

Sustainability, Clusters, and Competitiveness

Introduction to Focus Section

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Policy makers and analysts of the global economy sometimes discuss economic development and sustainability in terms of a trade-off or tension between prosperity and sustainability. In this point of view, climate change, sprawl, environmental degradation, economic inequities, and social injustices are the inevitable results of economic development strategies that disregard current and future sustainability challenges. The economy is only one of the three pillars—along with the environment and equity—that support sustainable development (Campbell, 1996). Yet scholarly writings about industry clusters and the practice of cluster-based economic development unfortunately have largely ignored sustainability. Understanding how regional economies influence sustainability is essential to clarifying the terms of these trade-offs and finding alternative strategies.

The authors in this issue shed light on the various aspects of clusters, sustainability, and competitiveness, and we hope to contribute to an emerging research agenda. The contributions were presented and discussed at the Academic Summit of The Competitiveness Institute's (TCI) 10th annual cluster conference, hosted by the Oregon Economic and Community Development Department and Portland State University in Portland, Oregon, in October 2007. Numerous practitioners and scholars debated the relationships between clusters and sustainability. The number and diversity of papers presented at the conference and the engaging discussions they launched illustrate the importance and relevance of the topic.

The Various Faces of Sustainability

Sustainability is a broad concept and encompasses the idea that any kind of development should not compromise the needs of future generations as stated in the 1987 Brundtland Report from the United Nations. In this context, the authors explore the relationships among

the various dimensions of sustainability as they relate to clusters and regional competitiveness.

Despite this broadly accepted definition, sustainability has many different connotations in the context of economic development. From an environmental perspective, sustainability focuses on the use and preservation of natural resources and the ecology of a place. Industry clusters do not exist in a vacuum, but they are rooted in specific geographic places and may be dependent on natural resources, including the environmental quality that attracts a skilled and mobile workforce. In what ways do issues of sustainability and livability influence cluster development and cluster competitiveness? Can we eliminate the notion of a trade-off between environmental preservation and economic vitality by incorporating the concepts of environmental quality and natural resource preservation into the place-oriented factors that contribute to cluster competitiveness?

The concept of sustainability also applies to the life cycle of a business or groups of firms in a cluster. Clusters emerge, grow, stagnate, and decline, and sometimes they regenerate and emerge from crisis. What factors contribute to a cluster's ability to sustain itself? What can we learn from cluster life cycles? Can we hope to detect and respond to cluster life cycles with public policy specific to the cluster's life stage?

During the past couple of years, firms have developed competitive niches around sustainable technologies and practices. Do these industries exhibit the characteristics of a cluster? Do these clusters thrive on the same factors as do more traditional clusters? What are the sources and determinants of their competitiveness? Is this merely a fad, or will sustainable industries still represent viable clusters in 10, 15, or 20 years? How will these clusters evolve as some of the key sustainability concepts are proven or discarded?

Scholars have long studied the impact of economic development on the people served by an economy and

the distributional impacts of growth. How does this conversation change in the context of clusters? Clusters are not just an amalgam of institutions, but they depend on individuals such as innovators, entrepreneurs, ordinary citizens, customers, and consumers. Their strength depends on the relationships among people, their ability to communicate, their degree of trust. How do sustainability policies affect social networks and thus the structure of human relationships supporting an economic cluster? Are social sustainability concepts of equity, justice, and diversity important for a region's competitiveness and the strength of its clusters? How does social sustainability influence a region's resiliency and ability to meet challenges such as natural disasters and economic shocks? In what ways does social inclusion influence competitiveness and cluster dynamics? What is the link between cluster development and prosperity?

The articles in this issue touch on some aspects of these important questions. Nevertheless, they only scratch the surface of the breadth and depth of issues that have yet to be explored in cluster research and practice.

Three Major Challenges for Cluster Practitioners

The contributions touch on three major challenges clusters are facing today: globalization, climate change, and social equity. Globalization and its impact on our economy force economic development scholars and practitioners to reconsider the nature and benefits of the connections between local and regional economies and the global economy. On one hand, globalization may undermine a cluster's vitality as competition for markets appears from unexpected places. On the other hand, globalization can create new customers, inject new technologies that improve competitiveness, and prevent local lock-in. Clusters cannot be viewed as localized islands of economic activities. Rather, they are critical nodes in a global network of places. Global value chains, an internationally mobile workforce, entrepreneurs and venture capitalists seeking international hot spots for their investments, and transnational innovation networks renew clusters through new ideas and innovations. Economic developers face the challenge to keep the cluster life cycle sustainable in a time when global connections seem to challenge yet advance the longevity and vitality of clusters. Parochialism, isolationism, and fear of globalization threaten the sustainability of clusters, and practitioners need to embrace transnational linkages to ensure cluster sustainability.

The second challenge is related to the environment and the threats we face from climate change. Climate change is challenging policy makers worldwide to find appropriate responses to lower CO₂ emissions, avert natural disaster, and protect the environment. The potential economic costs of these threats have created a business opportunity recognized by many entrepreneurs and firms that are solving technical and organizational problems and selling these solutions to the public and private sector. With an intense knowledge requirement, these "sustainable industries" have begun to cluster in areas where the technical knowledge is dense and the market demand is high.

In Germany, for example, the production of solar cells increased by 156 times between 1998 and 2005, sales in the German solar industry increased from 1999 to 2005 from 0.35 billion to €3.7 billion, and employment stands at about 42,500 (VDI Technologiezentrum GmbH, 2008). German states and regions are marketing their sustainable industry clusters, and firms are expanding internationally. In 2007, for example, the German firm SolarWorld announced the renovation of a vacant semiconductor plant in the Portland, Oregon, region. The firm is investing \$400 million in the production of solar wafers and cells for the U.S. market. Start-up firms in Silicon Valley and in other U.S. technology hot spots are searching for innovative alternatives to fossil fuel. Venture capital investments in clean technologies—the fastest growing venture capital segment—have surged in recent years. According to the MoneyTree report published by PricewaterhouseCoopers and the National Venture Capital Association, venture capitalists invested about \$2.2 billion in clean technologies in 2007, which marked a 45% increase compared to 2006 (PricewaterhouseCoopers, 2008). Intel Capital, the world's largest venture capitalist, invests in clean technologies. In 2008, Intel Capital invested \$50 million in SpectraWatt, a solar cell-manufacturing firm that spun off from Intel's Oregon facilities. The business case has been made, and cluster practitioners and academics are being challenged to understand the dynamics of sustainable industries.

The third challenge relates to social equity and ensuring a society's economic prosperity. As the middle class is dwindling in many developed countries and globalization is producing winners and losers, economic developers the world over should question the ways in which economic growth relates to development and progress. Although the cluster literature assumes an automatic link between successful cluster development and economic progress, it is not clear whether or how successful clusters offer a higher level of economic prosperity or greater equity. A Brookings Institution (2008) report, for example, shows how San

Jose—the major metropolitan area in the Silicon Valley—is a leader in productivity yet also has one of the worst wage inequality rates of the largest 100 metropolitan areas in the United States. Although the literature celebrates Silicon Valley as a successful high-tech cluster, few studies examine these inequalities. Cortright (2006) notes a gap in the literature about the link between clusters and wages or poverty. Indeed, Martin and Sunley (2003) deconstruct the notion that clusters “raise productivity, innovativeness, competitiveness, profitability, and job creation of their constituent firms, of the geographical areas in which the cluster is located, and thence the wider national economy” (p. 22) and challenge researchers to conduct more detailed studies about clusters and economic performance. Understanding the ways in which clusters contribute to social development is critically important if economic developers are serious about social sustainability.

Where We Are Today: Clusters and Sustainability

The articles published in this issue offer perspectives on the challenges presented above. They focus on three aspects of sustainability: the life cycle and sustainability of clusters themselves, sustainable industries as a cluster, and the social equity and globalization aspects of clusters.

Cluster Life Cycles and Sustainability

The notion of cluster life cycles can be compared to Vernon’s (1966) product life cycle model. Vernon’s notion that products are produced in different places depending on their stage of development is based on the theory of competitive advantage. As the product progresses from conception to birth, maturation, senescence, and death, the resources required to advance the process also change, as does the cost of the product. Thus, although the invention of a product requires intensive use of human capital, mass production requires less skilled labor but adequate factory space. These resources are found at least cost in different places. Similarly, although the demand for a product in its early stage will come from high-income nations that can pay the high price, prices will fall as the product matures, and therefore demand is drawn from a wider variety of places. Thus, as a product matures, the ideal location of production tends to change.

For clusters, particularly knowledge-based clusters, the sustainability challenge is to maintain the innovation cycle and the competitiveness of the resulting products and services even in the face of disruptive shifts in markets or knowledge. As illustrated by the case studies in Robert

Huggins’s article in this issue, renewal of knowledge cluster life cycles requires not only pursuing the benefits of the local cluster but also reaching out to global networks.

Broader network connections become important in part because of technological changes that blur the lines among industries and require knowledge transfers among actors that might not normally expect to gain from an exchange. Montana and Nenide’s article in this issue illustrates how these new relationships can be detected in emerging clusters, primarily composed of newly related industry sectors. They describe a new quantitative method for understanding how clusters are changing and identifying newly related sectors. With better analytical methods, cluster practitioners can encourage the broader connections necessary to extend the value chain and therefore the life of the cluster.

Sustainable Industry Clusters

Sustainable industry clusters are a knowledge-intensive subset of existing industry clusters such as energy, building, and food production. Essentially, these clusters find new ways to accomplish existing functions (creation of energy, building a structure, growing food). The new methods are innovative in that they require fewer resources and/or have fewer negative impacts on the environment or on society. Alternatively, sustainable industries solve environmental problems such as toxic waste clean-up or social problems such as providing clean water to poor nations at a reasonable price.

Because sustainable industries are highly dependent on technical knowledge, we might expect them to behave in a similar manner to other knowledge-based clusters. Thus, we would expect to observe the importance of proximity for idea generation and dissemination, key early adopters and sophisticated consumers as part of the development process, competition and cooperation among a group of innovative companies, and a set of related and supportive industries that create a value chain and a network of individuals and companies knowledgeable about specialized aspects of the technology and the business.

The green building cluster in Portland, Oregon, appears to fit these characteristics. As described by Allen and Potiowsky in this issue, demand conditions, factor conditions, and competitive conditions all appear to support the notion that green building is indeed a cluster in the classic sense. Many identify the Pacific Northwest as home to a technology-based clean energy cluster capable of generating \$2.5 billion in revenue and 12,000 jobs by 2020 (Climate Solutions, 2001).

Sustainable industry clusters may be unique with respect to the ways in which government interventions

influence their creation and evolution. To extend Michael Porter's notion of the role of government in upgrading clusters (Porter, 1998, p. 251), rules and regulations may actually influence the business case for sustainable industry clusters. In the case of Germany, public support and subvention of solar power facilitated the creation of a vibrant solar industry cluster that is evolving into an export industry. As Allen and Potiowsky note, Portland's green building industry benefited from a supportive policy framework. Renewable portfolio standards for utilities in many states are also stimulating the market for sustainable energy sources. Government intervention, standards, and certifications can thus stimulate cluster development.

Clusters, Social Sustainability, and Globalization

As social sustainability becomes a more commonly discussed part of the sustainability conversation, scholars have begun to ask how both globalization and clustering influence the global distribution of economic activity and income. Enright (2000) describes the paradox between the globalization of competition and the existence of local sources of competitive advantage in some industries. Although one might expect globalization to distribute economic activity more evenly throughout the globe, it actually allows for greater concentration as companies market their competitive advantages more broadly. This is analogous to economies of scale that allow for greater specialization of labor in larger organizations, leading to greater productivity. Thus, in some industries, globalization actually increases concentration rather than disbursing it more broadly. What does this mean for regions that are not endowed with competitive advantages in industries that can generate a high standard of living for their residents? Are these regions doomed to a forever disadvantaged position in the hierarchy of clusters? Some writers suggest that cluster policy can counter this trend by attracting branch plants and foreign direct investments.

Cluster strategy often emphasizes the need to exploit a homegrown source of competitive advantage rather than trying to copy the strategies of other places. It would appear that a strategy of attracting foreign direct investment is antithetical to the homegrown approach. Indeed, dominance of an economy by externally owned firms is viewed negatively because of the lack of local control over the fate of the company and its local workers. Yet Enright (2000) has shown that, in some cases, local clusters and multinational enterprises can be interdependent. The local cluster provides important competitive advantages, whereas the multinational enterprise can provide the spark

that leads to a cluster that is not dependent on any single company and offers sustainable benefits to the host region. Stephan Manning's article in this issue offers evidence of these kinds of mutual benefits in his case study of the development of an engineering cluster in Carpati, Romania. He makes the case that the influence of foreign investment can provide sustainable competitive advantages by teaching a region how to provide the services required to meet the needs of many companies.

Conclusion

Regional economic prosperity depends on the ability to grow and nurture competitive industry clusters. In turn, competitiveness increasingly depends on sustainable economic growth that does not compromise environmental quality and social progress. We seem to think that trade-offs between economic growth and sustainable development are inevitable. However, as we can see from the discussions in this issue, synergies and interdependencies exist between cluster development and sustainability. The most convincing case is made by clusters of sustainable industries. As cities and regions are noticing the economic potential of so-called green industries or clean technologies, they will most likely adapt their policies and try to nurture these types of clusters. Cluster life cycles and the need to connect regional economies to an international economic network are already on the policy agenda. Policy makers promote the internationalization of their clusters and respond to the need to ensure cluster sustainability. The most difficult issue facing policy makers and scholars is social sustainability and cluster development. As noted above, scholars have not paid enough attention to the contributions of clusters to social prosperity. This is a needed area of focus for both practitioners and scholars, especially at a time when U.S. metropolitan areas have high wage inequalities, cities and regions are losing the middle class, and poverty is on the rise (Brookings Institution, 2008).

The articles in this issue stimulate an interesting debate about trade-offs, synergies, and interdependencies between economic prosperity and sustainability. However, they raise only a small portion of the questions that need to be addressed in future research and the practice of cluster-based economic development.

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