscreen-mounted unit each time a vehicle enters the toll zone or passes a toll point within the zone. Limits are imposed on the number of charges that can be made so that people living near the ring, or those who have to make frequent crossings, do not have large bills.

Occasional users can pay by automatic coin machine or by a 'swipe card' at barrier lanes. Toll prices go up during peak rush hours and there are two charging periods with differing rates: 06:00-22:00 and 10:00-18:00. Heavy goods vehicles pay a double toll. Payment is made by a deposit on account or by automatic bank account withdrawals.

### **Outcomes**

Peak rush hour traffic has dipped by more than 10%. Some 60% of the planned transport and environmental improvements are locally financed through the road user charging, and the rest is financed by the state. Toll revenues have paid to improve roads and

build bypasses to cut traffic congestion. Income is also being used to give commuters other options by upgrading public transit, building bicycle paths and walkways, and even providing 200 free bicycles for use downtown.

It is estimated that the annual management cost of the Trondheim toll ring would be two and a half to three times larger if all toll collection was done manually. Public opinion was initially opposed at 72%, dropped to 48% two months after launch and reduced to 36% by 1996.<sup>12</sup>

## **United Kingdom**

In the UK during the 1990s, field trials were carried out with a view to charging tolls on motorways - creating a revenue stream that would allow the subsequent sale of the roads to private management companies. The Labour government elected in 1997 scrapped this policy, but instead shifted its focus towards road pricing in cities, where the worst congestion problems were thought to lie.

A number of UK cities, including Durham, Edinburgh, Durham, Leeds, Leicester, Nottingham, Cambridge and Bristol looked carefully at congestion pricing and in some cases conducted trials of electronic tolls linked to identifiers attached to car windows.

In London, there was surprise when the newly-elected Mayor, Ken Livingstone announced his intention to introduce congestion charging in the central area by 2003. A prominent left-winger, he was regarded as an unlikely advocate of pricing, but his view was that all Londoners would benefit by lower pollution levels (there would be fewer cars on the road, moving at more optimal, lower-polluting speeds), while more smoothly-flowing traffic would make bus journeys more predictable and thus encourage more people to use the buses.

## **Outcomes**

Despite initial widespread opposition to the London scheme, traffic levels have been cut significantly in the charging zone, which is to be expanded to the west of the city in 2007. One year after the charge was introduced, there were reductions in the zone of: 18% in traffic entering between 7am and 6.30pm; 30% in traffic delays and 10% in vans and lorries. There were increases of: 20% in pedal and cycle movements; 10-15% in powered two-wheel movements and 20% in taxi, bus and coach movements. The price has now risen from the initial £5 a day to £8, with a £10 charge envisaged in the near future. The revenue, of about £250 million each year, by law goes back into road upgrades and public-transport improvements.<sup>13</sup>

## **Melbourne**

The 22 km City Link Toll Road is a privately-operated, electronic toll road in the heart of Australia's second city that fully opened in 2000. It links major routes between Melbourne Airport, the port and industrial centres in the south-east.

Since its introduction, use has grown steadily to 650,000 customer accounts plus a million infrequent users (as of June 2003). These numbers are expected to grow. Transaction volumes for City Link for the year to 30 June were up 6.8%, and toll revenue was up 12%, compared with 2002 (one transaction is passage through any toll zone). Use by the freight industry has been particularly heavy.

The stated aims of the scheme were to improve: traffic movement around the central administrative district (CAD); vehicle access to the CAD and many facilities within inner-city Melbourne; access for freight movements for manufacturing industry and primary producers to the port, rail facilities and the airport; the environment in adjacent areas.

City Toll operates a fully electronic, cashless tolling system without toll stations or barriers. The system allows motorists to travel the entire route without stopping or slowing to pay tolls. Pre-paid e-tags fixed to the windscreen are read from overhead gantries. Toll statements are mailed quarterly and accounts must be topped up when balance falls below a certain level. It uses automatic vehicle identification technology (similar to London). Drivers without e-tags who fail to pay by noon next day have their registration number sent to the traffic camera office with a digital image of the vehicle. Offenders are fined a flat fee of \$100. 99.9% of vehicles are captured electronically.

## Outcomes

Congestion has been reduced in north and west Melbourne; pollution has been cut and safer conditions obtain on local streets. In 2001, a Royal Automobile Club of Victoria (RACV) study reported major improvements to journey times across the road network served by the City link Toll Road. Reduced journey times were calculated to save a typical commuter (10 peak period trips a week) between 2.8 and 3.25 litres of fuel a week. 89% of motorists surveyed said that City Link saved them time and 86% indicated that the toll road made getting around the city easier.<sup>14</sup>

## Stockholm

Congestion charging to cut traffic and pollution has this year come into effect in the Swedish capital, Stockholm. For a seven-month trial period, drivers entering or exiting the city during the daytime will be charged between 10 (\$1.30) and 20 kronor each time. The toll will remain in place until 31 July. City residents will then decide in a 17 September referendum whether to keep the charge.

Traffic appeared to be running smoothly on the first day of the scheme, with the city government saying traffic was down 16% within a week. One of the most forceful backers of the scheme is the Green Party, which insisted on its introduction in exchange for supporting the minority Social Democrat government. Critics say it is too expensive and that low-income commuters from the suburbs will be hardest hit.

Taxis, motorcycles, private cars run on environmentally friendly fuels, and cars with foreign or diplomatic license plates are exempt from the charge, which will come into effect on weekdays between 06:30 and 18:29. Drivers will pay up to 20 kronor each time they enter or exit the city, depending on the time of day, with a maximum daily charge of 60 kronor. The revenue is also earmarked for investment in public transport. Extra buses and subway trains have been put in service to cope with the expected additional demand.

The aim is to reduce traffic by 10-15% in the city, which stretches across 14 islands. Despite having only 760,000 inhabitants, Stockholm regularly falls prey to large traffic jams - an estimated half a million cars are thought to take to the roads every day.<sup>15</sup>

## The Four Stages of Road User Pricing

Road user charging developments can be categorized in several distinct stages and according to different principles:

- The corridor approach. Traditional revenue-generating single road toll schemes were first used in Roman times and, until relatively recently, have remained the main form of road charging. Today's electronic tolling technologies allow conventional toll roads and new HOT (high-occupancy tolling) lanes to play a broader role in congestion management.
- The area scheme. Typically applied to urban congestion charging schemes, this refers to charging users to drive in an area that has a closely integrated road system.
- National and transnational systems. Here, the charged area extends to a wider road network, rather than just an individual zone. To date, nearly all of the road user pricing schemes that have reached this stage involve heavy goods vehicles (trucks) and vary from major highways to the inclusion of all roads. Austria, France, Germany, Switzerland, and the United Kingdom all have or plan to have road user pricing nationwide for trucks.
- Integration. This will be a future stage in which customers make informed choices at every step of the journey across transport modes. The road user charge is meant to provide an incentive for the customer to make the most efficient transport choice. Advanced transportation technologies play an important role in making this stage possible.<sup>16</sup>

## Conclusion

It is clear that congestion charging schemes have been broadly successful in their aims, and have, for the most part, found acceptance over time, despite initial fears of change and expense. The more adaptable the scheme is, the more successful it has become. It appears that flexible, reactive pricing is key to making the system work for all, balancing usage with pricing.

The basic principle that arose in Singapore over three decades ago has now spread and begun to gather some momentum, as cities across the world face up to the harsh realities imposed by their ever-growing national fleet. Road building capacity is limited by competition over land for housing, commerce and industry in Europe especially, and with a booming global population, land for roads is also competing with the remaining fertile agricultural land.

Decisions must be made over land-use priorities. We have a finite space for agriculture, commerce, real estate, roads, leisure and so on. Creating schemes which address this issue by introducing financial incentives or disincentives has so far proven to be the only way of achieving concrete traffic reductions.

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<sup>1</sup> Goodwin, P. (2004) *The economic costs of road traffic congestion*. Discussion paper. The Rail Freight Group, London, UK, <http://eprints.ucl.ac.uk/archive/00001259/>. Viewed 28 February 2006.

<sup>2</sup> Downs, A, 2004, *Still Stuck in Traffic - Coping with Peak-Hour Traffic Congestion*, Brookings Institution Press. Introduction: [www.brook.edu/press/books/chapter\\_1/stillstuckintraffic.pdf](http://www.brook.edu/press/books/chapter_1/stillstuckintraffic.pdf). Viewed 28 February 2006.

<sup>3</sup> Deloitte Consulting, 2003, *Combating Gridlock – how pricing road use can ease congestion*, [www.deloitte.com/dtt/cda/doc/content/DTT\\_DR\\_Gridlock\\_110303.pdf](http://www.deloitte.com/dtt/cda/doc/content/DTT_DR_Gridlock_110303.pdf). Viewed 25 February 2006.

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<sup>5</sup> Land Transport Authority (LTA), Singapore Government, *Electronic Road Pricing*, [www.lta.gov.sg/motoring\\_matters/index\\_motoring\\_erp.htm](http://www.lta.gov.sg/motoring_matters/index_motoring_erp.htm). Viewed 28 February 2006.

<sup>6</sup> Ibid.

<sup>7</sup> Ibid.

<sup>8</sup> Deloitte.

<sup>9</sup> LTA.

<sup>10</sup> Ibid.

<sup>11</sup> Reform, *Singapore Road Pricing*, [www.reform.co.uk/website/reformaroundtheworld/singapore.aspx](http://www.reform.co.uk/website/reformaroundtheworld/singapore.aspx). Viewed 26 February 2006.

<sup>12</sup> Commission for Integrated Transport (CFIT), *Charging schemes around the world*, [www.cfit.gov.uk/congestioncharging/factsheets/world/](http://www.cfit.gov.uk/congestioncharging/factsheets/world/). Viewed 25 February 2006.

<sup>13</sup> Adam Smith Institute, *Charging forward - Traffic congestion pricing in cities*, [www.adamsmith.org/80ideas/idea/3.htm](http://www.adamsmith.org/80ideas/idea/3.htm). Viewed February 25 2006.

<sup>14</sup> CFIT.

<sup>15</sup> BBC Online, *Stockholm*.

<sup>16</sup> Deloitte.

# Urban Transport Solutions – Bogotá’s TransMilenio

## Introduction

Emissions from the transport sector represent the fastest growing source of global greenhouse gas emissions.<sup>1</sup> Developing nations throughout Latin America, Africa and Asia are rapidly adding enormous numbers of vehicles and people to their cities, putting pressure on local and national governments to find sustainable solutions to the needs of urban populations.

While developed nations engage in the transfer of low-carbon technologies to developing countries, in some cases excellent initiatives are flowing in the opposite direction. In Bogotá, Colombia, urban public transport has been revived via the Bus Rapid Transit system (BRT), or TransMilenio, which has circumvented the need for an expensive underground metro system, and could even provide a model for growing cities in the developed world. The need is certainly there; as of 2000, Bogotá, a city of seven million people, was the fifth most polluted city in Latin America, where cars account for 70% of all air pollution: producing 700 tonnes of carbonic gas, 57 tons of hydrocarbons, 24 tons of nitrogen oxide and two tons of sulphuric monoxide every day.<sup>2</sup>

This review will look at the TransMilenio system in Bogotá, the other transport policies that augment it, and its success in reducing pollution and congestion in the city. With 75% of the population residing in cities, Latin America is one of the most urbanised regions of the world, and a study of any successful transport systems there should prove instructive for those facing similar levels of urbanisation in the future.

## Vision for the city

“We want a city with more public space for children than for motor vehicles; a high population density and relatively short travel distances; people in public spaces; autonomy and freedom of movement for the children and the elderly; very low levels of noise and air pollution; small children walking out of home to the safety of pedestrian streets; homes with nearby stores, restaurants, movies and cultural activities; abundant parks, pedestrian streets, wide sidewalks, bicycle paths.”

– The Master Plan for Bogotá

## Background

The story of Bogotá’s TransMilenio begins in many ways with another Latin American city - Curitiba, Brazil. About 40 years ago, the authorities in Curitiba opted for a new master plan for the city. This plan defined five new arterial roads as key routes for the city to grow along, and suggested a BRT system as the chief mode of public transport. New zoning laws ensured that high-density development took place along the main routes, and reduced with distance from them. The BRT system on these main arterial roads was connected to the rest of the urban area by a network of feeder buses. The plan was developed and overseen by architect turned city mayor, Jaime Lerner, who has helped to guide it ever since. Soon after the BRT systems was implemented, bus ridership rose substantially, and pollution and congestion fell.

The system worked well for a number of years, until the city, which now has a population of some 1.8 million, became almost a victim of its own success, with its pedestrian centre, its many green spaces and other liveability factors attracting many more residents. Three major car manufacturers established themselves in the city. Now, Curitiba is once again swamped by private vehicle usage, and needs to find fresh solutions.

In Bogotá, another charismatic mayor took office and set about introducing positive urban transport initiatives. Enrique Peñalosa sought to avoid the huge traffic jams and other attendant problems resulting from overuse of cars in the city centre. Bogotá has seen decades of immigration from the strife-torn countryside, some 140,000 annually, whose growing consumption has contributed to the air pollution that lies on the city, trapped by the surrounding mountains. High levels of crime and corruption have hampered past reform

efforts and rising incomes have led to more cars and more gridlock. About 70,000 new cars join the fleet in this old colonial city each year.<sup>3</sup>

During the 1990s, Bogotá's road maintenance was poor, and a large portion of the city budget was being swallowed up by road widening and flyovers, yet there was no visible improvement in traffic congestion. Bogotá also faced other critical urban problems like high accident rates, high crime rates, increasing slums, poor infrastructure and absence of public spaces. In 1997, Bogotá was overwhelmed by its outstanding transportation problems and its transport budget was only allocated for road expansion and construction of overpasses in a few critical intersections.

After taking office in 1998, Mayor Peñalosa implemented a number of simple measures designed to make living in the city easier. He built new schools, paved roads, ran sewers to poor neighbourhoods, repaired existing parks and created new ones on derelict land, and introduced policies to restrict car use. As the city became easier to navigate, support for his efforts grew. The city built 70 miles of bicycle routes and closed several streets to cars, converting them into pedestrian malls.<sup>4</sup>

The city also restricts car use during rush hour, banning each car in the city from the downtown area two days a week, based on the license plate number. This resulted in 40% of cars being taken off the roads during peak hours on two days a week. The results were dramatic: the average commute time dropped by 21 minutes and pollution was significantly reduced.<sup>5</sup> The daily schedule for this 'Pico y Placa' system applies from 06:00 to 09:00 and from 16:00 to 19:00. A referendum was held in 2000 to ask if people wanted to extend the concept to introduce a complete ban at these times by 2015, and the idea was approved, which will give Bogotá one of the world's first car-free city centres.

## **Bus Rapid Transit**

The city's plan for a mass transit system was inspired by Curitiba, and Peñalosa opted for the cheaper BRT system rather than an underground metro, as it had proven that it could be effective. Most BRT systems today are being delivered in the range of US\$1–15 million/km, depending upon the capacity requirements and complexity of the project. By contrast, elevated rail systems and underground metro systems can cost from US\$50 million to over US\$200 million per kilometre.

The initial \$350 million, 38 kilometre TransMilenio system was operational in less than two years, launching in December 2000. Buses run in dedicated lanes down the centre of the city's main arterial roads, and are able to carry 800,000 people a day at an average speed of 26 kph - considerably outpacing cars and private buses.<sup>6</sup>

BRT essentially emulates the performance and amenity characteristics of a modern rail-based transit system but at a fraction of the cost. To achieve this level of quality, BRT systems tend to focus on an array of features that enable a city to transform a standard bus service into a mass transit system. These features include the following:

- Exclusive right of way lanes.
- Reformed business and institutional structures.
- Rapid boarding and alighting.
- Free transfers between routes.
- Pre-board fare collection and fare verification.
- Enclosed stations that are safe and comfortable.
- Clear route maps, signage and real-time information displays.
- Modal integration at stations and terminals.
- Clean vehicle technologies.
- Excellence in marketing and customer service.<sup>7</sup>

As with the system in Curitiba, private companies run the buses, on both the trunk roads and feeder routes, and are paid per kilometre travelled. Infrastructure facilities like bus lanes, stations and garages are handled by the government, while ticketing and operational activities related to equipment, smart cards, trust funds, buses and employee care are taken care of by the private sector.<sup>8</sup>

In addition, on-street parking has been eliminated from many streets, and is strictly enforced. In many cases, the previous parking bays have been converted into attractive public space, further severing the links between the city centre and car use.<sup>9</sup>

### **Ciclovía and Car-Free Day**

'Ciclovía' is another Bogotá transport policy, which bans all cars from 120 kilometres of the city's main arteries on Sundays and holidays, opening those streets to 2 million cyclists, walkers, and roller-bladers. In addition, the city recently completed a network of 'Ciclo-Rutas', 300 kilometres of bicycle paths, the most extensive dedicated bike path network in the world. The new paths, along with other bike promotion measures, have created a substantial increase in cycling. In 1997 only 0.5% of the population used the bicycle as a means of transportation, today the figure has increased to 5%.<sup>10</sup> The bike paths are also integrated with the TransMilenio, and its main stations have special bike parking facilities.

Bogotá's first Car Free Day was observed on Thursday, February 24, 2000. The whole urban area of 32,000 hectares was restricted to cyclists, pedestrians, rollerbladers and users of public transit. Public pressure, with help from the police, ensured that no cars entered the car-free streets. It moved seven million people by public transit and bicycle. Over 800,000 cars were left at home, and 1.5 million people travelled by bicycle.<sup>11</sup> On this workday 98% of all activities functioned normally. Indeed, many businesses reported increased sales. Due to these visionary efforts, Mayor Peñalosa was awarded the prestigious Stockholm Challenge Prize.<sup>12</sup>

### **Other Cities**

In part due to the influence of Bogotá and Curitiba, new BRT systems are already in operation in Beijing in China, Jakarta in Indonesia, Leon in Mexico, and Seoul in South Korea. Other cities such as Cape Town in South Africa, Dar es Salaam in Tanzania, Hanoi in Vietnam, Lima in Peru, Mexico City in Mexico, and Santiago in Chile, have projects underway. Delhi is also planning a high capacity bus system, bike lanes, and better sidewalks. Delhi has also started to order Tata Prototype low floor, high capacity buses.<sup>13</sup> Visits to Curitiba by US officials have even helped to catalyse a national BRT programme in the USA. However, none of these subsequent projects has reached the same level of quality or ambition as Bogotá or Curitiba. Without the high degree of political will exhibited in Bogotá and Curitiba, full implementation is often lacking. Further, both Bogotá and Curitiba have enjoyed a continuity of transport policy across several political administrations, allowing the project to develop with stability for all parties.<sup>14</sup>

### **Outcomes**

In Bogotá 72% of all trips are made by public transport, and the TransMilenio has reduced local pollution by 40% and road accidents by 93%.<sup>15</sup> As of March 2005, the network features 58 km of busways and 309 km of feeder routes.<sup>16</sup> Recently, the national government has assured US\$990m for the system's construction for the next 14 years.

Estimates have found that the system saves people an average of 300 hours of commuting time annually. Unlike expensive subways or elevated trains, the TransMilenio actually runs at a profit. The city plans to add a number of new lines to the system by 2015, so that 85% of residents will live within 500 meters of a bus station.<sup>17</sup>

Bogotá has placed great emphasis on pedestrian access, comfort and safety, and the streets are reportedly safer now than prior to the transport reforms and the various other policies implemented in Bogotá. Since 1998, crime rates have dropped dramatically. For instance, seven years ago there were 84 homicides per 100,000 people; today the rate has dropped to 30. By comparison, Washington, DC had 52 homicides per 100,000 people in 2002.<sup>18</sup>

The promenade for pedestrians and cyclists has also helped to rejuvenate old and dilapidated areas of the city, as pedestrianised streets are now integrated with the TransMilenio for better transport access. The increase in civic pride and engagement has

had other benefits and side effects. In 2000, seven thousand families paid an additional 10% property tax to be invested in education, public space, bikeways and public transport.<sup>19</sup>

Peñalosa attributes his success in Bogotá to focusing on improving the lot of people, not their cars: “All over the developing world resources are used to help the affluent avoid traffic jams rather than mobilizing the entire population,” he says. When asked why the system is not implemented more commonly, he responds, “... the only issue is a political one. They don’t want to take space from cars and give it to buses, bicyclists, and pedestrians.”<sup>20</sup>

## Conclusion

The degree to which the successes of both Curitiba and Bogotá can be replicated elsewhere is uncertain. Both cities benefited from highly charismatic mayors who made public space and transport a priority. Over 1000 city officials from about 50 countries have visited Bogotá in the past few years to study its transport system and its other liveability attributes.<sup>21</sup>

While congestion charging in cities such as Singapore and London has worked to some degree in reducing congestion, it has yet to produce a significant modal shift to non-motorised transport there, or to deliver the kind of investment in new transit services and options that Bogotá’s TransMilenio provides. Many cities would find difficulties with switching to a new system, particularly those that have already made large capital investments in light rail, metro or other mass-transit schemes. The low cost is one of the greatest appeals of BRT, and it has proven to be effective, particularly in developing countries that seek low-cost options for keeping their cities running efficiently in the face of rapid urbanisation.

While the buses run on fossil fuels, they will still be some way from being truly sustainable, but with improved alternative fuels and technologies emerging, including liquid natural gas, hydrogen fuel cells and hybrid engines, the future certainly has a place for this popular mode of public transport, which has been practically reinvented in Latin America.

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<sup>5</sup> Bogota-dc.com, 2006, *Bogota’s “Pico y Placa”*, [www.bogota-dc.com/trans/bog-tra.htm](http://www.bogota-dc.com/trans/bog-tra.htm). Viewed 24 April.

<sup>6</sup> Runyan.

<sup>7</sup> Wright and Fulton.

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<sup>12</sup> ITDP.

<sup>13</sup> Nair and Kumar.

<sup>14</sup> Wright and Fulton.

<sup>15</sup> UNEP, 2006, *Report card for UNEP - Industry as a partner for sustainable development*, [www.uneptie.org/outreach/csd14/report\\_cards/PDF/Public%20transport%2015%20March%2006.pdf](http://www.uneptie.org/outreach/csd14/report_cards/PDF/Public%20transport%2015%20March%2006.pdf). Viewed 25 April.

<sup>16</sup> Nair and Kumar.

<sup>17</sup> Runyan.

<sup>18</sup> BCC.

<sup>19</sup> Nair and Kumar.

<sup>20</sup> Runyan.

<sup>21</sup> Wright and Fulton.

# Urban Agriculture

## Introduction

Urban agriculture, as the literature will often make clear, has an extremely long history. This is understandable, in that transportation was limited in the past, and the hinterland of an urban area may not have been entirely safe from enemies. Agriculture within the walls or close to the city was safer, and its produce took less time and energy to distribute.

Passing rapidly through time to the modern day, urban agriculture is once again finding favour for a great many reasons. Increasing pressure is being applied to governments to also favour the practice through legislation. Policy can significantly support and enhance the production of food in urban areas.

The lack of a tax on aviation fuel provides another opportunity for commerce to engage in the patently absurd list of practices which have become notorious in recent years. The concept of 'food miles' has certainly swum into public focus, yet the alternatives to engaging in the existing system remain limited.<sup>1</sup> In the US food system in particular, sustainability does not feature significantly. Europe's Common Agricultural Policy, too, as an emphasis on technology-intensive production, which is yet to be effectively reshaped, despite the ongoing CAP reforms.

Nevertheless, organic and fairtrade foods have broken into mainstream consciousness in the north, and farmer's markets are becoming increasingly popular. The EU's four freedoms have allowed tastes to change and develop, and a long list of food scares have brought about a mistrust of food that has resulted in traceability systems and labelling schemes being implemented.

All of this and more could set the stage for a popular return to local food production, contributing to social capital and food security, and putting money into the hands of the urban poor. Urban agriculture means different things in different places, and this paper suggests that its benefits can be huge, not least to the creation of sustainable cities.

## Background

Some of the most advanced ancient civilizations practiced urban agriculture, including the Sumerians in the Middle East, and the Mayans, Incas and Aztecs in Latin America.<sup>2</sup> Medieval Europe saw a high level of urban self-sufficiency as well as the introduction of a variety of new agricultural techniques that contributed to significant population growth. Agricultural patterns changed throughout the medieval period, due to developments such as drainage and reclamation of wetlands, and the establishment of monasteries which formed new agricultural nuclei.<sup>3</sup>

By the time of the industrial revolution, farming practices had changed almost entirely, and the green revolution of the twentieth century distorted the geography of agriculture further. Now, forces of globalisation have taken the distribution of agricultural produce to extremes of distancing, to the point where the energy yield of food is but a fraction of its energy input. Reverting to locally-produced food is key in reducing energy inputs, especially as modern agriculture is so greedy in terms of fossil fuel and water use in particular<sup>4</sup>. The social, environmental and economic gains from UA are proven, and if current trends continue apace, it will by necessity come to the fore in civil practice.

## Definition and Techniques

Definitions of UA are more or less inclusive and broad, but they boil down to: the intensive production of foodstuffs and other consumables from horticulture, aquaculture, fodder, livestock and forestry, located within or on the periphery of an urban area, using resources in a circular fashion. Jacobi et al provide a variety of such definitions.<sup>5</sup>

One example of UA technique in the developed world is the plastic wading pool garden. This has the advantage of being cheap, costing less than \$30 for the pool and the compost. It can be placed on any flat area, such as rooftop areas or vacant lots, is safe from

any local soil contamination in wasteland areas, and prevents soil and water run-off. Feed sacks, oil drums, rubber tyres and so on can also be used for the same purpose.<sup>6</sup> Raised beds are often used in Latin America, edged for example with roof tiles. Further approaches are detailed below.

## **Cuba**

Among the world's top examples of urban agriculture, the city of Havana is often held up as a model of best practice. The collapse of the Soviet bloc after 1989 precipitated a decline in food security through greatly diminished export earnings, already restricted by the US trade embargo. During this 'Special Period' (1990-1994) as it is known,<sup>7</sup> the government proposed that urban agriculture be taken up across the city, and its state-run and private vegetable gardens now provide vegetables and fruit for the city's residents, as well as employment (22,000 jobs in 1999)<sup>8</sup>. In 2002, Cubans produced 3.4 million tons of food from 35,000 hectares of urban land; in Havana, 90% of the city's fresh produce came from local urban farms and gardens.

The Cuban government consider access to food as a basic human right, a fundamental which augments their support of this practice<sup>9</sup> The international recognition of its success has seen Cubans providing advice to other countries and cities, and as a direct result, Caracas, Venezuela is now operating a similar programme.<sup>10</sup>

The urban farms and gardens come in various shapes and sizes. One type is the Organoponico, or intensive vegetable garden, where vegetables and herbs are grown in raised beds. Then there are the smaller plot, patio, and popular gardens, which are managed by a family or group. Factories, offices, and businesses offer a third model of urban gardens - workplace gardens - which grow the food served in company cafeterias, while Havana citizens practice a fourth type of crop cultivation, using mesh tents to shade seeds and vegetables as they grow. Finally, there are suburban farms, which can be public or private; they not only produce food, but also serve a secondary purpose of filling in the empty spaces around the city's periphery, so that the land does not become illegal dumping grounds.<sup>11</sup>

UA in Havana is organised into 13 urban 'farms', which provide support to the different types of farmer groups. Basic Cooperative Production Units, of which 178 have been established since 1994, farm principally sugarcane and raise cattle. Loans and Services Cooperatives are groups of farm owners, many of whom grow flowers. The government has financed intensive farming on poor soils where large quantities of organic matter have been incorporated, including 19 hectares of high-yielding organic horticultural units that produce vegetables, spices and medicinal plants. Many of Havana's state-owned organisations have farms for producing food for their cafeterias with the excess sold to workers to take home. The government has provided seedling production centres, information bureaux and stores to sell seeds, biofertilizers and biopesticides. Cuba is now a recognised world authority on organic pest control. Inspectors enforce the city regulations for organic urban farming and fines are imposed when these regulations are violated.<sup>12</sup>

The country designates large amounts of resources both material and human to the scientific and technical formation of the agricultural sector. In Cuba there exist thirty three agricultural research centres, nineteen of which are directly under the management of the Agriculture Ministry; and eleven of which are based in Havana, forming a body that assists the development and introduction of science in agriculture.<sup>13</sup>

## **China**

The Chinese government aims to protect most of the country's farmland by the twin strategy of amalgamating villages and merging farms. Widely scattered villages are being consolidated into a few large 'urban villages' that are intended to improve rural living standards, and to make the delivery of services to people easier and more convenient. Jiangsu Province alone is consolidating its over 280,000 villages into some 50,000 larger villages, or cities, expecting to gain some 200,000 hectares of farmland in the process.

As the Chinese government sees it, millions of farmers have been living on very small patches of land that are just about sufficient for families to survive on, but too small for modern agricultural production. It claims that the productivity of farming has significantly

increased wherever rapid increases in the use of small tractors and trucks have occurred. But the mechanisation and modernisation of farming have created a huge excess labour force. The national application rate for chemical fertilisers increased from 58.9 kilograms per hectare in 1978 to 213.3 kilograms per hectare in 1993. During the same period average grain yields rose from about 2.5 tonnes per hectare to some 4.1 tonnes per hectare. In 1994 it was estimated that China had a huge surplus of agricultural workers and that by 2000 some 300 million farmers will not be needed in agriculture, equivalent to the entire population of the USA.

Until recently, highly intensive urban cropping systems made many cities in China self-sufficient in food from land areas administered by them. This policy was pursued systematically by Mao Tse Tung and has been modified only to a limited extent since the changes introduced by Dang Tsiao Ping. Despite China's rapid industrial development, food production is being purposefully maintained on peri-urban farmland. In Tianjin 20 per cent of people work in farming, in Shanghai 15 per cent and in Beijing 12 per cent, compared with about 45 per cent who work in industry.

Shanghai is China's most important industrial, commercial and financial centre, a metropolis of some 15 million people. The total land area administered by its authorities extends to 634,050 hectares. About 58 per cent of this land is occupied by the city itself, while 42 per cent, mainly on the periphery, is devoted to intensive agriculture. On 12,700 hectares of peri-urban land, 1.3 million tonnes of vegetables are produced per year, or 4,000 tonnes per day, supplying around 60 per cent of the city's vegetable needs.

Hydroponic (soil-less) vegetable cultivation in greenhouses is strongly supported by the city authorities. But traditional raised-bed cultivation is still predominant, with polythene tunnels much in evidence. The traditional practice of using nightsoil as fertiliser continues to be widely practised. Growers use large earthenware jars to store the nightsoil, which is diluted with water and then ladled onto the crops. However, the apartment blocks now springing up all over China's cities have flush toilets, making the collection and use of nightsoil as fertiliser much more difficult.

Shanghai has entered the fast lane of urbanisation, but the city administration has also realised that that the city will not be able to develop without a reliable local food supply. The city authorities are aiming for a considerable level of agricultural production within the city to assure a stable food supply for the urban population.

Shanghai is one of the world's fastest growing cities, yet half the 630,000 hectares administered by the city authorities has been set aside for urban agriculture. Some 800,000 people work on the city's own peri-urban farmland, producing vegetables, fruit, milk, eggs, chicken, pork, carp and catfish meat. A further two million work the land in the rural areas to the south of the city, with a greater emphasis on growing wheat and rice. The city's policy is to produce around one million tonnes of grain locally, assuring a high degree of self-sufficiency. Many farmers are migrants from rural areas doing jobs in which the people of Shanghai are becoming less keen to engage.

In Beijing there is much the same approach to urban farming as in Shanghai. The city authorities administer large areas of farmland. However, because the winter months are much colder there, farmers use ingenious methods to cope, maintaining cultivation with very little dependence on artificial heat, despite the icy weather that prevails for several months. To keep the heat in their polythene greenhouses at night, they cover them with several layers of bamboo mats.

The growth of Beijing to a city of around 11 million people has swallowed some arable land in recent years, reducing its area from 408,000 to 300,500 hectares between 1991 and 2001. On the other hand, the area under orchards has gone up substantially during this period, from 50,000 to 85,000 hectares. This is because they require less water and fertiliser, making them a highly sustainable system of cultivation.

Throughout China, city authorities are required by the central government to ensure the production of substantial amounts of food from the urban areas they administer. It appears as though this policy is here to stay despite rapid urbanisation. The Chinese authorities are keenly aware of the importance of including agriculture in planning their new cities.<sup>14</sup>

## UA Policies Elsewhere

Various cities have now created policies and systems which support UA. There follow some examples of where this practice has established itself firmly in the urban landscape.

### Vancouver, Canada

Current relevant policies in the city that support urban agriculture include the South East False Creek Official Development Plan and the SEFC policy statement, the Parks Board community garden policy, the Vancouver School Board school garden policy, and the City of Vancouver Food Action Plan. Food Policy supports the City's commitment to sustainability as well. In 2002, the City adopted a formal position, definition and principles on sustainability. Other city-wide initiatives include City Plan (which addresses neighbourhood safety and a healthy environment), Cool Vancouver's commitment to reducing greenhouse gas emissions, and Vancouver's Urban Landscape Taskforce. There are also several by-laws and planning documents that are relevant to urban agriculture.<sup>15</sup>

### Caracas, Venezuela

During the recent period of socio-political and economic change in Venezuela, urban agriculture is one of the many radical revolutionary projects developing across the country. In March 2003, urban agriculture became an official policy of the political process. Urban agriculture is a project that provides pesticide-free and affordable food for people. These projects are run by and for the community and its central locations establish a strong sense of community empowerment and collective efforts. In recent decades, Venezuela has been an oil-dominated economy where 92% of the population live in cities and only 5% of the gross national product comes from agriculture. Thus urban agriculture has become one of the many tools used to combat the extreme urban poverty and dependence on imported foods.

Since the election of Hugo Chavez and the creation of the new constitution, Venezuelans are given a voice in the institutionalization and implementation of policy for the development of their communities, including UA schemes. These projects are possible due to the support of the United Nations Food and Agricultural Organization, technical support from the Cuban government as well as funding by the Venezuelan Ministry of Land and Agriculture. The United Nations contribute to this urban agricultural project by providing experts from other developing countries such as Colombia, Cuba and Senegal. The Cuban government is giving its support by providing technicians who provide expert knowledge on the development of this project. The Venezuelan Ministry of Land and Agriculture launched the project by establishing 4000 micro gardens in Caracas and 20 agricultural cooperatives. The Venezuelan government aspires to supply 20% of the nation's vegetables through urban agricultural collectives.

Community involvement is manifested through direct collective work and as conscious consumers. The participants of these projects grow and maintain the organic micro-gardens and also sell the fresh produce at affordable prices. The community then become conscious shoppers, understanding the importance of purchasing their produce from these collectives, for their own wellbeing as well as for the empowerment of organized communities.<sup>16</sup>

### Rosario, Argentina:

The Urban Agriculture Programme was organized by the municipality of Rosario (run by the socialist party), two NGOs and the Pro-huerta (promotion of market garden) programme of the National Institute of Agricultural Technology (INTA).<sup>17</sup> The programme encompasses over 600 community gardens created on formerly vacant lots, on both public and privately owned land, as well as a distribution and sales network and projects designed to develop related industries.

The community gardens initially created to help confront the effects of the late 2001 economic collapse in Argentina have now become part of the government-run urban agriculture programme, which provides unemployed workers with work and food. Some 7,000 people who were out of work before entering the programme have joined forces to clear

the land, plant and harvest vegetables, and sell their produce in street market stalls. Many of them are also now involved in agricultural development projects aimed at supplying the market with organic produce, grown without chemical fertilisers or pesticides.

One of the key contributions has been the measures implemented by the city government to legalise the use of privately owned land for community gardens. The owners are exempted from paying municipal taxes on the land for two years, the standard time period for which the lots are ceded to the programme. If the owners have accumulated back taxes over the course of many years, they generally find it preferable to renew the contract for a longer period. In the case of public land, which accounts for the largest gardens, they have been pledged to the programme for a period of ten years. Up to 70 people work on each of these government-owned plots of land, which can be as large as five hectares. In the majority of these large gardens, food is produced exclusively for sale. The participants receive monthly training sessions, while technical assistance is provided in the field on a weekly basis.

In addition, the initiative has earned the recognition of the United Nations. In 2004, the U.N. Human Settlements Programme (UN-HABITAT) selected the Rosario Urban Agriculture Programme as one of the 'best practices' worldwide for improving people's living environment, especially among the poorest sectors of the population, while promoting sustainable development. This incentive motivated the Rosario city government to further increase its support for the project, and the local planning department is now involved in the task of identifying available areas in the city and designing new spaces that can be adapted for urban agricultural use. This has led to the emergence of a new kind of public area, known as 'garden parks'.

The Rosario programme is part of a network of cities working to develop urban agriculture. With the support of the Institute for the Promotion of Sustainable Development in Peru and the Resource Centre for Urban Agriculture and Forestry in the Netherlands, its organisers are seeking to promote the initiative as a development strategy that can be implemented in other cities.<sup>18</sup>

## Conclusion

Cuba is a leading example of UA practice, although perhaps an exceptional case. Its well-educated population is not only quick to adopt new techniques, but accepts a level of socialist regulation and control that would be difficult to impose in a less authoritarian regime. Nevertheless, from an almost standing start, its achievements in small-scale urban agriculture are remarkable. How can city authorities working in a less regulated situation achieve better policy-making for land use management? The first necessity is likely to be the setting up a municipal committee that includes representatives from all departments that have an interest in urban agriculture, including health, water supply and economic development. A policy must be developed and offered for public consultation. Plans must be developed to see what spaces may be available for urban agriculture and what type of farming activity would be most appropriate and where. Laws and regulations, especially relating to land tenure, must be drafted, and land taxation - and tax exemption if appropriate - defined. Tariffs must be set for the use of treated wastewater. For the continuing good management of urban agriculture, committees should be established to provide a link between the municipal authorities and users.<sup>19</sup>

UA has different benefits in the developed world, compared to the developing world, although some are shared. For the former, aside from those positive attributes already listed, it can provide a level of preparedness for any interruption to food supply, caused most likely by future oil shortages. The skills of self-reliance that wartime and baby boomer generations in the west took for granted are dwindling in younger generations as the separation from the land extends in time and space. Gardening, while still culturally embedded in some countries, is less popular in others, and gardens compete for space with roads and housing.

Agricultural policy in the EU is veering away from industrial-scale production, and toward land stewardship, further affecting our capacity to feed ourselves. Britain and Portugal are not food secure at this time, a matter that will require serious consideration from both governments in the future. UA, in the face of increasing urbanisation across the continent and the rest of the world, should be examined by governments for a variety of reasons. As

carbon emissions targets begin to bite and many governments face failure to achieve them, food miles are increasingly seen as a major contributor to the problem.

The 2005 DEFRA report on the validity of food miles as an indicator of sustainability, found the following for the UK: Food transport accounts for 25% of all HGV vehicle kilometres in the UK; food transport produced 19 million tonnes of CO<sub>2</sub> in 2002, of which 10 million tonnes were emitted in the UK (almost all from road transport), representing 1.8% of the total annual UK CO<sub>2</sub> emissions, and 8.7% of the total emissions of the UK road sector. Transport of food by air has the highest CO<sub>2</sub> emissions per tonne, and is the fastest growing mode. Although air freight of food accounts for only 1% of food tonne kilometres and 0.1% of vehicle kilometres, it produces 11% of the food transport CO<sub>2</sub> equivalent emissions. The direct environmental, social and economic costs of food transport are over £9 billion each year, and are dominated by congestion.<sup>20</sup>

The same forces that make UA such an attractive option for sustainable cities may also compel consumers to save energy by moving down the food chain.<sup>21</sup> Meat production is very energy-intensive, and as with high-food-mile vegetables, the energy content is a fraction of that which it took to produce. In any part of the world, local food, produced without chemical inputs, can be a win-win-win proposition when supported by local government, and urban agriculture is one of the best examples of this.

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<sup>2</sup> Girardet, H, 2004, *Cities People Planet*, Wiley and Sons Ltd, Chichester.

<sup>3</sup> Roberts, J M, 1996, *The Penguin History of Europe*, Penguin Books Ltd, London.

<sup>4</sup> Murray, D, 2005, *Oil and Food: A Rising Security Challenge*, Earth Policy Institute, <http://www.earth-policy.org/Updates/2005/Update48.htm>. Viewed 12 April 2006.

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<sup>7</sup> De la Salle, J, 2004, *Growing Cities: Cuba's Experiment With Urban Agriculture During the "Special Period"*, [www.cityfarmer.org/cubaThesis.html#thesis](http://www.cityfarmer.org/cubaThesis.html#thesis). Viewed 12 April 2006.

<sup>8</sup> Kovalski, S, 1999, *Cuba Goes Green: Government-Run Vegetable Gardens Sprout in Cities Across Island*, [www.cityfarmer.org/CubaGreen.html](http://www.cityfarmer.org/CubaGreen.html). Viewed 12 April 2006.

<sup>9</sup> Pinderhughes, R, 2000, *Urban Agriculture in Havana, Cuba*, [http://bss.sfsu.edu/raquelrp/publ/2000\\_aug\\_pub.html](http://bss.sfsu.edu/raquelrp/publ/2000_aug_pub.html). Viewed 12 April 2006.

<sup>10</sup> Girardet.

<sup>11</sup> Barclay, E, 2004, *Gardens Renew Cuba's Urban Core*, [www.metropolismag.com/cda/story.php?artid=150](http://www.metropolismag.com/cda/story.php?artid=150). Viewed 12 April 2006.

<sup>12</sup> Novo, M, 2003, *Urban Agriculture in the City of Havana*, <http://www.cosg.org.uk/mario.htm>. Viewed 12 April 2006.

<sup>13</sup> Ibid.

<sup>14</sup> Girardet, H, 2004, *Cities, People, Planet – Liveable Cities for a Sustainable World*, Wiley-Academy, London.

<sup>15</sup> Planners for Tomorrow, 2006, *Vancouver Context*, [www.plannersfortomorrow.ca/salon/index.php?blog=17&catsel=245](http://www.plannersfortomorrow.ca/salon/index.php?blog=17&catsel=245). Viewed 13 April 2006.

<sup>16</sup> Indymedia, 2005, *Venezuela: Urban Agriculture*, [www.sbindymedia.org/newswire/display/2573/index.php](http://www.sbindymedia.org/newswire/display/2573/index.php). Viewed 13 April 2006.

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<sup>18</sup> Valente, M, 2006, *Urban Gardens Provide More than Just Food*, Inter Press Service News Agency, [www.ipsnews.net/news.asp?idnews=32099](http://www.ipsnews.net/news.asp?idnews=32099). Viewed 13 April 2006.

<sup>19</sup> New Agriculturist, 2003, *Planned to perfection?*, [www.new-agri.co.uk/03-5/focuson/focuson3.html](http://www.new-agri.co.uk/03-5/focuson/focuson3.html). Viewed 12 April 2006.

<sup>20</sup> DEFRA, 2005, *The Validity of Food Miles as an Indicator of Sustainable Development*, <http://statistics.defra.gov.uk/esg/reports/foodmiles/execsumm.pdf>. Viewed 13 April 2006.

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# Participatory Budgeting – Porto Alegre

## Introduction

The last five years have witnessed an increasingly confused attitude toward democracy from those who claim to champion it. Following the September 11<sup>th</sup> attacks, some politicians from the US in particular declared that those events had occurred due to an extremist hatred of democracy and freedom. In response, several governments introduced various measures which eroded the democratic freedoms of their own citizens, in the name of protecting that same democratic system. Since then, serious questions concerning the meaning and extent of western democracy are rightfully being asked.

Debates about democracy are not new, and many political philosophers throughout history have searched for successful models that serve all levels of society. Breakthroughs sometimes occur in surprising places: In one corner of Brazil, an interesting experiment has been quietly taking place since 1989, which has forged a new, participatory model of democracy. This paper looks at its operation, and suggests that it holds merit as an alternative to existing democratic processes that are failing to address active participation and local priorities, especially in deprived areas.

## Background

Porto Alegre (loosely translating as Port Cheerful) was founded in 1742 by immigrants from the Azores. The city is now the largest in the region, home to around 1.3 million people and is the capital of the state of Rio Grande do Sul. It is situated in the southern region of Brazil, near the border of Argentina and Uruguay.

The end of the dictatorship in the 1980s saw different city governments set up decentralization programs alongside participatory programs. The capital cities of Curitiba, Recife, Rio de Janeiro and Salvador had all developed participatory structures by the mid-to-late 1980s, with varying degrees of decision-making power. However, against this potted rise in civic engagement, in many other cases voting is lacklustre and faith in democratic institutions has been low.<sup>1</sup>

Since 1989, Porto Alegre has been governed by a coalition of leftist parties, under the general leadership of the Workers' Party, or Partido dos Trabalhadores (PT). The PT was formed in 1979 by a coalition of unions, social movements and other leftist organizations, to provide a voice for such movements. Its legitimacy was established and reinforced by successive re-elections. The municipal administration, or 'Popular Administration', has brought significant material improvements to the most impoverished citizens of the city. In terms of education, the number of schools more than doubled since the Popular Administration took office.<sup>2</sup>

In 1990, after only one year in power, the PT introduced Participatory Budgeting (Orçamento Participativo or 'OP') in Porto Alegre. The idea goes back to the 1970s and the social movements that would eventually usher in democracy in the mid-1980s. Radical popular educators and progressive clergy in these movements emphasized the importance of autonomy and participatory democratic procedures; throughout the country citizens formed neighbourhood associations and social movements to demand a voice in such local affairs as transportation, health, and housing.<sup>3</sup>

## Mechanism

The overwhelming popularity of OP after just one year saw the administration expand the programme beyond neighbourhood issues when it was re-elected in 1992. A year later, a series of Thematic Forums were created to discuss city-wide expenditures in areas such as urban planning, transportation and economic development. These forums also elect members to the Municipal Budget Council. It now approves the entire capital budget and deliberates on all city expenditures. Over time a series of other participatory councils have also been created to discuss more qualitative aspects of city programmes on issues such as housing, health, culture and the environment.<sup>4</sup>

The cornerstone of the system is community meetings. These begin in the early spring with preparatory meetings at which the municipality reports on execution of the previous year's budget and investment plan, and local priorities are discussed. Two types of meeting are then held: at 'thematic plenary' meetings, local residents review the state budget and vote on their priorities for investments, and at 'regular plenary' meetings, they elect delegates who will represent them.

A 'forum of delegates' is held in June to review projections of the city's income and expenditures. The delegates also visit the sites for which funding has been requested for works and services in order to assess needs. Projects are then prioritised by means of a scoring system and using specific indicators. Also in June, the newly elected city participatory budgeting council (COP) takes office and submits the priorities to the city government. Through the second half of the year, the COP works with the municipality to harmonise the established project priorities with the infrastructure needs identified by the city. Together, the COP and municipality prepare a budget plan and investment and services plan, which are submitted to the mayor and city council for final approval.<sup>5</sup>

The way that decisions are made in participatory budget meetings marks a real break from past models of civic engagement. Participants spend a fair amount of time in deliberative discussions. Though most decisions are made through votes, significant deliberation, in meetings and at the edges of official forums, paves the way for them. This complex process is spread out over a year, and participants regularly resolve conflicts over priorities. A district could choose to divide available funds into many small projects, such as paving 100 metres of dirt road in each of the 20 settlements, or spend them all on a major collective priority, such as a thoroughfare or a school. Arriving at a decision sometimes involves tense moments and much negotiation. Active participants play key roles in creating solutions and finding ways to balance the needs of neighbourhoods and the whole district.

In addition to providing a forum to choose projects and priorities, participatory budget meetings enable other forms of collective action and discussion. Government-sponsored meetings on the technicalities of street-paving projects would seem at first unlikely places for discussions of, for example, the setting of poor urban peripheries. Yet in the meetings, participants regularly carve out these spaces for open-ended discussion. People come together in a regular meeting place and address all kinds of needs, fashioning a language of public responsibility and rights that evolves from their work together. Participants bring newspaper clippings to meetings to discuss current affairs; they recruit volunteers for outside projects; they organize protests, some aimed at the administration itself. The participatory budget has been so successful at drawing participants and delivering results that administrators have accepted these other discussions as healthy democratic discourse.<sup>6</sup>

## **Outcomes**

In Porto Alegre a significant portion of the annual municipal budget (9-21% of the total) is decided through OP, funding hundreds of projects with a completion rate of nearly 100%. These projects have achieved almost full water and sewer coverage, a threefold increase in the number of children in municipal schools, and significant increases in the number of new housing units provided to needy families. After 12 years of OP, daycares increased from 2 to 120. Homes with sanitation increased from 46% to 85% between 1989 and 1999. 25 kilometres of new road have also been added.<sup>7</sup>

Expenditures in certain areas, such as health and housing, are much higher than the national average, yet the municipalities' administrative costs and overheads have declined over the years. And Porto Alegre has managed to create a redistributive regime that is fiscally responsible and has remained transparent. International institutions such as the World Bank have repeatedly praised it. Preliminary results of a national analysis conducted in the late 1990s show that participatory budgeting tends to lower poverty rates and improve education.<sup>8</sup>

As the policy began to gain international recognition, the government also gained local popularity for being innovative and responsible. Those people participating in the Municipal Budget Council gained a certain 'moral authority'. This helped garner the support of groups that still questioned the policy, such as technical personnel within the bureaucracy who doubted the ability of ordinary people to make budget decisions. The result was a bureaucracy that worked better, responding with agility to the demands of budget participants.

One of the outstanding achievements of OP has been its effectiveness in bringing the poor into public decision-making. The poorest neighbourhoods participate in much greater numbers than middle-class ones where streets have already been paved, sewers built and children are sent to private schools. Surveys show assembly participants have lower incomes and education levels than averages for the city as a whole.<sup>9</sup>

The rate of participation in OP in Porto Alegre is also impressive. Once the process started to show results - three or four years after its introduction - the number of participants grew dramatically. By 2004, some 20,000 were attending the first round of meetings, many of them for the first time. A conservative estimate is that 10% of adults in the city have at some stage participated.<sup>10</sup>

The most enduring value of the OP, however, is that citizen participation has now become a way of life, accepted by people as well as politicians as the *modus operandi* in all realms of public decision-making. Furthermore, citizen groups have grown and strengthened in response to increased opportunities for effectively influencing government actions. Contrary to the common assumption that civil society must strengthen before government will improve, in Porto Alegre a state-initiated policy that has encouraged civic organizing has helped consolidate the new practices at all levels.<sup>11</sup>

### **The Spread of OP**

In Sao Paulo, Brazil, residents have been invited to comment on how they wish to see 10% cent of the city's budget spent. In the last few years, 150 new schools and five hospitals in the neighbourhoods most in need of them have been material products of the new participatory democracy in Sao Paulo. By 2003, some 80,000 residents had come together in over 450 local community gatherings, and revealed poverty, education and the environment as their greatest concerns. Also in Brazil, the northern Amazonian city of Belém has successfully implemented an OP programme. As of June 2000, it is estimated that nearly 100 municipalities and five states have implemented some sort of an OP program. There is wide variation in the success as some administrations only play lip service to the programs while other administrations are financially constrained so that they are unable to implement new public works.<sup>12</sup>

In Argentina, the seaside resort of Villa Gesell has also decided to use OP. As a seaside resort whose population of 30,000 swells into seven figures in the holiday season, it needed to find an acceptable balance between the needs of tourists and of the local people. Villa Gesell's conferences, featuring representatives of the municipality and the neighbourhood areas, have resulted in an evolution of the city's infrastructure to better accommodate the needs of tourists. Meanwhile five other municipalities in the region of Villa Gesell have gone from watching and admiring the city's government to creating their own participatory meetings.

In Belgium, the city of Mons, home to over 91,000 people, was selected as the laboratory for an experiment in participatory budget-shaping. It was overseen by Alexandre Seron and Mayor Elio di Ruo, who is also president of the Belgian Socialist party. Mr Seron sees participatory democracy as a major improvement when compared with representative democracy. The first major project to emerge out of 80 meetings over a year and a half in Mons was the creation of a community newspaper.<sup>13</sup>

In addition to the above, countries as diverse as Germany, Indonesia, Canada and Romania have also begun experimenting with participative budgeting, as well as institutions such as universities in the US. The OP system is certainly not intended to be a one-size-fits-all policy, but there is no doubt that the spread of this model is continuing across the world.

### **Lessons**

Richard Hatcher studied OP with particular regard to its role in education, and found the following: 'Clearly, participatory democracy has developed in a context in Brazil which is very different from that in the UK. There is no suggestion that it can simply be translated in to a programmatic alternative here. Participatory democracy needs to be understood not as a set of procedures and structures which can be abstracted from the political vision which

animates it, but as a political strategy. In that light it does have, I would argue, important lessons for us:

1. Participatory democracy works. First, it demonstrates that mass deliberative participatory democracy can work. That is tremendously important, because it shows that there is a viable, realistic, alternative to rule by technocratic managerialism, the market, and the alienating forms of liberal democracy, contrary to what not only the ideologues of neo-liberalism but also some of its more pessimistic critics would have us believe.

2. It can create a general popular interest. OP demonstrates that it is possible to construct through participatory democracy a general popular interest, grounded in the local but not limited to an aggregation of particular local interests. The OP process is oriented towards the construction of the general interest at the city level because it doesn't aim simply at each district determining its own needs - it forces each entity to place its demands in relation to others, the objective being an agreed budgetary programme for the whole city.

In Britain, in contrast, the perspective of many of the advocates of local participation is a recognition of differing interests and the belief that the opportunities for dialogue in forms of 'participatory democracy' can harmonise those interests. The experience in southern Brazil is very different: participatory democracy creates common agendas informed by redistributive social justice, but it tends to crystallise and sharpen conflicts between the popular classes and the political and economic elite.

3. OP can exercise power over the local state. We can contrast the PT strategy of popular power over the local state with forms of 'participatory democracy' in Britain. These range from consultation by local government (for example on urban development projects) to elements of low-level operational management within local government (e.g. neighbourhood forums, estate management by tenants, school governing bodies).

4. It demonstrates a different kind of political party. The participatory democracy experience is the result of the dialectic of three elements - the social movement, the local state apparatus and the party. The interrelationship is mutually constitutive. It should direct our attention to the centrality of the question of the party and its relationship to the social movement. Much British writing about the renewal of local democracy and the creation of active citizenship has by-passed this issue, in effect accepting that democratic renewal can take place under the aegis of the existing political parties. The PT exemplifies the possibility of a different kind of political process.

5. OP integrates education and social action. I have said that participatory democracy is in a sense fundamentally an educational process. This provides the basis for a theory of learning - the RS government calls it the Dialectic of Knowledge - which embraces both society as a whole and the education system. The social-political process is an educational process. The educational process is a social-political process. It is a theory which connects pedagogy and politics, the classroom and the wider society, social change and individual change. It provides a radically different perspective on the relationship between class cultures and the curriculum, not to mention notions of the 'learning society' and 'education for citizenship', from those current in Britain.<sup>14</sup>

## Conclusion

In this time of uncertainty over the nature and efficacy of modern democracy, questions are being raised over its inclusiveness, its ability to respond to and represent differing interests, its scale and so on. New models of democracy are therefore a most welcome addition to the debate. The success of OP in one of the most challenging democratic environments in the world throws new light on the issue, and presents an opportunity for active reform or replacement of institutions that are failing in their duty to represent the people who depend on them for effective public governance.

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# Eco-labelling

## Introduction

The labelling of environmentally-friendly products has been developing for almost 30 years, and ideally provides customers of all types with a ready method of informing purchase decisions. There are many established national labels as well as a European Union label, and now international labels covering standards within sectors such as food, forestry and fisheries, as well as energy efficiency ratings for 'white goods' such as fridges and washing machines.

These labels are largely voluntary, but are valuable for guiding domestic consumption choices, as well as for commercial and governmental procurement decisions. With time, however, and in the face of a growing global population and shrinking resources, trade is likely to be subject to increasing regulation and verification of sustainability standards. In such a scenario then, it follows that being prepared through current precedent will stand commerce in good stead for applying an effective framework to business in the future.

This review will address several key labels, looking at their genesis, mechanisms and outcomes. Of key importance, however, are the issues concerning the EU Eco-label and the national labels. It is clear that harmonisation and customer comprehension considerations are paramount in successfully running schemes which facilitate customer choice and are workable for business.

The constraints of space prevent a more detailed exploration of the developments within each sector, which in some cases are profound, but this overview is intended as an introduction to the subject, to give an account of how eco-labelling began, grew and diversified over time. In addition, it assesses the value of this phenomenon for environmentalism.

## Definitions

'Eco-labelling' is a voluntary method of environmental performance certification and labelling that is practised around the world. An eco-label is a label which identifies overall environmental preference of a product or service within a specific product/ service category based on life cycle considerations. In contrast to 'green' symbols or claim statements developed by manufacturers and service providers, an eco-label is awarded by an impartial third-party in relation to certain products or services that are independently determined to meet environmental leadership criteria.

There are many different voluntary (and mandatory) environmental performance labels and declarations. The International Organization for Standardization (ISO) has identified three broad types of voluntary labels, with eco-labelling fitting under the Type 1 designation.<sup>1</sup>

- ISO Type I: The product must exceed a pass/fail limit on a series of criteria based on the results of lifecycle assessment. The label is issued and endorsed by an independent third party, such as an environmental group, a private body set up to run the label, or a government department. Examples are the EU Eco-label, the Nordic Swan and the German Blue Angel.
- ISO Type II: This is self-declared product claim made by manufacturers. The ISO 14021 standard defines the basis of a claim, to ensure it is truthful and does not mislead.
- ISO Type III: This covers statements of environmental performance, such as the output of CO<sub>2</sub> from vehicles and is generally most useful in business-to-business communication. The basis of the claim is endorsed by a third party. In Sweden, for example, the Swedish Environment Council runs such a programme. (This type will be defined by the ISO 14025).
- Product specific - single issue labels: some labels have been developed that cover specific groups of products, such as agriculture (organic labels), timber (the Forest Stewardship Council - FSC) and fish (the Marine Stewardship Council - MSC). The

FSC and MSC concentrate on ecological criteria and include social issues in their criteria. Both use a multi-stakeholder approach.

The ISO has identified that these labels share a common goal, which is: "...through communication of verifiable and accurate information, that is not misleading, on environmental aspects of products and services, to encourage the demand for and supply of those products and services that cause less stress on the environment, thereby stimulating the potential for market-driven continuous environmental improvement."<sup>2</sup>

### **The German 'Blue Angel'**

The world's first eco-label was the German 'Blue Angel', which was launched by the Federal Minister of the Interior and the Environmental Ministers of the German states in 1978. This innovation took a decade to begin spreading, but has since become a point of reference for many other labels around the world.

The program is jointly administered by three organizations: the Environmental Label Jury, the German Institute for Quality Assurance and Labelling, and the Federal Environmental Protection Agency. The Environmental Label Jury, which decides on the criteria for the different product groups, includes representatives of industry and commerce, environmental and consumer organizations, trade unions, churches, and science. The Federal Environmental Protection Agency develops the criteria, incorporating the results of consultation with selected stakeholders, and the German Institute for Quality Assurance and Labelling is responsible for the contracts with the producers.

The implementation of the program has been a success, despite its gradual development and uptake. Due to its popular acceptance, the German position regarding the introduction of the European label has been clear. From the outset, the Germans have demanded the co-existence of both the European and German labels on the German market. The 'Blue Angel' provided a proven model and influenced many new labelling schemes introduced in recent years. Moreover, the rapid diffusion of this environmental policy innovation is at least partly driven by efforts to harmonize existing standards.<sup>3</sup>

### **European Union Eco-label**

The stated aims of the EU Eco-label are twofold: to promote products which have a reduced environmental impact compared with other products in the same product group, and to provide consumers with accurate and scientifically-based information and guidance on products.<sup>4</sup>

According to the EU, 'the overall objective of Community policy on the environment and business is to contribute to sustainable development. The EU eco-label scheme is now part of a wider approach on Integrated Product Policy (IPP) within the 6th Action Programme on the Environment. The European eco-label is based on the vision of greening non-food products all over Europe in a joint and common approach of all European stakeholders brought together in the European Union Eco-labelling Board (EUEB). The scheme's core assets are its growing numbers of customers and stakeholders: their information, their ideas and their desire and ambition for green products all over Europe. The eco-label is a rapidly growing brand, which organises people around the pursuit of common interests and causes. It is, therefore, a very valuable policy tool for the better integration of the Community's environment, single market and other policies.'<sup>5</sup>

As well as coordinating the 'Competent Bodies', the EUEB develops and updates the eco-label criteria, the corresponding assessment, and the verification requirements. The EUEB act when instructed by the Commission and it is the Commission's job to ensure that the EUEB's tasks are executed in accordance with the mandates and the regulations.<sup>6</sup>

Each of the product groups are designed to meet established environmental and performance standards. The complete life-cycle of a product or a service is examined in detail, from the extraction of raw materials, progressing through production to distribution and use phases, and ending with final disposal. In the case of services, the acquisition of goods for service performance, the service performance and the waste management are the key environmental aspects which are investigated.

Proposals for the definition of product groups and ecological criteria are made either at the request of the EUEB or by the Commission. The Commission gives a mandate to the EUEB to develop or review the eco-label criteria. Priority product groups will be listed in the joint working plan. On the basis of these mandates the appropriate EUEB member, supported by a working group and the Commission, will draft appropriate eco-label criteria and the assessment and verification requirements related to these criteria. The Competent Body will take into account the results of feasibility and market studies, life cycle considerations and an improvement analysis. A regular feed-back process to the whole EUEB is ensured. Finalised criteria are submitted to the Regulatory Committee of national authorities and voted upon. If the Committee takes a favourable view of the proposal, the Commission proceeds with its adoption and publication. Otherwise, the Committee submits the proposal to the Council of Ministers for decision.<sup>7</sup> Stakeholder input is provided by the 'Consultation Forum' which involves five interest groups: industry, commerce, consumer organizations, environmental organizations, and trade unions.<sup>8</sup>

The Blue Angel certainly influenced the EU's label, but the Nordic countries and France opted for a scheme which would address all environmental problems arising from the product, in addition to those related to the production process.

The EU program has now been modified. It was assumed that parallel labelling schemes would result in internal market distortion, consumer confusion, and the limitation of the market value of the EU label. The revisions were actually introduced because it emerged that it was unlikely that the European label would substitute national labels in the long run.<sup>9</sup>

Countries which already had an established national eco-label system when the 'European Flower' was introduced in 1992 are unwilling to modify or phase out their own labels. As many member states had developed their own labelling schemes prior or parallel to the EU decision, a path-dependent development was triggered. This resulted in the competition and co-existence of different eco-labels within national boundaries. These dynamics restrict the harmonization of standards within the European Union considerably. Unfortunately, the 'European Flower' is not very well known in most member states while national labels like the German 'Blue Angel' are widely accepted by manufacturers and consumers alike. Moreover, in some countries the European criteria are considered as inappropriate.<sup>10</sup>

What is missing from the EU label is an internal assessment of its effectiveness. No literature has been identified on this issue, and none of the four national competent bodies that were approached with regard to this matter during a recent eco-labelling study were aware of any such data being collected.<sup>11</sup>

## **The Soil Association**

The above labels apply to non-food items. Filling this gap are organisations such as The Soil Association, a registered charity which was founded in 1946 by a group of farmers, scientists and nutritionists who observed a direct connection between farming practice and plant, animal, human and environmental health. They promote awareness of issues such as: genetic engineering in food; pesticides and their use; threats to wildlife from intensive agriculture; antibiotics; closure of small abattoirs; harmful effects of intensive farming on food quality and safety; setting standards to ensure the integrity of organic food and other products.<sup>12</sup>

The Soil Association symbol can be found on over 70% of Britain's organic produce, which provides a guarantee that it has been grown or produced to the highest standards of organic integrity. They also undertake certification of timber and wood products through the 'Woodmark' symbol, which achieved FSC accreditation in 1996 (see FSC section). Soil Association Certification Ltd enforces these standards through certification and regular inspections of producers, processors and suppliers.

## **FSC**

The Forestry Stewardship Council (FSC) developed to some extent in response to the 'forest crisis' of the 1980s. The issues included deforestation in tropical forests, the loss of old-growth forests in temperate and boreal zones, threats to forest biodiversity and ecological

functions, and land rights of indigenous people.<sup>13</sup> When governments did not take a lead in providing solutions to these problems, and other initiatives failed, environmental organisations like WWF International were compelled to act. They took a lead in forming the FSC, and are the organisation most identified with it.

The use of most national labels is usually spread by government, but in this case that is done by NGOs. The underlying objective of the FSC criteria is sustainable forest management. Therefore, the FSC criteria comprise ecological, social, economic and managerial aspects. However, the certificate is limited to the production of timber and does not include wood processing. In terms of the manufacturing process, in order to qualify for the label, wood processing companies must provide assurance that the flow of timber can be controlled ('chain of custody' certificate for wood-processing companies). The FSC also works as an accrediting organization for organizations that wish to perform FSC forest certifications.

Over the past 10 years, 50 million hectares in more than 60 countries have been certified according to FSC standards while several thousand products are produced using FSC certified wood and carrying the FSC trademark. FSC operates through its network of National Initiatives in more than 34 countries.<sup>14</sup>

## **UTCS**

Urban Tree Certification System, (UTCS) is a management, carbon sequestration and forest utilization plan, for utilities, US states, cities and towns for participation in the CDM (Clean Development Mechanism). CDM was developed under the Kyoto protocol and is administered by the United Nations. It allows participants to earn carbon credits from Certified Emissions. To a certain extent, UTCS was developed in response to what were perceived as the shortcomings of the FSC certification scheme.

UTCS is an integrated system created by a company called Green Energy Resources that includes documentation, services to help local municipalities implement the standards, inventory tracking for Green Certificates and training.

Their stated aim is 'to advance socially responsible and economic goals of government-approved development practices of environmental performance, implement a universally adoptable (sub)urban timber certification system with chain of custody provisions, promote wood recycling, ensure environmentally sound forestry practices and reduce deforestation and global climatic changes.'

Within these aims are further specific objectives: Improve the quality of life of local communities; reduce noise pollution; improve the quality of air and water; maintain and restore natural habitats for wildlife; educate private and public industries in the urban sector, on the need for recycling wood; to view wood & wood-bi-products as cash generating resources for local government; to encourage forest industry companies to locate closer to urban communities; create jobs; promote greater environmental utilization efforts, consistent with state and universal recycling initiatives; demonstrate impact relationships of local conservation efforts as profoundly effectuating national and global decisions and climatology; develop tree inventories; reduce waste at landfills and other sites; prevent dumping, rotting, and natural resource exploitation; encourage maximum resource utilization and efficiency while preserving existing natural forests.<sup>15</sup>

While the UTCS is still at an early stage, it is interesting to note the introduction of a new label which has been directly brought into being to progress the standards and procedures set by another scheme.

## **MSC**

According to their mission statement, 'the Marine Stewardship Council is an independent, global, non-profit organisation whose role is to recognise, via a certification programme, well-managed fisheries and to harness consumer preference for seafood products bearing the MSC label of approval.'

The MSC has developed an environmental standard for sustainable and well-managed fisheries. It uses a product label to reward environmentally responsible fishery management and practices. Consumers, concerned about overfishing and its environmental

and social consequences will increasingly be able to choose seafood products which have been independently assessed against the MSC Standard and labelled to prove it. This will assure them that the product has not contributed to the environmental problem of overfishing. Though operating independently since 1999, the MSC was first established by Unilever, the world's largest buyer of seafood, and WWF, the international conservation organisation, in 1997. Recently, as large a chain as Wal-Mart has taken part, and is 'seeking to source all of its wild-caught fresh and frozen fish for the North American market from fisheries that meet the MSC's independent environmental standard for sustainable and well-managed fisheries.'<sup>16</sup>

The MSC has succeeded in bringing together a broad coalition of supporters from over 100 organisations in more than 20 countries. The organisation is headed by the Chief Executive who reports to the Board of Trustees. The MSC programme works through a multi-stakeholder partnership approach, taking into account the views of all those seeking to secure a sustainable future.<sup>17</sup> Currently, 40 fisheries worldwide are engaged in the MSC programme, representing over three million tonnes of seafood and 14 of these have met the MSC standard. Worldwide there are now more than 300 seafood products bearing the MSC eco-label in 24 countries. Together the global retail value of MSC-labelled seafood in 2004/05 was \$133,609,933. The United Nations Food and Agriculture Organisation has recently published eco-labelling guidelines for fish and fishery products.<sup>18</sup>

## Fairtrade

Fairtrade Labelling was created in the Netherlands in the late 1980s. The Max Havelaar Foundation launched the first Fairtrade consumer guarantee label in 1988 on coffee sourced from Mexico.

The Fairtrade label is an independent consumer label which appears on products as an independent guarantee that disadvantaged producers in the developing world are getting a fair price for their produce. For a product to display the label it must meet international Fairtrade standards. These standards are set by the international certification body Fairtrade Labelling Organisations International (FLO). Producer organisations that supply Fairtrade products are inspected and certified by FLO. They receive a minimum price that covers the cost of sustainable production and an extra premium that is invested in social or economic development projects.

The Fairtrade Foundation licenses the Fairtrade Mark to products which meet FLO standards. The supplier (brand-owner or main national distributor) must sign the Foundation's Licence Agreement which provides a licence to use the Mark.

Development agencies recognised the important role that consumers could play to improve the situation for producers. By buying direct from farmers at better prices, helping to strengthen their organisations and marketing their produce directly through their own one world shops and catalogues, the charities offered consumers the opportunity to buy products which were bought on the basis of a fair trade. Today FLO co-ordinates Fairtrade Labelling in 20 countries including the UK.<sup>19</sup>

### Sales of Fairtrade products in the UK (£million)\*

	1998	1999	2000	2001	2002	2003	2004
Coffee	13.7	15.0	15.5	18.6	23.1	34.3	49.3
Tea	2.0	4.5	5.1	5.9	7.2	9.5	12.9
Chocolate/cocoa	1.0	2.3	3.6	6.0	7.0	10.9	16.5
Honey products	n/a	> 0.1	0.9	3.2	4.9	6.1	3.4
Bananas	n/a	n/a	7.8	14.6	17.3	24.3	30.6
Other	n/a	n/a	n/a	2.2	3.5	7.2	27.3
<b>TOTAL</b>	<b>16.7</b>	<b>21.8</b>	<b>32.9</b>	<b>50.5</b>	<b>63.0</b>	<b>92.3</b>	<b>140.0</b>

Source: [http://www.fairtrade.org.uk/about\\_sales.htm](http://www.fairtrade.org.uk/about_sales.htm)

\* assumes a margin of 40% for retailers (30% on bananas)

## Outcomes

Objections to eco-labelling schemes exist, especially where large corporations are concerned, as the following example demonstrates: 'A particular challenge to the transnational firms are those emerging labels that identify the local character of a food - one that is produced, processed and distributed within a small geographic area. The SAFE Alliance in the UK is developing a 'Food Miles' green label that provides consumers with information about how far food has travelled. Many organizations are developing 'locally-produced' symbols that allow consumers to identify food from their own region. For example, Ontario has at least four such labels, identifying foods from the Windsor, Peterborough, Niagara and Renfrew Valley areas. Such labels allow consumers to purchase based on their feelings about a particular place. For transnationals, this is a direct contradiction to the type of food system they are trying to develop. One where consumers have no allegiance to place, but only to price and perceived quality (as expressed through brand-name allegiance).'<sup>20</sup>

Another issue, raised by Stø et al, concerns the complex messages that go out to consumers via eco-labels: 'We might want consumers to engage in ecologically modernised consumption and to internalise environmental consciousness in ordinary consumption patterns, but we still want to highlight an eco-friendly lifestyle as a positive identity, and we also want the eco-label to work as a symbol, much in the same way as brands operate.'<sup>21</sup> Therefore, eco-labels are advised to operate on multiple levels, but ultimately make consumers feel good about using them.

A South African study of eco-labels found mixed results: 'Studies have shown that on the whole eco-labelled products have not had a significant impact on markets, except in specific product categories, and/or in countries with a relatively high level of environmental awareness and disposable income. Eco-labelling schemes have had a greater impact when the labels have become a requirement imposed by retailers and/or when they are used as tools within government procurement and institutional purchasing programmes. The active involvement of environmental and consumer organisations, as well as the media, has also been instrumental in facilitating the more widespread adoption of labels. The overall environmental effectiveness of the various programmes has been difficult to evaluate.

In those countries where the labelling initiative has been in place for a sufficient period of time, and where specific studies have been undertaken, there are some positive indications that the eco-label has had a valuable impact on promoting direct improvements (in addition to their general awareness-raising benefits). Examples include some of the specific benefits that have been attributed to the Nordic Sweden, the Blue Angel and the Swedish Good Environmental Choice. An important contributory factor to the environmental effectiveness of labels is the level of consumer awareness and attitudes, which varies considerably between countries. In Germany, Canada and Japan – all countries having a generally well informed and comparatively wealthy consumer group – the level of awareness of eco-labels is estimated at between 45-50%. A number of surveys have indicated that the consumers generally have a limited willingness to pay a premium for environmentally preferable products. The recent comprehensive study of the Nordic Swan's impact on Danish consumers is an interesting exception.'<sup>22</sup>

## Conclusion

Despite the slow uptake of eco-labels, and their mixed results, they have had successes, and have the opportunity to exploit brand-name recognition conditioning that the buying public has been exposed to for over two centuries. Marketing is now a science, drawing heavily on psychology, and in many ways bears a great deal of responsibility for the levels and patterns of over-consumption in the modern world.

When the tungsten light bulb was invented, many early electrical items in the US were invented in order to create needs, so that it would be worth the enormous expense of creating a national electricity grid, beyond the simple need for electric lighting. The creation of needs and wants has accelerated massively since then, and it is only in recent times that the need to change these reckless consumption patterns has been identified.

Eco-labelling can help people make choices between positive products or services such as those that will minimise energy use, or sustain resources, and those that will simply exploit under-valued resources. Their introduction is ultimately a positive thing, but needs to

form part of an integrated strategy to raise awareness and lower environmental and social impacts of consumption.

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<sup>1</sup> Global Ecolabelling Network (GEN), 2004, *What is Eco-labelling?*, [www.gen.gr.jp/eco.html](http://www.gen.gr.jp/eco.html). Viewed 28 March 2006.

<sup>2</sup> GEN.

<sup>3</sup> Kern et al, 2001, *Ecolabelling and Forest Certification as New Environmental Policy Instruments. Factors which Impede and Support Diffusion*, pp.6-7, [www.essex.ac.uk/ECPR/events/jointsessions/paperarchive/grenoble/ws1/kern\\_etal.pdf](http://www.essex.ac.uk/ECPR/events/jointsessions/paperarchive/grenoble/ws1/kern_etal.pdf). Viewed 21 March 2006.

<sup>4</sup> [www.europa.eu.int](http://europa.eu.int), 2005, *Eco label*, Activities of the European Union: Summaries of Legislation, <http://europa.eu.int/scadplus/leg/en/lvb/l28020.htm>. Viewed 21 March 2006.

<sup>5</sup> [www.europa.eu.int](http://europa.eu.int), 2005, *An overview of the EU Eco-label Scheme*, [http://europa.eu.int/comm/environment/ecolabel/whats\\_eco/ov\\_concept\\_en.htm](http://europa.eu.int/comm/environment/ecolabel/whats_eco/ov_concept_en.htm). Viewed 26 March 2006.

<sup>6</sup> Kern.

<sup>7</sup> Europa, *overview*.

<sup>8</sup> Kern.

<sup>9</sup> *Ibid*.

<sup>10</sup> *Ibid*.

<sup>11</sup> National Economic Development and Labour Council (NEDLAC), 2006, *Global Review of Eco-Labels: Implications for South Africa*, [www.nedlac.org.za/top.asp?inc=research/fridge/eco\\_labelling/evaluation.html](http://www.nedlac.org.za/top.asp?inc=research/fridge/eco_labelling/evaluation.html). Viewed 26 March 2006.

<sup>12</sup> [www.soilassociation.org](http://www.soilassociation.org).

<sup>13</sup> Kern.

<sup>14</sup> Forest Stewardship Council, *About FSC*, <http://www.fsc.org/en/about>. Viewed 19 April 2006.

<sup>15</sup> Green Energy Resources, *Green Energy Resources UTCS Plan Creates Pathway for US to Join International CDM and ETS Trading*, <http://www.greenenergyresources.com/utcs.html>. Viewed 22 March 2006.

<sup>16</sup> MSC, 2006, *Wal-Mart sets 100% sustainable fish target for North America*, [www.msc.org/html/ni\\_203.htm](http://www.msc.org/html/ni_203.htm). Viewed 28 March 2006.

<sup>17</sup> MSC, 2002, *About MSC*, [http://www.msc.org/html/content\\_462.htm](http://www.msc.org/html/content_462.htm). Viewed 27 March 2006.

<sup>18</sup> Unilever, 2006, *Label classification*,

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# Circular Economy

## Introduction

After decades of employing environmentally damaging techno-industrial systems around the world, a new, complex, integrated approach to sustainable industry and waste management is emerging. The components of the Circular Economy (CE) system are strong in biomimicry, or the practice of copying nature's systems. Such ecological metaphors can be found in other concepts for designing sustainable systems, for example, Industrial Ecology, The Natural Step, the McDonough-Braungart principles, and much of Natural Capitalism.<sup>1</sup>

All stages of a product's life cycle may, through CE, be rooted in sustainability. This can include creating it from biodegradable or eco-friendly materials, sourcing the materials from another industry's by-products, maximising the reusability of the product, designing in an ability to strip down and reuse its components, minimising wastes at the end of its useable life and using as much of it as possible for inputs into new processes.

Eco-Industrial parks (EIPs) enact this synergistic concept by siting compatible companies near one another, and creating a materials flow between them, in a logical progression of the systems approach to waste.

Other, complimentary methodological facets of sustainable production have developed in recent times, including Life-cycle Assessment, Material Flow Analysis and Environmental Management Systems, an internal method of environmental accounting.

Germany has again shown leadership in the CE issue. The development of waste management policy there has demonstrated exemplary foresight and action, building legislation into a sustainable approach that has also had the benefit of creating jobs, as well as an export market in technology and overseas consultation.

This paper will address Germany's contribution to CE development through groundbreaking policy, as well as Japan's moves in this direction, both of whom are now assisting China in the design and creation of a circular economy system. A special case in Denmark is also included.

## Circular Economy concepts

The CE approach to resource efficiency integrates cleaner production and industrial ecology in a broader system encompassing industrial firms, networks or chains of firms, eco-industrial parks, and regional infrastructure to support resource optimization. State-owned and private enterprises, government and private infrastructure, and consumers all have a role in achieving the CE.

There are three basic levels of action. At the individual firm level, managers must seek much higher efficiency through the 3Rs: reduce consumption of resources and emission of pollutants and waste, reuse resources, and recycle by-products. Sustainable product and process design is important in German and Japanese recycling economy plans and is just emerging as a component of the Chinese CE concept.

The second level is to reuse and recycle resources within eco-industrial parks and clustered or chained industries, so that resources will circulate fully in the local production system.

The third level is to integrate different production and consumption systems in a region so the resources circulate among industries and urban systems. This level requires development of municipal or regional by-product collection, storage, processing, and distribution systems.

Efforts at all three levels include development of resource recovery and cleaner production enterprises and public facilities to support realization of the CE concept. This adds a strong economic development dimension through investment in new ventures and job creation. The CE therefore opens opportunities for both domestic and foreign enterprises.

A logical extension of the third regional level of action would be integrating management of flows among urban, suburban, and rural resource recovery systems. An example would be bio-refineries utilizing discarded biomass from rural and urban sources. Such refineries would operate with a range of technologies for converting these resources into bio-energy, bio-fuel, and bio-materials.<sup>2</sup>

The following sections show how Germany, Japan and China are working towards realisation of an effective domestic circular economy.

### **German Circular Economy development**

Before the Waste Disposal Act in 1972, German waste management was rudimentary, and saw contamination of various sites through a lack of standards for treatment and disposal. The 1986 Waste Avoidance and Waste Management Act was more progressive, addressing waste avoidance, recycling, energy recovery and proper final disposal. The Packaging Ordinance of 1991 again stressed waste avoidance as well as recycling.<sup>3</sup> It generally requires manufacturers and distributors to take back packaging and to re-use it or recycle its constituent materials, and is a prototype for legislation designed to close substance cycles.<sup>4</sup>

The commercial and manufacturing sectors can be released from individual take-back obligations by joining a nation-wide collection system. Industry set up its own take-back and recycling system in 1993, financed by more than 19,000 licensees using the Green Dot as a label on their packaging and, in this way, funded the separate collection, sorting and recycling of plastic sales packaging. The Duales System Deutschland AG, a non-profit company, is in charge of organizing this system and recycling sales packaging.<sup>5</sup> Within a decade of the Green Dot System coming into being, more than 20 million tons of used packaging were recycled, and the consumption of packaging per year has been reduced by about 1.3 million tons compared to 1991 levels.<sup>6</sup>

Perhaps the greatest single piece of legislation in German waste management legislation so far was the 1996 Closed Substance Cycle and Waste Management Act (CSCWMA). This waste management policy represents a major step towards closed-loop recycling and building a circular economy, and clearly enacts the 'polluter pays' principle. In order to promote this environmentally sound recycling-based economy, balance sheets for different substances and materials must be drawn up.<sup>7</sup>

As a logical consequence, product responsibility is one of the centrepieces of the CSCWMA that aims at promoting the development of products, which on the one hand are of multiple use, have a long life, are repair-friendly, and, on the other hand, can be recycled and disposed of in the safest possible way. This is summed up by Article 22: "Parties who develop, manufacture, process and treat, or sell products have product responsibility for achievement of the aims of closed substance cycle waste management."<sup>8</sup> Building on this, Germany developed tighter legislation that addressed different aspects of waste management.

In 2001, the Ordinance on Environmentally Sound Disposal of Municipal Waste was adopted, specifying a regulation enacted in 1993 which stipulated that by the year 2005 at the latest, the disposal of non pre-treated domestic waste would be prohibited. As a consequence, disposal of mixed waste with organic and soluble components will not be possible without prior thermal and/or mechanical-biological pre-treatment.

Based on this Act, the Federal government has issued a number of statutory ordinances and guidelines as well as voluntary agreements, containing requirements for waste supervision, transport licenses, specialized waste management companies and associations, waste management concepts, waste-life-cycle analysis and requirements for the disposal and recovery of wastes. Special legal regulations exist for the following goods: Packaging, end-of-life vehicles, batteries, electric and electronic equipment, waste oil, waste wood, commercial wastes, biodegradable wastes, sewage sludge, and hazardous wastes. Voluntary agreements exist for construction and demolition waste and special paper. In addition, the Federal government has issued a waste incineration ordinance based on the Federal Immission Control Act.

Further progress has been made on the closed loop substance cycle and on product liability. The deposit on drinks cans, which started on 1st January 2003, reduced the amount of single-use packaging. A new Packaging Ordinance came into force in May 2005 which determines that the deposit on drink cans must be 25 cents.

The Waste Disposal Ordinance, in force since 1 March 2001, stipulated that by 1 June 2005 at the latest, household waste must be sufficiently pre-treated before disposal; thermal and high-performance mechanical/ biological processes may be employed for pre-treatment. The Federal government has also adopted a Landfill Ordinance.

With a view to encouraging more waste recycling, the Federal government has introduced ordinances on commercial waste from settlements, waste wood and underground stowage of waste, together with amendment of the Waste Oil Ordinance.<sup>9</sup>

This pioneering raft of legislation continues to develop, with refinement and progress being made regularly, as a result of addressing perceived needs with political will and public support.

### **Kalundborg Eco-Industrial Park, Denmark**

An eco-industrial park (EIP) can be considered to be an industrial system of planned materials and energy exchanges, that seeks to minimize energy and raw materials use, minimise waste, and build sustainable economic, ecological and social relations.

By learning from nature, EIPs try to form an engineered or self-organized industrial symbiosis system, like Kalundborg EIP in Denmark, where for over 20 years, a group of industries, including a power company, a pharmaceutical plant, a wallboard producer, and an oil refinery, have shared and circulated resources. Excess heat is used by the community and other by-products not usable within the park are sold to companies in the vicinity. The close location to each of the industries is crucial in making this system work, as it becomes economically unfeasible to transport wastes over longer distances.

The Kalundborg park was not established simply to comply with environmental regulations. The park evolved almost spontaneously over a number of decades and now includes some 20 projects. This inter-company arrangement works for several reasons: cheaper materials and energy, minimization of disposal costs, income generated from production residue, and greater environmental responsibility. This combination of incentives shows how economic benefits and corporate environmental responsibility can go hand in hand.<sup>10</sup> Some common features of EIP success have been identified, for example: industry match in terms of inputs and outputs; high efficiency of material flows; energy flows and information flows.<sup>11</sup>

### **Japan**

The economic boom in Japan, running from the post-war period to the 1980s, saw a typical process of pollution and waste accumulation. The restricted geography of the islands led to the emergence of well-thought out ideas about how to maintain growth while overcoming those physical and resource limits.

Laws relating to general recycling, packaging and recycling of home appliances were introduced through the 1990s, which served to heighten public awareness. The report published by MITI (Ministry of International Trade and Industry) in July 1999, "Vision of a Recycling-oriented Economy", addressed the above issues and promoted integration of environmental and resource-saving measures within all economic activity. Market-based mechanisms, partnerships between business, consumers and government and the environmentalisation of industry were all components of the approach suggested in the report. This development is projected to lead to a market worth \$300m, and the creation of 1.4m jobs.<sup>12</sup>

2000 was named the "First Year of a Recycling-oriented Society", and saw the introduction of six more recycling-related bills. The 'Basic Law for Promoting the Creation of a Recycling-oriented Society' provides a basic legislative framework for such a society and rules over other recycling-related laws and regulations. This law defines the recycling-oriented society, determines the distribution of roles and responsibilities among the related parties, sets out basic principles for necessary measures, and requests the formulation of a national basic plan. In accordance with this law, the Government of Japan decided the first basic plan for promoting the creation of a recycling-oriented society in March 2003.

The Law for Promotion of Effective Utilization of Resources requires the industry sector to implement waste reduction, reuse and recycling activities from upstream to downstream processes. It is an enormously significant piece of legislation, mainly aimed at creating an economic system with higher resource and environmental efficiencies. The law sets seven categories in which 3R (Reduce, Reuse, Recycle) efforts shall be made. A cabinet order was issued to designate 69 product categories in 10 industries effective from

April 2001. In addition, regulations in accordance with the characteristics of individual products are implemented through five other recycling laws, and the Green Purchasing Law promotes the procurement of recycled products by the public sector.

There are several lessons to be drawn from Japan's experience, including public awareness, prevention rather than cure, and market-based solutions. These issues have all been shown to have a great bearing on the success of policy, to engage cooperation, to avoid unnecessary costs in the future and to internalise environmental costs within industry. The 'Extended Producer Responsibility' policy is also helping to shift the waste burden from public sector waste management to private sector economic activity. Policy development in this direction has helped Japan to decrease waste production, while fostering a culture of socio-environmental responsibility.<sup>13</sup>

## **CE in China**

China's leadership, inspired by Japanese and German Recycling Economy Laws, has formed a Circular Economy (CE) initiative that could have huge implications for the rest of the world. A US level of consumption would quickly overwhelm gains in productivity through the rebound effect, which occurs when higher rates of efficiency and lower pollution are overcome by overall increases in industrial output.

For foreign producers, China's success in the Circular Economy effort would set a new level of competitiveness in the world economy. The issue of competitiveness gained through resource optimization is synergistic with rapid development of regional trade alliances and networks of joint ventures.

The laws of both thermodynamics and economics make a completely "Circular" Economy or closed-loop system impossible. At some point in any system it becomes too costly to get the last gains in efficiency of resource use. Many substances we use, such as paint, metal plating, and lubricants are inherently dissipated through their use. However, it is possible to move toward a more circular economy. In China it is vitally important that this rapidly growing country succeed in achieving more efficient use of resources and less pollution.

Once citizens' basic needs are met, CE leaders are aware of the challenge involved in shifting to lower material consumption patterns, an approach that improves quality of life and avoids the Western lifestyle of wasteful consumption and 'throw-away habits'. However, given the present level of poverty, the main focus is on meeting basic needs through maximum efficiency of resource-use.

The Circular Economy concept brings together cleaner production and industrial ecology with its application in eco-industrial development. Circular Economy plans, such as ones completed in Liaoning and Jiangsu Provinces, call for development of eco-industrial parks and networks as central strategies.<sup>14</sup>

The task force charged with exploring CE benefits and strategies found that implementation was vital in economic, social, industrial and environmental terms. A need for vast improvement was identified in China's energy and resource optimization. GDP per kg unit of energy (oil equivalent) was found to be only US\$0.7. In the US it is \$3.4, in Germany \$7 and in Japan \$10.5.<sup>15</sup>

In the last few years, NDRC, China's top economic planning body, named Guiyang a pilot city of the nation's circular economy program. The provincial government said that Guiyang has reached accords with business partners to build more than 20 projects based on the concept of a circular economy and involving contractual investment of about 20 billion yuan, or \$2.4 billion.

German-based KfW Bankengruppe provided the city 2.6 billion yuan (about \$313.3 million) to fund 15 projects covering the chemical industry and infrastructure development. The United Nations Environment Program offered US\$100,000 to help develop the circular economy, while the European Union provided €500,000 and Germany contributed €200,000 in policy research and joint projects.<sup>16</sup>

## Outcomes

Recycling is proving an effective tool for job creation. In Germany, a 1999 stockbroker's survey found that 150,000 people were employed in the waste and recycling industries, more than in telecommunications or steel.<sup>17</sup>

The effectiveness of the closed cycle approach may be measured by the avoided waste streams as well as the collection and recycling rates and the economic benefits through efficient use of resources and energy (eco efficiency). From Germany's experiences representing several decades of policy evolution and huge efforts by all involved stakeholders, the following major conclusions can be drawn:

- Tapping the potential of the general public can be highly effective. The majority of Germans have proven to be both very responsive and cooperative in any measures that are being taken to reduce or recycle waste. Both individual citizens as well as non-governmental organizations have become major supporting factors leading to the success of policies.
- Involving relevant stakeholders and appealing to their responsibility is crucial. Achieving active participation such as voluntary self-commitments has shown to be vital for waste policies. Proactive communication addressing pressure groups from industries and related associations is likely to generate substantial support. For instance, the German paper industry released a voluntary self-commitment in 1997 of increasing the waste paper recycling quota. After years of high investments, the utilization rate of recycled waste paper in paper production reached 65% in 2001.
- Making use of market mechanisms and market-based instruments increases efficiency. Relying on the polluter pays principle is instrumental in leading to reduction at the source of any waste cycle. For example, a deposit fee system, introduced in early 2003 for one-way drinking containers, has proven to be very effective in reducing littering and shifted consumption on a large scale to returnable containers.
- Adjusting counterproductive regulations at an early stage reduces hazards and long-term costs. The CSCWMA, for example, gives a preference to recovery before disposal, which has led to the use of hazardous waste to fill abandoned coal mines, a legally possible way of recovery. Reacting to this development, the German government issued the Ordinance on Underground Waste Stowage in 2002, regulating in detail types of waste, rock formations and documentation with regard to underground stowage of waste.
- Applying principles of circular economy pays off economically in the long-term. Focusing on efficiency reveals potential for cost reduction both in companies and in the whole economy. Additionally, the search for eco-efficient solutions in production unleashes innovative forces and creates business opportunities resulting in enhanced competitiveness not only domestically but also internationally.<sup>18</sup>

In 2003 the EU adopted the Integrated Product Policy, which seeks to reduce environmental damage from products, rather than reduce consumption levels. The intention is to stimulate all stakeholders to contribute to creating greener products, through instruments and approaches similar to those above. It demonstrates a broadening concern with the life-cycle of products, and may help to level the playing field for all EU member states.

The circular economy is in many ways the next logical step for both developed and developing countries. While energy gets a great deal of attention, resource efficiency is just as important for sustainable development, in that a growing world population, with rising expectations, must be accommodated and protected through wise legislation, while at the same time protecting the environment and its resource bases.

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# Plastic Bag Levy

## Introduction

The introduction of the levy on plastic bags in Ireland was introduced in March 2002 and has been hailed as a singular success across a range of indicators. This progressive measure has since been introduced elsewhere, in differing forms, and debated widely for adoption in other countries.

'Eco taxes' and other market-based solutions are becoming increasingly called for with regard to many different products and services, and can aid pollution measures, reduction of local government spending on remedial measures (i.e. chewing gum and ATM receipt taxes) and so on. The plastic bag tax has produced the kind of immediate effects that makes it attractive to other policy makers, including revenue savings and generation.

## Purpose

The Irish government's statement on the legislation reads as follows: 'The primary purpose of the plastic bag levy is to reduce the consumption of disposable plastic bags by influencing consumer behaviour. Since its introduction on 4 March 2002 the levy has been an outstanding success. The fall in the consumption of plastic bags has been considerable, with the reduction being estimated at over 90%, while receipts collected by the Revenue Commissioners up to the end of September 2004 have realised almost €30 million.'<sup>1</sup>

## Mechanism

The tax is simple. Plastic bags at checkouts are charged at 15 cents each, aside from the exemptions, which are: 're-usable shopping bags which are sold for 70 cents or more, bags used to contain fresh meat, fish or poultry (whether packaged or otherwise), bags used to contain loose fruit and vegetables and other foods that are not otherwise packaged and bags used to contain ice. Plastic bags used to contain goods or products sold on board an aircraft or ship, and in an area of a port or airport to which intending passengers are denied access unless in possession of a valid ticket or boarding card, are also excluded from the levy.'<sup>2</sup>

Administration is similarly straightforward. Retailers keep simple records on purchasing and receipts, while the government monitors retailer compliance and collects revenue.<sup>3</sup> The Waste Management Acts 1996 and 2001 contain the Regulations which apply the levy: Waste Management (Environmental Levy) (Plastic Bag) Regulations 2001. Therefore, the Waste Management code and the Regulations share the same enforcement provisions. In addition, the Regulations adapt various provisions of the Tax Acts for the purposes of the Revenue Commissioners' functions.<sup>4</sup> Enforcement is undertaken by both the Revenue Commissioners and local authorities.

## Environmental Impacts of Plastic Bags

Plastic bags do not bio-degrade but rather photo-degrade in the sun by breaking apart into small pieces of "plastic dust," a process that takes between 20 and 1,000 years to occur. These small toxic pieces contaminate the soil and waterways and enter the food chain. Many bags end up in the oceans and kill sea turtles, whales and other marine mammals who mistake the bags for food. Many cows, goats and other animals die by accidentally eating the bags.

The burning of plastic bags releases harmful gases into the air, and using non-recycled paper bags instead contributes to the loss of trees, which are major absorbers of greenhouse gases. Biodegradable plastic bags might seem to be the ideal solution since they decompose in about 18 months. However, chemical residues from these bags result in water, soil and crop contamination. Bag littering could possibly increase if people believe biodegradable bags are less harmful to the environment and will disappear quickly.<sup>5</sup>

After being discarded, many plastic bags go airborne and are caught in trees and fences, as well as ending up in the stomachs of birds. They clog gutters, sewers and waterways. This led the Irish to call the bags their "national flag" and South Africans to dub them the "national flower."<sup>6</sup> Beyond the litter issue, statistics suggest we have developed a thoughtless reliance on plastic bags - Britons get through eight billion a year, equivalent to 133 per person. Made of polyethylene - more commonly known as polythene - they are also hazardous to manufacture.<sup>7</sup>

Among the estimated 6 million tonnes of rubbish dumped into the world's oceans each year, in every square mile of ocean it is estimated that there are over 46,000 pieces of plastic. Collection, hauling and disposal of plastic bag waste create additional environmental impacts. An estimated 8 billion pounds of plastic bags, wraps and sacks enter the waste stream every year in the US alone, putting an unnecessary burden on diminishing landfill space and causing air pollution if incinerated.<sup>8</sup>

### Embodied Energy Content of Plastic Bags

Plastic films and feedstock are produced from natural gas or crude oil. It is estimated that the whole field of plastics films globally uses about 2% of the oil barrel (transport, heating, and power generation etc. using about 85%). Natural gas has a higher energy content per tonne, but has differing energy processing requirements. Plastic grocery bags produced from either source material contain a high proportion of this latent energy and have a calorific value nearly twice that of coal. This energy can be recovered via re-use, material recycling or when used to displace oil imports or other fossil fuels via waste to energy systems, as so widely practised throughout the EU.

Any comparison made between paper and plastics bags thus demonstrates the higher energy content per tonne of plastic bags but because plastics bags are so much lighter, the energy content per plastic bag is roughly half the energy content of the equivalent of the paper bag.<sup>9</sup>

The following tables show that switching to paper bags would not be a better option than using reusable bags, in terms of environmental impacts. Professor Bob Fenton of the University of Winnipeg carried out a study entitled "The Winnipeg Packaging Project: Comparison of Grocery Bags", comparing the results of five different reports concerned with comparing Life Cycle Analysis data for different types of paper and plastic carrier bags. Despite disparities in the findings, the trends show that paper bags also contribute to increased pollution and emissions.

### Comparison in the Use of Fossil Fuel

*Source	GJ's Per Million Bags	
	Plastic	Paper
MRI	1,656.78	1,629.00
German	1,060.83	1,161.11
Gaines	1,417.47	865.46
Franklin	1,326.99	950.12

### Comparison of Emissions

*Source	Atmospheric		Waterborne	
	Plastic	Paper	Plastic	Paper
MRI	2.61	6.48	0.33	2.53
German	0.35	1.13	0.01	0.04
Franklin	0.41	1.21	0.07	1.14

Source: [http://www.bpf.co.uk/bpfissues/plastic\\_bag\\_tax\\_winnipeg\\_material\\_comparison.cfm](http://www.bpf.co.uk/bpfissues/plastic_bag_tax_winnipeg_material_comparison.cfm)

\*These references are:-

- MRI: Midwest Research Institute, New York 1974
- German: German Federal Office of the Environment 1988
- Gaines: Gaines LL, Argonne National Laboratories 1981
- Franklin: Franklin Associates Ltd, New York - 1981/1990

## Other Countries

The United States uses an estimated 100 billion plastic bags each year, consuming about 12 million barrels of oil. Don Lipsey, a Wal-Mart store manager in New York, estimates that his store uses more than 300,000 bags per week. The bags cost consumers about \$30 billion annually in the form of higher prices. New York authorities have begun to look at a plastic bag levy in response.

In January 2005, The San Francisco Commission on the Environment unanimously approved a proposal asking the city to charge grocery shoppers 17 cents for every paper or plastic bag they take home. If approved by the Board of Supervisors and mayor, the fee would be the first of its kind in the country. Jared Blumenfeld, director of the city's Department of the Environment, said the fee was determined by dividing the total cost in cleanup, disposal and lost recycling revenue because of plastic shopping bags - about \$8.7 million - by the number of bags dispersed in the city by large grocery stores each year, which is about 50 million.<sup>10</sup>

In 2004, Taiwan banned plastic bags and plastic utensils, and in March 2005, Bangladesh introduced an outright ban on all polythene bags after they were found to have been the main culprit during the 1988 and 1998 floods that submerged two-thirds of the country. The problem was that discarded bags were choking the drainage system.<sup>11</sup>

Australia is banishing plastic bags with the help of a government grant. As of July 19, 2004, 10 Victorian towns, two markets and a shopping centre agreed to ditch them. After failing to win national support for a tax on plastic shopping bags, Environment Minister John Thwaites issued a challenge to Victorian towns and shopping centres to use alternatives.<sup>12</sup>

From 2003, under a new law in the northern Indian state of Himachal Pradesh, anyone found even using a polythene bag could face up to seven years in jail or a fine of up to 100,000 rupees (\$2,000). Politicians in the picturesque Himalayan state, a popular tourist destination, say polythene pollution is a major problem. "We have directed all our officials to enforce the new law strictly," State Environment Minister JP Negi said. "Polythene pollution is not just an ugly sight in the hills, it has seriously damaged the environment by choking the soil." It is not just disposal that is subject to the legislation. The new law bans the production, storage, use, sale and distribution of polythene bags. The law is based on legislation passed by the national parliament, but Himachal Pradesh is the first state to have implemented it.<sup>13</sup>

In 2006 Rwanda has also begun restricting the use of plastic bags. Drocella Mugorewera, the environment minister, said that anyone using plastic bags is breaking a recent law on environmental protection aimed at cleaning up cities.<sup>14</sup>

In May 2003 South Africa brought in legislation against their 'national flower'. According to the South African Government the country had been using over eight billion bags a year. Retailers handing out the bags now face a fine of 100,000 rand (\$13,800) or a 10-year jail sentence. The legislation means shoppers will either have to take bags with them when they go shopping, or buy new, thick, stronger plastic bags that are easier and more profitable to recycle.<sup>15</sup>

## Outcomes

Irish retailers are enjoying significant financial savings as they can stock a smaller quantity of bags (on average, they were spending \$50 million a year on single-use plastic bags before the tax). Many retailers are also now benefiting from selling reusable bags.<sup>16</sup> More dramatically, within two years of the levy being introduced, approximately 18 million litres of oil had been saved due to reduced production of plastic bags.<sup>17</sup>

The so-called "PlasTax" also raised \$9.6 million dollars in its first year that the Irish government ring-fenced for a "green fund" for waste management and other environmental initiatives.<sup>18</sup> The Irish Environment Minister Martin Cullen stated: "The levy has been an outstanding success in achieving what it set out to do. Over one billion plastic bags will be removed from circulation while raising funding for future environmentally friendly initiatives. It is clear that the levy has not only changed consumer behaviour in relation to disposable plastic bags, it has also raised national consciousness about the role each one of us can, and must play if we are to tackle collectively the problems of litter and waste management."<sup>19</sup>

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# Mine Ban Treaty

## Introduction

War has a long memory. Landmines are one of the worst physical manifestations of this, in their capacity to create enduring 'collateral damage', and because they can force the ultimate price upon the citizens of areas already ravaged by conflict and poverty. These people cannot afford to lose family members, limbs or any other means of making a living, and it is especially cruel and needless to do so years after the conflict has supposedly ended.

Since 1991, groups have been working together to encourage all nations to sign up to an international agreement on the banning of antipersonnel landmines. At the time of writing, 149 countries have taken part in the international mine ban treaty, with 45 yet to do so. While these successes are enormously significant and steadily growing, there remain enough countries outside the agreement to equal roughly two-fifths of the earth's land surface.

One of the stand-out facts about the agreement was that it was negotiated more rapidly than any major international agreement in history<sup>1</sup>. This in itself signifies a broad realisation that something is intrinsically wrong with the utilisation of such an indiscriminate, inhumane and costly weapon in the modern age.

## Campaign background

The ground for the campaign was laid in 1991, when a group of NGOs and individuals coordinated efforts to seek a global ban on antipersonnel landmines. In October 1992, the founding organisations of The International Campaign to Ban Landmines (ICBL) came together to formalise this effort. They were Handicap International, Human Rights Watch, Medico International, Mines Advisory Group, Physicians for Human Rights, and Vietnam Veterans of America Foundation.

The ICBL defines itself as a flexible network of organizations that share common objectives. The Campaign calls for an international ban on the use, production, stockpiling, and transfer of antipersonnel landmines, and for increased international resources for humanitarian mine clearance and a mine victim assistance program.<sup>2</sup>

Previously, there was much opposition to a ban. The 1995-96 Review Conference of the 1980 Convention on Certain Conventional Weapons (CCW) failed to agree to substantial restrictions on anti-personnel landmines (APLs) within its framework. However, by May 1996, around 40 countries had declared various degrees of unilateral bans or moratoria on the production of mines, as well as their use and transfer. In October of that year, Canada hosted a conference on 'Towards a Global Ban on Anti-Personnel Mines,' held in Ottawa, which 71 countries attended (47 participating and 24 observer States). The 'Ottawa Declaration,' issued on 5 October and signed by 50 States, urged a total APL ban to be concluded and signed by December 1997, and to enter into force in 2000. In December 1996, 157 countries committed themselves to this goal in United Nations General Assembly Resolution 51/45S, which called upon all countries to conclude a new international agreement totally prohibiting anti-personnel mines on a high priority basis. No country opposed the resolution and only 10 abstained.

Austria led development and circulation of a draft anti-personnel mine ban treaty text and hosted two expert meetings to discuss it. Two meetings were held there in 1997, followed by an expert's meeting in Bonn, to discuss possible verification measures to be included in the final product.

The Brussels International Conference for a Global Ban on Anti-Personnel Mines saw participation from 154 countries. In total, 117 states committed to the achievement of a total ban within a year in the Brussels Declaration, which called for the convening of a conference in Oslo to negotiate a ban on the basis of the draft prepared by the Austrian government. Norway consequently hosted a meeting in autumn 1997 to continue negotiations on the treaty text. 91 countries took part in the negotiations and 38 were present as observers, including the International Committee of the Red Cross (ICRC), the International Campaign to Ban Landmines (ICBL), and the United Nations (UN). On 18 September, the participating States succeeded in adopting a draft treaty text without a vote. In December, the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on

their Destruction was opened for signature in Ottawa and thereafter at the UN headquarters in New York. The Mine Ban Treaty entered into force on 1 March 1999, only 15 months later.<sup>3</sup>

The involvement of Diana, Princess of Wales and her highly publicised visits to war-torn Angola and Bosnia gave a tremendous boost to the anti-landmine campaign and helped to galvanise public opinion and apply additional pressure on governments.<sup>4</sup>

## **The Treaty**

The Mine Ban Treaty bans the use, production, transfer and stockpiling of antipersonnel landmines. It prohibits anti-personnel mines only, whereas the 1980 CCW regulates anti-tank or anti-vehicle mines.

Article 1, general provisions, states the following:

1. Each State Party undertakes never under any circumstances:
  - a) To use anti-personnel mines;
  - b) To develop, produce, otherwise acquire, stockpile, retain or transfer to anyone, directly or indirectly, anti-personnel mines;
  - c) To assist, encourage or induce, in any way, anyone to engage in any activity prohibited to a State Party under this Convention.
2. Each State Party undertakes to destroy or ensure the destruction of all anti-personnel mines in accordance with the provisions of this Convention.<sup>5</sup>

It agrees to destroy or ensure the destruction of all stockpiled anti-personnel mines owned, possessed, or controlled by it within four years of the entry into force of the Convention for this State (Articles 1 and 4); and to destroy or ensure the destruction of all anti-personnel mines in mined areas under its jurisdiction or control within 10 years of the entry into force of the Convention for this State (Article 5) a State Party commits to take all appropriate legal, administrative, and other measures, including the imposition of penal sanctions, to prevent and suppress any activity prohibited under the Convention undertaken by persons or on territory under its jurisdiction or control (Article 9).<sup>6</sup>

The real test of the ban's effectiveness, however, lies in its implementation. There is no overall mechanism that could force states parties to comply with the treaty, but for the first time in history, an informal civil-society based network of monitors was created to monitor and compile information about countries' landmine policies and activities. A full report is published every year as the Landmine Monitor Report by a core group of ICBL members.<sup>7</sup>

## **Monitoring and compliance**

States Parties are required to report regularly to the UN Secretary-General on all stockpiled mines, mined areas, mines retained for training purposes, destruction of mines, national implementation measures, and measures taken to prevent civilians from entering mined areas (Article 7). If there are concerns about a State Party's compliance with the Convention, another State Party may seek clarification through the UN Secretary-General, and if necessary a special meeting of States Parties could be held for the review of the matter. This meeting may authorize the sending of a fact-finding mission consisting of up to nine experts to the requested State Party with a three to 14-day notice. On the basis of the mission's report, the meeting of the States Parties may propose corrective actions or legal measures in accordance with the UN Charter.<sup>8</sup>

ICBL has established a global monitoring network, the Landmine Monitor initiative, comprising over 100 researchers based in 85 countries. The main output is an annual report which covers every country in the world (not just treaty nations), assessing progress and identifying problems in all aspects of the landmine issue, including use, production, trade, stockpiling, mine clearance, mine awareness, mine casualties and mine victim assistance. The first report, the 1,100-page Landmine Monitor Report 1999: Toward a Mine-Free World, was released in May 1999 to the First Meeting of States Parties of the Mine Ban Treaty, in Maputo, Mozambique.

Article 8 provides for fact-finding missions to investigate potential violations of the treaty. During the Oslo negotiations, most delegations were clear that an overly intrusive arms control-type verification and compliance regime was unnecessary in the case of

antipersonnel mines. Article 8 is therefore modelled more after the international humanitarian law model of fact-finding.

The ICBL has stressed the need for States Parties to urgently put in place the structures and methodology necessary to carry out Article 8 regarding compliance. The ICBL also believes that it is necessary and urgent for the United Nations Secretary-General to delineate steps he has or will take to fulfil his treaty-mandated role regarding Article 8. The ICBL has further stressed that, in the effort to effectively establish a new international norm against antipersonnel mines, it is important for States Parties to consider compliance in a broader perspective than Article 8. The ICBL believes that a mechanism or body is needed to facilitate attempts to address compliance concerns short of formally invoking Article 8 and its official requests for clarification and possible fact-finding missions.<sup>9</sup>

## Outcomes

In recognition of its achievements, the campaign was awarded the Nobel Peace Prize in 1997, together with its then coordinator, Jody Williams. The Norwegian Nobel Committee applauded the campaign for changing a ban from 'a vision to a feasible reality', and recognized that it offers a model for disarmament and peace.<sup>10</sup>

Among the ban's achievements are that:

- It established an international norm stigmatising the use of landmines.
- It led to a virtual stop of international trade in landmines.
- More than two thirds of all mine-producing countries have ceased production.
- Those who continue to produce landmines have agreed not to export them.
- Approximately 40 million stockpiled landmines have been destroyed.<sup>11</sup>

Most importantly, the Mine Ban Treaty will prevent new mines from going into the ground in participating countries. However, there are already millions of mines left over from previous wars, and hundreds of thousands of people who have already been injured and require assistance for the rest of their lives.<sup>12</sup>

It appears that use of anti-personnel mines is on the wane globally, production has dropped dramatically, trade has halted almost completely, stockpiles are being rapidly destroyed, funding for mine action programs is on the rise, while the number of mine casualties in some of the most affected states has fallen greatly. And very importantly, even non-States Parties and non-signatories to the Mine Ban Treaty are taking some important steps toward eliminating anti-personnel mines and joining the ban treaty.<sup>13</sup>

The Landmine Monitor Report 2005 showed further positive progress on the issue. Use of antipersonnel mines by both governments and rebels declined. Just three governments laid mines in 2005: Myanmar, Nepal, and Russia. Landmine Monitor removed two countries from its list of antipersonnel mine producers, Egypt and Iraq, following new statements by those countries. Once again, there was virtually no trade in antipersonnel mines throughout the world. Seventy-one States Parties have completed stockpile destruction, and all together, they have destroyed 38.3 million antipersonnel mines.

International donors provided nearly \$400 million to mine action in 2004, the highest total ever. Over 135 square kilometres of mine-affected land were cleared in 2004, and another 170 square kilometres were freed through battle area clearance. These operations destroyed about 140,000 antipersonnel mines, 50,000 anti-vehicle mines, and 3 million items of unexploded ordnance (UXO).

There were new mine and UXO casualties reported in 58 countries, eight less than the previous year. The number of new casualties around the world decreased to 6,521 in 2004, compared to 8,065 in 2003. However, due to significant under-reporting in many countries, Landmine Monitor estimates that there are 15,000 to 20,000 new mine and UXO casualties each year. Landmine Monitor counts 84 mine-affected countries. An estimated 200,000 square kilometres of the world's area is still contaminated by mines and UXO.

It appears that at least seven of the 13 States Parties with mine clearance deadlines in 2009 appear unlikely to meet the deadline. Many with deadlines in 2010 and beyond will also have difficulties. Most mine-affected countries are a long way from finishing the job. Mine action funding is benefiting too few countries, with almost half of 2004 funding going to just three countries (Afghanistan, Iraq, and Cambodia).

The global total of mine survivors continues to grow steadily - now estimated at some 300,000 to 400,000 - yet victim assistance funding has remained essentially stagnant for years, and has dropped sharply as a percentage of overall mine action funding. Landmine Monitor finds that assistance to mine survivors was inadequate in 51 of the 58 countries with new mine casualties.

Forty-seven countries have not ratified or acceded to the Mine Ban Treaty, including some of the world's most populous and militarily powerful nations, and some of the biggest producers and stockpilers of antipersonnel mines. The pace of universalisation has fallen markedly, with only three countries joining in 2004 and three in 2005. This compares to eight in 2002 and 11 in 2003.

In addition to the three governments using antipersonnel mines, some 40 Non-State Armed Groups used mines in 13 countries, mostly notably Burma, Colombia, and Nepal. While this is three fewer countries than last year, it is clear that use of antipersonnel mines by rebel groups is now far more widespread than use by government forces.

Landmine Monitor still counts 13 antipersonnel mine producers, including the United States which has not produced since 1997 but is poised to make a decision to resume production. Non-States Parties hold an estimated 160 million antipersonnel mines, including an estimated 110 million by China, 26.5 million by Russia and 10.4 million by the US.<sup>14</sup>

With regard to anti-mine devices, a new approach has been developed by UK-based humanitarian de-mining specialists Disarmco, in conjunction with ordnance and explosives experts at Cranfield University. The UK government's Department for International Development (DFID) has been sponsoring the development of this project to the tune of approx £500,000 over the last two years. The funding has been provided via DFID's Conflict and Humanitarian Affairs Department's programme of Mine Action Research which aims to assist carefully focused research and development projects which will make mine clearance more cost-effective.

The project sought a means of destroying mines already laid, and had two aims. One was to find a cheap and simple mechanism for the self-destruction of mines. The second aim was for this device to be capable of manufacture in the mine affected country using ingredients that in themselves are not dangerous. Their solution was 'Dragon,' a fiercely burning torch that will cause the mine to detonate and thus render it harmless.

Andy Willson, Programmes Officer for Mine Action, DFID, said: "The mobile unit has dramatically reduced the typical costs associated with the production of anti-land mines and UXO devices that often run into hundreds of pounds. With the new system, local labour - under suitably trained supervisors - can produce the pyrotechnic torches on site and this further reduces production and transportation costs of the clean up efforts as well as creating much needed employment opportunities at the same time."<sup>15</sup>

While some are looking at new technology for detecting and disarming extant mines, the US is said to be instead developing alternative weapons. According to the US Campaign to Ban Landmines, The Pentagon has spent more than \$320 million on researching alternatives to conventional antipersonnel mines since 1997. The new 'Spider' mine system alone has already cost U.S. taxpayers \$130 million.<sup>16</sup>

## Conclusion

The treaty has been successful in providing a legislative framework for the elimination of landmines from the global arsenal. While it has achieved a great deal through its implementation in the majority of countries, there remains many more supposedly leading nations which have yet to sign up to it. As with the Kyoto Protocol for example, these nations need to show solidarity regarding progressive policy, and share in the responsibility of protecting the innocent from harm.

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