

# Washington University Global Studies Law Review

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Volume 5 | Issue 2

---

2006

## China's Cities, Globalization, and Sustainable Development: Comparative Thoughts on Urban Planning, Energy, and Environmental Policy

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### Recommended Citation

Edward H. Ziegler Jr., *China's Cities, Globalization, and Sustainable Development: Comparative Thoughts on Urban Planning, Energy, and Environmental Policy*, 5 WASH. U. GLOBAL STUD. L. REV. 295 (2006), [https://openscholarship.wustl.edu/law\\_globalstudies/vol5/iss2/3](https://openscholarship.wustl.edu/law_globalstudies/vol5/iss2/3)

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# CHINA'S CITIES, GLOBALIZATION, AND SUSTAINABLE DEVELOPMENT: COMPARATIVE THOUGHTS ON URBAN PLANNING, ENERGY, AND ENVIRONMENTAL POLICY

EDWARD H. ZIEGLER\*

*Good fortune is lighter than a feather, Yet no one knows how to carry it, Misfortune is heavier than the earth, Yet no one knows how to avoid it.*

Tao Te Ching<sup>1</sup>

## I. INTRODUCTION

China is no longer a slumbering giant. Its appetite for resources and energy is enormous and growing.<sup>2</sup> The largest construction boom in world history is currently underway in China, and the country's need for resources to fuel that development is increasingly felt in world markets.<sup>3</sup> As China rapidly develops a modern industrial and technological economy, it joins the United States and other industrialized nations as a

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\* Edward H. Ziegler, Professor of Law, University of Denver Sturm College of Law. I want to gratefully acknowledge Christina Robertson, my research assistant, for her work on this Article. I also would like to express my appreciation to the University of Denver Sturm College of Law for supporting this research by granting me a Research Professorship for the 2005–2006 academic year.

1. TONG SING: THE CHINESE BOOK OF WISDOM 123 (Charles Windridge & Cheng Windridge eds., 2003). Wendell Berry provides a contemporary expression of this sentiment:

The practical problem, in short, is that life is instantaneous but we can deal with it only in terms of duration, and in our dealing we are always, by necessity, a little late. This is the dilemma and the tragedy of life in time, and our computers, no matter how capacious or fast, are there with us.

Wendell Berry, *Is Life A Miracle*, in CITIZENSHIP PAPERS 181, 187 (2004).

2. See *infra* notes 4–13.

3. See C. FRED BERGSTEN ET AL., CHINA: THE BALANCE SHEET 34–35, 42–43 (2006).

On an absolute scale, China's current pace of urbanization is unparalleled in history. China's urban population has ballooned by an astounding 200 million over the last decade—the equivalent of the entire population of the United States. This has led to unprecedented increases in demand for urban housing, transportation, water, and sewage systems, and other urban infrastructure.

*Id.* at 31–32. On a per capita basis, China is poorly endowed with most natural resources. Per capita availability of arable land, for example, is only 0.095 hectares, 60% below the world average; per capita availability of water is 75% below the world average; and per capita availability of most key mineral resources is well under half the world average. Jian Dong, *China Stresses Imminence of Changing Extensive Economic Development Model*, CHINA ECON. NEWS, Aug. 1, 2005, at 1–2.

major consumer of resources and energy, as well as a major polluter of local and global ecosystems.<sup>4</sup> The magnitude of growth in China is such that the global impact of its transformation is now unfolding across all nations of the world.<sup>5</sup>

China has become the second largest consumer of energy in the world behind the United States.<sup>6</sup> It is already the world's largest consumer of concrete, coal, and iron ore.<sup>7</sup> In addition, China is the world's second largest consumer of oil, and approximately half of the oil is imported.<sup>8</sup> China's demand for electricity is also growing rapidly. One report estimates that the demand will increase by 2600 gigawatts by 2050. This increase is equal to adding four 300 megawatt power plants every week for the next forty-five years, or adding more than 9000 300 megawatt power plants by the middle of this century.<sup>9</sup> The vast majority of these power plants are likely to be powered by coal.<sup>10</sup>

4. Christopher Flavin & Gary Gardner, *China, India, and the New World Order*, in STATE OF THE WORLD 2006 3–4 (Linda Starke ed., 2006).

5. *Id.* The authors therein note:

Over the past two years, the world has seen a preview of this future. Soaring prices for oil and other commodities symbolize the strains being added to the world's resource base—on top of the still-growing resource needs of already industrialized countries. Even the world's poorest nations are being affected by the rise of India and China—as seen recently in riots over rising oil prices in Indonesia, growing pressure on Africa's forests and fisheries, booming export markets in soybeans and mineral ores from South America, and the loss of low-skilled manufacturing jobs in Central America and Southeast Asia.

*Id.* at 4.

6. ENERGY INFO. ADMIN., COUNTRY ANALYSIS BRIEFS: CHINA 2 (Aug. 2006), <http://www.eia.doe.gov/emeu/cabs/China/pdf.pdf> [hereinafter CHINA ANALYSIS BRIEF].

7. See Jianguo Liu & Jared Diamond, *China's Environment in a Globalizing World*, 435 NATURE 1179, 1180 (June 30, 2005); David Zweig & Bi Jianhai, *China's Global Hunt for Energy*, FOREIGN AFFAIRS, Sept.–Oct. 2005, at 25; CHINA ANALYSIS BRIEF, *supra* note 6, at 10; Keith Bradsher & David Barboza, *Pollution from Chinese Coal Casts Shadow Around Globe*, N.Y. TIMES, June 11, 2006; *China Must Reform Energy Price, Taxes to Curb Demand*, REUTERS, June 16, 2006. See also TED C. FISHMAN, CHINA INC. 111 (2005).

8. See BERGSTEN ET AL., *supra* note 3, at 33.

The combination of modest natural resources endowments and rapid sustained growth has rendered China increasingly dependent on imports to satisfy its basic needs for petroleum and a broad range of other natural resources. Between 1995 and 2005, China's energy consumption rose 80 percent, even as domestic oil production growth slowed. Consequently, China now relies on imports to meet almost half its petroleum demand. According to the International Energy Agency, while China accounted for under a tenth of global petroleum demand, it accounted for slightly more than a third of incremental world oil consumption over 2002 through 2004, contributing materially to upward price pressure in the global marketplace.

*Id.*

9. Bryan Walsh, *The Impact of Asia's Giants: How China and India Could Save the Planet—Or Destroy It*, TIME, Apr. 3, 2006, at 61–62 [hereinafter Walsh, *Asia's Giants*]. See also Bradsher & Barboza, *supra* note 7; Peter Harmsen, *China Warns Too Many Power Plants Are Being Built*, AGENCE FRANCE-PRESSE, June 8, 2006, <http://www.petroleumworld.com/story06060804.htm> (last

Like the United States, nearly all of China's energy is produced by fossil fuels.<sup>11</sup> China is the world's second largest source of greenhouse gas emissions from fossil fuels, after the United States. Those emissions are expected to grow to nearly equal the entire industrialized world's increase in greenhouse gas emissions from 2000 to 2030.<sup>12</sup> The events in China and the United States during the first half of this century may govern the issues of peak oil, global warming, and climate change for the world.<sup>13</sup>

China's growth continues to be transformative in scale. In nearly every way and from almost any perspective, China's growth seems unprecedented and unending. China's economic growth during the past twenty-five years, for example, is the largest and most sustained economic expansion in modern history.<sup>14</sup> Economic expansion and relocation to China's cities are radically altering China's urban infrastructure and built-environment, in addition to fueling China's increase in demand for resources and energy.

Over 300 million Chinese peasants moved from the countryside to cities during the past twenty-five years. This constitutes the largest migration in world history.<sup>15</sup> Moreover, growth in China is far from over. China's urban areas will have to be developed to accommodate perhaps as many as 500 million more peasants (nearly twice the population of the United States) by mid-century.<sup>16</sup> During the next fifteen years, China is

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visited June 8, 2006).

10. Walsh, *Asia's Giants*, *supra* note 9.

11. See CHINA ANALYSIS BRIEF, *supra* note 6.

12. Jia Hepeng, *China Is Second Biggest Greenhouse Gas Emitter*, SCIDEV.NET, Nov. 24, 2004, <http://www.scidev.net/news/index.cfm?fuseaction=printarticle&itemid=1761&language=1>; Walsh, *supra* note 9, at 61.

13. Walsh, *supra* note 9, at 61.

14. FISHMAN, *supra* note 7, at 12. See generally Presentation by Lu Xinshe, Vice Minister, Ministry of Land and Res., on Land Use and Planning in China (2003), [http://www.cip-icu.ca/english/outreach/china/chinaVM\\_pres.pdf](http://www.cip-icu.ca/english/outreach/china/chinaVM_pres.pdf). Fareed Zakaria, *Does the Future Belong to China?*, NEWSWEEK, May 9, 2005, at 29; *The Tiger in Front*, THE ECONOMIST, Mar. 5, 2005, at 10; Michael Elliott, *A New China Rises: Small World, Big Stakes*, TIME, June 27, 2005, at 30.

China's economy has grown approximately 9% per year for more than twenty-five years, the fastest growth rate for a major economy in recorded history. In that same period it has moved 300 million people out of poverty and quadrupled the average Chinese person's income. All this has happened, so far, without catastrophic social upheavals. Zakaria, *supra*.

15. FISHMAN, *supra* note 7, at 7; Gordon Feller, *Chinese Urbanization's Potentially Pacifying Power*, WORLD & I, Mar.-Apr. 2005, at 50; Dian Tai, *Regulation of Land Use Shows Progress*, CHINA DAILY, Aug. 14, 2004, available at [http://www.chinadaily.com.cn/english/doc/2004-08/14/content\\_365275.htm](http://www.chinadaily.com.cn/english/doc/2004-08/14/content_365275.htm).

16. Correspondence with Coll. of Architecture & Urban Planning, Tongji Univ., Shanghai Tongji Urban Planning & Design Inst., Shanghai, China (June-Nov. 2005) (on file with author). See also Howard W. French, *Riots in a Village in China as Pollution Protest Heats Up*, N.Y. TIMES, July 19, 2005 [hereinafter French, *Riots*]; Feller, *supra* note 15.

expected to construct new buildings totaling more than thirty billion square meters in floor space.<sup>17</sup> There is simply no historical precedent anywhere in the world for an urban transformation of this magnitude.

China is revising and adopting growth management and urban planning policies in an attempt to address critical energy, environmental, and other sustainable development issues related to continued economic expansion and urban development.<sup>18</sup> This Article discusses the development of China's modern cities and China's emerging urban planning and growth management programs as they relate to implementing newly established sustainable development policies. Global sustainable development issues are discussed by comparing future growth and urban development in the United States and China. This Article examines urban sprawl, density of the built-environment, energy policy, automobile use, and transportation planning relative to future urban development and to their potential impact on future resource and energy consumption. The Article also examines the critical issues of peak oil, global warming, and climate change.

This Article notes that despite China's policy to encourage automobile ownership, China's urban planning policies seem aimed at avoiding the development of a completely automobile dependent economy and culture, unlike the United States' economy and culture. This Article concludes with the observation that growth management and energy policies in both the United States and China appear to be on a collision course with the new global energy and environmental realities of the twenty-first century. Throughout this process, China is in a position to learn and benefit from the United States' experience with energy, environmental, and urban planning policies. Perhaps, the United States may learn something from China as well.

## II. CHINA'S GROWTH AND SUSTAINABLE DEVELOPMENT

The development and expansion of China's modern cities have involved the largest construction and expansion of the human built environment in the history of the world.<sup>19</sup> Existing cities and metropolitan regions throughout China are being substantially redeveloped and expanded. Furthermore, many new satellite cities and towns are under

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17. *China Launches Massive Reconstruction of Buildings for Energy Saving*, XINHUA NEWS AGENCY, Mar. 29, 2006, [http://english.people.com.cn/200603/29/eng20060329\\_254429.html](http://english.people.com.cn/200603/29/eng20060329_254429.html).

18. See BERGSTEN ET AL., *supra* note 3, at 166 n.3; See generally NAT'L DEV. AND REFORM COMM'N, CHINA MEDIUM AND LONG TERM ENERGY CONSERVATION PLAN (Nov. 25, 2004), [http://fourfact.com/images/uploads/China\\_Energy\\_Saving\\_Plan.pdf](http://fourfact.com/images/uploads/China_Energy_Saving_Plan.pdf).

19. Zakaria, *The Tiger in Front*, *supra* note 14, at 4.

construction. These new satellite cities are currently some of the largest development projects in the world.<sup>20</sup>

Aside from the new tunnels, bridges, airports, power plants, expressways, overpasses, subways, light rail systems, port facilities, manufacturing plants, office towers, shopping complexes, and public buildings, China is constructing nearly six billion square feet of residential development each year. This is far more than the United States, which has led the world in construction and expansion of the built-environment until now.<sup>21</sup> In 2005, Shanghai constructed more new high-rise living and working spaces than now exist in all of New York City.<sup>22</sup> New towns are springing up in many rural areas, and existing cities are booming. Much of this growth, however, has been largely uncontrolled and poorly planned.

Unlike the United States, and contrary to what some believe, China is not rich in natural resources.<sup>23</sup> China needs to feed about 22% of the world's population, but only has 7% of the world's arable land.<sup>24</sup> Moreover, about two-thirds of China's farmland is rated "poorly productive."<sup>25</sup> China continues to lose farmland through soil erosion, decreases in soil fertility, and steadily expanding urban encroachment and sprawl.<sup>26</sup> China's forest and water resources, on a per capita basis, are also far below world averages.<sup>27</sup>

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20. Alexander E. Kalamaros, *Shanghai's Sustainable New Towns: Five New Town Projects in Shanghai Showcase China's Commitment to Sustainable Development*, URB. LAND, Feb. 2006, at 54–56.

Shanghai offers one of the most striking examples of the process of urbanization taking place in China. Of the more than 12 new town projects to be implemented in Shanghai over the next 15 years, five will carry the theme of sustainable urban development. Also, a larger sustainable communities program is already being carried out across the eastern portion of China. Together, these projects seek to achieve important social and economic goals at the same time that urban growth in China is being fed by a combination of rural migration and market forces.

*Id.* at 55.

21. See Xiannian Ye, *China Real Estate Market: An Overview for U.S. Real Estate Practitioners*, NAT'L ASS'N OF REALTORS, Aug. 12, 2004, <http://www.realtor.org> (search "Search REALTOR.org" for "Xiannian Ye"; follow "NAR: International: China Real Estate Market" hyperlink).

22. David Barboza, *China Builds Its Dreams, and Some Fear a Bubble*, N.Y. TIMES, Oct. 18, 2005, at A1.

23. THE IMPACT OF CHINA'S ECONOMIC REFORMS UPON LAND, PROPERTY AND CONSTRUCTION 146 (Jean Jinghan Chen & David Wills eds., 1999) [hereinafter IMPACT OF CHINA'S ECONOMIC REFORMS]. See generally CHINA'S FORESTS (William F. Hyde et al. eds., 2003).

24. Presentation by Lu Xinshe, *supra* note 14, at 12. See generally *China to Revise Overall Land Use Plan*, CHINA DAILY, May 10, 2005, [http://www.chinadaily.com.cn/english/doc/2004-05/10/content\\_329451.htm](http://www.chinadaily.com.cn/english/doc/2004-05/10/content_329451.htm); *China Sets Ceiling on Farmland*, CHINA DAILY, July 18, 2002, [http://www.china-daily.com.cn/en/doc/2002-07/18/content\\_128497.htm](http://www.china-daily.com.cn/en/doc/2002-07/18/content_128497.htm).

25. Presentation by Lu Xinshe, *supra* note 14, at 12.

26. JARED DIAMOND, COLLAPSE 364–65 (2005); IMPACT OF CHINA'S ECONOMIC REFORM, *supra* note 23, at 147. See generally Klaus Hubacek & Sun Laixiang, *A Scenario Analysis of China's Land*

China is developing and is still relatively poor.<sup>28</sup> It only produces about 80% of the energy that its economy needs.<sup>29</sup> Although China has large coal reserves, in terms of immediately exploitable deposits, these coal reserves are actually less than half the world average on a per capita basis. Oil and gas reserves are even less abundant.<sup>30</sup> China imports about half of its oil, an increasing amount of natural gas, and even coal from Australia.<sup>31</sup> China's government now views the conservation and efficient use of investment capital, skilled labor, and natural resources in the expansion of its built-environment as necessary to maintain high rates of economic growth in the future.<sup>32</sup> Reducing waste and excessive infrastructure costs

*Use and Land Cover Change: Incorporating Biophysical Information Into Input-Output Modeling*, 12 STRUCTURAL CHANGE AND ECON. DYNAMICS 367 (Dec. 2001); "Protective Cultivation" Applied in North China on Trial, CHINA.ORG, July 15, 2002, <http://www.china.org.cn/english/2002/Jul/36892.htm>.

China's land per capita is one third of the average world level. The explosive recent urbanization has both aggravated the land shortage and land degeneration. *China to Revise Overall Land Use Plan*, *supra* note 24.

In March 2003, China's new law on rural land contracts took effect. For more than twenty years, China had implemented a contract responsibility system in rural areas. Under this system, farming households contracted with rural authorities to use and manage land. In 1993, the term of the land contract was extended to thirty years. However, some local authorities arbitrarily reduced the contract term and altered land use rights by administrative decree. The local officials' abuses led to many disputes, which resulted in violence in some provinces.

Agricultural issues and farmers' concerns have become urgent challenges for China. In response, the central government is working to boost the rural economy and increase farmers' incomes. The 2003 land law attempts to curb abuses by local officials by prohibiting revisions of the land use rights before the expiration of the contract and premature reclamation by contractors. Farmers will be allowed to legally transfer, re-contract, enter into share-holding ventures, and exchange land use rights. Protection of land use rights will encourage social stability, agricultural development, and future investment. See *Law Protects Long-term Land Use of Chinese Farmers*, PEOPLE'S DAILY, Mar. 2, 2003, [http://english.peopledaily.com.cn/200303/02/eng20030302\\_112533.shtml](http://english.peopledaily.com.cn/200303/02/eng20030302_112533.shtml).

Although these measures have improved the economic opportunities in the countryside, corruption is still rampant in rural development. The Political Bureau of the Communist Party of China met in December 2005 and reaffirmed its commitment to root out and combat corruption within the system. The Bureau recognized that despite "sound opportunities in economic and social development", the agricultural infrastructure is still "vulnerable, culturally backward," making it increasingly difficult to increase farmer's incomes. People's Daily.com, *Hu Jintao Chairs Politburo Meeting on Rural Development, Corruption*, [http://english.people.com.cn/200512/21/eng20051221\\_229664.html](http://english.people.com.cn/200512/21/eng20051221_229664.html) (last visited Jan. 25, 2007).

27. Liu & Diamond, *supra* note 7, at 1179, 1182. China has 0.1ha of forest per person, compared with the world average of 0.6ha, and its per capita water supply is only one quarter of the world average. *Id.* See also Walsh, *supra* note 9.

28. Zakaria, *The Tiger in Front*, *supra* note 14, at 3.

29. FISHMAN, *supra* note 7; CHINA ANALYSIS BRIEF, *supra* note 6, at 8.

30. IMPACT OF CHINA'S ECONOMIC REFORMS, *supra* note 23. See also Zweig & Jianhai, *supra* note 7.

31. Zweig & Jianhai, *supra* note 7, at 28–30. Twenty years ago, China was East Asia's largest oil exporter, yet it is now the world's second largest oil importer. China's imports accounted for 31% of the global growth demand for oil in 2004. *Id.* at 25.

32. IMPACT OF CHINA'S ECONOMIC REFORMS, *supra* note 23, at 149; FISHMAN, *supra* note 7, at

associated with rapid and largely unplanned urban development has become an important government priority.<sup>33</sup>

In addition, officials in Beijing think that better growth management and sustainable development policies are necessary to address China's immense environmental issues.<sup>34</sup> China's environmental record is one of the worst in the world. Some parts of China have serious problems with the cessation of river flows and the availability of potable water. Water shortages also affect economic development and manufacturing production in some areas.<sup>35</sup> Among other serious environmental problems (reports in China occasionally mention cancer villages and environmental riots),<sup>36</sup> the loss of productive farmland has become a critical issue in

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26. See French, *Riots*, *supra* note 16; Yan Huang, *Urban Spatial Patterns and Infrastructure in Beijing*, LAND LINES (Lincoln Inst. of Land Pol'y, Cambridge, Mass.), Oct. 2004, at 1, available at <http://www.lincolnst.edu/pubs/pub-detail.asp?id=969>.

A World Bank report estimates that environmental damage alone costs China 8–12% of its annual GDP. Increasing car ownership and soaring energy demands ensure that the environmental pressures are unlikely to abate. Benjamin Robertson, *China Waking Up to a Green Nightmare*, ALJAZEERA.NET, Oct. 28, 2004, <http://english.aljazeera.net/English/Archive?ArchiveID=7361>.

33. *Sound Urban Plans Called*, CHINA DAILY, May 12, 2005, at 4; Hubacek & Laixiang, *supra* note 26; Scott Hillis, *China to Eschew Fast Growth in New Economic Plan*, REUTERS, Oct. 7, 2005, <http://www.enn.com/today.html?id=8980>; Zhang Tingting, "Protective Cultivation" Applied in North China on Trial, CHINA.ORG, July 15, 2002, <http://china.org.cn/english/2002/Jul/36892.htm>; *Land Use Program Kicks Off Fourth Year*, NEWS (China-U.S. Ctr. for Sustainable Development, Portland, Or.), Sept. 2004, <http://www.chinauscenter.org/organization/news.asp> (follow "next" hyperlink; then follow "Land Use Program Kicks Off Fourth Year" hyperlink).

34. See *supra* notes 20, 24. See also CHINA ANALYSIS BRIEF, *supra* note 6; DIAMOND, *supra* note 26, at 358.

According to the World Bank, sixteen of the world's twenty most polluted cities are in China. The Yangtze River absorbs three tons of sewage a minute. Office workers who cannot see the river occasionally smell its rotten egg odor on warmer days. Robertson, *supra* note 32.

35. CHINA ANALYSIS BRIEF, *supra* note 6, at 9. See also DIAMOND, *supra* note 26, at 358, 364.

36. French, *Riots*, *supra* note 16; Kathy Chen, *Fixing Up Grounds Around Beijing Palace Is No Walk in Park*, WALL ST. J., Aug. 26, 2005, at A1; Jean-Francois Tremblay, *Tempers Flare in China*, 38 CHEMICAL ENGINEERING NEWS, Num. 39, Sept. 26, 2005, at 21–28; Robertson, *supra* note 32.

The Chinese press sometimes reports on "cancer villages" where dangerous toxins are literally killing the local population and polluting factories are routinely fined or shut down. Robertson, *supra* note 32.

These environmental concerns often result in rioting. In December 2005, residents of a small fishing village near Hong Kong feared that the construction of a coal-fired generator in their area would result in significant pollution and protested. The protests resulted in a violent conflict between the villagers and police, and twenty people may have been killed. Howard W. French, *Villagers Tell of Lethal Attack by Chinese Forces on Protesters*, N.Y. TIMES, Dec. 11, 2005 [hereinafter French, *Villagers Tell of Lethal Attack*]. China's government reports that in 2004 there were 74,000 significant public disturbances—many related to environmental conditions. French, *Villagers Tell of Lethal Attack*, *supra*.

See also Jennifer L. Turner & Lu Zhi, *Building a Green Civil Society in China*, in STATE OF THE WORLD 2006 152 (Linda Starke ed., 2006) (discussing the growing role of nongovernmental environmental organizations inside China and new environmental protection and energy efficiency initiatives by China's leadership).



recent years as grain production has continued to decline and China has had to import food to feed its people.<sup>37</sup>

China's government is now implementing important new policy initiatives that provide the first steps toward the creation of a national land-use planning and sustainable development policy framework for managing urban growth.<sup>38</sup> These policy initiatives provide for an integrated hierarchy of tiered planning for urban growth through the establishment of national sustainable development goals and policies followed by the adoption of regional and local plans.<sup>39</sup> This program requires adoption of comprehensive local plans, zoning maps, and development codes; furthermore, it provides for integrated land development review and the adoption of land information monitoring and assessment systems.<sup>40</sup>

Major goals of this growth management program include providing for economic development through the efficient use of land and resources, minimizing waste and curtailing the excessive infrastructure costs of uncontrolled urban sprawl, promoting rational and efficient infrastructure and transportation systems, and promoting sustainable development policies involving historic and natural resource conservation and environmental protection, particularly with respect to water supply and productive farmlands.<sup>41</sup> For China, sustainable economic development is

37. Tai, *supra* note 15. See also *China Sets Ceiling on Farmland*, *supra* note 24; Hubacek & Laixiang, *supra* note 26; Le-Min Lim & Samuel Shen, *Curbs on Land Use to be Tightened*, THE STANDARD, Mar. 8, 2005, <http://www.thestandard.com.hk/stdn/std/China/GC08Ad01.html>; IMPACT OF CHINA'S ECONOMIC REFORMS, *supra* note 23, at 147; *China to Continue Controlling Land Supply in 2005*, PEOPLE'S DAILY, Mar. 29, 2005, [http://english.people.com.cn/200503/29/print20050329\\_178633.html](http://english.people.com.cn/200503/29/print20050329_178633.html); *Experts Call to End Illegal Reclamation of Land*, CHINA DAILY, Feb. 24, 2005, <http://www.china.org.cn/english/2003/Feb/56534.htm>.

China has more than one fifth of the world's population but less than 7% of the planet's arable land. *Id.* Lu Xinshe, the Vice-Minister of Land and Resources recognized in 2002, stated that it was vital for China to protect enough farmland to ensure a high proportion of self-sufficiency in grain production. Colin Campbell, *China's Rural Transformation*, INT'L DEV. RESEARCH CTR., May 3, 2002, [http://www.idrc.ca/es/ev-5502-201-1-DO\\_TOPIC.html](http://www.idrc.ca/es/ev-5502-201-1-DO_TOPIC.html).

China's supply of arable land is dwindling, thus any shift in land use from agricultural to non-agricultural could have far reaching consequences. The decline in arable land resulting from China's rapid rural industrialization over the last twenty years is one of many pressing and immediate concerns. Internal migration also compromises agricultural production. Sam Ho, a Canadian researcher, observes that in some areas there has been so much migration that only the very young and very old remain to work the land. Campbell, *supra*. See also Presentation by Lu Xinshe, *supra* note 14, at 21–23.

38. Presentation by Lu Xinshe, *supra* note 14, at 17–38.

39. Presentation by Lu Xinshe, *supra* note 14, at 23–29. See also BERGSTEN ET AL., *supra* note 3, at 166 n.3; NAT'L DEV. AND REFORM COMM'N, *supra* note 18; BERGSTEN ET AL., *supra* note 3, at 34–35, 42–43; Hillis, *supra* note 33.

40. Presentation by Lu Xinshe, *supra* note 14, at 30–36.

41. Presentation by Lu Xinshe, *supra* note 14, at 21–23. See also *International Conference on*

now embracing the integration of resource consumption, energy security, and critical environmental policy issues in the urban planning process.<sup>42</sup>

### III. SPRAWL, ENERGY, AND THE ENVIRONMENT

In the United States, there is no comparable national growth management policy or sustainable development strategy.<sup>43</sup> State governments typically leave urban planning, zoning, and growth management to cities and counties acting in pursuit of their own local parochial interests.<sup>44</sup> Over the last half century, this local framework for

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*Land Use Planning and Policy*, *supra* note 37. Sarah Schafer & Anne Underwood, *Building in Green*, NEWSWEEK, Sept. 28, 2005; Hillis, *supra* note 33.

China plans to move 400 million people into urban centers by 2030. In an effort to promote comprehensive development, American architect and industrial designer William McDonough was named co-chair to the China-U.S. Center for Sustainable Development to spearhead an ambitious experiment in environmentally sound development. McDonough's projects include the village of Huangbaiyu and six other major cities. If successful, McDonough's brand of eco-design could be the model for China's new urbanism.

McDonough's contention, that industrial cities designed from the ground up based on ecological principles could be more efficient, is important to China where energy efficiency is essential for continued modernization and economic growth. China currently uses three times more energy per square meter than either Europe or the United States to heat and cool buildings and is the second largest energy consumer in the world. McDonough's comprehensive approach is likely to be unfeasible in most countries, but may be possible in China where the government can impose its plans without significant resistance.

According to McDonough's design, cities will be built around interconnected parks that could support humans and wildlife. Streets will be angled and oriented on the diagonal to break up cold winter wind, keep city air clean, and maximize the amount of sunlight that reaches apartments all year long. Cities will be zoned for a mix of commercial, residential, and light industrial use to ensure that transportation links residences with workplaces. Rooftop farm plots will be connected by bridges over streets. New building materials and solar power grids will maximize energy efficiency. Bamboo wetlands will purify wastes and bamboo can be harvested and used as building material. McDonough is even working on developing toilet bowls so slippery they can be flushed with a fine mist. Schafer & Underwood, *supra*.

42. See generally Kalamaros, *supra* note 20.

43. Edward H. Ziegler, *Urban Sprawl, Growth Management and Sustainable Development in the United States: Thoughts on the Sentimental Quest for a New Middle Landscape*, 11 V.A. J. SOC. POL'Y & L. 26, 45-60 (2003).

44. *Id.* at 52-53. Local zoning and growth management programs in the United States are largely designed to address quality of life issues within a particular community and to promote low-density sprawl throughout any given metropolitan region. See ROBERT FREILICH, FROM SPRAWL TO SMART GROWTH 4-5 (1999); HENRY DIAMOND & PATRICK NOONAN, LAND USE IN AMERICA 106 (1996); Ziegler, *supra* note 43, at 53-54.

Severe restrictions on the density or type of development allowed within a community often reflect, from a regional perspective, a dysfunctional and virulent environmental NIMBYism (Not In My Back Yard) that results from the political activism (and often class or racial bias) of existing residents concerned about the "quality" and impact of new development on their neighborhood and within their community. Today, zoning restrictions on the development of "open space" and on other "environmentally sensitive" areas are the hallmark of any well drafted smart growth "Gucci" or "Birkenstock" sprawl zoning code.

growth management in the United States has produced a landscape of low-density, automobile-dependent sprawl.<sup>45</sup>

Most major metropolitan areas throughout the industrialized world experienced some degree of outward sprawling during the latter half of the twentieth century.<sup>46</sup> In the United States, however, the densities in these sprawling development patterns have generally been so low that, by a worldwide standard, the resulting built-environment can appropriately be called “hypersprawl.”<sup>47</sup> European development densities, by contrast, are about ten times greater than development densities in the United States.<sup>48</sup> Moreover, densities in Asian cities can be fifteen or twenty times greater than those in many developed areas of the United States.<sup>49</sup> Suburban residential densities in some developing areas of the United States are less than twenty residential dwellings per square mile.<sup>50</sup>

*Id.*

45. See JAMES KUNSTLER, *THE GEOGRAPHY OF NOWHERE: THE RISE AND DECLINE OF AMERICA’S MAN-MADE LANDSCAPE* 10 (1993); ANDRES DUANY ET AL., *SUBURBAN NATION: THE RISE OF SPRAWL AND THE DECLINE OF THE AMERICAN DREAM* 4 (2000); ROBERT FISHMAN, *BOURGEOIS UTOPIAS: THE RISE AND FALL OF SUBURBIA* 16–17 (1987). See also PETER CALTHORPE, *THE NEXT AMERICAN METROPOLIS: ECOLOGY, COMMUNITY, AND THE AMERICAN DREAM* 47 (1993) (noting the national population increased only 21% between 1969 and 1990, but total vehicle miles traveled increased by 82%).

46. See JOEL KOTKIN, *THE CITY: A GLOBAL HISTORY* 122–24 (2005) (discussing sprawl as a global phenomenon); ROBERT BRUEGMANN, *SPRAWL: A COMPACT HISTORY* (2005) (discussing sprawl throughout the world before and after the automobile). See also MOSHE SAFDIE & WENDY KOHN, *THE CITY AFTER THE AUTOMOBILE: AN ARCHITECT’S VISION* 3 (Lynne Missen ed., 1997).

Is there a common denominator to the ailments of cities of the industrialized west and of the populous Third World, in the North and in the Tropics—of New York and Mexico City, Jakarta and Hong Kong, Toronto and Copenhagen? Despite distinct differences of scale and resources, of climate and history, there is, indeed, a universal pattern. Everywhere in the world we find examples of expanded regional cities—cities that in recent decades have burst out of their traditional boundaries, urbanizing and suburbanizing entire regions, and housing close to a third of the world’s population.

*Id.*

47. ROBERT W. BURCHELL, *TRANSIT COOPERATIVE RESEARCH PROGRAM REPORT 39: THE COSTS OF SPRAWL—REVISITED* 6 (Nat’l Acad. Press 1998), available at [http://www.landuse.msu.edu/related/trans\\_sprawl.pdf](http://www.landuse.msu.edu/related/trans_sprawl.pdf). The automobile has transformed the landscape of the United States into a completely automobile (and oil) dependent human society. Safdie and Kohn note: “Automobiles and their road systems have completely redefined the old boundaries of cities. Today’s regional city of seventy or eighty miles across encompasses the ‘old’ downtown (or in some cases, several old downtowns), as well as industrial, commercial, and residential sprawl.” SAFDIE & KOHN, *supra* note 46, at 4.

48. BURCHELL, *supra* note 47.

49. *Id.*

50. This calculation is based on an allowed residential density limit of one residential unit per thirty-five acres of land—a density restriction found in some developing suburban areas. Boulder County, Colorado, for example, enforced this type of density restriction in its agricultural zones, some of which are directly in the path of suburban development northwest of Denver. *Id.*

This pattern of sprawl development in the United States requires an expensive infrastructure and consumes a large amount of energy.<sup>51</sup> Sprawl increases the urban footprint of population growth even in metropolitan areas near “transit friendly” cities (by American standards) such as San Francisco, Chicago, and Boston.<sup>52</sup> The United States, which has less than 5% of the world’s population, consumes about 25% of global oil production, and most of the oil is consumed for transportation.<sup>53</sup> If China ever achieves the present per capita energy consumption of the United States, it will need to consume all the oil now produced throughout the world.<sup>54</sup>

#### IV. THE AUTOMOBILE, FOSSIL FUELS, AND SUSTAINABLE DEVELOPMENT

The United States is an automobile and oil dependent society. It is, and will increasingly be, vulnerable to fluctuations in global oil prices and supplies.<sup>55</sup> The United States is also accruing a large and unsustainable infrastructure maintenance deficit as a consequence of its road system.<sup>56</sup> The United States’ current infrastructure maintenance deficit is approximately \$2 trillion and is expected to increase by more than \$100 billion each year.<sup>57</sup> Whether these hypersprawl related costs should be passed onto (or can even be paid by) future generations is increasingly the

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51. See BURCHELL, *supra* note 47. The average American’s environmental impact is thirty to fifty times that of the average citizen in a developing country. Each American generates five tons of carbon dioxide, a greenhouse gas, each year. In addition, the United States accounts for only 5% of the world’s population yet consumes 30% of the natural resource base, including 20% of the planet’s metals, 24% of its energy, and 25% of its fossil fuels. Leila Cabib, *Balancing Act*, E. MAG., Nov.–Dec. 2000, at 28, <http://www.emagazine.com/view/?871>.

52. Robert Geddes, *Metropolis Unbound: The Sprawling American City and the Search for Alternatives*, AMERICAN PROSPECT, Nov.–Dec. 1997, at 40; WILLIAM FULTON ET AL., WHO SPRAWLS THE MOST? HOW GROWTH PATTERNS DIFFER ACROSS THE U.S. 19–20 (The Brookings Inst. 2001), available at <http://www.brookings.edu/es/urban/publications/fulton.pdf>.

53. Keith Schneider, Commentary, *Sprawl No Antidote to Terror*, GREAT LAKES BULLETIN NEWS SERV. (Mich. Land Use Inst., Beulah, Mich.), Dec. 6, 2001, <http://www.mlui.org/growthmanagement/fullarticle.asp?fileid=11872>.

54. Craig Simons, *Car Culture: ‘We Want to Push the Limits’*, NEWSWEEK, May 9, 2005, at 40–41.

55. Tom Kenworthy, *Energy Independence May Be a Pipe Dream*, U.S.A. TODAY, Oct. 25, 2004, at 17A. See generally JULIAN DARLEY, HIGH NOON FOR NATURAL GAS: THE NEW ENERGY CRISIS (2004); COBY VAN DER LINDE, THE STATE AND THE INTERNATIONAL OIL MARKET: COMPETITION AND THE CHANGING OWNERSHIP OF CRUDE OIL ASSETS (2000); ZUHAYR MIKDASHI, TRANSNATIONAL OIL: ISSUES, POLICIES AND PERSPECTIVES (1986).

56. Ziegler, *supra* note 43, at 43–45.

57. American Soc’y of Civil Engineers, Estimated Infrastructure Maintenance GAP (2003), <http://www.asce.org>. The Colorado State Department of Transportation recently estimated that the state’s transportation deficit will be \$103 billion by 2030. Editorial, *Slower State Growth Means Time to Plan*, THE DENVER POST, Dec. 24, 2004, at B-06.

subject of debate. Moreover, scientists are now claiming that carbon dioxide emissions from the burning of oil and other fossil fuels are exacerbating global warming and climate changes that could have devastating consequences for the planet before the end of this century.<sup>58</sup>

China has recently taken significant steps towards increasing automobile production and ownership.<sup>59</sup> In 1995, there were an estimated ten million motor vehicles in China.<sup>60</sup> By 2005, there were an estimated 100 million vehicles in China (approximately 30% of that number is estimated to be private passenger automobiles).<sup>61</sup> Last year, China was reported to have invested about \$25 billion in its auto manufacturing industry.<sup>62</sup> In 2004, China produced over two million automobiles and began exporting cars to European and other Asian countries.<sup>63</sup> By 2007, China expects to produce about fourteen million vehicles and plans to begin exporting automobiles to the United States.<sup>64</sup>

China's future oil consumption will obviously need to increase substantially in order to keep pace with this increase in private automobile

58. See Jane Sanders, *Heating Up: Study Shows Rapid Urbanization in China Warming the Regional Climate Faster than Other Urban Areas*, GA. TECH RESEARCH NEWS, June 22, 2004, <http://gtresearchnews.gatech.edu/newsrelease/china-climate.htm>; WILLIAM C. BURNS, *GLOBAL WARMING: A PRIMER* (1996); N.H. RAVINDRANATH & JAYANT A. SATHAYE, *CLIMATE CHANGE AND DEVELOPING COUNTRIES* (2002); THOMAS E. LOVEJOY & LEE JAY HANNAH, *CLIMATE CHANGE AND BIODIVERSITY* (2005); FRANCES DRAKE, *GLOBAL WARMING: THE SCIENCE OF CLIMATE CHANGE* (2000). See also Jim Hansen, *The Threat To The Planet*, 53 THE NEW YORK REVIEW OF BOOKS No.12 (2006). Hansen notes:

If human beings follow a business-as-usual course, continuing to exploit fossil fuel resources without reducing carbon emissions or capturing and sequestering them before they warm the atmosphere, the eventual effects on climate and life may be comparable to those at the time of mass extinctions. Life will survive, but it will do so on a transformed planet. For all foreseeable human generations, it will be a far more desolate world than the one in which civilization developed and flourished during the past several thousand years.

*Id.*

59. Correspondence with Coll. of Architecture & Urban Planning, *supra* note 16. Automobile manufacturing in China increased by 80% from 2002 to 2003. General Motors, Ford, and Japanese automakers are investing billions of dollars in new Chinese plants. In addition, car sales are booming. At the June 2004 unveiling of the Cadillac CTS line, a GM company official told *Business Week* that GM expected China to quickly become Cadillac's second largest market. Oil prices and supplies are pressing concerns, considering the potential oil consumption of the Cadillac CTS line, which only gets sixteen to nineteen miles a gallon in city driving and twenty-five miles a gallon on highways. Knight Ridder, *China's Oil Appetite Could Undermine U.S. Energy Plans*, FORTWAYNE.COM, Aug. 20, 2004, <http://www.energybulletin.net/1713.html>.

60. Simons, *supra* note 54, at 40.

61. Correspondence with Coll. of Architecture & Urban Planning, *supra* note 16.

62. Feller, *supra* note 15, at 50, 59. See *IMPACT OF CHINA'S ECONOMIC REFORMS*, *supra* note 23.

63. Feller, *supra* note 15; Peter S. Goodman, *Chinese SUV Has Europeans in a Buying Tizzy*, THE DENVER POST, Aug. 9, 2005, at 30A; *IMPACT OF CHINA'S ECONOMIC REFORMS*, *supra* note 23.

64. Feller, *supra* note 15.

ownership.<sup>65</sup> During the last ten years, China's oil consumption doubled.<sup>66</sup> In absolute terms, however, China's increase in annual oil consumption (about 1.3 billion barrels) is comparable to the increase in annual oil consumption in the United States (about 1.1 billion barrels) during that period.<sup>67</sup> The United States is still a growing country, as its population is expected to increase to about 400 million people by mid-century.<sup>68</sup> About eighteen million new automobiles are sold each year in the United States, and this number will continue to grow.<sup>69</sup> Individually, both China and the United States add more than three million private passenger vehicles to their respective fleets of motor vehicles each year.<sup>70</sup> A sobering fact from a sustainable development perspective is that on a global basis, the number of motor vehicles is increasing at almost twice the rate of population growth. During the period of 1980-2000, the total number of vehicles increased from 380 million to 752 million, which equals a compound annual growth rate of 3.5%, while the population has increased by 1.6 billion, or a compound annual rate of 1.6%.<sup>71</sup>

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65. Zweig & Jianhai, *supra* note 7, at 25; STEPHAN FAIRFIELD ET AL., *Some Observations on Street Life in Chinese Cities*, LAND LINES (Lincoln Inst. of Land Pol'y, Cambridge, Mass.), Oct. 2004, at 5, available at <http://www.lincolninst.edu/pubs/pub-detail.asp?id=970>; Howard W. French, *A City's Traffic Plans Are Snarled by China's Car Culture*, N.Y. TIMES, July 12, 2005, at A3.

66. Elliott, *supra* note 14, at 33; Keith Bradsher, *From China, Some Relief on Oil Demand*, N.Y. TIMES, July 14, 2005, at C1; Ridder, *supra* note 59.

67. Elliott, *supra* note 14, at 33.

68. BUREAU OF THE CENSUS, U.S. DEP'T OF COMMERCE, POPULATION PROJECTIONS OF THE UNITED STATES BY AGE, SEX, RACE, AND HISPANIC ORIGIN: 1995 TO 2050 (Feb. 1996), <http://www.census.gov/prod/1/pop/p25-1130/p251130.pdf>. The Census Bureau predicts, by a conservative estimate, that the United States population could increase to 571 million people within the next hundred years. In 2000, the United States was the fastest growing country in the industrial world. Some warn that the United States' growth rate, which is double that of Europe, jeopardizes the economy and the environment. Illegal immigration alone may add over one million people per year to the United States population. See Donald L. Barlett & James B. Steele, *Who Left the Door Open?*, TIME MAGAZINE, Sept. 20, 2004, at 51. Leila Cabib argues that immigration control can curb the resource depletion and mitigate the environmental damage associated with rapid population growth. Cabib, *supra* note 51, at 28. The Census Bureau projections indicate that by 2050, 80% of the population growth will be attributable to immigrants and their descendents, who have settled here since the 1990s. Without the current level of immigration, there would be no net population growth in the United States. However, immigration control as an environmental protection tool is controversial. Politicians and even some ardent environmentalists are uncomfortable addressing the issue, especially when genuine humanitarian concerns are implicated. *Id.*

69. OFFICE OF HIGHWAY POLICY INFO., U.S. DEP'T OF TRANSP., OUR NATION'S HIGHWAYS 2000, No. FHWA-PL-01-1012, at 13 (2000), available at [http://www.fhwa.dot.gov/ohim/onh00/our\\_ntns\\_hwys.pdf](http://www.fhwa.dot.gov/ohim/onh00/our_ntns_hwys.pdf) [hereinafter OUR NATION'S HIGHWAYS].

70. OUR NATION'S HIGHWAYS, *supra* note 69; FISHMAN, *supra* note 7, at 117.

71. Press Release, The Counselors of Real Estate, Can Cities Cope? 60 Million People Streaming into Urban Areas Annually (Oct. 31, 2002), available at [http://www.cre.org/newsroom/news\\_article.cfm?lid=%20504](http://www.cre.org/newsroom/news_article.cfm?lid=%20504). This low density pattern of automobile-dependent land development is seen by some urban policy analysts as supporting a paradigm shift in the growth pattern of metropolitan areas in industrial societies. See ANTHONY DOWNS, NEW VISIONS FOR METROPOLITAN AMERICA 206-07

## V. FUTURE GROWTH, ENERGY, AND GLOBAL WARMING

Based on expected future growth, including increases in population, the resource and energy needs of both China and the United States will increase substantially in the years ahead. By mid-century, China's population is expected to increase by 300 million people, and the United States' population is expected to increase by more than 100 million people.<sup>72</sup> Resource and energy consumption will also increase in China and the United States because in each country the number of households is increasing faster than population growth (due to declining household size).<sup>73</sup> In addition, the physical size of individual housing units is increasing both in China and the United States.<sup>74</sup> China's growing urban population is expected to increasingly consume resources and energy on a level comparable to the United States and other first world countries.<sup>75</sup> Furthermore, in the United States, the low density pattern of sprawl development will likely continue in the near future. Hence, population growth in the United States will continue to generate high per capita rates of resource and energy consumption.<sup>76</sup>

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(1994). "Specifically the view of urban life as center focused is giving way to the view of urban societies as low density networks." *Id.* at 206. See generally JONATHAN BARNETT, *THE FRACTURED METROPOLIS* (1995). See also KOTKIN, *supra* note 46, at 122–24 (discussing sprawl as a global phenomenon). See generally BRUEGMANN, *supra* note 46 (discussing sprawl before and after development of modern automobile culture).

72. See FISHMAN, *supra* note 7, at 40; Cabib, *supra* note 51, at 28; Jim Motavalli, *Coming to America*, *E/ENVTL. MAG.*, Nov.–Dec. 2000.

73. See U.S. DEP'T OF AGRIC., *Population Growth and Demographic Change, 1980-2020*, 25 FOOD REV. 10, 10–12 (2002), available at <http://ers.usda.gov/publications/FoodReview/May2002/frvol25i1b.pdf>; DIAMOND, *supra* note 26, at 360.

74. See NAT'L ASS'N OF HOME BUILDERS, HOUSING FACTS, FIGURES AND TRENDS (Mar. 2006); Li Yan, *China's Real Estate Industry in a Boom*, PEOPLE'S DAILY, Sept. 25, 2001, [http://english.people.com.cn/english/200109/25/eng20010925\\_80981.html](http://english.people.com.cn/english/200109/25/eng20010925_80981.html); DIAMOND, *supra* note 26, at 360.

75. DIAMOND, *supra* note 26, at 372–73; THE IMPACT OF CHINA'S ECONOMIC REFORMS, *supra* note 23, at 147.

76. Martin C. Pedersen, *Cities in the Digital Age*, METROPOLIS MAG., Jan. 2004, at 1, available at [http://www.joelkotkin.com/Urban\\_Affairs/MET%20Cities%20in%20the%20Digital%20Age.htm](http://www.joelkotkin.com/Urban_Affairs/MET%20Cities%20in%20the%20Digital%20Age.htm). Joel Kotkin, senior fellow at the Davenport Institute for Public Policy at Pepperdine University, states "that the overwhelming trend borne out by the 2000 census is that the decentralization of industry and population seems inexorable." *Id.*

Some argue that the current United States population of about 300 million is unsustainable and already exceeds the country's carrying capacity. Hundreds of thousands of acres of farmland are lost each year to land development. Daily, 3.2 billion gallons more water is permanently removed than is replaced from aquifers, which is equivalent to half the water that flows through the mouth of the Mississippi River every day. Despite efforts to conserve energy, United States consumption grows daily. Ninety-three percent of the increase in U.S. energy use is attributable to population growth. In order to accommodate this growth and urban expansion, an area equal to the state of Delaware is paved yearly. Cabib, *supra* note 51, at 28. For a contrary view, see PIETRO S. NIVOLA, *LAWS OF THE LANDSCAPE* 4–5 (1999). The author therein observes:

To meet the enormous demand for energy in the years ahead, China and the United States are likely to build hundreds, perhaps thousands, of traditional coal-fired, greenhouse gas emitting power plants.<sup>77</sup> This is not good news to those concerned about global warming and climate change, especially since the United States and China are the world's two largest sources of carbon dioxide emissions.<sup>78</sup>

The situation will get worse before (or if) it will get better. Nearly all of the energy generated in both China (about 92%) and the United States (about 90%) is produced by the combustion of coal, oil, and natural gas, all fossil fuels whose use results in significant carbon dioxide emissions.<sup>79</sup> Currently, the United States is investing in the research and development

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Between 1982 and 1992 the state of Arizona sacrificed 49,280 acres a year to urban development. Even if this rapid rate were to continue unchecked well into the next millennium, however, Arizona's urbanized acreage in the year 2020 would remain under 2% of the state's overall surface. One can debate how "sustainable" that fraction will be, but clearly one cannot argue that vacant land in places like Arizona is a comparatively scarce commodity to be husbanded the way it is in, say, the Netherlands.

*Id.*

77. FISHMAN, *supra* note 7, at 115; Huang, *supra* note 32; Sanders, *supra* note 58; Craig Canine, *How to Clean Coal*, ONEARTH, Fall 2005, at 21, 22. China consumes twice as much coal as the United States, yet the United States consumes more coal on a per capita basis. The United States has an enormous amount of coal deposits for future use. See Jeff Goodell, *Coal's False Promise To America*, INT'L HERALD TRIBUNE, June 24–25, 2006, at 7, where the author points out that:

The biggest problem with America's bounty of coal is not what it does to our mountains or the atmosphere, but what it does to our minds. It preserves the illusion that we don't have to change our lives. Given the profound challenges we face with the end of cheap oil and the arrival of global warming, this is a dangerous fantasy.

78. Canine, *supra* note 77, at 22; DIAMOND, *supra* note 26, at 371. China currently accounts for 12% of the world's carbon dioxide emissions, which contribute to global warming. If current trends continue, China could account for 40% of the world's total emissions by 2050. *Id.* China is the key to any effort to reduce greenhouse gases, since it is expected to experience the most significant increase in carbon dioxide emissions between now and 2025. CHINA ANALYSIS BRIEF, *supra* note 6, at 10. See also JEFF GOODELL, *BIG COAL: THE DIRTY SECRET BEHIND AMERICA'S ENERGY FUTURE* 230 (2006). Goodell notes:

The coal-fired power plants that China will build between now and 2012 will generate more than twice the amount of greenhouse gases than the Kyoto Protocol signers agreed to cut by 2012. By 2025, if China continues down the path it's on, it will overtake the United States as the largest greenhouse gas polluter in the world. In other words, if China doesn't figure out a way to avoid the coal-burning development path of the West, the chances that the world will be able to meet a warming target of 3.5 degrees Fahrenheit—the point beyond which the rise of abrupt climate change begins to increase dramatically—are virtually zero.

*Id.*

79. CHINA ANALYSIS BRIEF, *supra* note 6; ENERGY INFO. ADMIN., COUNTRY ANALYSIS BRIEFS: UNITED STATES, 2 (Nov. 2005), <http://www.eia.doe.gov/emeu/cabs/Usa/pdf.pdf> [hereinafter U.S. ANALYSIS BRIEF]. See generally BRUCE PODOBNIK, *GLOBAL ENERGY SHIFTS: FOSTERING SUSTAINABILITY IN A TURBULENT AGE* (Temple Univ. Press 2006); PAUL ROBERTS, *THE END OF OIL: ON THE EDGE OF A PERILOUS NEW WORLD* (Houghton Mifflin 2004); VACLAV SMIL, *ENERGY AT THE CROSSROADS: GLOBAL PERSPECTIVES AND UNCERTAINTIES* (MIT Press 2003).



of coal gasification and carbon sequestration (green goal) technologies. However, critics contend that the investment is not enough compared to the gravity of the problem and the potential magnitude of the technical, legal, and social problems that will need to be resolved.<sup>80</sup>

In China and the United States, alternative energy sources, such as solar, wind, and geothermal energy, produce less than 1% of the energy consumed.<sup>81</sup> Given the state of today's technology, experts believe that it is highly unlikely that these alternative "carbon-free" energy sources will replace fossil fuels as the major energy sources in either country by mid-century.<sup>82</sup> Energy conservation and energy efficiency will undoubtedly help facilitate the transition to a society that is not dependent on fossil fuels. However, the science and technology of alternative solar and wind energy sources are far from adequate to facilitate a complete transition in the near term. It appears that neither the United States nor China is

80. Canine, *supra* note 77, at 28–29. See also *Green Energy Resources Gains International Recognition*, BUS. WIRE, May 2, 2005, available at <http://www.greenenergyresources.com/pdfdocs/archives/2006071819212513.pdf>; M.S. Dresselhaus & I.L. Thomas, *Alternative Energy Technologies*, 414 NATURE 332 (2001); Derek Pooley, *Contemplating Future Energy Options*, 1 NUCLEAR FUTURE 192 (2005).

With respect to the scientific and technical issues that must be addressed, see Jens R. Rostrup-Nielsen, *Making Fuels from Biomass*, 308 SCIENCE 1421 (2005); Anna K. Behrensmeier, *Climate Change and Human Evolution*, 311 SCIENCE 476 (2006); Robie Macdonald, *Climate Change, Risks and Contaminants: A Perspective from Studying the Arctic*, 11 HUMAN & ECOLOGICAL RISK ASSESSMENT 1099 (2005); Roger A. Pielke, Sr., *Land Use and Climate Change*, 310 SCIENCE 1625 (2005); Quirin Schiermeier, *Climate Change: A Sea Change*, 439 NATURE 256 (2006).

For a discussion of the complex and problematic legal and social issues that are potentially involved in moving to a non-carbon future, see John H. Knox, *The International Legal Framework for Addressing Climate Change*, 12 PENN ST. ENVTL. L. REV. 135 (2004); Richard L. Ottinger, *Global Climate Change Kyoto Protocol Implementation: Legal Frameworks for Implementing Clean Energy Solutions*, 18 PACE ENVTL. L. REV. 19 (2000); ALEXANDER GILLESPIE, CLIMATE CHANGE, OZONE DEPLETION AND AIR POLLUTION: LEGAL COMMENTARIES WITH POLICY AND SCIENCE (2006); Steven M. Hoffman, *Community Energy: A Social Architecture for an Alternative Energy Future*, 25 BULLETIN OF SCI., TECH. & SOC'Y 387 (2005).

81. See U.S. ANALYSIS BRIEF, *supra* note 79. U.S. "energy from wind and solar resources combined account for only 0.2 percent of total U.S. energy use." Michael J. Brandemuehl, *A Sustainable Energy Future Possible*, THE DENVER POST, Dec. 4, 2005, at 4E.

Although China's use of alternative energy sources is dwarfed by its use of coal, oil, and natural gas, China remains "the world's largest user of solar power for household purposes." FISHMAN, *supra* note 7, at 110. Solar rooftop water heaters have become increasingly popular in cities where electricity is rationed or regularly unavailable. *Id.* at 110–11. The methods, however, are quite low-tech. *Id.* at 110.

82. See Timothy Gardner, *Clean Coal Isn't Climate-friendly Yet*, REUTERS, Oct. 7, 2005, and Martin Hoffert, *Creating a Sustainable Energy Future: Moving from Theory to Reality, Charting a Sustainable Energy Pathway for Colorado and the Rocky Mountain West* (Colorado Sustainable Energy Forum CD-ROM, Apr. 25, 2005). See generally DAVID G. VICTOR, CLIMATE CHANGE: DEBATING AMERICA'S POLICY OPTIONS (Brookings Inst. Press 2004); CLIMATE CHANGE: SCIENCE, STRATEGIES & SOLUTIONS (Eileen Claussen ed., BRIU 2001).

currently making the large investment necessary to phase out fossil fuels by mid-century.<sup>83</sup>

## VI. URBAN GROWTH, ENERGY, AND GREEN DEVELOPMENT

Beijing recently created a new powerful energy agency, the State Energy Office, to monitor energy resources and advise the government on resource and energy security issues.<sup>84</sup> China also recently adopted plans for a strategic oil reserve program similar to the program now existing in the United States.<sup>85</sup> But Chinese government officials seem intent on preventing China from becoming a completely automobile-dependent society. Reports in China increasingly link the conservation and efficient use of resources and energy security to the development of a more rational framework for urban growth and expansion in the future.<sup>86</sup> While automobile ownership will surely increase in China, officials in Beijing are calling for the curtailment of urban sprawl and the implementation of development policies preserving alternative (non-automobile dependent) modes of transportation in urban areas.<sup>87</sup> China is heavily investing in all

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83. See generally Gardner, *supra* note 82; CHINA ANALYSIS BRIEF, *supra* note 6.

According to Li Junfeng of the Chinese Renewable Energy Association, the government's goal is to increase the total reliance on renewable energy sources from the present level of [five to six percent to ten percent] by 2010. However, government figures show that producing electricity from renewable energy is almost twice as expensive as burning coal, throwing some doubt over how widely adopted it will become. "Prices are prohibitive," says Yu Jie of Greenpeace. "We believe, though, that this can be reduced by locally producing, rather than importing the necessary construction materials plus the government should offer tax incentives for operators."

Robertson, *supra* note 32. See generally PODOBNIK, *supra* note 79; ROBERTS, *supra* note 79; SMIL, *supra* note 79.

84. Zweig & Jianhai, *supra* note 7, at 36.

85. CHINA ANALYSIS BRIEF, *supra* note 6, at 7–8. In 1975, Congress passed the Energy Policy and Conservation Act (EPCA), which established the Strategic Petroleum Reserve (SPR) to store up to one billion barrels of oil. U.S. ANALYSIS BRIEF, *supra* note 79, at 5. By 2005 the Department of Energy had filled the SPR to 700 million barrels at President Bush's direction. After Hurricane Katrina hit, the President authorized the sale of thirty million barrels of oil from the SPR to "maintain suppliers and calm markets." *Id.*

The EPCA allows the President to withdraw SPR oil as "required by 'a severe energy supply interruption or by obligations of the United States' under the International Energy Agency." *Id.* at 6. Oil distributed pursuant to an emergency drawdown order is auctioned off to the highest bidder. *Id.*

86. *Sound Urban Plans Called*, *supra* note 33; Schafer & Underwood, *supra* note 41; Hillis, *supra* note 33; Tingting, *supra* note 33; *Land Use Program Kicks Off Fourth Year*, *supra* note 33.

In December 2001, China adopted a market-oriented mechanism to control land sales within five years. Pursuant to this mechanism, applications for profit-driven real estate projects will be resolved through public bidding. *China to Control Land Use Through Public Bidding*, XINHUA NEWS AGENCY, Dec. 6, 2001.

87. French, *Riots*, *supra* note 16; Huang, *supra* note 32. See also FISHMAN, *supra* note 7, at 118–22; Presentation by Lu Xinshe, *supra* note 14, at 21; FAIRFIELD ET AL., *supra* note 65.

forms of public transit in its cities, particularly light rail networks and rapid transit systems.<sup>88</sup>

Urban planners in China and the United States are increasingly aware of the link between the density of urban development and the resultant resource and energy consumption.<sup>89</sup> Resource and energy consumption in modern urban areas, particularly the burning of fossil fuels and greenhouse gas emissions, also typically relate to the environmental impact of development. As David Owen points out in his recent article “Green Manhattan,” high density development tends to be “green development.”<sup>90</sup> In large part, this simply has to do with the lower resource, energy, transportation, and environmental costs associated with higher-density development.<sup>91</sup> For example, in the United States where more than 80% of trips are by private automobile because of its lower density development,<sup>92</sup> the transportation sector accounted for roughly 28% of all energy consumption in 2005.<sup>93</sup> By contrast, in China where over 80% of trips are

Ten years ago, “the Chinese owned only 10.4 million [motor] vehicles, almost all of them [being] in government or corporate fleets.” Craig Simons, *Car Culture*, NEWSWEEK, May 9, 2005, at 40. Currently, there are over twenty-three million motor vehicles in China. *Id.* A Swiss study in 2003 found that 40% of Chinese families planned on buying a new automobile. Indeed, new sales increased 82% in 2003 and 11% in 2004, despite Beijing’s attempts to slow down its economy. *Id.*

88. See FISHMAN, *supra* note 7, at 2; Presentation by Ximing Lu, Dir., Shanghai Transp. Planning Inst., on Shanghai City Comprehensive Transportation: Planning for Movement and People (July 8, 2005), [http://urban-age.net/0\\_downloads/pdf\\_presentations/Shanghai/04.02-ximing\\_Lu-Planning\\_for\\_movement\\_and\\_people.pdf](http://urban-age.net/0_downloads/pdf_presentations/Shanghai/04.02-ximing_Lu-Planning_for_movement_and_people.pdf).

89. See Presentation by Ximing Lu, *supra* note 88. That there is a direct correlation between low-density metropolitan development (as in the United States) and very high transportation energy costs was, in part, the focus at a recent urban planning conference in Shanghai addressing the future of China’s cities. See Presentation by Ximing Lu, *supra* note 88. See also Presentation by Hermann Knoflacher, TU Vienna, on Urban Age So Far—Mobility (July 8, 2005), [http://www.urban-age.net/0\\_downloads/pdf\\_presentations/Shanghai/04.01-Hermann-Knoflacher-Urban\\_age\\_so\\_far\\_Mobility.pdf](http://www.urban-age.net/0_downloads/pdf_presentations/Shanghai/04.01-Hermann-Knoflacher-Urban_age_so_far_Mobility.pdf).

90. David Owen, *Green Manhattan*, THE NEW YORKER, Oct. 18, 2004, at 111. The author states that:

The key to New York’s relative environmental benignity is its extreme compactness. Manhattan’s density is more than eight hundred times that of the nation as a whole. Placing one and a half million people on a twenty-three-square-mile island sharply reduces their opportunities to be wasteful, and forces the majority to live in some of the most inherently energy-efficient residential structures in the world: apartment buildings.

*Id.*

91. *Id.* at 112. Owen observes that “[s]preading people out increases the damage they do to the environment, while making the problems harder to see and to address.” *Id.* He goes on to state that “[t]he environmental challenge we face, at the current stage of our assault on the world’s non-renewable resources, is not how to make our teeming cities more like the pristine countryside . . . [, but rather] how to make other settled places more like Manhattan.” *Id.*

92. CALTHORPE, *supra* note 45, at 47.

93. ENERGY INFO. ADMIN., *Energy Consumption by Sector 1949-2005*, in ANNUAL ENERGY REVIEW 2005, at 36, available at <http://www.eia.doe.gov/emeu/aer/consump.html> (follow the “pdf” hyperlink in the “Graphs” column). Consumption includes coal, natural gas, petroleum, nuclear

by walking, cycling, or public transit, the transportation sector's energy consumption accounted for only a tiny fraction of total consumption.<sup>94</sup> This correlation helps explain why in the United States over 80% of the crude oil supply goes toward automobile use and transportation,<sup>95</sup> as well as why the United States has about ten times the per capita energy consumption of China.<sup>96</sup>

## VII. PLANNING, DENSITY, AND NEW SATELLITE CITIES

An interesting aspect of growth management in China today is the emerging policy against continuing the very high-density construction that has characterized so much of China's recent development in many of its large cities. Some Chinese planners already consider China's major cities too crowded and are looking to decrease the density in their main urban core areas.<sup>97</sup>

China's officials and planners are embracing the concept of "satellite towns" in outlying suburban areas of major cities such as Beijing and Shanghai.<sup>98</sup> This will be a complicated and huge undertaking, as some of these satellite towns are planned to accommodate anywhere from 500,000 to over one million people.<sup>99</sup> Moreover, these towns typically include major automobile expressways and rapid mass transit (often light rail) connections to the core areas of major hub cities.<sup>100</sup> The new towns are designed to be largely independent cities with the necessary infrastructure to support their expected populations, including residential, office, commercial, recreational, cultural, educational, and manufacturing facilities, as well as all necessary utilities.<sup>101</sup>

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electric power, hydroelectric power, wood, waste, alcohol fuels, geothermal, solar, wind, coal coke net imports, and electricity net imports. *Id.* at 38 n.4.

94. Presentation by Hermann Knoflacher, *supra* note 89, at 19.

95. U.S. ANALYSIS BRIEF, *supra* note 79.

96. CHINA ANALYSIS BRIEF, *supra* note 6, at 15.

97. Huang, *supra* note 32, at 4.

98. *Satellite Towns to Ease Population Pressure*, BEIJING THIS MONTH, Mar. 1, 2004; *Beijing to Be Divided into Four Functional Zones*, BEIJING THIS MONTH, Feb. 15, 2005; Presentation by Shiling Zheng, Tongji Univ., on Shanghai's Transformation (July 8, 2005), at 28, [http://urban-age.net/0\\_downloads/pdf\\_presentations/Shanghai/02.01-Shiling\\_Zheng-Shanghai.pdf](http://urban-age.net/0_downloads/pdf_presentations/Shanghai/02.01-Shiling_Zheng-Shanghai.pdf).

99. See Presentation by Shiling Zheng, *supra* note 98. See also *Satellite Towns to Ease Population Pressure*, *supra* note 98.

100. See Presentation by Ximing Lu, *supra* note 88.

101. See Presentation by Shiling Zheng, *supra* note 98, at 27; Presentation by Ximing Lu, *supra* note 88.

These satellite cities often have what would be described in the United States as “New Urbanist” design characteristics.<sup>102</sup> A good example is the plan for the satellite town of Qingpu located about thirty-five miles west of Shanghai. The city is planned for a population of 500,000 to 600,000 people.<sup>103</sup> With more than half the new city’s land located in northern industrial zones, the population will be about the same as Denver, Colorado, although Qingpu will only be about one-fifth the geographic size of Denver. First, development will occur in stages moving outward from the existing city of Qingpu (population about 100,000), and will ultimately require substantial redevelopment of the existing city, including the new channeling of the Youdun River, which will traverse the new city in many places.<sup>104</sup>

Most areas in the northern half of the official plan for the new City of Qingpu are industrial and manufacturing zones, and sites for public utilities and power generation. The lower half of the plan largely consists of rather high-density residential apartment neighborhoods with a mix of commercial retail, office, schools, recreational, cultural, and public uses planned at designated sites throughout those neighborhoods. Parks and other open green spaces are also included in the plan. A major expressway

102. Schafer & Underwood, *supra* note 41; Ron Nyren, *Dialogue: Global Design & Development*, URBAN NEWS, Nov.–Dec 2005; Design Collective, US-China Housing Shanghai Demo Project, <http://www.designcollective.com/Planning/> (follow “TND–New Communities” hyperlink; then follow “US-China Housing Shanghai Demo Project”).

As a land development concept, New Urbanism is usually characterized as a more compact, higher-density, mixed-use, and integrated development design. It includes a range of housing types, including affordable housing, and pedestrian friendly neighborhoods that are sometimes linked with mass transit and high density modes of transit-oriented development. *See generally* PETER KATZ, *THE NEW URBANISM: TOWARD AN ARCHITECTURE OF COMMUNITY* (Joel Stein ed., McGraw-Hill, Inc. 1994); WILLIAM FULTON, *THE NEW URBANISM* (LINCOLN INST. OF LAND POLICY 1996); CALTHORPE, *supra* note 45. Whether New Urbanism will actually have any significant impact on the low-density and automobile-dependent landscape and the so-called “Smart Growth” movement in the United States remains to be seen. *See* Ziegler, *supra* note 43, at 56–57. The author therein states:

In theory, “smart growth” zoning codes should combine selective protection of scenic vistas, important open space areas and environmentally sensitive lands with significant zoning designations of land for growth areas that allow more compact, higher-density, mixed-use and pedestrian friendly developments—sometimes referred to as “New Urbanist” development. The reality, though, is that many modern zoning codes too often contain the former protective environmental restrictions but shun the latter more generous development provisions. Unless zoning and land development codes are changed to allow, or to actually require, this type of mixed-use, higher-density residential development in both infill and greenfield areas, New Urbanism may prove to be just a form of New Suburbanism—sprawl with front porches.

*Id.*

103. Official Plan for New Satellite Town of Qingpu, Shanghai (2005) (on file with author). *See also* Correspondence with Coll. of Architecture & Urban Planning, *supra* note 16.

104. Correspondence with Coll. of Architecture & Urban Planning, *supra* note 16.

and light-rail rapid public transit will connect the new city to Shanghai to the east.<sup>105</sup>

#### VIII. PLANNING AND PRESERVATION OF ALTERNATIVE TRANSIT MODES

The official plan for the East Qingpu area of the satellite city of Qingpu highlights some of the design features of this new mixed-use "neighborhood." The modified grid street pattern is evident on the plan and much of the residential housing is a short walk from the major town center. The width of this neighborhood will be about one mile across. Rapid light rail public transit serves the neighborhood and runs along the major east-west thoroughfare just north of the town center.

Residential areas in the East Qingpu plan generally consist of residential zones planned for six to eight story apartment buildings.<sup>106</sup> Blocks in the residential apartment district will vary from about 600 to 1200 feet in length.<sup>107</sup> On internal residential streets, sidewalks will be eighteen feet wide with a roadbed about thirty-six feet wide. The residential densities will be about the same as parts of Berlin and Amsterdam.<sup>108</sup> Although the density will be greater than most "new urbanist" projects developed in the United States, it will be lower than the density of central Vancouver or Lower Manhattan, both of which are city models for the "true urbanist" planning movement.<sup>109</sup>

Some zones, both at the town center and in a few other neighborhoods, are planned for commercial/office uses with fifteen to eighteen story buildings.<sup>110</sup> There are also a few truly mixed-use zones along some neighborhood streets. These planned for apartment buildings with street level commercial retail for shops, restaurants, and neighborhood services. Parks, open green space, and landscaped areas are generously placed throughout the plan, a common design element in China's new development projects.<sup>111</sup>

An interesting aspect of the East Qingpu plan is the extent to which the plan is pedestrian friendly. There will be onsite parking (split between

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105. *Id.*

106. Official Plan for East Qingpu Neighborhood, Qingpu Satellite City, Shanghai (2005) (on file with author). *See also* Correspondence with Coll. of Architecture & Urban Planning, *supra* note 16.

107. Correspondence with Coll. of Architecture & Urban Planning, *supra* note 16.

108. *Id.*

109. *See generally* Trevor Boddy, *Vancouverism vs. Lower Manhattanism: Shaping the High Density City*, ARCHNEWSNOW.COM, Sep. 20, 2005, <http://www.archnewsnow.com/features/feature177.htm>.

110. Official Plan for East Qingpu Neighborhood, *supra* note 106.

111. *Id.*

surface and underground of about 3.5 spaces for every 4 units) in the apartment zones to accommodate widespread private automobile ownership. Unlike most neighborhoods in the United States, however, life will not be completely automobile dependent.<sup>112</sup> One will easily be able to walk, bike, or take public transportation virtually anywhere. Everyone should be able to live, work, and play without owning or using an automobile.

Planners hope to maintain a transit-mode split in these satellite cities as close to the existing transit-to-job mode split in Shanghai (which now has about two million automobiles) as possible. The Shanghai transit-mode split is currently as follows: trips to work by walking about 29%; by cycling about 25%; by public transit about 24%; by electromobile about 6%; by motorcycle about 5%; and by private automobile about 9% (and about 2% by other methods).<sup>113</sup>

Another interesting aspect of the East Qingpu plan is the limited amount of parking available beyond the onsite apartment parking in the residential areas.<sup>114</sup> The parking near the major town center and the light rail transit stop is expected to be largely reserved for government officials and private business executives.<sup>115</sup> Some streets may also be completely closed to motor vehicles.<sup>116</sup> In the new East Qingpu neighborhood, planners intend for it to be more convenient to walk, cycle, or take public transit than to drive a car when traveling virtually anywhere in the immediate area of the city. This is a near complete inversion of the modern American development prototype.<sup>117</sup>

Time will tell, of course, how this plan for the new satellite city of Qingpu is implemented as development moves forward. The wait may not

112. *See generally* Boddy, *supra* note 109.

113. *See* Presentation by Hermann Knoflacher, *supra* note 89, at 19; FISHMAN, *supra* note 7, at 83. *See also* FAIRFIELD ET AL., *supra* note 65, at 6–7.

114. Correspondence with Coll. of Architecture & Urban Planning, *supra* note 16.

115. *Id.*

116. *Id.*

117. *See* CALTHORPE, *supra* note 45. The modern American Development is largely shaped by high rates of automobile ownership and the pervasiveness of automobile dominated transit options. INTRODUCTION TO THE METROPOLIS ERA: VOLUME 2, MEGA-CITIES 14 (Mattei Dogan & John D. Kasarda eds., Sage Publications 1988).

In cities where there is a high proportion of households owning an automobile, like American cities, the density of people is necessarily reduced accordingly. That cars require a substantial amount of space at a variety of locations is an important, but frequently overlooked, basic fact in comparative studies of urban density.

*Id.*

be long. The build out period for the entire city of Qingpu is estimated to be only fifteen years.<sup>118</sup>

#### IX. GROWTH MANAGEMENT, ENERGY, AND THE ENVIRONMENT

China's government hopes that new urban planning and growth management policies will provide regulatory mechanisms that are better able to address its serious development and environment problems.<sup>119</sup> According to recent reports, China's initiatives under this new growth management system already are having significant success in protecting farmland through widespread downzoning of earlier designated local economic development and industrial zones, and by curtailing the development of golf courses and upscale low-density villa projects on the fringe of urbanizing areas.<sup>120</sup> This turn to the green of more sustainable and comprehensive growth management policies and planning programs appears to be rooted in China's need to continue to promote job creation and economic development. It is widely believed that continued substantial economic development is necessary to maintain long-term social stability within the country.<sup>121</sup>

In the years ahead both China and the United States will face the challenge of coping with a potential energy crisis related to world oil supply and price.<sup>122</sup> Both countries import a substantial percentage of their oil—China 45% and the US 58%—and much of this oil is imported from the Middle East.<sup>123</sup> As the world's oil supply is substantially exhausted during this century, world oil prices will rise.<sup>124</sup> The United States' economy is still very dependent upon automobiles and oil and this is unlikely to change in the near future. If oil prices rise dramatically, the

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118. Correspondence with Coll. of Architecture & Urban Planning, *supra* note 16.

119. Presentation by Lu Xinshe, *supra* note 14, at 21–23. Corruption in the land transfer and development process is also a pressing problem. In 2004, the Chinese government forbade private land transfers by public officials and required that they occur through public auction. The Ministry of Land and Resources disciplined officials involved in about 168,000 illegal land deals in 2003. *Id.*

120. See *Law Protects Long-term Land Use of Chinese Farmers*, PEOPLE'S DAILY, Mar. 3, 2003; *China to Continue Controlling Land Supply in 2005*, PEOPLE'S DAILY, Mar. 29, 2005; *China Curbs Excessive Land Use in Industrial Parks*, CHINA DAILY, Nov. 3, 2005; Le Min Lim & Samuel Shen, *Curbs on Land Use to Be Tightened*, THE STANDARD, Mar. 8, 2005; *China Sets Ceiling on Farmland*, CHINA.ORG, July 2002.

121. See Hubacek & Laixiang, *supra* note 26, at 367–70; Zakaria, *The Tiger in Front*, *supra* note 14, at 12; *Hu Calls for a Stable Community*, SHANGHAI DAILY, May 24, 2005, at 4.

122. See PODOBNIK, *supra* note 79; ROBERTS, *supra* note 79; SML, *supra* note 79; JOHN TILTON, *ON BORROWED TIME?* (2003).

123. See ROBERTS, *supra* note 79, at 333–41.

124. *Id.*



United States could potentially face an urban and economic collapse.<sup>125</sup> China depends less on automobiles and oil and the country's urban planners seem intent on preventing the loss of major non-automobile modes of transit in China's cities and towns.<sup>126</sup>

Neither country has yet to directly face the enormous challenge of reducing its CO<sub>2</sub> greenhouse gas emissions. Addressing the problems of global warming and climate change, which could have devastating consequences for the planet, will require an enormous investment in the research and development of alternative energy technologies, innovative CO<sub>2</sub> reduction, and carbon capture strategies and techniques.<sup>127</sup> China is still a relatively poor and developing country, with about 800 million impoverished peasants.<sup>128</sup> As with other environmental problems, China is likely to allocate substantial resources only to sustainability issues that directly relate to maintaining job creation and future economic growth in the near term.<sup>129</sup> This approach parallels that of the United States during its first hundred years of industrial growth, when economic development almost always took precedent over environmental protection and conservation.<sup>130</sup>

## X. FUTURE GROWTH AND SUSTAINABLE DEVELOPMENT POLICY

It seems that the United States and other first world countries will need to finance the development of alternative energy technologies and new

125. See Ridder, *supra* note 59; ROBERTS, *supra* note 79.

126. See Presentation by Hermann Knoflacher, *supra* note 89; Presentation by Ximing Lu, *supra* note 88. See generally Schafer & Underwood, *supra* note 41.

127. Hoffert, *supra* note 82. See generally DAVID G. VICTOR, CLIMATE CHANGE: DEBATING AMERICA'S POLICY OPTIONS (2004).

128. See generally IMPACT OF CHINA'S ECONOMIC REFORMS, *supra* note 23; DIAMOND, *supra* note 26; Jayanthi Iyengar, *Beijing Unveils Land Reform Policy*, ASIA TIMES, Mar. 11, 2003, <http://www.atimes.com/atimes/China/EC11Ad01.html>; Jim Jubak, Commentary, *China: The Dragon That Isn't*, MSN MONEY, July 15, 2005, <http://moneycentral.msn.com/content/P119985.asp>.

129. See generally Zakaria, *The Tiger in Front*, *supra* note 14, at 6; Presentation by Lu Xinshe, *supra* note 14.

130. See DIAMOND, *supra* note 26, at 374–75; IMPACT OF CHINA'S ECONOMIC REFORMS, *supra* note 23, at 149–54. See also GOODELL, *supra* note 78, at 233. Goodell states:

Chinese leaders understand very well that the reason global warming threatens the stability of the planet today is because the industrialization of the West—those 150 blissful years of burning fossil fuels—loaded up the atmosphere with CO<sub>2</sub>. They also are quite aware of the fact that the average American is thirty times richer than the average Chinese, and they don't hesitate to remind people of it. As one Chinese delegate involved in negotiations over the Kyoto Protocol put it, "What [developed nations] are doing is luxury emissions. What we are doing is survival emissions."

*Id.*

techniques for reducing CO<sub>2</sub> greenhouse gas emissions.<sup>131</sup> Contrary to what some may believe, there are simply no readily available technological and financially feasible solutions to the world's peak oil and global warming problems.<sup>132</sup> Finding and implementing solutions to these problems will be an extremely difficult and costly undertaking. As Jared Diamond's recent book *Collapse* makes plain, there are no guaranteed solutions.<sup>133</sup> The United States currently appears to be in denial about the existence and magnitude of the potential peak oil and global warming problems.<sup>134</sup> The United States has neither a national growth management policy nor coherent national energy strategy. Furthermore, its national, state, and local governmental policies continue to support and subsidize localized urban planning programs that will virtually guarantee that the future environment and metropolitan landscape will be dominated by automobile-dependent and fossil-fuel consumptive sprawl.<sup>135</sup>

Consider, for example, the size of the disconnect between these two potential "future growth" realities. According to Martin Hoffert, a respected NYU scientist and expert in alternative energy systems, by 2050 the world may need to produce as much as two or three times the world's current energy production accommodate expected growth. To prevent many of the potentially devastating problems associated with global warming and climate change, this energy will all need to be produced without releasing greenhouse gases.<sup>136</sup> Similarly, the expected growth

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131. See U.S. ANALYSIS BRIEF, *supra* note 79, at 12–13 (discussing U.S. funding for renewable energy and energy efficient technologies).

132. See Walsh, *supra* note 9, at 61; Bradsher & Barboza, *supra* note 7; Matthew L. Wald, *Search for New Oil Leads to Processed Coal*, N.Y. TIMES, July 5, 2006, at C1, C4; Peter Harmsen, *China Warns Too Many Power Plants Are Being Built*, AGENCE FRANCE-PRESSE, June 8, 2006, available at <http://www.petroleumworld.com/story/06060804.htm>; Gardner, *supra* note 82.

133. See DIAMOND, *supra* note 26.

134. See Hoffert, *supra* note 82. See generally PODOBNIK, *supra* note 79; ROBERTS, *supra* note 79; SMIL, *supra* note 79; CLIMATE CHANGE: SCIENCE, STRATEGIES & SOLUTIONS, *supra* note 83; N.H. RAVINDRANATH & JAYANT A. SATHAYE, CLIMATE CHANGE AND DEVELOPING COUNTRIES (2002); Pooley, *supra* note 80.

135. In the absence of metropolitan regional planning, one can expect local zoning and growth management programs in the United States to continue promoting low-density, automobile-dependent sprawl. See ANTHONY DOWNS, NEW VISIONS FOR METROPOLITAN AMERICA 39–40 (1994); Ziegler, *supra* note 43, at 58–60. See also Richard Moe, *Growing Smarter: Fighting Sprawl and Restoring Community in America*, ENV'T'L & URB. ISSUES, Winter 1997, at 13. Moe observes:

We can't seem to shake our attachment to yesterday's vision of tomorrow—the dream of an auto centered utopia where skyscrapers soar above acres of parkland and great highways stretch toward the horizon. The fact that this vision completely disregards the way communities really work hasn't stopped generations of planners from adopting it as the paradigm of The Way Things Ought To Be.

*Id.*

136. Hoffert, *supra* note 82. During 2004, all solar and wind energy technologies combined

scenario in the years ahead for the United States and China includes hundreds of millions of additional people striving for first world levels of consumption, construction of hundreds or thousands of coal-fired power plants that emit greenhouse gases, and the addition of several hundred million oil-consuming and greenhouse-gas-emitting motor vehicles.<sup>137</sup> The latter growth scenario is the future that the United States is presently moving toward.<sup>138</sup>

Globally, these contrasting scenarios do not portend a smooth and steady transition from our fossil-fueled industrial world to a stable and sustainable clean-energy future. Something will have to give way as these opposing growth scenarios play out in the years ahead.<sup>139</sup> A recent report by the World Watch Institute states the matter in rather direct and unambiguous terms:

Global ecosystems and resources are simply not sufficient to sustain the current economies of the industrial West and at the same time

accounted for less than 1% of U.S. energy consumption. Brandemuehl, *supra* note 81. *See also* Feller, *supra* note 15, at 52; THE IMPACT OF CHINA'S ECONOMIC REFORMS, *supra* note 23, at 146. Only 6% of U.S. energy demand was met with all forms of renewable energy sources. As of October 2005, only twenty states have adopted mandates aimed at increasing the proportion of renewable power consumed. Renewable energy growth is stunted by little or no development of new hydroelectric sites, a decline in the use of biomass for non-electric purposes, and the high capital costs of most renewable energy production facilities as compared to fossil-fueled alternatives. Other concerns also plague renewable energy growth. The first U.S. offshore windmill park was proposed for construction off of Cape Cod. Although the project could have powered 200,000 local homes, residents opposed it because they believed the project would mar the landscape. U.S. ANALYSIS BRIEF, *supra* note 79, at 12. Snob zoning and NIMBYism often dominate the land development process in the United States. *See* Ziegler, *supra* note 43.

137. Hoffert, *supra* note 82. *See also* DIAMOND, *supra* note 26, at 372–76; CHINA ANALYSIS BRIEF, *supra* note 6; Zweig & Jianhai, *supra* note 7; Ridder, *supra* note 59; Tingting, *supra* note 33; FISHMAN, *supra* note 7, at 115–17; French, *Riots*, *supra* note 16; FAIRFIELD ET AL., *supra* note 65; THE IMPACT OF CHINA'S ECONOMIC REFORMS, *supra* note 23; Flavin & Gardner, *supra* note 4, at 8–11 (discussing problematic sustainable development issues involved in China's carbon energy future). *See generally* Pooley, *supra* note 80; Dresselhaus & Thomas, *supra* note 80; Jens R. Rostrup-Nielsen, *supra* note 80; Rebecca Smith, *As Emission Restrictions Loom, Texas Utility Bets Big on Coal*, WALL ST. J., July 21, 2006, at A8 (about 75% of the over one hundred major power plants for electricity generation in the United States that are planned for construction in the near term are expected to be traditional pulverized coal plants that will substantially increase carbon dioxide emissions).

138. *See generally* GOODELL, *supra* note 78.

139. Critics of sprawl point out that it is enormously expensive, economically inefficient, fiscally irresponsible, harmful to local and global environments, and utterly unsustainable on fossil fuels into the future. *See generally* Robert W. Burchell, *The Evolution of the Sprawl Debate in the United States*, 5 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 137 (1999); Francesca Ortiz, *Biodiversity, The City, and Sprawl*, 82 B.U. L. REV. 145 (2002); Patrick Gallagher, *The Environmental, Social and Cultural Impacts of Sprawl*, 15 NAT. RESOURCES & ENV'T 219 (2001); Michael Lewyn, *Suburban Sprawl: Not Just an Environmental Issue*, 84 MARQ. L. REV. 301 (2000). *See also* F. KAID BENFIELD ET AL., *ONCE THERE WERE GREENFIELDS: HOW SPRAWL IS UNDERMINING AMERICA'S ENVIRONMENT, ECONOMY AND SOCIAL FABRIC* (1999).

bring more than 2 billion people into the global middle class through the same resource intensive development model pioneered by North America and Europe. Limits on the ability to increase oil production, shortages of water, and the economic impacts of damaged ecosystems and rapid climate change are among the factors that make it impossible to continue current patterns on such a vastly larger scale. Humanity is now on a collision course with the world's ecosystems and resources. In the coming decades, we will either find ways of meeting needs based on new technologies, policies, and cultural values, or the global economy will begin to collapse.<sup>140</sup>

The road towards sustainable development, in both China and the United States, promises to be a long and difficult one. The future of growth, urbanization, and energy consumption in China clearly adds some urgency to the task of designing and implementing sustainable development policies in the United States. In addition to research and development of alternative energy sources and distribution systems, this task may require a substantial change in how Americans envision, design, and regulate the environment which accommodates our suburban automobile-dependent lifestyle.<sup>141</sup> As we move forward, this will be a

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140. Flavin & Gardner, *supra* note 4, at 3–4.

141. Affluent suburban sprawl and consumerism are now widespread and well entrenched in modern American culture. Changing this pattern of automobile-dependent development and curbing this lifestyle will necessarily require some substantial change in how we envision our individual quality of life, along with a substantially expanded sense of responsibility and community beyond our immediate neighborhoods, both locally and globally. See Ziegler, *supra* note 43, at 62–65. See also Burchell, *supra* note 139, at 151 (surveys indicate that low-density sprawl is still a preferred lifestyle by many new family households); Polly La Barre, *How To Lead a Rich Life*, FAST COMPANY, Feb. 19, 2003, at 14. La Barre therein writes:

One of the more shocking measures of our “prosperity” is the fact that the United States spends more on trash bags than 90 other countries spend on *everything*. In other words, the receptacles of our *waste* cost more than all of the goods consumed by nearly half of the world's nations.

*Id.*

tremendously challenging undertaking, as it will likely require a shift in cultural perspective and values.<sup>142</sup>

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142. See Wendell Berry, *Two Minds*, in *CITIZENSHIP PAPERS* 85, 87 (2004), wherein Berry notes: The trouble is not just in the way we are thinking; it is also in the way we, or anyhow we in the affluent parts of the world, are living. And it is going to be hard to define anybody's living as a series of simple choices between irrationality and rationality. Moreover, this is supposedly an age of reason; we are encouraged to believe that the governments and corporations of the affluent parts of the world are run by rational people using rational processes to make rational decisions. The dominant faith of the world in our time is in rationality. That in an age of reason, the human race, or the most wealthy and powerful parts of it, should be behaving with colossal irrationality ought to make us wonder if reason alone can lead us to do what is right.

*Id.*