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# City Regeneration

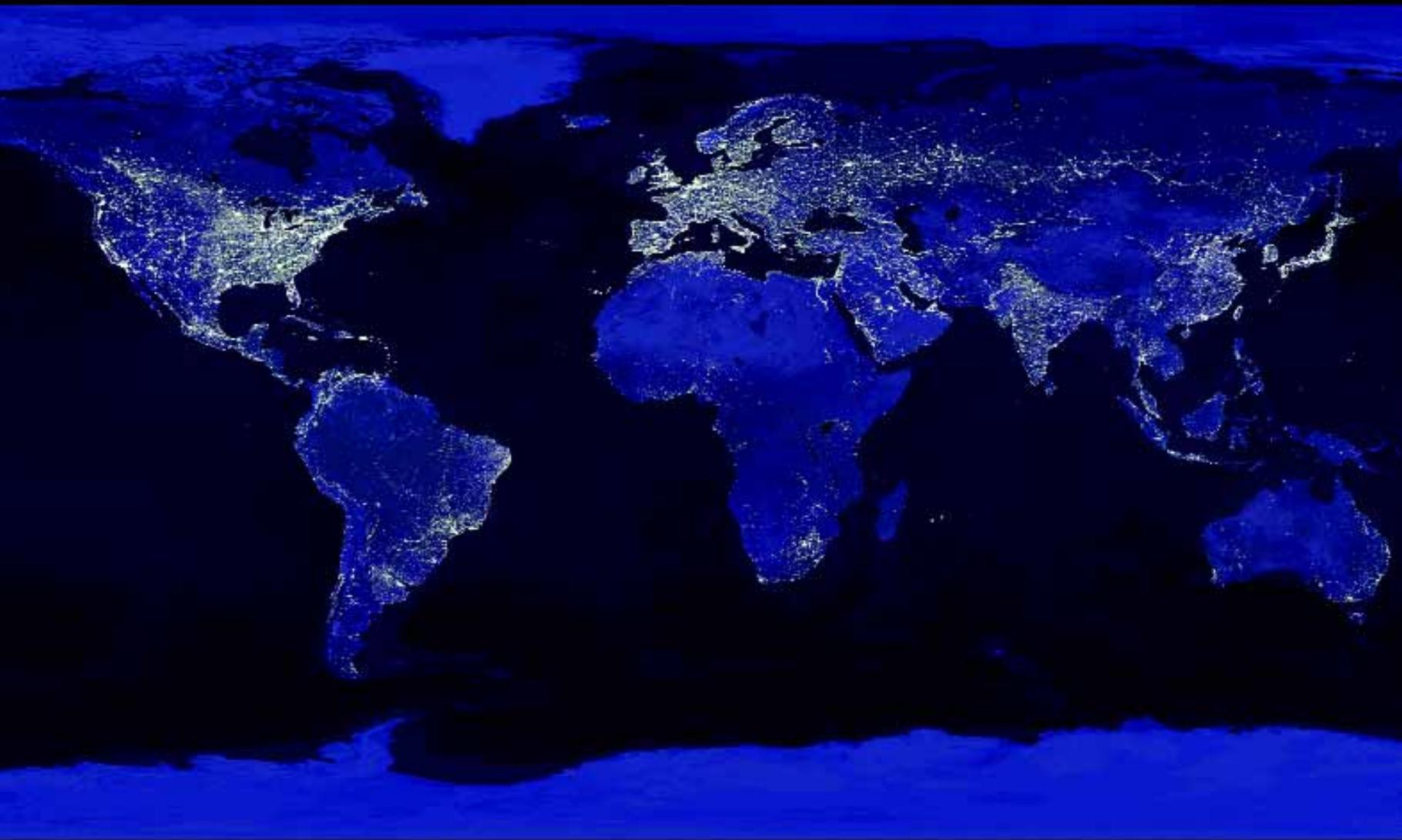
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Scott Hawken

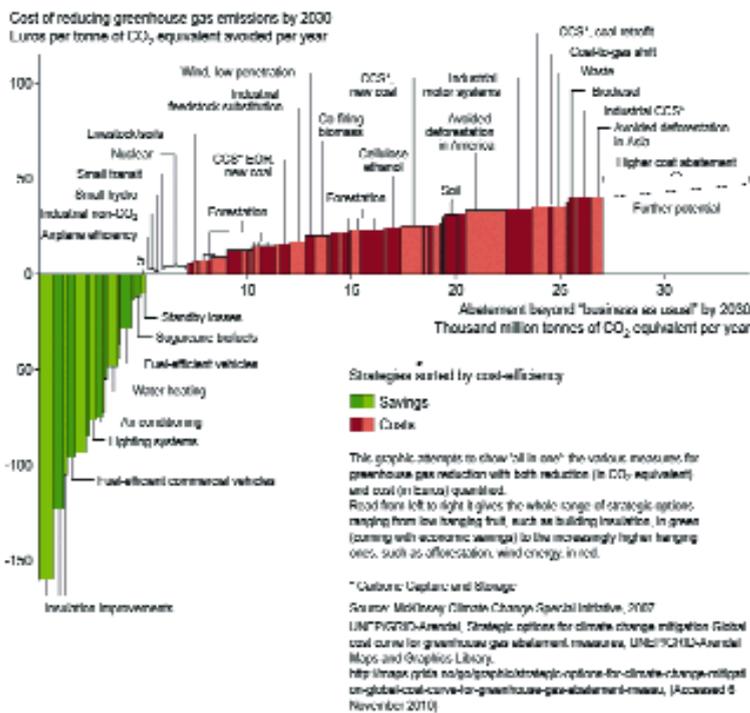
# The Hundred Year Forest

Carbon Offset Forests in the Dispersed Footprint of Fossil Fuel Cities



Carbon offset forests can form a new green urban structure as cities respond to the carbon economy. Blacktown City Council, Western Sydney, has invested in more than 20 urban forests.

### Strategic options for climate change mitigation Global cost curve for greenhouse gas abatement measures



On evenings when there is a new moon, sensors mounted on the U.S. Air Force's, Defense Meteorological Satellite Program are sensitive enough to record the illumination from city lights. Over a period of several new moons, the data the satellites' retrieve is able to be pieced together to produce a global image of city lights. The images describe the dispersed spatial pattern of the fossil fuel city, shimmering into the night as loose stellar clusters of settlements networked with highways and infrastructure. Mesmerizing and unsettling, the images of these glowing urban territories indicate the dispersed spatial patterning of urban energy use, however, the relation between the spatial patterning of our cities and greenhouse gas emissions is complex and challenging. To date the lack of comparative analyses between metropolitan areas makes it difficult to confirm or refute best practices and policies. A common standard for assessing the carbon footprint of global cities was only introduced in 2010 at the UN's World Urban Forum in Rio de Janeiro. Some trends are clear with denser cities having much lower energy consumption per capita in the transport sector. Activities of urban residents, urban land conversions and land-use and transport models need to be better integrated in carbon accounting models to allow local decision makers to understand the consequences of planning decisions.

Whatever the relationship between the spatial form of our cities and greenhouse gas emissions, we must find the answer for climate neutral urban patterns in the footprint of existing cities. New boutique carbon neutral cities, such as Masdar in Abu Dhabi, are built on green field sites and are not appropriate for the scale of the challenge confronting the massive dispersed metropolises of today. As we can clearly see in the night lights images, cities today do not exist as compact centres but form dispersed urban territories.

While moments of density occur within such territories the general spatial condition is one of fragmented and patchy networks made up of a heterogeneous mix of residential enclaves, industrial parks, waste sites, infrastructure easements interspersed with forests, agriculture, leftover voids and overlooked open space. It is this last category that interests us most in this article. These overlooked open spaces have the potential to form a new green urban structure of carbon offset forests as cities respond to the carbon economy. Furthermore such urban spaces are not likely to diminish over time as cities are not only growing larger but are becoming more dispersed according to recent World Bank reports. This strong trend is not limited to developed or developing cities but is a worldwide phenomenon.

In the future, policy incentives for carbon sequestration will drive land use change in rural and urban areas alike. For a variety of reasons urban carbon offset forests are an essential component of the carbon

mitigation portfolio. Urban forests have effects beyond the sequestration of carbon. They help to reduce the emission of CO<sub>2</sub> from urban areas by providing shade and climate control functions that considerably reduces the need for heating and cooling within cities. They have been shown to preserve the life of built surfaces by sheltering them from harsh solar rays. They also provide a large surface area to help remove dust and pollutants from the air while improving the hydrology, biodiversity and soils of our cities. These functions are distinct from forests situated in remote and rural areas. Such functions are not illusory but are quantified for different cities around the world. Locating and designing these within the dispersed cities of today is an essential challenge for urban professionals, ecologists, communities, business and government. Urban forests can be considered as all trees within a city. However, there are a variety of scales and types of forest such as street trees, larger peripheral forests and opportunistic patches within denser parts of the city. Some cities such as Durban in South Africa have already considered the implications of the carbon economy in relation to the spatial structure of the city. Durban is implementing an open space carbon inventory as a tool in urban strategic planning. Other cities, such as Chicago, have been scientifically documenting the climatic value of their urban forests for several decades. However, it is much rarer to find city councils investing in carbon certified offset forests.

### Between pragmatism and idealism

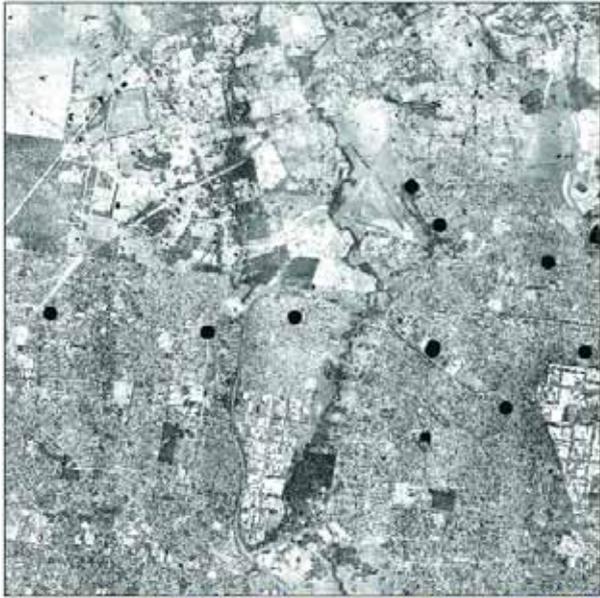
Carbon offset forests are one component of a portfolio of carbon mitigation strategies aimed at achieving climate neutral cities. This portfolio includes reducing the carbon footprint of the city through more efficient energy use, through sourcing alternative carbon neutral power supplies and where carbon neutrality cannot be achieved through these approaches, through offsetting carbon output through carbon credit trading. Under mandatory carbon trading schemes, carbon credit trading allows industries that cannot economically reduce CO<sub>2</sub> emissions to buy credits from industries that have reduced their emissions more than the level required. In the voluntary carbon market, people voluntarily choose to buy carbon credits or certificates to offset their carbon emissions. For instance, people are participating in the voluntary carbon market when they buy carbon certificates or “offsets” to make up the carbon emitted in an airline trip or for running a car.

There are strong arguments to suggest that carbon trading is the most economically rational way to fight global warming. However, since the failure of the Copenhagen summit and President Barack Obama’s political troubles in the United States, carbon trading has not been as dynam-



Page 93: Mesmerizing and unsettling, NASA's night lights imagery of glowing urban territories indicates the dispersed spatial patterning of urban energy use.

The megalopolis of the eastern seaboard of the USA is the most spectacular urbanized region. Europe appears as a vast urbanized territory conveying an image of urban unity far more powerful than any rhetoric on the European Union.



0 1 2 4 6 8 Kilometers

Blacktown City Council in Western Sydney is typical of peripheral urban areas with a mix of uses and spaces. The second drawing shows existing forests while the third drawing highlights potential Kyoto compliant land able to be converted to forests. New carbon offset forests are indicated by the black dots distributed throughout the area.

ic as projected. In Australia the uncertainty created by the failure of the federal government to introduce a carbon emissions trading scheme has stalled investment in both dirty old power stations and new clean technologies, forcing energy prices up many times more than the standard rate of inflation. This suggests that doing nothing is the most expensive option for federal governments in both the short and long term. In places such as Australia where there is no national scheme and no explicit mandatory requirements to offset emissions, there is a lack of clarity for investors and those wishing to offset their carbon emissions. Within such an uncertain regulatory environment planting carbon offset forests is relatively unproblematic. It is a relatively easy solution available to all cities. It doesn't require the development of new technologies or massive investments in alternative energy sources. It is also an accessible approach for individuals, communities, local and federal governments along with small and large businesses. In many ways it is the ideal introduction into the carbon market.

### One hundred year forests in Blacktown, Western Sydney

The Regenes Project, initiated by Western Sydney's Blacktown City Council has realized this and has invested in more than 20 urban forests which can be seen as test cases on various land types. With funding from the NSW Environmental Trust and conducted through a partnership of Blacktown City Council and Liverpool Plains Shire Council, Regenes planted locally native vegetation in ways that complied with the reforestation carbon accounting and trading requirements of the internationally-accepted Kyoto Protocol and those of the Australian Government. For each forest site these requirements included:

1. The site was clear of forest as at 31 December 1989 and the forest was planted on or after 1 January 1990.
  2. The site is at least 0.2 hectares in area and at least 10 metres wide while the crown cover of the planted forest must cover at least 20 percent of the site at maturity with the dominant species reaching a height of at least 2 metres at maturity.
  3. The applicant for carbon credits must have ownership or control of the registered carbon sequestration rights on the title of the eligible land.
- The Australian Government's draft emissions trading scheme legislation also requires a legal instrument on the relevant land titles to protect the carbon forests for 100 years. Therefore, the Regenes site selection process included carefully selecting sites so as to avoid land-use conflicts for 100 years into the future. The first challenge for Regenes was to reconceptualize overlooked open space as productive spaces able to generate green capital. Plantings have been established on land adjacent to

sports grounds, along riparian corridors, as buffer zones between infrastructure easements and residential or industrial parcels, in areas aimed at integrating fragments of remnant local vegetation and as remediation measures on post industrial sites such as quarries.

After space was located, the Regenes Project faced the challenge of using local vegetation and of ensuring that the plantings are maintained for at least 100 years. Within Western Sydney, the predominant vegetation community prior to clearance is the critically endangered Cumberland Plain Woodland. However, it is untested as a carbon sequestering ecosystem. Australia has some of the most carbon dense forests in the world in its Victorian Mountain Ash forests that store 1,867 tonnes of carbon per hectare. But these forests are not consistent with the local biodiversity of Western Sydney. The Regenes forests are assessed using the National Carbon Accounting System (NCAS) though such systems are not well suited to the new types of forests being planted as they are based upon generic forestry data for monocultures such as *Pinus radiata*. The sequestration rates for different species and vegetation communities vary widely. As a result Regenes is partnering with scientists to capture additional data on Mixed Species Environmental Plantings (MSEP) in order to refine the system.

### Integrated ecosystem service economy

The potential for the forests to shift planning strategies into long-term perspective of more than 100 is perhaps the most exciting aspect of the project. These are inter-generational forests that the communities of today are building. The forests will form a new green framework within the overlooked, underutilized spaces of the low density city for 100 years and more. This physical contribution to the future structure of the city is the most significant spatial aspect of the urban carbon offset forest.

Urban planners, landscape architects and all those involved in urban design need to leverage the new carbon spatial economy to transform our fossil fuel cities. The implications of this transformation need to be investigated immediately to take advantage of opportunities in existing urban patterns at the metropolitan scale while also ensuring that offset forests are designed effectively and creatively at the scale of the site. Equally, the establishment of carbon accounting and carbon forests may well be the beginnings of a movement where the planet's multi-trillion dollar ecosystem services are factored into the urban economy. Benefits human populations derive from ecosystems, such as food, air and water are currently obvious but undervalued externalities. The carbon economy may well be excellent training for societies to integrate these ecological services into the economy.



The establishment of carbon forests on different sites in Western Sydney through the Regenes Project actively involves individuals, small businesses and community groups in the voluntary carbon economy.