

A Paradigm Shift in Planning: Dealing with Climate Change and the Ever-Increasing Human Footprint

By Billy Riggs, AICP

Existing patterns of urban and suburban development seriously impair our quality of life. The symptoms are more congestion and air pollution resulting from our increased dependence on automobiles, the loss of precious open space, the need for costly improvements to roads and public services, the inequitable distribution of economic resources, and the loss of a sense of community...¹

So begins the preamble to the "Ahwahnee Principles," written by some of the world's leading planners at the historic Ahwahnee Hotel in Yosemite National Park in 1991. These principles emphasized the challenges facing planners who design cities, and worked to establish a "new urbanism" that could guide planning in the future. The truth and breadth of these thoughts are now of increasing importance as the human race considers the impacts of cities on our very existence. Statesmen and authors such as Al Gore and George Monbiot have brought to light the huge issues facing the globe in regard to climate change.

In his book, *Heat*, Monbiot notes that just a two-degree rise in global temperatures will lead to massive impacts, including the loss of all arctic permafrost, the death of 18 percent of plant and animal species, and a rise of one meter or more in sea level.² Water will increase in salinity, coral reefs will die, and crop yields will become minimal. Low-lying countries such as Bangladesh and Ethiopia will be inundated.

Many public agencies, such as San Francisco's Bay Conservation and Development Commission, are now embracing the validity of such predictions, and the planning community is beginning to change its thinking on how climate change is affecting community development and resource use. Planners and others are working to develop planning-oriented solutions to complex, disturbing problems. Such problems have both local and international implications, and solutions are not always easy. However, taking a holistic, integrated ecological approach to mitigate the human footprint on the environment could be the first step to addressing climate change within communities.

This article (1) provides an overview of the concept of an ecological footprint and its relationship to climate change, (2) discusses carbon markets and offsetting, (3) explores new regulations in California and elsewhere that place binding limits on climate emissions, and (4) evaluates where that leaves practicing planners attempting to move closer to the sustainable vision outlined by the Ahwahnee Principles and new urbanism.

The Ecological Footprint

The concept of an ecological footprint is similar to a basic tenet of science — that every action has an equal and opposite reaction. This premise, used by Sir Isaac Newton to describe the third principle of motion, parallels theories of Timothy Beatley, Paul W. Taylor, and Ian McHarg, which describe an ethical "disposition towards the environment... 'about choices and decisions we make which affect the environment and hence affect human life."³

The baseline theory is that humans should embrace environmental ethics, including:

- the Rule of Nonmaleficence (the duty not to harm creatures in the natural environment, particularly those that do not harm man);
- the Rule of Noninterference (a duty to refrain from denying freedom to organisms and a general "hands off" policy for ecosystems and organisms);
- the Rule of Fidelity (restrictions to deceiving or betraying wild creatures); and
- the Rule of Restitutive Justice (requirements of restorative or compensatory action for previous injustices done to organisms and ecosystems).

Practically speaking, adhering to these ethics means recognizing that the earth has finite amounts of land and resources to be allocated in a way that balances human and natural interests. This theoretic global earth share forms the basis for concepts of sustainable development and what has been called the "triple bottom line" — balancing environmental, economic, and social equity. This balance could include all the requirements for supporting human lifestyles, including transportation, food production, water, waste absorption, and energy needs.⁴



Measuring an ecological footprint is a way of calculating and, ideally, counteracting any negative results of resource use and human interference with the environment. It has been developed through the work of those such as William Rees and Mathis Wathernackel at the Global Footprint Network (<http://www.footprintnetwork.org/>) and their "living planet report" with the World Wildlife Federation, which measures the footprint of nations around the world and works to explain terms such as "biocapacity" — the capacity of the earth to

maintain human impacts. According to their calculations, the earth's population requires 2.2 hectares (5.4 acres) per person to sustain current lifestyles; however, Americans need 9.6 hectares per person, or the equivalent of five earths total.

While there is no definitive method of measuring ecological footprints, a simple tool is the ecofootprint calculator provided by Global Footprint Network.⁵ Another popular tool is the Resource and Energy Analysis Program (REAP), which was designed by the Stockholm Environment Institute. More advanced tools that look at material flows throughout their life-cycle, such as Arup's Integrated Resource Modeling (IRM) and GaBi,⁶ have been developed using REAP as a basis. These were the key tools in a recent balanced and holistic, sustainable development in Dongtan, China. IRM calculates the whole of environmental impacts, compiling information such as "how much productive land and sea is needed to provide the energy, food and materials"⁷ with emissions and waste data to produce a comprehensive metric for environmental evaluation.

A carbon footprint documenting the air emissions that would affect climate change is just one of the measures of an ecological footprint. To some extent, carbon can be regenerated by land and biotic features that are integrated into development design. According to the Stockholm Environmental Institute, however, human demands on the environment are overshooting nature's ability to neutralize human impacts — hence the mounting problems with global climate change. Carbon footprinting is becoming popular through use of greenhouse gas protocols that work to limit emissions through the establishment of carbon markets.

Carbon Markets

Beginning with the 1997 Kyoto Protocol and continuing with the December 2007 United Nations climate change negotiations in Bali, the world has made carbon footprinting a priority by setting targets and goals for carbon reductions. The objective of the Kyoto agreement, which the United States signed but failed to ratify into law, was to work toward greenhouse gas stabilization with the goal of reducing impacts on the earth's ecosystem. The agreement established nation-by-nation reduction targets that spawned the creation of both regulatory and voluntary mechanisms to commoditize carbon, otherwise known as carbon markets.

Up until 2007, regulatory markets based on Kyoto existed only in Europe. These included the European Union Emissions Trading Scheme (EU ETS) and the United Kingdom Emissions Trading Scheme (UK ETS). These focused on regulating large emitters on a national scale. The European Union was also the first to establish a voluntary carbon trading market, the European Climate Exchange (ECE) (<http://www.europeanclimateexchange.com>). Under the ECE, industries and polluters are given annual carbon allowances that they cannot exceed unless they purchase additional allowances from other companies or individuals that fall below their allocations.

The Climate Action Network, a worldwide network of nongovernmental organizations working to limit climate change, has criticized this effort as not wholly effective in reducing emissions.⁸ The market exceeded a billion tons of carbon traded in 2007,⁹ however, and a similar voluntary trading scheme was established in Chicago as the Chicago Climate Exchange (CCX) (<http://www.chicagoclimatex.com>).

California's Carbon Reduction Target

Chicago's voluntary carbon market was preceded by a bold policy action by the state of California that created the first legally binding carbon reduction target in the United States. (The eastern state Regional Greenhouse Gas Initiative [RGGI] has developed a multistate memorandum of understanding to monitor and attempt to regulate emissions.) In 2007, the state passed the California Global Warming Solutions Act, or Assembly Bill (AB) 32, establishing a legally binding target to reduce California's greenhouse gas emissions to 1990 levels by 2020. While the Kyoto Protocol and recent Bali conference set loose targets for 25- to 40-percent reductions by 2020,¹⁰ the California legislation made emissions reductions into law. In a state that is the largest emitter of greenhouse gas in the United States and the twelfth largest emitter in the world,¹¹ the targets are equivalent to a 25-percent reduction of business as usual.

To achieve AB 32 targets, the state plans to unveil a program of regulatory and market mechanisms that may be similar to the EU ETS and UK ETS to achieve real, quantifiable, cost-effective reductions in emissions. By January 2008, the California Air Resources Board (CARB) must identify the 1990 emissions levels, along with a "Scoping Plan" for achieving the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions by 2020. (The CARB recently identified the 1990 levels to be 427 million metric tonnes of carbon dioxide equivalent.) The plan will identify significant sources of greenhouse gases within the state and the regulations needed to establish a mandatory monitoring and reporting system for these sources in order to achieve mandated reductions. The California Climate Action Registry (CCAR) will most likely be the basis for this mandatory reporting system.

Recent lawsuits based on AB 32 have brought the enforcement of these policies into the planning spectrum, with the rationale that inclusion of the policies in local and regional plans is essential. In the city of San Bernardino, a general plan was ruled inadequate because it did not consider the carbon footprint of future development and relevant climate change impacts within the scope of an environmental impact report (EIR). Similarly, a recent ruling in Seattle made it mandatory to consider climate change under the Washington Environmental Policy Act (WEPA).

In the San Francisco Bay Area, regional plans are being augmented to account for climate change and to focus on emissions reduction. The Bay Area Air Quality Management District (BAAQMD), the regional entity in charge of monitoring federal and state criteria emissions, will eventually have regulatory oversight of emission levels and offsets once the CARB completes the Scoping Plan. The BAAQMD has adopted a climate protection program that coordinates with other regional governing bodies in the form of a Joint Policy Committee (JPC).¹² The JPC has assembled representatives from all cities and counties region-wide to address the regionally unifying and cross-disciplinary issue of climate change. The JPC has done research and published memos that have helped identify actions that need to be taken to curb greenhouse gas emissions. The JPC's Bay Area Regional Agency Climate Protection Program (May 2007) has set significant regional priorities and goals¹³ and highlighted important issues, such as the fact that 200 square miles of low-lying filled land bordering San Francisco Bay would be vulnerable as a result of one meter of sea rise brought about by climate change.¹⁴

Where Does This Leave Practicing Planners?



Planners now have a role in shaping the discussion of global climate change and are leading the charge to set standards for the human ecological and carbon footprint on the planet. Planners can help establish market mechanisms, such as carbon trading, as well as policies and regulations like tough standards and environmental documentation requirements. Much of the planner's role, however, must be based on the core environmental ethic of providing for more efficient

and holistic planning from the ground up. This is where the tools of ecological and carbon footprinting become effective — when they are used as benchmarks that can both inform and improve the planning process.

The development in Dongtan, China, mentioned previously took this holistic approach in early planning phases. Located on an island in the middle of the Yangtze, the area was a critical Ramsar Convention wetland habitat for migrating birds and was under pressure from urban development and agricultural production in neighboring Shanghai. Much of the wetland had been filled and converted to agriculture.

Taking this critical habitat into account, the government of Shanghai commissioned a team of experts to develop a city to house 500,000 people with the goals of relieving urban pressure while protecting the adjacent wetland. Using the REAP (Resource Enhancement and Protection) integrated resource management tool, a development is now being constructed that fully preserves the wetlands while allowing for compact development and agriculture. Around 60 percent of the land area is dedicated to wetland preservation, with a buffer that is 3.5 kilometers wide at its narrowest point. Transport vehicles will have no particulate output, and green space, food and waste production, biodiversity, water, and wastewater services will all be integrated into a platform that does not degenerate the environment but rather regenerates it. The development will use only renewable fuels, for example, and will incorporate organic farming that adds nutrients back to the soil using processed city wastes.



A similar holistic systems approach formed the basis for the Beddington Zero Energy Development, or BedZED, in the United Kingdom, which aimed to achieve a completely carbon-neutral development (i.e., one that produces as much energy from only renewable sources as it consumes). The project is unique in that it is the first to incorporate up-to-the minute thinking on sustainable development into every aspect of the program, from energy-efficient water use to superior insulating techniques to the design of

heating and cooling systems. The project incorporates technology and uses only the energy available from renewable sources generated on the site.

In California, the carbon footprint of new development is evaluated using tools developed by the CARB, such as URBEMIS2007 (<http://www.urbemis.com>), to calculate strategic level of carbon dioxide (CO₂) emissions. These tools are based on vehicle miles traveled and can be used mainly for broad analysis. However, other tools such as Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET),¹⁵ Arup's IMPACT model (Impact Model for the Prediction and Assessment of CO₂ from Transport), IRM, and GaBi are being used for more detailed emissions and life-cycle carbon footprint calculation, mostly in Europe. These tools may have future application and translation to projects the United States.

Conclusion

While carbon footprinting may not offer the answer to the many difficult trade-offs and lifestyle adjustments that may be necessary to address the issue of climate-changing gases, it provides a platform for better planning. Carbon footprinting is a tool that draws on the basic principles of science; it measures the relative

carbon emissions connected to even the most basic human actions. Many current and pending plans lack such a framework, but ideally planners will embrace the global paradigm shift in thinking and do as the Ahwahnee Principles suggest in closing: draw on the present and the past to "plan communities that will more successfully serve the needs of those who live and work within them."



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NOTES

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Images: Top — The planning for Dongtan, China, located in the Shanghai region, used a REAP-based system called IRM to measure the ecological footprint of planning alternatives. ©Arup. Middle — A modern depiction of Dongtan "Eco-City" near Shanghai, China. ©Arup. Bottom — Beddington Zero Energy Develop located just outside of London illustrates efficient, carbon-neutral building design. ©Arup.

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