**ECOHEALTH**

Book Reviews

Creating Sustainable Communities: The Quadruple Bottom Line

Humans seem to have surpassed the environmental limits of the world as we know it (Rockstrom et al. 2009). Environmental degradation and global climate change are some manifestations of the harm we are inflicting on our ecosystem. Fortunately, there are also uplifting examples of humans nurturing their natural habitat and creating sustainable communities in a changing world. A new edited book by Roetman and Daniels (2011) on this topic is worth noticing. It presents a compilation of creative activities currently under way at the Barbara Hardy Institute at the University of South Australia. The authors address carbon and waste reduction strategies, urban design, transport planning, housing, solar power generation, tourism, education, and a number of other issues.

Traditionally, sustainability has been confined by the "triple bottom line" with three overlapping and interdependent goals (Elkington 2004): (1) to live environmentally sustainable or viable in the long-run; 2) to live economically sustainable that maintains the living standard in the long-term; (3) live socially sustainable in the present and future. However, "health" has been omitted from this sustainability discourse. This book transcends this very limited definition of sustainability that focuses on the triple bottom line by taking a "one health" approach. It presents case studies from a number of disciplines that aim to advance optimal health for people, animals and the environment. By recognizing that "health" is ultimately the bedrock of sustainability, this book frames sustainability as the "quadruple bottom line".

A few of these case studies of the quadruple bottom line are presented below in four overlapping categories: environment, economy, equity, and health.
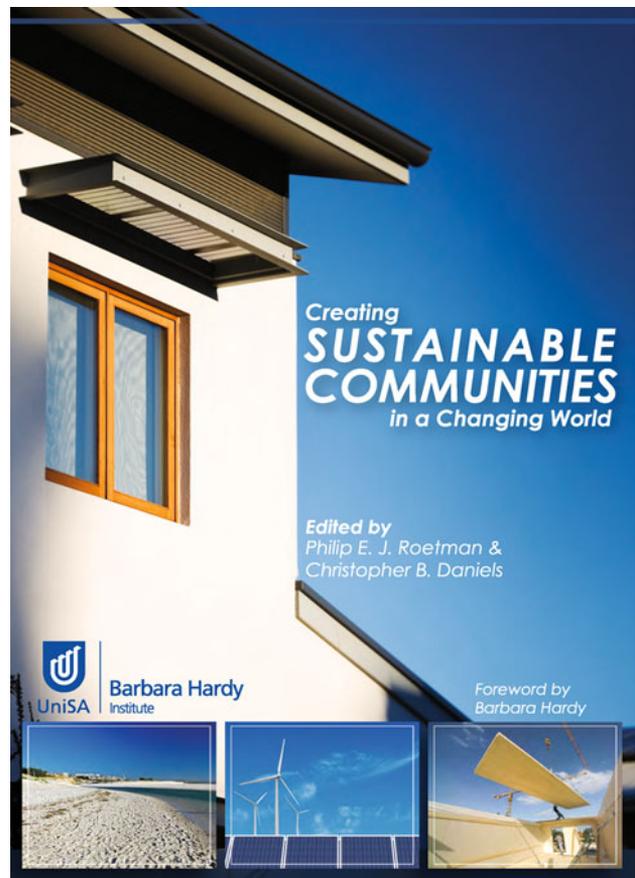
Environment: Responding to the threats of climate change is daunting at best. Chapter 3 in this book presents a number of adaptation and mitigation strategies for a number of sectors: agriculture, water management, transport and planning, health and human services and natural environments in the context of South Australia's draft climate change adaptation strategy. This strategy emphasizes collaboration with local governments, commerce and

community representatives to better respond to the local sensitivities and capacities. The ecological footprint is presented in chapter 8 and computed for a number of scenarios (e.g. reductions in car travel or a decrease in the consumption of animal products) with all the components that factor into these calculations. Reducing the ecological footprint for local communities through carbon reduction strategies (Chap. 4) can be achieved by facilitating the bulk purchase of solar photovoltaic panels and solar water heating systems. The ''zero-waste city'' (Chap. 5) concept is another example of reducing the footprint where waste is seen as a resource that can be recovered. For example, the South Australian food waste pilot study disposes food waste in garden organics bins rather than into residential waste bins that end up in the landfill.

Economy: The construction industry in its current form is largely unsustainable because it consumes considerable amounts of fossil fuel energy and generates a great deal of waste during demolition (Chap. 6). Thus, alternative building practices are highly desirable. A timber-based, prefabricated low-carbon construction system for multi-storey inner-city housing can be an attractive alternative. It is based on light-weight prefabricated, modular panels that are manufactured off-site and are recyclable. Although no such houses have been built in South Australia to date, the wheels have been set in motion to roll out a panel manufacturing plant and to follow some successful European construction models that have used these panels. Berry and Saman (Chap. 18) discuss the economics of zero-energy homes in light of price and non-price barriers to construction of homes that are inexpensive, comfortable, functional, and environmentally sustainable.

Several chapters are devoted to sustainable transport (Chaps. 14, 15, 16, and 17). For example, replacing combustion-based vehicles with electric vehicles is an example where fossil fuel consumption can be diminished. Pudney (Chap. 16) describes the construction of a solar-powered racing car as an extreme example of what can be accomplished technically with electric vehicles. However, currently the main disadvantages of such cars are the limited range and long recharge times. Electric vehicle batteries contain only a fraction of the energy of a tank of petrol. The uptake of such vehicles by local communities depends on creating a recharge grid and catalyzing behavior and life style changes. Sustainable transport also depends on the development of urban communities with access to public transportation, and to safe bicycle and pedestrian networks. This issue is particularly pertinent for Australia, which has among the highest per-capita greenhouse gas emissions in the world, and where the average vehicle occupancy of all cars traveling on suburban roads in only 1.53 persons per vehicle.

Equity: Social sustainability aims to integrate diverse groups and cultural practices in a just and equitable fashion. The goal is to assure fairness, opportunity, social services (including health and education), gender equity, political accountability, and participation. Global environmental change threatens to undermine precisely these values, despite the fact that the poorest communities, such as the Peachey Belt in northern Adelaide, are those with the lowest carbon emissions (Chap. 10). Thus, social inclusion is even more important under such environmental circumstances to assure that these communities are given a voice in the political decision-making process. Education is the key in achieving social sustainability, and a number of interesting chapters discuss curricula in primary, middle school, and universities (Chaps. 26, 27, and 28). Community-based participatory research on locally important projects illustrates the inherent synergies between research, education and community engagement (Chap. 29). There is an interesting chapter (Chap. 11) on the complexities of social sustainability at a UNESCO world heritage site, where certain aspects of cultural practices and social expression are valued, but others may be marginalized. Social inclusion can also be fostered by high quality public open spaces that attract people of all age groups to participate in community activities (Chap. 23). My own work in the northwest United States has illustrated how such venues, can provide an important space for formal and informal social gatherings and interactions that strengthen collective efficacy, social capital and health (Semenza et al. 2007).

Health: The ''one health'' concept is addressed in this book in a chapter on urban biodiversity and in a couple of human health chapters (Chaps. 21, 22, and 23). Urbanization, globalization, and climate change are some of the drivers that create new threats to both animals and humans. While the fact that community health is included in this book is an enormous asset, the relative scarcity of case studies addressing sustainability health issues is nevertheless disheartening. The authors illustrate how urban biodiversity provides a number of benefits to city dwellers through environmental moderation and ecosystem services. They elaborate on how vegetation buffers the impacts of noise and air pollution and provides shelter from direct sun exposure; for example, trees can abate the heat island effect by reducing ambient temperatures during heat wave epi-

sodes, which otherwise can have dire public health consequences as we have shown in the US (Semenza et al. 1996). One chapter (Chap. 22) also discusses healthy ecosystems that can have other health benefits when it comes to infectious diseases, water quality, and mental health. Naturally, for the readers of *EcoHealth*, these examples are of great interest and it would have been desirable to expand on these case studies. The authors also point toward the future with strategies of maintaining ecosystems, e.g., preservation of riparian (watercourse margin) vegetation in a watershed in order to provide safe drinking water or phytoremediation (plants that absorb arsenic, mercury, lead, etc.) to detoxify contaminated soil and water.

Creating resilient communities in times of global environmental upheaval can be guided with pragmatic case studies such as those presented in this book. Roetman, Daniels and colleagues have given us a refreshing compilation of original examples from a number of disciplines. If readers of this review are not already enticed to pick up this book, then maybe an incentive will be found among the following curiosa to be discovered in the volume: How "tweeters" threaten sustainable communities by eroding their heritage amenity or sense of place; how "slow travel" and the "10 km hotel" are becoming the insider tip to experience an authentic journey; and how the "Darwin matrix" is a more holistic way to think about sustainable travel and transport.

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