

## CHAPTER 3 -- TRANSFORMING THE URBAN ECONOMY<sup>1</sup>

*To Pursue Inclusive and Balanced Growth...*

*Cities should balance economic growth and social development; seek to achieve an optimal relationship between social equity and economic efficiency; strive to create an institutional environment of shared rights and interests, equal opportunity, and fair competition; and work to reduce inequities in income. They should enable all residents to share the fruits of urban development and fully realize their personal growth.*

*...And Balanced Urban-Rural Development*

*Cities should coordinate balanced development with rural regions through the provision of services and infrastructure. Cities should strive to reduce the urban-rural gap, take into consideration the interests of disadvantaged social groups, and encourage and aid the integration of rural populations into the city. More efforts should be taken to improve and optimize urban-rural linkages as well as regional networks. Cities should actively initiate urban-rural dialogue to achieve harmony in their interactions.*

Shanghai Declaration on Better Cities, Better Life

### 1. ISSUES AND CHALLENGES

Cities represent the most powerful economic engines in the world. The transformation of cities to sustainable economic development will be critical to the 21<sup>st</sup> century global state of affairs.

As a Mayor, you have many options that you might exploit to transform a city's economy. Energy use, which has a commensurate impact on carbon emissions, presents a strong lever for addressing global climate change. Alternatively you may choose to focus on other sectors as urban needs for water, materials and infrastructure are increasing at exponential rates. City officials and traditional urban planners are struggling to sustainably grow their economies and

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<sup>1</sup> This chapter was authored by Warren Karlenzig, with valuable input and contributions from Zhou Zhenhua and Mohan Peck.

manage the physical metro-area footprint while at the same time ensuring a livable urban environment. Investments in the built environment in developing economies will continue to be high in coming decades.

There are genuine opportunities for city leaders to reduce carbon emissions and pollution, enhance ecosystems, and minimise environmental risks. Compact, relatively densely populated cities with mixed-use urban form are more resource-efficient than any other settlement pattern with similar levels of economic output. Integrated design strategies and technologies are available to improve urban transport, the construction of buildings, and the development of urban energy, water, and waste systems in such a way that they reduce resource and energy consumption and avoid lock-in effects.

For urban managers, there is both a window of opportunity and a business case to cost-effectively drive down carbon emissions and production of pollutants in the rapidly growing urban centers of developing nations.<sup>2</sup> Cities are increasingly being targeted as a key source of scalable global economic solutions, particularly in sustainable development. Correspondingly, clean technologies (usually defined to include renewable energy, alternative fuels, advanced transportation, advanced materials, waste treatment and water conservation technologies) are expected to be some of the top emerging growth industries. The investment community recognizes the unprecedented opportunities in sustainable development: a 2009 survey on global venture capital trends, for instance, reported that 63 per cent of surveyed venture capitalists anticipated an increase in their investment in the clean-tech sector, the highest percentage among all sectors considered.<sup>3</sup>

Following proven successes for the urban investment model in Hong Kong, Bilbao, Barcelona, and Sydney, international banking and financing institutions are in the process of shifting focus from the national level to the city level.<sup>4</sup> Large cities such as Shanghai and Mumbai provide attractive centers for international investment as they emerge as centers of global financial services. In India, for example, cities are forecast to garner 85 per cent of the nation's total tax revenue (up from current level of 80 per cent), which will provide the primary source for financing economic development on a national scale. By 2030, 70 per cent of all new jobs in

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<sup>2</sup>“Reinventing the City: Three Prerequisites for Greening Urban Infrastructures,” WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010: <http://www.slideshare.net/itsgowri/wwf-low-carboncities>

<sup>3</sup>“Cities and Green Growth: Issues Paper for the 3<sup>rd</sup> Annual Meeting of the Organisation for Economic Co-operation and Development (OECD) Urban Roundtable of Mayors and Ministers,” 25 May, 2010, OECD Conference Center, Paris, p.23: [http://www.oecd.org/site/0,3407,en\\_21571361\\_45068056\\_1\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/site/0,3407,en_21571361_45068056_1_1_1_1_1,00.html)

<sup>4</sup>“Urbanization and Urban Management Policy Framework and International Experience,” Tim Campbell, Urban Advisor, the World Bank: <http://info.worldbank.org/etools/docs/library/39815/M1S3CampbellTimEN.pdf>

India will be created in cities, though cities are expected by that date to represent only 40 per cent of the nation's total population.<sup>5</sup>

### **1.1. TRANSITION TO A LOW-CARBON ECONOMY**

In order to control carbon emissions and meet the economic, resource and public health challenges of urban growth, city managers will need to quickly begin shifting their spending from high-carbon intensity infrastructure to modern infrastructure that produces very low carbon emissions in production, transport and operations. This necessary transformation will require long-term and strategic action plans to guide capital investments toward infrastructure solutions offering attractive returns. These returns can take many forms including reduced operating costs, low-carbon, lower air and water pollution levels, and greater resource efficiency.<sup>6</sup> Cities and metropolitan regions are well positioned to develop policy and programmatic solutions that best meet specific geographic, climatic, economic, and cultural conditions. They are equally well placed to develop innovative policy solutions that can be scaled up into regional or national programmes, or to provide a “real world” laboratory for national pilot programmes on the urban level.<sup>7</sup>

The dramatic shift toward scalable sustainable urban development provides urban leaders with a means to cope with daunting urban challenges and risks. During what will be a profound period of transition from business-as-usual to low-carbon and increasingly sustainable urban economies, there will be a need to reach critical system synergies bridging traditional industry sectors (energy, transportation, communications, media, real estate development, building and infrastructure, food and agriculture). System-based sustainable development is a complex undertaking, yet it presents global economic opportunity on an unprecedented scope and scale.<sup>8</sup> Cities in developing nations will not only share in this economic evolution, in many sectors they will help lead the transformation.

An often-cited clean energy example from a developing nation is that of Suzlon Energy, an Indian company founded in 1995, which in 2009 was the world's sixth-largest wind turbine

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<sup>5</sup>“India's Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth,” McKinsey Global Institute, April 2010, p.13-14:  
[http://www.mckinsey.com/mgi/reports/freepass\\_pdfs/india\\_urbanization/MGI\\_india\\_urbanization\\_fullreport.pdf](http://www.mckinsey.com/mgi/reports/freepass_pdfs/india_urbanization/MGI_india_urbanization_fullreport.pdf)

<sup>6</sup>“Reinventing the City: Three Prerequisites for Greening Urban Infrastructures,” WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010:  
<http://www.slideshare.net/itsgowri/wwf-low-carboncities>

<sup>7</sup>“Cities and Green Growth: Issues Paper for the 3<sup>rd</sup> Annual Meeting of the Organisation for Economic Co-operation and Development (OECD) Urban Roundtable of Mayors and Ministers,” 25 May, 2010, OECD Conference Center, Paris, p.11

<sup>8</sup>Ibid, p.12

manufacturer.<sup>9</sup> Biofuels are also a clean technology area where the developing countries see themselves as having a global comparative advantage. Brazil in particular, which has been developing its bioethanol industry for the last 30 years, is pursuing a strategy to promote this industry worldwide. Malaysia, which has invested heavily in palm oil over the last decades, sees low-carbon biodiesel fuel as a new market for its palm oil.<sup>10</sup>

Mayors of cities need to combine multiple policy instruments and technologies in order to achieve the ambitious goal of higher urban growth at lower carbon intensity.<sup>11</sup> A dramatic shift at the urban level toward more integrated strategy, policymaking and operations is necessary. A good first step toward more sustainable city operations is sustained municipal investments in infrastructure that reduce energy, water and material use, and thus are less carbon-intensive. For example, distributed renewable energy systems don't necessarily require utility poles or excavated underground power transmission lines. Water systems that feature electronic sensors to detect the exact location of leaks spare streets from being torn up while preserving otherwise-wasted municipal water.

Such supply-side measures alone, however, will not be enough. Urban policy makers could pursue an integrated policy package that looks at three related phenomena: 1) how companies adjust to new sustainability-related business opportunities and adjustments in the price of energy; 2) how individual consumers or citizens change their preferences for products and services; and 3) how modern technologies are developed and effectively diffused in the marketplace.

We have seen that new economic and market development strategies are emerging rapidly as a direct result of urban population growth and innovation, particularly in green building, renewable energy, alternative fuels, information and communications technologies, and advanced material production. At the management level, information and communications technologies are being deployed to monitor and control the use of resources across cities in buildings, transit systems and infrastructure (see Chapter 8 - ICT for Smart and Connected Cities"). As a result, local authorities and business leaders are at the center of public-private collaboration that is shaping the urban economy. In some cities citizens have been involved in such planning efforts, while in others economic initiatives are being spearheaded by private sector advisors and key government leaders. The most thorough and proactive of these initiatives have included multiple stakeholders from many sectors.<sup>12</sup>

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<sup>9</sup>India was ranked sixth of manufacturers worldwide in 2009, having installed 6,000 cumulative Megawatts (MW): [http://wapedia.mobi/en/List\\_of\\_wind\\_turbine\\_manufacturers#1](http://wapedia.mobi/en/List_of_wind_turbine_manufacturers#1).

<sup>10</sup>"Green Industry for a low-carbon future: A greener footprint for Industry," UN Industrial Development Organization (UNIDO), Vienna, 2010, p.7.  
[http://www.unido.org/fileadmin/user\\_media/UNIDO\\_Header\\_Site/About/Green\\_Industry\\_Initiative.pdf](http://www.unido.org/fileadmin/user_media/UNIDO_Header_Site/About/Green_Industry_Initiative.pdf)

<sup>11</sup> Carbon intensity is the ratio of greenhouse gas emissions produced relative to gross domestic product.

<sup>12</sup> Another example of citizen-government-private collaboration in planning of green urban economies includes "The Economy and Economic Development" (co-authors Scott Edmondson

## 1.2. GLOBALIZATION AND THE EMERGING URBAN ECONOMY

Globalization, with rapidly innovative business models, is transforming the competitive landscape of business by increasing types and velocities of transactions. A central feature of the new urban era is the movement of people, information and goods to urban areas accompanied by the growing flow of public and private capital.

People are gravitating to cities not only for economic opportunity, but also for better education and the non-stop flow of ideas, information and culture. Complexity and velocity are the fabric of “always-open” global innovation networks that center on urban clusters. Urban regions gather together a critical mass of people with highly specialized and advanced skills who know how to engage in particular productive activities.<sup>13</sup>

To attract resources and sustain the momentum of development, cities can enhance their growth potential by cultivating a number of vibrant leading industrial subsectors. The growth of these leading sectors can be increased by the formation of clusters of networked firms that compete, cooperate, attract skilled labor, generate capital and induce technological spillovers. Collaboration between manufacturers and service providers can lead to greater specialization, which provides advantages to both groups, in particular job creation. Finally, competitive clusters must be capable of upgrading, of diversifying and of incubating new industries.

Such industrial clusters tend to form around urban centers that have strong development orientation and leadership. Cities can be attractors for R&D, worker training, software, product design and branding, and organizational capabilities. Major research firms and multi-national corporations can also act as cluster hubs. To thrive, industrial clusters require anchors. The size and wealth of the urban market can be a powerful anchor. So too can a research university that provides high quality skilled labor, information networks, access to the knowledge economy, patenting, and technological innovation. Social infrastructure that speaks to the livability of a city can also help anchor these clusters. How a city goes about developing these anchors determines its overall competitiveness in the global economy.

Global competitiveness may soon be defined in part by carbon emission rates. Low-carbon economies will gain a decisive edge over economies that remain relatively heavy per-capita carbon emitters. This competitive advantage will be gained not only because of environmental and quality of life factors but also because of the potential merger of international trade rules and

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and Warren Karlenzig) section of city-adopted *Sustainability Plan* for San Francisco, California, United States, 1997 <http://www.sustainable-city.org/>

<sup>13</sup>“Teamwork: Why Metropolitan Economic Strategy is the Key to Generating Sustainability Prosperity and Quality of Life for the World,” Marc A. Weiss, *Global Urban Development Magazine*, Volume 1, Issue 1, May 2005. <http://www.globalurban.org/Issue1PIMag05/Weiss/article.htm>

carbon emissions regulations. In some cities, regional air pollution from high-carbon urban industry, utilities and transportation has already impacted economic competitiveness by necessitating reduced airport traffic and idling ground transportation fleets.<sup>14</sup>

Globally, carbon emission allowances likely will decrease over time under the pressure of international commitments.<sup>15</sup> Because of these economic and policy drivers, new low-carbon technologies that reduce greenhouse gases represent a major area of global economic growth. By 2020, the global market for environmental products and services is expected to double to US \$2.74 trillion from its 2010 annual value of US \$1.37 trillion. Energy markets will account for half of this increase. Trade in 40 key climate-friendly technologies almost doubled (from US\$67 billion to US\$119 billion) between 2002 and 2008.<sup>16</sup> Renewable energy in China alone in 2009 contributed \$17 billion in revenue and one million jobs.<sup>17</sup>

In summary, demographic trends, as well as economic data and forecasts, suggest that the trend towards low-carbon cities has the potential to shape the 21<sup>st</sup> century as much or more than earlier advances in transportation, communications, energy, construction and industrialization.

## 2. MENU OF OPTIONS: URBAN ECONOMIC DEVELOPMENT

### 2.1. FINANCING OF MODERN ECONOMY AND CLEAN TECHNOLOGY

New approaches to financing modern economic development, particularly clean energy technologies, are emerging on the scale of cities, regions and nations worldwide. One example has been the construction of Masdar City, Abu Dhabi (see case study in Chapter 6 – Green Buildings for a Resource Efficient Future). Masdar has created a “financial ecosystem” strategy for its clean technology incubation, establishing a clean technology venture fund of USD \$245 million with a consortium of banks, businesses and technology companies. The venture fund targets investments in sustainable technologies being developed at the Masdar City site including thin film solar energy, waste-to-energy and water purification systems. A similar new fund of USD \$500-750 million started in early 2010 with additional partners.<sup>18</sup>

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<sup>14</sup>“To avoid Olympic smog, Beijing limits traffic,” Chicago Sun Times,” 20 July, 2008: <http://www.suntimes.com/sports/olympics/china2008/1065390,olymptraff072008.article>

<sup>15</sup>“China and a Sustainable Future: Towards a Low-Carbon Economy and Society,” UNDP/ Renmin University China, 2010: <http://www.undp.org.cn/pubs/nhdr/nhdr2010e.pdf>

<sup>16</sup>“Environment and Energy,” Australian Trade Office: <http://www.austrade.gov.au/Home/Environment-and-Energy/default.aspx>

<sup>17</sup>“China and a Sustainable Future: Towards a Low-Carbon Economy and Society,” China Human Development Report 2009/ 2010, UNDP/ Renmin University China: <http://www.undp.org.cn/pubs/nhdr/nhdr2010e.pdf>

<sup>18</sup>“Masdar Venture Capital: Making finance accessible to clean technology companies,” Alexander O’ Cinneide, Masdar Investment Fund, accessed 6 September 2010:

The World Bank Group established Climate Investment Funds in 2008, which includes a Clean Technology Fund and a Strategic Climate Fund in support of numerous urban programmes under a Pilot Programme on Climate Resilience. Through the Pilot Programme, Egypt, for example, is seeking finance under a clean tech investment plan to scale up a number of initiatives including: i) development of wind energy farms; ii) addressing Cairo's urban transport needs by replacing old public buses and private taxis with a new fleet of compressed natural gas vehicles; iii) completing two new lines of its underground metro; and iv) preparing for new Bus Rapid Transit and Light Rail Transit systems.<sup>19</sup>

In China national, regional, and local governments are offering clean energy companies generous subsidies to establish operations in their localities, including free or below-market priced land, low-cost financing, tax incentives, and money for research and development. In just over three years this approach has helped transform Baoding, China as a polluting automobile and textile production city into the fastest-growing hub of wind and solar energy equipment manufacturing in China (see case study on Baoding this chapter).<sup>20</sup>

**Preparing for long-term sustainability through public-private financing.**

The Republic of Korea, decided it wanted to become a leader in the emerging technology of broadband connectivity. The nation embarked upon an ambitious public-private financing campaign that resulted in 95 per cent household broadband penetration, which was the world's leading rate in 2009. Using this technology base as a competitive differentiator, South Korea has set well defined economic and technology goals for the development of a national smart grid (which utilizes broadband communications), including the strategy of becoming a world leader in exporting smart grid technology products and services. This strategy is based on public-private partnerships in both research and construction that include government financial incentives.<sup>21,22</sup> (See case study this chapter: "South Korea's Smart Grid Roadmap 2030")

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<http://www.slideshare.net/mindrom/masdar-venture-capital-making-finance-accessible-to-clean-technology-companiesby-alexander-ocinneide>

<sup>19</sup>"Catalyzing Low Carbon Development? The Clean Technology Fund," Smita Nakhooda, World Resources Institute, May 2009, (accessed 6 September 2010) p. 4-5

<sup>20</sup>"Rising Tigers," The Breakthrough Institute, Oakland, California United States, 2009, p.12-13:[http://thebreakthrough.org/blog/Rising\\_Tigers.pdf](http://thebreakthrough.org/blog/Rising_Tigers.pdf)

<sup>21</sup>"Cities and Green Buildings: In the transition to a green economy," Moustapha Kamal Gueye, UNEP Brief, 2008: <http://www.unep.ch/etb/ebulletin/pdf/Cities> and building brief.pdf

<sup>22</sup>"The Smart Money's on Korea's Smart Grid Tech," The Next Silicon Valley, 22 July, 2010. <http://www.thenextsiliconvalley.com/technews/793/The-smart-moneys-on-Koreas-smart-grid-tech>

## 2.2. TARGETED PUBLIC FINANCIAL POLICIES

In some countries, national level financial policy measures are providing support for clean energy technology adoption through a variety of targeted public policies, including technology-specific production incentives, government procurement offers and sustained and long-term lines of credit in the form of low-cost financing and credit guarantees. One example of credit guarantees is the tax credits provided by the United States under the American Resource and Recovery Act, where solar energy system implementations for homes and businesses receive a 30 per cent tax credit, with an unlimited ceiling on credits.<sup>23</sup> Low cost financing can include low-interest loans, such as China's 2-3 per cent loans for renewable energy system installation. Government procurement offers may be technology based, district based, or both, such as city districts in China supporting low-carbon technology implementation where the government offers 50 per cent financing for solar photo-voltaic street lighting renovation.<sup>24</sup>

An example of a clean technology investment policy tied to a national carbon emission reduction policy goal is the Clean Technology Fund Investment Plan for Indonesia. It leverages co-financing of USD\$400 million to support Indonesia's goals of providing 17 per cent of its total energy use from renewable energy and improving energy efficiency by 30 per cent from business-as-usual by 2025. Specifically, the Investment Plan proposes Fund co-financing for two programmatic areas: scaling up large-scale geothermal power, and acceleration of initiatives to promote energy efficiency and renewable energy (particularly biomass). The Fund plans to mobilize financing of up to USD\$2.7 billion from multilateral financiers, state-owned enterprises, and the private sector. If additional resources are available, a second phase of the Investment Plan is expected to include investment in low-carbon transport and other renewable energies.<sup>25</sup>

## 2.3. ATTRACTION AND RETENTION OF A SKILLED WORKFORCE

The emergence of the urban economy rests upon the ability to attract and retain a skilled, knowledgeable workforce. This specialized labor pool requires access to the high-quality education and training that is complementary to the development of new industries. Because new industries are evolving quickly in the areas of construction and related professional services, for instance, quality education and training are necessary not only for those entering these job markets, but also for seasoned employees that need to update training for certifications. Local

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<sup>23</sup>“Federal Tax Credits for Consumer Energy Efficiency,” United States Energy Star programme site accessed 6 September 2010: [http://www.energystar.gov/index.cfm?c=tax\\_credits.tx\\_index](http://www.energystar.gov/index.cfm?c=tax_credits.tx_index)

<sup>24</sup>“On Clean Energy, China Skirts Rules,” Keith Bradsher, *The New York Times*, 8 September 2010, accessed 10 September 2010: <http://www.nytimes.com/2010/09/09/business/global/09trade.html?emc=eta1>

<sup>25</sup>“Clean Technology Investment fund for Indonesia,” Climate Investment Funds, 12 April 2010, Accessed 6 September 2010: [http://docs.google.com/viewer?a=v&q=cache:dgwT8b1vb-EJ:www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF\\_Indonesia\\_investment\\_plan\\_041210.pdf+regulatory+and+pricing+policies+%22clean+technology%22&hl=en&gl=us&pid=bl&srcid=ADGEEShuQ4JpnrB-oAR1VAiB62pT](http://docs.google.com/viewer?a=v&q=cache:dgwT8b1vb-EJ:www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_Indonesia_investment_plan_041210.pdf+regulatory+and+pricing+policies+%22clean+technology%22&hl=en&gl=us&pid=bl&srcid=ADGEEShuQ4JpnrB-oAR1VAiB62pT)



universities, colleges and crafts training institutes are similarly important as resources for younger students, mid-career employees changing careers, and disadvantaged workers interested in learning professions and crafts in the green economy, particularly renewable energy system installation and energy efficiency auditing and improvements for buildings.

In manufacturing, workers from dislocated or obsolete industries can sometimes take advantage of targeted training programmes to adapt their skills to emerging industry opportunities. A case in point is Toledo, Ohio (United States), which lost many of its local jobs in the glass manufacturing industry during the 1990s and early 2000s. Local and state officials worked with private industry and local universities to develop job training for the solar photo-voltaic industry that would leverage legacy production worker knowledge and equipment from closed-down glass manufacturing facilities. The glass manufacturing industry was retooled to become one of the leading centers of solar photo-voltaic research, development and assembly in the United States.<sup>26,27</sup>

#### **2.4. MANAGING RURAL-URBAN NETWORKS, INCLUDING MIGRATION**

City leaders must effectively prepare for and adapt to rural-urban migration, particularly in countries experiencing high levels of these migrations, like China, India, Brazil, Bangladesh, Nigeria and the Democratic Republic of Congo. Successful global cities are those that are more capable of leveraging resources, including employees, from their regional network, including rural areas. Large cities in particular need to focus on improving their capacity to serve their region while effectively managing growth and efficiently allocating resources.

Because urban poverty is a persistent feature in many developing countries, policy-makers must ask how rural-urban migrants can be assimilated in an equitable way. There is a need to assess quality of life in low-income neighborhoods in which rural migrants are more likely to settle, and to reduce inequalities between migrants and existing city residents.

In order to better control rapid migration, city leaders should adopt regional planning when building infrastructure and providing basic services. If rural areas acquire similar infrastructure and services, then rural-urban migration rates slow. Nevertheless, cities will continue to expand, therefore effective industrial and transportation planning in cities and their surrounding areas are important elements in anticipation of growing populations.<sup>28</sup> In order to avoid urban sprawl, which has negative environmental impacts on metro areas and also is a land use that typically

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<sup>26</sup>“Switching to Green Job Training,” *Community College Times*, 7 September, 2010, accessed 10 September 2010: <http://www.communitycollegetimes.com/Article.cfm?ArticleId=2916>

<sup>27</sup>“Emerald Cities: Urban Sustainability and Economic Development,” Joan Fitzgerald, Oxford University Press, New York, 2010, pp. 55-59. Also see, “Cities on the Front Line,” Joan Fitzgerald, *The American Prospect*, 13 April 2009: [http://www.prospect.org/cs/articles?article=cities\\_on\\_the\\_front\\_lines](http://www.prospect.org/cs/articles?article=cities_on_the_front_lines).

<sup>28</sup>“Economic transformation and urban-rural relations,” Shanghai World Expo, Shanghai, China 9-10 September 2010: [http://www.mae.ro/pdf/Expo-2010/2010.03\\_Ev5\\_Economic\\_Transformation\\_and\\_Urban\\_rural\\_relations.pdf](http://www.mae.ro/pdf/Expo-2010/2010.03_Ev5_Economic_Transformation_and_Urban_rural_relations.pdf)

limits mobility options for inhabitants, cities should plan for high density housing that is conveniently located with equitable access to transportation, utilities and city services. Services, for instance, might include introductory training on urban amenities including public transportation, public libraries, and education and child care, as well as networking opportunities for new migrants. Cities could provide legal support services for migrants requiring contracts for new employment and housing opportunities.<sup>29</sup>

## 2.5. INDUSTRY CLUSTERING

The development of industry clusters has resulted from a combination of many regional factors: relevant pools of indigenous knowledge and skills; the regional location of engaged educational and training institutions; access to venture investment capital and affiliated talent networks; along with supportive government policy and funding. Many industry clusters (Boston, United States; Freiburg, Germany; and San Francisco-Silicon Valley, United States) have benefited from all of these factors.

The emergence of new industry clusters in places largely lacking the significant presence of venture capital firms or personnel—Baoding, China (see case study this chapter) and Toledo, Ohio,<sup>30</sup> for instance—demonstrates that early stage industry clusters have been able to attract significant enough investment from government and private sources to successfully establish themselves. As global market competition for industries increases, there will be multiple success models for such industries, ranging from models that are largely self-organized, to those pre-planned and directed by either local, regional or national government policy.

Strategic foresight exercises can assist local governments to map out a long term cluster development strategy and to provide the stable financing for R&D that research intensive industries frequently require. For cities, the incentive policies to attract industry need to be supplemented by others that secure the city finances and ensure that related services and housing meet expectations of the industrial talent pool. But providing services and infrastructure are not enough. Cities must also market themselves aggressively by organizing events and seeking out business investors, both domestic and international. Such marketing is a reliable way of infusing capital and ideas into existing clusters and growing new clusters.

## 2.6. NEW URBAN LOW-CARBON INITIATIVES

An increasing number of low-carbon city initiatives are being sponsored by cities and foundations<sup>31</sup> such as the C40 Initiative, non-governmental organizations like ICLEI,<sup>32</sup> countries such as China,<sup>33</sup> international organizations such as the World Bank and International Energy

<sup>29</sup>“Rural-to-urban migration and the sustainability of urban growth,” Bingqin Li, accessed 28 September 2010: [sticerd.lse.ac.uk/case/events/barcelona/Bingqin\\_Li.pdf](http://sticerd.lse.ac.uk/case/events/barcelona/Bingqin_Li.pdf)

<sup>30</sup>“Cities on the Front Line,” Joan Fitzgerald, *The American Prospect*, 13 April 2009: [http://www.prospect.org/cs/articles?article=cities\\_on\\_the\\_front\\_lines](http://www.prospect.org/cs/articles?article=cities_on_the_front_lines)

<sup>31</sup><http://www.sdtfoundation.org/index.php>

<sup>32</sup>[http://www.wwfchina.org/english/sub\\_loca.php?loca=1&sub=96](http://www.wwfchina.org/english/sub_loca.php?loca=1&sub=96)

<sup>33</sup><http://english.peopledaily.com.cn/90001/90776/90882/6981549.html>

Agency,<sup>34</sup> as well as academic and city alliances, such as that between The Global Carbon Project and Nagoya University in Japan.<sup>35</sup>

China announced in 2010 a low-carbon cities pilot programme for eight cities, Baoding, Xiamen, Hangzhou, Guiyang, Nanchang, Chongqing, Shenzhen, and Tianjin. Under the low-carbon cities programme, the eight municipalities, ranging from a population of one to eight million, will plan for low-carbon industry technology investment while attempting to reduce industry and citizen energy consumption. The low-carbon pilot programme is also being implemented in five provinces, including Liaoning, Shaanxi, Yunnan, Hubei and Guangdong. Guangdong is the only province that also includes a low-carbon pilot city, which is Shenzhen.

The low-carbon initiative issued by China's National Development and Reform Commission in 2010 was directing the targeted provinces and cities to build data systems inventorying their greenhouse gas emissions in order to draw up low-carbon development planning and to create supporting state and city development policies. The low-carbon pilot programmes will also promote low-carbon lifestyles and consumption for citizens. Successes from pilot areas are intended to be modeled for other areas of the nation. Pilot areas will attempt to combine characteristics of local industry with low-carbon development strategy, accelerating low-carbon technology innovation to upgrade traditional industries. Pilot areas are directed to follow closely the latest global advances in low-carbon technologies and promote joint research and development with foreign countries.<sup>36</sup>

An important low-carbon urban initiative that is gaining traction globally is the adoption of feed-in tariffs to support the market development of renewable energy technologies for distributed electricity generation. By their nature, feed-in tariff regimes put a legal obligation on utilities and energy companies to purchase electricity from renewable energy producers at a favourable price per unit, and this price is usually guaranteed over a certain time period, say 20 years. The guaranteed access to the grid, favourable rate and the tariff term guarantee, mean that feed-in tariffs create security for investment by producers, manufacturers, investors and suppliers. They make the cost of clean energy competitive with conventional forms of energy, which do not internalize the costs of pollution and are also heavily subsidized.

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<sup>34</sup>[http://www.globalcarbonproject.org/global/pdf/GCP\\_Nagoya\\_NIES\\_Agenda\\_web.pdf](http://www.globalcarbonproject.org/global/pdf/GCP_Nagoya_NIES_Agenda_web.pdf)

<sup>35</sup><http://www.gcp-urcm.org/A20090217/HomePage>.

<sup>36</sup>“China launches low-carbon pilot in select cities, provinces,” Online People's Daily, 19 August 2010, accessed 15 September 2010:

<http://english.peopledaily.com.cn/90001/90778/90862/7110049.html>

### 3. CASE STUDIES

#### 3.1. BAODING, CHINA -- CREATING A MODERN ECONOMY BASED ON CLEAN ENERGY



*The deployment of solar photoelectric panels for electricity production.*

A city of one million about 100 miles southwest of Beijing, Baoding has ascended rapidly as a working urban model of China's transition to a clean energy economy.<sup>37</sup> Within four years Baoding's economic growth rate surpassed that of all other cities in the heavily industrialized Hebei province - its strong performance has been linked to a 40 per cent growth rate in companies producing low-carbon technologies. These companies include almost 200 producers of wind, photo-voltaic and thermal solar, biomass, and energy efficiency technologies. As of 2010, approximately 20,000 Baoding jobs have been created in clean energy, including 7,000 jobs at Yingli Solar, one of the nation's largest photo-voltaic producers, with more than \$1 billion in fiscal 2009 revenues. Baoding's combined companies in 2008 sold 500 megawatts (MW) of solar products and 5089 MW of wind power products.<sup>38</sup>

The municipality's recent economic performance likely helped convince national leadership in selecting Baoding in August 2010 as one of eight cities and five provinces in China slated to become nationally sponsored low-carbon pilot projects. Under the low-carbon cities programme, the eight municipalities will engage in strategic planning for low-carbon industry technology investment while attempting to reduce citizen energy consumption by addressing lifestyle

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<sup>37</sup>"China is leading the race to make renewable energy," Keith Bradsher, *New York Times*, 30 January, 2010. <http://www.nytimes.com/2010/01/31/business/energy-environment/31renew.html>

<sup>38</sup>"China to Develop Low Carbon Cities," *People's Daily*, 12 October, 2009  
<http://english.peopledaily.com.cn/90001/90776/90882/6781237.html>

issues.<sup>39</sup>This innovative programme demonstrates an emerging platform linking China's clean energy manufacturing industry with policy support, research institutions, and other social systems.

Baoding's apparent success as both a center of production and deployment of clean energy technologies has its origins in numerous strategic and collaborative actions taken at the local and national level, and the international level.

In 2008 Baoding joined with international environmental non-governmental organization Worldwide Fund for Nature (WWF), based in Gland, Switzerland, to design a "low-carbon city" initiative intended to spur research and growth in clean energy and energy efficiency technologies. The effort was undertaken in conjunction with China's National Development and Reform Commission.<sup>40</sup>

Baoding's clean energy industry growth, however, was initially reportedly the result of its Mayor's interest in developing a new economy after lakes in the area experienced fish-die offs that were attributed to water pollution from local industry. The city had traditionally been an industrial center for textile production and, more recently, automobiles when the Mayor, Yu Qin, helped close hundreds of local polluting factories.

After the national government in 1992 established the Baoding Industry High-Tech Development Zone,<sup>41</sup> Mayor Yu Qin began researching clean energy technologies through visits to nations with early-stage renewable industries in Europe. Baoding decided it would also emulate the industrial cluster model of California's Silicon Valley, but instead of semi-conductors and software, the city began to create what it calls "Power Valley." "Polluting first and paying later is very expensive. So we chose renewable energy to replace traditional industry," said Mayor Yu Qin in a *Christian Science Monitor* article.<sup>42</sup> Baoding area companies and the city were able to secure bank loans with interest rates as low as two per cent—the result of a government policy of steering loans toward renewable energy investments.<sup>43</sup>

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<sup>39</sup>"China launches low-carbon pilot in select cities, provinces," *Online People's Daily*, 19 August 2010, accessed 15 September 2010:

<http://english.peopledaily.com.cn/90001/90778/90862/7110049.html>

<sup>40</sup>"The Greening of the Monster," Rebecca Macfie, *New Zealand Listener*, 10-16 July, 2010 Vol. 224 No 3661

[http://www.listener.co.nz/issue/3661/features/15754/the\\_greening\\_of\\_the\\_monster.html](http://www.listener.co.nz/issue/3661/features/15754/the_greening_of_the_monster.html)

<sup>41</sup>Baoding Industry High-Tech Development Zone website:

[http://www.bdgxq.cn/english/ggk\\_eng.asp](http://www.bdgxq.cn/english/ggk_eng.asp)

<sup>42</sup>"The World's first Carbon Positive City will be in...China? The Mayor of Baoding Is on a Crusade to Make It a Hub of Renewable Energy", Peter Ford, *Christian Science Monitor*, 16 August 2009. <http://www.csmonitor.com/Innovation/Energy/2009/0810/how-baoding-china-becomes-world-s-first-carbon-positive-city>

<sup>43</sup>"China is leading the race to make renewable energy," Keith Bradsher, *New York Times*, January 30, 2010. <http://www.nytimes.com/2010/01/31/business/energy-environment/31renew.html>

Exports are important in bolstering the city's local economy: one company makes turbine blades for wind farms in Texas, while another company supplies solar panels to Portugal for what is currently one of the largest solar power stations in the world. By one account, the city may be among the world's first to go "carbon positive."<sup>44</sup> This would mean that the carbon emissions saved annually worldwide through the use of equipment made in Baoding would outweigh the city's own greenhouse gas emissions.

Baoding's Jinjiang International Hotel generates a maximum of 300 kilowatts (kW) of electricity. A plaque at the building's entrance informs visitors that it would take 104 tons of coal, emitting 270 tons of CO<sub>2</sub>, to produce the equivalent amount of power for a year. Another PV-clad building, which serves as a business center, produces up to 500kW, and a third building at the site will bring the total capacity of the complex to 1500kW.<sup>45</sup>

Both the hotel/visitor's center and the city of Baoding are a testament to the timely potential of green technologies and to China's future as a leading force in the modern economy.

### **Lessons Learned**

Baoding represents one of China's brightest hopes in terms of both renewable energy manufacturing and deployment. It is clear that the city of one million is benefiting from renewable energy exports in terms of boosting its local economy; the city has also devised innovative approaches for developing programmes that incentivize large-scale deployment of energy efficiency and renewable energy technologies. Next, as part of a new national low-carbon pilot city programme (led by the National Development Reform Commission), Baoding will likely need to quantify if there is a linkage between its emerging urban low-carbon industrial base and its local low-carbon building and infrastructure construction and operations programmes. Cities attracting clean energy investments will need to consider if the overall merits of developing clean energy and energy efficiency technologies include demonstrating such technologies for local visitors, and deploying them effectively on a large enough scale to reduce local-carbon emissions.

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<sup>44</sup>"Reinventing the City: Three Prerequisites for Greening Urban Infrastructures" WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010: <http://www.slideshare.net/itsgowri/wwf-low-carboncities>

<sup>45</sup>"The Greening of the Monster," Rebecca Macfie, New Zealand Listener, 10-16 July, 2010 Vol. 224 No 3661 [http://www.listener.co.nz/issue/3661/features/15754/the\\_greening\\_of\\_the\\_monster.html](http://www.listener.co.nz/issue/3661/features/15754/the_greening_of_the_monster.html)

### 3.2. BILBAO, SPAIN: LOW-CARBON REDEVELOPMENT<sup>46</sup>



*The Guggenheim Museum in the redeveloped new urban heart of Bilbao.*

Photo courtesy of Wikipedia.com

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<sup>46</sup> Ploger, Jorg, “Bilbao City Report”, Centre for Analysis of Social Exclusion, CASereport 43, 2007

Historically, the City of Bilbao, Spain was dominated by heavy industries, such as steel, shipyards, and machine engineering. By the 1970s the aging industrial sector was in a steep decline and was particularly hard hit by the energy crisis in the middle of that decade. Between 1975 and 1995, 60,000 manufacturing jobs – almost half of the industrial workforce – were lost in the metropolitan area. The proportion of manufacturing jobs dropped from 46 to 27 per cent. Some large industrial companies that had dominated the local economy for a long time, such as the Altos Hornos steelworks in Barakaldo or the Euskalduna shipyard in Bilbao, were modernized and continued production but with only a fraction of their original workforce. Other companies collapsed completely. Workers and unions engaged in years of workplace actions and occasional outbursts of violent labour conflict.

Metropolitan Bilbao suffered from serious environmental degradation as a result of its industrial past. Air, water and soil were seriously polluted. Industrial waste and household sewage drained into the river without being treated until the late 1980s. The main harbor or Nervión was ecologically dead. Closing of industrial plants left a total of 340 hectares of obsolete industrial wastelands in metropolitan Bilbao. Many of the sites were covered with derelict industrial buildings and the soil was deeply contaminated. In Barakaldo, more than one third of the total land was brownfield sites with vacant structures and disused infrastructure.

This recognition and the urgency of the immediate situation in Bilbao provoked debates about the best strategy and actions to initiate recovery. The interaction of all levels of government led to consensus on the need for action and drove the emergence of a strong redevelopment strategy. The ‘Strategic Plan for the Revitalisation of Metropolitan Bilbao’ was adopted in 1991. *Bilbao Metrópoli-30* was founded in 1991 to act as a facilitator for the regeneration process and to promote the objectives set by the strategic plan.

In its founding documents *Bilbao Metrópoli-30* identified four fields of action:

1. formation of a knowledge-based high-tech sector;
2. inner-city urban renewal, especially revitalization of the Old Quarter;
3. environmental improvements, namely reducing river pollution and restoring industrial brown fields; and
4. strengthening cultural identity through culture-led urban regeneration.

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To implement the strategic plan, another development agency, the Bilbao Ría 2000, was created in 1992, with the authority to regenerate specific ‘opportunity areas’ in Bilbao. Its main aim is to manage the large-scale revitalisation of abandoned land formerly occupied by old industries or by obsolete transport infrastructure.



Bilbao Ría 2000 is a not-for-profit publicly sponsored partnership that operates like a private sector company. The agency is based on a complex model involving all levels of government. This integrated model was necessary because decision-making is located at different administrative levels, i.e., urban planning by local government, fiscal power by provincial government, and land ownership often by central government authorities. Shareholders include a land management company (SEPES), the Port Authority, two railway companies (FEVE & RENFE), the Basque government, the Provincial government, the City of Bilbao, and the City of Barakaldo. Taking control of the vacant land was essential for redevelopment. Land owned by some of the shareholders was brought into the company's portfolio.

While start-up funding came from central and regional governments and the European Union, Bilbao Ría 2000 is now self-financing in its activities. This is done through the revaluation of land as a result of the rezoning of its land-use designation and the subsequent sale to developers. Profits must be re-invested in the public company and in urban regeneration activities. The financial autonomy of its operations is considered highly significant for the success of Bilbao Ría. Owing to its mandate, its access to land, and its financial autonomy, it has become the major planning and urban regeneration entity in Bilbao.

By investing a total of €560 million between 1997 and 2006, Bilbao Ría was able to successfully regenerate the following designated 'opportunity areas':

- **Abandoibarra:** This was formerly brownfield land occupied by harbour and railway infrastructure on the riverfront in central locations. This area was redeveloped to create the attractive new urban heart of Bilbao.
- **Zorrozaure:** This was a peninsula occupied by mixed, mostly lower-value, harbour, industrial and residential buildings and activities. The project restructured land use here and connected it to the planned future extension of Abandoibarra.
- **Ametzola/Eskurtze:** This area south of central Bilbao was dominated by dense residential developments. The project removed much of the old physical infrastructure that divided this area, such as deep railway cuttings.
- **Miribilla and Morro:** These abandoned mining areas on the hilly slopes south east of central Bilbao were reclaimed and became the site of new housing construction.

The private sector was initially very cautious about investing in 'opportunity areas' of Bilbao. Public-sector investment was necessary to create confidence in the sites and in Bilbao as a whole. To assure the business community, the provincial government planned to relocate to a business tower in a zone to be redeveloped.

The most well-known redevelopment site in Abandoibarra is the landmark Guggenheim Museum designed by the architect Frank Gehry. The museum opened in 1997 attracting over a million visitors in its first year and immediately became a major tourist attraction. The cost of €144 million for this risky but prestigious investment was covered entirely with public sector funding, shared by the provincial and regional governments. Other major developments on the Abandoibarra site are the €72 million Euskalduna Conference Centre on the former shipyard and a modern shopping mall, the latter being the first significant private sector investment.

Environmental restoration was essential to the redevelopment effort. On many of the derelict sites formerly occupied by industrial uses and now earmarked for redevelopment, the contaminated soil had to be removed. But perhaps the single-most important project in terms of environmental clean-up was the construction of the new water sanitation system. This project, carried out by the province's water utility, Consorcio de Aguas, helped restore the river, which had been very heavily polluted from industrial uses and untreated household sewage. The total investment cost of €1 billion was shared by different levels of government.

To further the economic transformation, a major strategic element was the development of a Technology Park. The Technology Park for the Bilbao metropolitan area was built close to the airport in Zamudio. Today, 6,000 people are employed in 350 businesses at that complex.

In comparison with the major physical investments, the social consequences of the urban crisis received considerably less attention. But the most striking social intervention was the creation of a new city agency, Lan Ekintza, which was set up in 1998 to link fragile parts of the labour force with job opportunities. Lan Ekintza translates into 'action for employment'. Its objective is to find solutions for job and skill mismatches resulting from labour market restructuring. Its main services include: assistance in job searches; assistance with business startups; vocational training; and skills development. Lan Ekintza also offers special services to immigrants in order to foster their integration into the labour-market. Special efforts are concentrated on the disadvantaged area of Bilbao La Vieja where many social problems are concentrated. On an average annual basis, the agency places some 2,000 people in jobs and assists in the startup of approximately 100 new businesses.

### **Outcomes**

Bilbao's recovery from industrial decline has by now become one of the most well-known success stories in Europe. It is a good example of a city actively engaging in globalization strategies and getting transformed in the process. The integrated approach to redevelopment was very ambitious. The aim was to change the city's image from a declining industrial city to a modern post-industrial one. Physically, Bilbao is now a transformed city.

In terms of economic restructuring, there has been a marked shift in employment from the industrial towards the service sector. In 2005, the proportion of the workforce employed in manufacturing was 22 per cent, less than half of its share in 1975 (46 per cent). The share of

those employed in the service sector has on the other hand increased from slightly less than half to over two thirds of the workforce.

Notwithstanding the steep decline of its old industries, Bilbao still has a significant industrial base, higher than in many other cities. Hence, the strong focus on marketing Bilbao as a post-industrial city only partly reflects the reality. Although the share of manufacturing employment is shrinking, the actual number of employees in this sector in Greater Bilbao has increased slightly. Metropolitan Bilbao has experienced a massive increase of overall employment from 267,000 to 380,000 jobs between 1995 and 2005.

Despite its initial problems and public-sector dominance, the Abandoibarra regeneration with its landmark Guggenheim Museum is widely seen as a success story and Abandoibarra is now attracting significant private sector investment. While the provincial government decided not to occupy the proposed office tower, the large energy company Iberdrola has decided to build its new headquarters on the site. Today, the high-profile projects of Bilbao Ria can be found all over the city and several more are currently in the planning process.

### **Lessons learned**

The financial model of land value enhancement through changing the land-use of old industrial sites has been very successful in financing urban regeneration in Bilbao. The financially self-supporting approach enables the agency to finance its own redevelopment strategies. The model of Bilbao Ría 2000 demonstrates that action can be taken even in the context of strained public budgets. Due to the requirement that financial gains have to be reinvested, this allowed some unprofitable projects to be financed in other parts of the city, e.g. in the deprived inner-city neighbourhood of Bilbao La Vieja.

The creation of the regeneration agency Bilbao Ría 2000 was key to the physical transformation of the city. The agency was given the resources and the power to implement an ambitious programme. The delegation of planning and implementation powers to a body outside of the City Council, the entrepreneurial approach of Bilbao Ría and the focus on physical regeneration all combined to yield a successful result. But key to the success was bringing together all levels of government in the project. This carefully constructed but functioning balance between different political interests has been very important.

One criticism is that the city residents have not been sufficiently involved in the redevelopment process. The whole implementation plan was very top down with little public participation. Some suggest that the design of some of the new public spaces appeals more to affluent groups and fails to create amenities for all of the society.

### 3.3. SOUTH KOREA'S SMART GRID ROADMAP 2030

The Republic of Korea, commonly known as South Korea, launched a national “Low-Carbon, Green Growth” programme<sup>47</sup> to reduce its fast-growing global climate change emissions and to also cut imports of imported fossil fuels. The country was in part reacting to international studies ranking it the world’s fastest increasing carbon emitter and the world’s fifth-largest oil importer.<sup>48</sup> The “Low-Carbon Green Growth” programme consists of numerous initiatives to structurally change the economy while creating a new export growth engine. The programme impacts numerous national sectors including construction, transportation, the domestic consumer market, energy and energy transmission.

As part of the Low-Carbon Green Growth programme, South Korea’s national government introduced a “Smart Grid Roadmap 2030,” to plan for next-generation networks integrating information technology into the power grid. The Smart Grid Roadmap 2030 programme is expected to have significant economic impacts on the cities of South Korea, particularly Seoul, the nation’s capital and largest city, which had approximately 10 million inhabitants in 2010. The global market for smart grid technologies and services is forecast to grow from \$70 billion in 2009 to \$171 billion in 2014.<sup>49</sup>

Moreover, a number of companies from South Korea have been involved in a 2010 deal to outfit old commercial skyscrapers in the U.S. city Chicago with new smart grid technologies, demonstrating the feasibility of the national strategy to become a global leader in green tech exports.<sup>50</sup>

South Korea’s Smart Grid Roadmap 2030 has laid out the goal of completing a smart grid test bed by 2012. As of 2010 an immense research test bed was under construction on the nation’s island of Jeju, south of mainland South Korea.<sup>51</sup> The roadmap has set a national goal of completing a functional smart grid across the nation’s metro areas by 2020.

The government of South Korea estimates that public-private investments of seven trillion Korean Won (about US\$6 billion) for technology development (68 per cent private, 32 per cent public) and 20.5 trillion Won (about US\$17.5 billion) for infrastructure construction (97.5 per cent private, 2.5 per cent public) would be needed through 2030. These investments would yield an estimated 50,000 domestic jobs annually (1 million jobs by 2030), while reducing energy imports, greenhouse gas emissions (an estimated 230 million tons) as well as the need to build new power plants.

<sup>47</sup><http://www.adb.org/documents/events/2009/Climate-Change-Energy-Workshop/KOR.pdf>

<sup>48</sup><http://www.businessgreen.com/business-green/news/2256676/korea-moves-ahead-smartgrid>

<sup>49</sup>Gigaom, Katie Fehrenbacher, 26 May, 2009: <http://earth2tech.com/2009/05/26/smart-grid-to-grow-21-per-cent-a-year-to-17b-in-5-years/>

<sup>50</sup>“The Smart Money’s on Korea’s Smart Grid Tech,” The Next Silicon Valley, 22 July, 2010.

<http://www.thenextsiliconvalley.com/technews/793/The-smart-moneys-on-Koreas-smart-grid-tech>

<sup>51</sup><http://www.iti.illinois.edu/news/press-releases/iti-collaborate-korea-smart-grid-security>

South Korea's Smart Grid Roadmap 2030 is divided into five sections:

- **Smart power grid:** would require building a monitoring and control system of the national power grid, and also building a grid failure prediction and automatic recovery system
- **Smart consumer:** residential smart power meters would be distributed nationwide, with a corresponding automated energy management system
- **Smart transportation:** the plan calls for developing a nationwide charging infrastructure with an information and communications technology-based electric vehicle operating system
- **Smart renewables:** creation of a large-scale renewable energy generation complex and large capacity energy storage devices
- **Smart electricity service:** development of a dynamic power pricing system, which would enable a consumer electricity trading system

Smart power grids are being developed between supply and consumption sources as well as to accommodate smart transportation systems and smart renewables. Smart grids are expected to pave the way for numerous new business models and businesses. Emerging business models are based on technologies wrapped in a variety of information and functional services, from remote monitoring and control of residential or office appliances, to electricity trading services for both businesses and consumers.

According to one online industry publication, South Korea is at a global advantage in developing its smart grid technology goals, as the country of 48 million depends on just one energy utility, making planning and implementation easier. Another advantage South Korea has is its broadband network. After the Asian financial crisis of 1998, South Korea embarked on a plan to become a worldwide leader in broadband. The nation succeeded; in 2009, 95 per cent of households reported broadband access, the highest rate of residential penetration in the world.<sup>52</sup>

"[With Smart Grid Road Map 2030] South Korea is saying, 'this is what smart grid is and we've got the existing knowledge base to be technology leaders here'," said David Leeds, a smart grid analyst with GTM Research in Greentechmedia. "South Korea imports essentially all of its energy, so there is a necessity there that may drive Korea to develop next-generation smart grid technologies ahead of the pack."<sup>53</sup>

## Lessons Learned

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<sup>52</sup><http://www.physorg.com/news164595432.html>

<sup>53</sup>"South Korea Guns for the Finish Line," Katherine Sneed, Michael Kanellos, Greentechgrid, 16 March, 2010 <http://www.greentechmedia.com/articles/read/south-korea-guns-for-smart-grid-finish-line/>

South Korea's national programme "Smart Grid Roadmap 2030" emerged from the nation's overall "Low-Carbon Green Growth" strategy, demonstrating a technology-focused approach in support of the national goal of reducing carbon while increasing clean technology industry exports. Smart Grid Roadmap 2030 provides tangible goals for job creation as well as mobilization of private financing that will be needed in research and development, construction and technology deployment. Within South Korea's Smart Grid Roadmap 2030, five sectoral elements (transportation, consumers, renewables, electricity, power grid) are nested within. Precise milestones for each of these sectoral areas are broken into three phases: Phase 1 (2010-2012), Phase 2 (2013-2020), and Phase 3 (2020-2030). This framework provides cities a clear and compelling model for how each sector will be impacted: for instance in the "Consumer" sector for Phase 1, "Real time price information" will be provided.

### 3.4. San Jose, California's Green Vision



*The city of San Jose, California is at the center of Silicon Valley.*

San Jose, United States is a city of one million located in California's Silicon Valley. This is a renowned location where investors, manufacturers, suppliers and technology innovators have established dense networks of relationships that can provide cost and innovation advantages for

the region.<sup>54</sup> From Google, Apple and Hewlett Packard to Facebook and Twitter, the Silicon Valley has witnessed the creation of start-up companies that constitute the underpinnings of the global economy and modern culture. San Jose has been more recently trying to leverage this hotbed of innovation with a “Clean Tech Strategy” that sets goals for economic growth and job creation in clean technology jobs in clean energy, and resource efficiency.

As part of a larger “Green Vision,” the city’s Clean Tech Strategy has set a goal by 2022 of creating 25,000 clean tech jobs from its current total of about 4,000 jobs in the clean tech sector. This strategy intends to leverage the region’s easy access to venture funding, highly skilled engineers and entrepreneurs, world-class research institutions, supportive government policies, and technology incubators like San Jose’s Environmental Business Cluster.<sup>55</sup>

The San Jose clean technology strategy uses traditional business retention and attraction approaches combined with sophisticated networking of technology and governmental partnerships that are:

- Providing incentives and services at every stage of growth to encourage both established clean technology companies and start-up firms to stay and grow in San José;
- Incubating next-generation technologies through partnerships with local universities and the US Department of Energy’s National Renewable Energy Laboratory-backed Environmental Business Cluster;
- Providing city demonstration opportunities for innovative clean technology products;
- Creating opportunities for local residents to receive training for employment in clean technology industries;
- Advocating for legislative changes that will support the clean technology industry’s growth.

The San Jose-based Environmental Business Cluster is a clean technology incubator that provides commercialization support and facilities for emerging clean energy and environmental technology companies. Founded in 1994 by the city of San Jose in conjunction with San Jose State University’s Research Foundation, its services include expert coaching and strategic counsel, focused educational and networking programmes, targeted access to investors, strategic partners and industry networks, office space, equipment, conference rooms and training facilities.<sup>56</sup>

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<sup>54</sup>“Rising Tigers,” The Breakthrough Institute, Oakland, California, United States, 2009, p.9  
[http://thebreakthrough.org/blog/Rising\\_Tigers.pdf](http://thebreakthrough.org/blog/Rising_Tigers.pdf)

<sup>55</sup>“San Jose’s Green Vision,” City of San Jose, United States website, accessed 20 August, 2010.  
<http://www.sanjoseca.gov/greenvision/CleanTech.asp>

<sup>56</sup>San Jose Environmental Business Cluster website, accessed 20 August, 2010:  
<http://www.environmentalcluster.org/>

As one of the largest environmental and clean technology incubators in the United States, the Environmental Business Cluster has assisted more than 150 companies since its founding in areas such as water purification, advanced transportation, wind and solar energy, waste heat recovery, sustainability, social networking, power management and testing, and alternative fuels. The Environmental Business Cluster supported 22 companies as of August 2010. One company that recently emerged from the incubator designs concentrating solar photovoltaic technologies; it raised \$30 million in financing and was named as a “2008 Company of the Year” by Business Week.

Since 2003, the Environmental Business Cluster has also been working with the California Energy Commission and the U.S. Department of Energy’s National Renewable Energy Laboratory to provide commercialization services to selected applied research grant recipients.<sup>57</sup>

The city of San Jose and the Environmental Business Cluster developed an Electronic Transportation Development Center, where emerging and established technology companies collaborate on the design, development, prototype fabrication, and technology licensing for clean energy technologies. The city is establishing pilot programmes for new technologies such as electric school buses, refuse trucks and fueling stations, while incorporating designs and electronics from the Silicon Valley region to make the vehicles cleaner, safer, and more secure.<sup>58</sup>

San Jose’s Green Vision is attempting to “use our buildings, lands and processes” to accelerate the growth of local clean technology economic development, according to the city’s Clean Technology Regional Policy Manager, Scott Green. He said across from San Jose City Hall is an electric vehicle charging station that was assembled at two locations in the city. Green stressed that continuing San Jose’s clean technology industry economic development process will require ongoing policy engagement at all levels of government, capital investment, fair and stable rules of the road and collaboration and coordination across multiple disciplines. Importantly, it can also count on research partnerships with universities both near the Silicon Valley, such as Stanford University, and beyond it, such as the University of California at Davis. Another collaborative approach the city has taken, Green said, is to play matchmaker with local clean technology companies in developing contracts with large corporations in the city on energy saving retrofitting. Such an effort has saved San Jose corporations like EBay, Adobe Systems and Brocade more than \$1 million in energy costs, while providing energy retrofitting revenues and jobs for city-based clean technology start-ups.<sup>59</sup>

## Lessons Learned

San Jose’s Green Vision programme provides goals and milestones so the U.S. city of one million can leverage the Silicon Valley’s leading base of technology and business model innovation in the creation of clean technology economic development. In addition to partnering with a nationally supported technology innovation center, the Environmental Business Cluster,

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<sup>57</sup>Ibid

<sup>58</sup>“New home, bank for San Jose green car developer Synergy,” Mary Duan, *San Jose Business Journal*, 10 Jan., 2010: <http://sanjose.bizjournals.com/sanjose/stories/2010/01/11/story8.html>

<sup>59</sup>Conversation with Scott Green, Clean Technology Policy Manager, San Jose: 9 August, 2010.



San Jose tracks the number of local clean technology sector jobs and has set longer-term job creation goals for the city's clean technology sector. San Jose has attempted to utilize a number of operational tactics for supporting clean technology industries by making its buildings, land and operations open to pilot project collaboration, as well as matching smaller clean technology and energy efficiency companies with contract opportunities provided by the city's many large corporations.

### **3.5. FEED-IN TARIFFS SUPPORT RENEWABLE ENERGY IN GERMAN CITIES**

Feed-in Tariffs (FITs) support the market development of renewable energy technologies, especially electricity generation. They put a legal obligation on utilities and energy companies to purchase electricity from renewable energy producers at a favourable price per unit, and this price is usually guaranteed over a certain time period, say 20 years. Tariff rates are usually determined for each renewable technology in order to take into account their differing generation costs, and to ensure profitability. The guaranteed access to the grid, favourable rate and the tariff term guarantee, mean that FITs create security for investment by producers, manufacturers, investors and suppliers. FITs make the cost of clean energy competitive with conventional forms of energy, which do not internalize the costs of pollution and are also heavily subsidized. The Feed-In Tariff (FIT) has proven to be one of the most effective policy instruments in overcoming the cost barriers to introducing renewable energy and making it economically viable.

The German FIT has been a great success and is generally regarded as the best example of an effective FIT law. While Germany's energy use has remained relatively stable, renewables have accounted for an ever greater portion of the electricity consumed, helping to limit Germany's greenhouse gas emissions. It has been estimated that as of 2010 the FIT law itself had directly saved more than 33 million tonnes of carbon dioxide from being released into the atmosphere.

In 2008, renewables accounted for about 16 per cent of total electricity consumption in Germany – up from 10.2 per cent in 2005. From 2000 to 2008 the volume of electricity produced from renewable sources supported by the FIT law increased from about 13.6 terawatt hours (1TWh = 1,000,000 kWh) to over 70 TWh.<sup>60</sup>

The solar sector in Germany has grown considerably thanks to the Feed-in Laws. Germany is the largest solar heating producer in the world with a 47 per cent share of the global market. As of 2007 there were over 40 companies in Germany that produce solar system components. The industry employs more than 20,000 people and generated €1.7 billion in revenue per year. The renewables industry as a whole in Germany earned €21.6 billion in 2006, up from €16.4 billion in 2005, and employed about 214,000 people – more than the nuclear and the coal industries

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<sup>60</sup> IEA Statistics

combined. It is expected that by 2020 the renewable energy industry will employ between 400-500 thousand people.

### **Key elements of FIT legislation<sup>61</sup>**

Some key elements that legislators must consider when introducing a FIT law are:

- *Impose a priority purchase obligation.*

Grid operators must be obliged to connect renewable energy producers to the grid, whether the producers are utilities, businesses or private households, and they must transmit the electricity they produce. This should be a priority obligation so that electricity from renewable energy sources is purchased ahead of electricity from other sources. The consequence of this obligation may well be that conventional power generation plants must reduce their production.

- *Determine which technologies and plants will be covered by the law.*

A FIT law needs to state clearly what renewable energy technologies and plants are covered by it.

- *Determine a fair tariff rate.*

The tariff rate for electricity generated from renewable sources must be set at a level that guarantees profitability and reflects the costs associated with electricity production from that source. Getting the tariff rate right is one of the most important and most difficult tasks. If it's too high, windfall profits for producers will follow. If it's too low, there will be little or no investment. For this reason it is important to include a mechanism for adjusting the tariff.

- *Guarantee the tariff rate over a specific period of time.*

The price-per-unit rate should be guaranteed for a specific period of time after qualifying producers have connected to the grid. This ensures the profitability of production, and the security of investment for producers, manufacturers, investors and suppliers. The duration can be set differently for each eligible technology. A time limit should be fixed in order to reduce the overall costs of the FIT system. Restricting payment to a certain number of years also speeds up the innovation cycle by replacing old technology with new and more efficient equipment. Experience has shown that tariffs should be guaranteed for a reasonably long period of time, otherwise, investment security may be hampered. The German FIT law guarantees the rate for a period of 20 years, which has proven effective.

- *Determine an effective way of financing the FIT law.*

There are two main options for financing the feed-in tariffs. The costs could be covered by a cost sharing mechanism for all electricity end-users, or it could also be done through a fund. Most countries with FIT laws, including Germany, have financed it through a cost sharing mechanism. Such a mechanism equally distributes the costs onto the electricity bills of all consumers. This usually ensures that the cost per consumer is very low – in Germany it comes to approximately €1.50 per month per household. The major political advantage of this financing method is that

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<sup>61</sup> A copy of the German FIT legislation (Renewable Energy Sources Act) in English is available at: <http://www.solarpaces.org/Library/Legislation/docs/EEG%20English.pdf>

it is separate from the national budget, and therefore less vulnerable to changing political moods.

- *Reduce the tariff rate each year.*

Reducing the annual per kWh tariff rate for plants qualifying for connectivity to the grid under the FIT law encourages innovation and cost cutting. In Germany, for example, the 2005 tariff rates per kWh for PV plants connected to the grid were reduced by 6.5 per cent in 2006. This annual digression of tariff rates has spurred on innovation and encouraged very rapid growth in the renewable energy sector.

### Lessons Learned

Some of the benefits of a well-designed feed-in tariff law are:

- *A reduction in CO2 emissions.* Well designed FIT laws can greatly increase the market share of renewable energy, thereby replacing fossil fuel based power with clean electricity generated from renewable sources.
- *The creation of jobs.* The growth of the renewable energy industry will create jobs for thousands of workers. In Germany, for example, as of 2007, the renewable energy industry in Germany employed about 249,000 people – almost 60 per cent of whom were employed as a direct result of the German FIT law.
- *A more secure domestic energy supply.* By expanding the market share of renewable energy produced domestically, countries will rely less on imported fossil fuels.
- *An increased drive for technological innovation.* Good FIT rates for renewable technologies increase the drive for innovation, and encourage investment in technologies such as wind and solar energy that have huge potential.
- *The creation of fair market conditions for renewable technologies.* Renewable technologies have been unable, in the past, to compete with conventional energy sources that do not internalize environmental costs and are frequently heavily subsidized. FIT laws help to level the playing field, and enable renewables to compete.

## 4. BETTER CITY, BETTER LIFE: POLICY OPTIONS FOR SUSTAINABLE ECONOMIC DEVELOPMENT

*Strategy1: Bridge traditional industry sectors in order to create sustainable economic development at the regional, city and project level.*

Policy Option 1	Utilize new financing instruments and economic support for low-carbon assessment and development for industry, land use and planning, transportation, energy generation and use, buildings, forests, agriculture and infrastructure.
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Policy Option 2	Facilitate a transition to low-carbon economy by adopting feed-in tariff legislation to catalyze investment in renewable energy for electric power generation in the industrial, commercial, residential and government sectors of the local economy.
<i>Strategy 2: Develop goals and programmes for green economic growth in both traditional and emerging industry sectors.</i>	
Policy Option 3	Assess current industry base/ service sector and prioritize best opportunities for green economic transformation based on regional differentiators, including physical assets, location, tourism and workforce characterization.
Policy Option 4	Investigate emerging economic opportunities, assess regional/local competitive advantages, and opportunities for economic growth and third-party financial support.
<i>Strategy 3: Improve integrated city and metro sustainable economic development capabilities</i>	
Policy Option 5	Facilitate aligned sustainability fiscal management across departments, including waste, energy, water, streets, building and transportation management through budgetary and financing mechanisms.
Policy Option 6	Utilize goals to measure and manage sustainable economic development performance indicators for areas including waste, water, energy, transportation, green building, sustainable materials and tourism industries. Deploy strategic tools such as scorecards, maps and dashboards to make results easy to understand and act upon.
<i>Strategy 4: Create sustainable economic development growth mechanisms including subsidies, enterprise zones, land use, land purchases, public-private partnerships and business facilitation</i>	
Policy Option 7	Develop metro area green economic growth policies and levers for sustainable enterprise zones, local green industry subsidies, tax incentives, land purchase and land use facilitation.
Policy Option 8	Systematically create new business opportunities for local new economy start-ups by introducing them to the city's existing base of corporations and industries

	requiring such products or services.
Policy Option 9	Utilize existing city government utilities, infrastructure, facilities, fleets and resources for implementation or testing of green products and services in order to increase regional or local green economic opportunities.
Policy Option 10	Leverage both public and private economic development financing for new infrastructure, energy, transportation and water projects, including international support and partnerships.

## 5. RELATED LINKS FOR FURTHER INFORMATION:

United Nations Environment Programme: Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. (2011) [www.unep.org/greeneconomy](http://www.unep.org/greeneconomy)

<http://www.weforum.org/documents/gov/Environment/TF%20Low%20Carbon%20Prosperity%20Recommendations.pdf>

“Task Force on Low-Carbon Prosperity: Recommendations,” World Economic Forum, 2009

[http://www.oecd.org/document/42/0,3343,en\\_21571361\\_45068056\\_45068202\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/42/0,3343,en_21571361_45068056_45068202_1_1_1_1,00.html)  
 Organization for Economic Co-operation and Development site, including report, “Cities and Green Growth: Issues Paper for the 3<sup>rd</sup> Annual Meeting of the OECD Urban Roundtable of Mayors and Ministers”, 25 May, 2010, OECD Conference Center, Paris.

[http://www.globalurban.org/Issue1PIMag05/Weiss\\_article.htm](http://www.globalurban.org/Issue1PIMag05/Weiss_article.htm)

“Teamwork: Why metropolitan economic strategy is the key to generating sustainable prosperity and quality of life for the world,” Marc A. Weiss, Global Urban Development Magazine, Global Urban Economic Development Institute, Issue 1, volume 1, May 2005

<http://www.slideshare.net/itsgowri/wwf-low-carboncities>

“Reinventing the City: Three Prerequisites for Greening Urban Infrastructures”, WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010

<http://www.pwc.com/us/en/cities-of-opportunity>

“Cities of Opportunity,” Price Waterhouse, 2010. Analyzes 21 global centers of economic activity, by financial, economic, environmental factors

<http://www.greengrowth.org/rethink.asp>

United Nations Economic and Social Council for Asia and the Pacific (ESCAP) site

[http://www.greengrowth.org/capacity\\_building/Download/GG\\_capacity\\_development/Green\\_Growth\\_Capacity\\_Development\\_Brochure-resized.pdf](http://www.greengrowth.org/capacity_building/Download/GG_capacity_development/Green_Growth_Capacity_Development_Brochure-resized.pdf)

United Nations Economic and Social Council for Asia and the Pacific (ESCAP) report on rethinking growth

[http://www.nyc.gov/html/om/pdf/2009/pr465-09\\_plan.pdf](http://www.nyc.gov/html/om/pdf/2009/pr465-09_plan.pdf)

Site for New York City PlaNYC 2030

<http://www.nycedc.com/SupportingYourBusiness/Industries/Green/Pages/Green.aspx>

Site for New York City Green Economy Plan

<http://www.routledge.com/books/details/9780415953610/>

Description of book on squatter settlements and economic innovation, “Shadow Cities: A billion squatters, a new urban world” Robert Neuwirth, 2006 Routledge

“Catalyzing Low-Carbon Development? The Clean Technology Fund,” Smita Nakhoda, World Resources Institute, May 2009, (accessed 6 September 2010)