Chapter 7

From risk to resilience: what role for community greening and civic ecology in cities?

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Introduction

One of the greatest risks following a natural disaster or conflict in cities is the ensuing social chaos or breakdown of order. Failed cities, such as parts of New Orleans following Hurricane Katrina and Baghdad following war in Iraq, can be viewed as socio-ecological systems that, as a result of disaster or conflict coupled with lack of resilience, have "collapsed into a qualitatively different state that is controlled by a different set of processes" (Resilience Alliance 2006). Communities lacking resilience are at high risk of shifting into a qualitatively different, often undesirable state when disaster strikes. Restoring a community to its previous state can be complex, expensive, and sometimes even impossible. Thus, developing tools, strategies, and policies to build resilience before disaster strikes is essential.

The Resilience Alliance has led the way in developing a broadly interdisciplinary research agenda that integrates the ecological and social sciences , along with complex systems thinking to help understand the conditions that create resilience in socio-ecological systems. Through consideration of diverse forms of knowledge, participatory approaches, and adaptive management, in addition to systems thinking, the Resilience Alliance integrates multiple social learning 'strands' (Dyball *et al*. 2007). Although the resilience work has not focused on cities, its approach is consistent with a call by the Urban Security group at the U.S. Los Alamos National Laboratory for "an approach (to studying urban ecosystems) that integrates physical processes, economic and social factors, and nonlinear feedback across a broad range of scales and disparate process phenomena" (Urban Security 1999).

Social-ecological systems exhibit three characteristics related to resilience: (1) the amount of change the system can undergo and still retain the same controls on function and structure, (2) the degree to which the system is capable of self organization, and (3) the ability to build and increase the capacity for learning and adaptation (Resilience Alliance 2006). Diversity is fundamental to retaining functional and structural controls in the face of disturbance. Biological diversity provides functional redundancy, so that if one species declines (e.g. a nitrogen

fixing species), other species providing the same ecosystem services will continue to function Similarly, when diverse groups of stakeholders, including resource users from different ethnic or religious groups, scientists, community members with local knowledge, NGOs, and government officials, share the management of a resource, decision-making may be better informed, stakeholders may be more invested in and supportive of the decisions, and more options exist for testing and evaluating policies.

Self-organization refers to the emergence of macro-scale patterns from smallerscale rules, such as the emergence of ecosystem patterns related to nutrient cycling or plant size distributions as a result of evolution acting at the species level (Levin 2005), or the development of a market economy in laissez-faire political systems. Participation of local residents in managing their own resources also may be viewed as a form of self-organization and can lead to adaptive learning and eventually greater resilience (Olsson *et al.* 2004). For example, following a hurricane on the island of Montserrat, local people involved in rebuilding undertook development projects, such as building a community center and implementing new farming practices, which were not directly related to disaster recovery but were integral to longer-term resilience strategies (Vale and Campanella 2005). In another example, refugees living in camps in Somalia and Kenya learned new methods of growing food, which they took back to their communities following resettlement (Smit and Bailkey 2006).

The Montserrat and African cases provide examples of positive feedback loops, which are also critical to resilience theory. People acquired skills and new knowledge, and applied them to enhancing community development, food security, and the local environment. This, in turn, should create a system that is more resilient in the face of a new disturbance or disaster. One challenge for the development community is how to foster local leadership and action leading to positive feedback loops that lead to resilience. This is in contrast to some interventions that result in destructive, positive feedback loops, such as when following a conflict lack of meaningful employment opportunities for men leads to violence, which in turn leads to destruction of infrastructure and even fewer employment opportunities.

Building resilience through nurturing diversity, self-organization, adaptive learning, and constructive positive feedback loops is consistent with calls for a shift in disaster relief thinking from identifying what is missing in a crisis (needs, hazards, vulnerabilities) to identifying the strengths, skills, and resources that are already in place within communities (IFRC 2004). Such thinking parallels recent calls for asset-based approaches in international development, which emphasize building on existing natural, social, human, financial, and physical capital. However, tools

and policies that are consistent with asset-based approaches to building resilience in cities are sorely lacking.

In this chapter, we argue that urban community greening and other 'civic ecology ' approaches that integrate natural, human, social, financial, and physical capital in cities, and that encompass diversity, self-organization, and adaptive learning and management leading to positive feedback loops, have the potential to reduce risk from disaster in cities through helping communities to develop resilience before a disaster, and to demonstrate resilience after disaster strikes. We realize that an emphasis on community greening may be counterintuitive, given that many urban residents have unmet fundamental needs including sanitation, personal safety, and land tenure. However, we contend that some individuals and communities take it upon themselves to improve their environment even under the most difficult conditions, and that such action not only is part of resilience but should be incorporated into asset-based development and educational schemes.

In making our argument, we build on and add to existing literature on resilience and draw on our own experience with urban community greening. First, we apply resilience theory to *urban* socio-ecological systems, an important gap in a body of literature focusing largely on aquatic, agricultural, and marine systems. Second, we expand on Vale and Campanella's (2005) comparative analysis of resilience narratives from cities experiencing disasters, which focuses largely on the built rather than the *natural environment*, and on efforts led by government, the private sector, and outside NGOs, as opposed to *community-based* initiatives to build resilience . Perhaps more important, we propose an asset- and community-based *tool*, urban community greening, which can serve as the focus of future adaptive co-management, social learning, and research into resilience in cities. We show how urban community greening builds multiple forms of capital in ways that are distinctly different from other types of greening, and that contribute to diversity, self-organization, and adaptive learning and thus provide the conditions necessary for resilience in socio-ecological systems. Finally, we integrate resilience theory and urban community greening to propose a new 'civic ecology' framework in which to view urban community greening and other socio-ecological, participatory, asset-based approaches to building resilience in cities.

Urban community greening

Community-based efforts to create green spaces in cities, such as community and living memorial gardens and community forestry, are distinct from other types of greening, including green political movements or more formal 'pedigreed' landscapes such as city parks and botanic gardens (Hough 2004). An example of urban community greening comes from Soweto township near Johannesburg,

South Africa, where local residents, many of them immigrants from more rural areas, have taken it upon themselves to reclaim a hill that was overgrown and the scene of rampant sectarian violence during apartheid. Today the Soweto Mountain of Hope (Lindow 2004) is a vibrant garden and outdoor 'community center' incorporating protest sculptures, a women's kitchen and meeting circle, dance and drumming classes and concerts, and huts reflecting the building styles of diverse ethnic groups in South Africa. The Soweto Mountain of Hope also acts as a memorial to victims of AIDS; the garden is along a major thoroughfare leading to a large cemetery and a number of garden plots are planted in the shape of AIDS ribbons. Given Johannesburg's high crime rate and its designation by some as a city at risk of 'failing' (Norton 2003), the Soweto Mountain of Hope is an example of community-based resilience under conditions that commonly follow disaster or conflict. It also provides a test case for how such community-based efforts might enhance resilience in the face of future conflict.

Similar to what occurred in Soweto, the community garden movement in North America can be viewed as a community-based response to urban crime and decay. As city dwellers in New York and elsewhere experienced rising violence and abandonment by politicians in the 1970s, they refused to accept that they and their neighborhoods were the "troubling by-products of urban growth and decay...problems to be solved by politicians, city planners, and environmental professionals" (Anderson 2004). Instead, they took it upon themselves to transform crime- and trash-ridden vacant lots into urban landscapes that represented a new kind of nature incorporating ecological and cultural value. We contend that the active engagement of these community members, many of whom were low-income minorities and immigrants, helped to build stronger, more resilient neighborhoods prior to disaster, and that their efforts would be revisited following disaster. For example, after 9/11, many community gardens became living memorial gardens, whose purpose was to create an outlet for grief and a unifying, community building demonstration of solidarity and support, all of which can contribute to resilience .

Thus, as opposed to more formal city parks, urban community greening refers to the leadership and active participation of city residents who take it upon themselves to build healthier sustainable communities through planning and caring for 'socioeco-logicalspaces' and the associated flora, fauna, and structures. Urban community greening encompasses community gardens where city dwellers share a gardening space, often by dividing it into individual family plots and common areas such as benches and casitas; memorial gardens created spontaneously by community members following disaster and conflict; trough gardens where individuals plant in troughs located throughout a city; gardening and tree planting along green areas created by transportation corridors such as railroads and highways; as well as

sacred groves of trees and other forms of community forestry. It also encompasses urban agriculture (Smit and Nasr 1999), although the emphasis is more on building individual and social resilience than on food production per se. We contend that whereas greening in general enhances mental, physical, and community health, urban community greening builds natural, human, social, financial, and physical capital in unique ways with important implications for building resilience prior to and following a disaster or conflict.

Building resilience

Numerous studies have shown that the ability to see or experience green space can reduce domestic violence, quicken healing times and reduce stress, improve physical health, and bring about cognitive and psychological benefits for children and adults (Sullivan and Kuo 1996, Ulrich 1984, Hartig *et al.* 1991, Kaplan and Kaplan 1989, Taylor *et al.* 1998, Wells 2000). In addition to building human capital, green areas in apartment complexes have been demonstrated to build social capital through fostering a sense of safety and reducing crime rates in cities (Kuo and Sullivan 2001, Kuo *et al.* 1998). Furthermore, throughout the last century and continuing today, gardening also has been a means for soldiers and victims of war to fight back for their own mental well-being, as well as for the disenfranchised to become involved in acts of defiance. Gardens themselves represent resilience in that they "resist not only environmental difficulty but also social, psychological, political, or economic conditions" (Helphand 2006).

We can expect urban community greening at a minimum to foster the same sorts of resilience-building human and social capital as other types of green space. More important, urban community greening has been demonstrated to build additional forms of capital that relate directly to the diversity, self-organization, and adaptive learning characteristics of resilient societies.

Diversity and the ability to maintain function and structure in the face of Change

In densely populated cities, community greening contributes to landscape heterogeneity, adding multiple, small-scale, distributed patches to the green spaces created by formal parks. Furthermore, urban community gardens are sites of biological diversity generally reflecting the cultural and ethnic diversity of the surrounding community. For example, in Sacramento, California, Mien refugee gardeners grow Asian varieties of squashes, eggplants, and beans; in New York City, Latin American gardeners plant alache, epazote, and papalo; and in Grahamstown, South Africa, community gardeners grow a diversity of 'imifino' or wild, edible greens. Whereas the biologically diversity found in community

greening generally is not native, it potentially could foster ecological resilience, such as when planting little used varieties reduces risks from insect and disease. Furthermore, the genetic, species, and landscape diversity associated with smallscale agriculture gains importance when cities are viewed as socio-ecological systems. For example, the diversity of fresh produce gathered from community and school gardens in South Africa is seen as playing an important role in helping HIV/AIDS affected individuals maintain healthy immune systems, and thus contributes to individual resilience.

Community greening may also foster human diversity. In North America, South Africa, and Bosnia-Herzegovina, internally-displaced individuals and immigrants representing a diversity of ethnic groups can be found working together in community gardens. Furthermore, community gardens tend to be meeting places for people of all ages and sometimes from a range of economic status.

A question arises as to whether 'human' diversity, such as that represented in urban community greening, is critical to resilience, and if so, what types of diversity are important (e.g. ethnic, views about natural resources management, gender, age). Certainly, one can point to resilient cities in which cultural diversity was not a factor, including Tangshan China following the 1976 earthquake, Gernica following Franco's collusion with the Germans to bomb this Basque stronghold, and Tokyo following earthquakes, fires, and war (Vale and Campanella 2005). In these cases, either strong governments or private industry played a major role in rebuilding, often with the express purpose of setting a political agenda (such as demonstrating a more open economy following the death of Mao in China, or destroying Basque culture in Guernica). On the other hand, new immigrants have been instrumental in rebuilding North American cities after disaster, including Irish and German immigrants following the 1835 fire in New York City (Page, 2005), and Latin American immigrants following civil unrest in the 1990s in Los Angeles (Fulton, 2005) . And efforts to foster participatory natural resources management are built on the assumption that engaging diverse stakeholders in decision-making creates a larger portfolio of more equitable and better-informed land management policies. Research addressing the differences in past rebuilding efforts, and in the ability to rebuild following future disasters, among cities varying in the degree to which they incorporate a diversity of stakeholder perspectives and cultures could help shed light on the question of the importance of human diversity in resilience in urban systems.

Some development and disaster-relief efforts specifically use community greening to nurture diversity, reconciliation, and recovery among ethnic groups that have been engaged in war and conflict. For example, Jews and Palestinians plant trees together in Israel and Palestine to promote the human contact they believe is

necessary for achieving peace (Serotta, no date). Through an American Friends Service Committee sponsored project in Bosnia-Herzegovina, people from different ethnic groups, including war veterans and widows, work side by side to grow food for themselves and their families (AFSC 2006).

Active participation and the capacity for self-organization

In community gardens and other community green spaces we have visited across North America, we hear the stories of individuals, often refugees, who have experienced serious trauma as a result of disaster, war, or civil strife, and who while perhaps unable to find or hold a job, are welcomed into a community garden where they are able to plant seeds, water, remove weeds, and otherwise work with the land to create food and beauty while regaining emotional stability. Similarly, in South Africa, poor township women engaged in gardening were able to find solace following domestic violence, gained greater control over their household food security and consumption, and experienced a greater sense of stability in coming to new, often transient communities (Slater 2001).

These examples of 'gardens as horticultural therapy' (Worden *et al.* 2004) demonstrate how community greening creates human capital, and we have seen in the section on diversity above how community greening fosters natural capital. Community greening also creates financial and physical capital, which, along with human and natural capital, leads to social capital. For example, in South Africa, community gardens often are designed as a means for unemployed community members to produce food and earn money, and North American gardens produce fresh food that is not otherwise available to families and elderly neighbors, and that is sometimes sold to create income for gardeners. Furthermore, through bringing in high-quality soil, constructing roof-top and other water collection systems, and building 'casitas' or sheds for social activities and cooking, gardeners contribute to the physical capital in cities. Community gardens also become a safe space where youth and adult neighbors come to socialize, participate in cultural events (e.g. concerts, harvest celebrations), relax, learn about gardening, exercise, and enjoy nature (Armstrong 2000, Hynes 1996, Patel 1991, Rees 1997, Saldivar-Tanaka and Krasny 2004, Schmelzkopf 1995). Unlike many other development efforts, which create a sense of dependency, through engaging community members in producing things of value, community greening can create independence and self reliance (Gutman 1987).

Because community gardens generally engage participants in multiple forms of communal activity and community action, they can serve as active training grounds for civic participation (Westphal 2003). For example, in many cities, community greeners organize to secure and defend a right to use land that more powerful

city government and business interests would like to develop commercially. They also actively plan and manage what is grown and the activities that are allowed to occur at these sites. Such planning often entails working with people from diverse backgrounds to solve problems, such as how to sanction gardeners who do not follow rules about pesticides and weeding, or how to work with the city to provide a water system or more effective police protection. Through these activities, community greeners gain multiple competencies, ranging from how to grow food and proper nutrition to how to work in multicultural groups to advocate with city government (Hynes 1996, Pinderhughes 2001). They also create social networks, the ability to take an active role in controlling violence and other aspects of community life, and a sense of self-efficacy and empowerment (Slater 2001, Westphal 2003).

In most cases, community greeners themselves initiate the myriad of activities that occur in community green spaces, which in turn lead to increased human, social, and other forms of capital and enhanced food security. Viewed as a socio-ecological system, community gardens nurture constructive, positive feedback loops and are self-organizing, i.e. new system-level patterns emerge from the interactions of people and plants within the system, and these changes in the larger community in turn create greater opportunities for individual community members.

Capacity for learning and adaptation

In social systems, institutions and networks that foster learning and store knowledge and experience, create flexibility in problem solving, and balance power among interest groups play an important role in adaptive capacity (Berkes *et al.* 2000, Roling and Wagemakers 1998, Scheffer *et al.* 2000). Given that individuals engaged in urban community greening work, organize, and learn together, and often gain a sense of empowerment and self-efficacy that leads to action and advocacy, community greening can be viewed as an institution or network that contributes to social learning related to community development and food security.
Two scenarios we have observed in New York City provide examples of the role of community gardening and related community-supported agriculture (CS A) and farmers' markets in social learning. Brook Park Community Garden in the Bronx is the focus of multiple activities in the neighborhood. It includes vegetable plots and memorial flower plantings to commemorate victims of 9/11. A wealth of youth education activities occur on the site and an asphalt area that has not yet been converted to green space serves as a site for dance lessons. Canoes along the border fence attest to the garden's participation in a larger advocacy campaign to restore the nearby East River. At specified times each week, community members reflecting the ethnic diversity of the surrounding neighborhood drop by to pick

up farm produce that is brought in from a rural CS A farm. The diversity of people and activities present in the garden provides a rich opportunity for sharing and learning. The garden itself can be viewed as an 'experiment' in managing for food security and community development in cities (BPCG 2006).

Compared to the richness of activities, structures, and land uses in Brook Park Community Garden, the farmers' market next to the fence surrounding the former site of the World Trade Centers, consisting of four long tables on a concrete walkway, may appear sterile at first glance. But viewed as a community initiative to bring back activity and life to the disaster site consisting of rubble, imposing signs extolling the recovery efforts, and grandiose plans for a new monument, the 'ground zero' farmers' market takes on new significance. The individuals who were engaged in the farmer's market prior to 9/11 watched the falling towers; today they see the market as the first step in creating the ecological, social, and cultural diversity needed to bring back their community .

The American Community Gardening Association (2006) provides a network for learning from these and the thousands of other community greening programs across North America, but often greening efforts in poor communities do not have the resources to participate in its activities. In Africa, Asia, and Latin America, we can find numerous examples of urban and community agriculture involving multiple NGO and community partners, and the Resource Centres on Urban Agricultural and Food Security provides a network for learning from these efforts (RUAF 2006, Smith and Bailkey 2006). A need exists for greater networking to further leverage the social learning potential of these and the many other community greening initiatives internationally.

What's missing? Civic ecology, adaptive co-management, and social learning

Thus far, we have argued that urban community greening, through creating human, social, and other forms of capital, plays an important role in fostering diverse, self-organizing, and adaptive communities, i.e. communities that one would expect to demonstrate resilience in the face of disaster. We also have provided examples from Bosnia-Herzegovina, the Middle East, and New York City where community greening was used as an intervention strategy specifically to promote resilience following conflict or disaster. Other examples of the use of greening as an intervention following disaster include using raised beds to grow traditional foods in mobile home parks following Hurricane Katrina, and community agriculture projects implemented at refugee camps to address environmental, economic, and psychological damage following the 2005 tsunami in Sri Lanka, and after fighting in Somalia. Interestingly, through participating in agricultural training programs

in camps, refugees may take home new and more varied agricultural techniques than they had before displacement, and thus foster adaptive learning more broadly (RUAF 2006).

What then remains to be done? We contend that the next step is for policy makers and researchers to work to formally integrate urban community greening into adaptive co-management strategies for building communities that are resilient prior to disaster, and able to recover after disaster . As part of this adaptive co-management strategy, we should seek to mobilize the cooperation and 'spontaneous leadership' that emerge through urban community greening to build networks that will participate in management and research decisions. Our recommendations build on the work of Weinstein and Tidball (2007), who suggest that policy makers, NGOs, and international agencies should seek to shape the environment by creating an enabling environment for development and growth, security, peace, stability, and societal healing through leveraging existing local skills, infrastructure and markets.

To guide these efforts, we propose an approach that builds on four factors identified as critical to natural resource management during periods of change and reorganization: (1) learning to live with change and uncertainty; (2) nurturing diversity for resilience; (3) combining different types of knowledge for learning; and (4) creating opportunity for self-organization towards social-ecological sustainability (Folke 2002). Our approach also expands on our ongoing work using community gardens as sites for community and youth sustainability education in cities, through which we have developed a program that integrates multi-cultural and intergenerational understanding, learning from community members and scientists, and civic action (Krasny *et al.* 2006). Combining these perspectives, we propose 'civic ecology' as an approach to natural resources management, education and empowerment, and community development. Civic ecology seeks to help people to organize, learn, and act in ways that increase their capacity to withstand, and where appropriate to grow from, change and uncertainty, through nurturing cultural and ecological diversity, through creating opportunities for civic participation or self-organization, and through fostering learning from different types of knowledge. In the context of this discussion, the ultimate goal of civic ecology is to build social-ecological resilience prior to and following disaster or conflict in cities . Note that education is an integral component of civic ecology, and that the type of learning that occurs through civic ecology education (Krasny and Tidball, 2006; Table 7.1, Figure 7.1) has many parallels to a definition of social learning that integrates negotiation, reflexivity, participation, and systems thinking as strategies to incorporate ecological complexity and the diverse experiences and knowledge of multiple stakeholders in addressing management issues (Dyball *et al*, 2007).

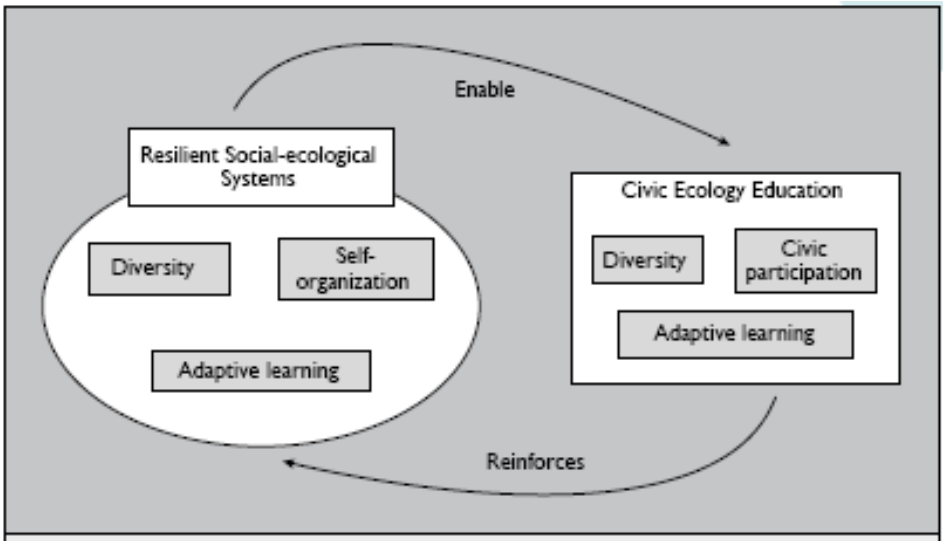

Figure 7.1. Civic Ecology Education draws from and helps people learn about the assets of social-ecological systems, including diversity, self-organization, and adaptive learning. The education efforts in turn foster diversity, participation, and adaptive learning, and thus reinforce existing resilience in social-ecological systems. See also Table 7.1.

Table 7.1. Resilience Attributes (Walker et al. 2001) and Civic Ecology Education.

Resilience attributes	Civic ecology
Diversity	Programs incorporate diverse forms of knowledge (western scientific and traditional) Youth and adult participants represent diverse cultures Programs take place at sites with biodiversity
Self-organization	Activities include local actions and advocacy to improve the community and environment
Adaptive learning	Within one program, educators and youth learn how to conduct better programs and how to improve the environment Across programs, educators share what they have learned

South Africa provides some good examples of multiple civic ecology approaches being incorporated into government and foreign donor policy, in particular through programs of the South African National Biodiversity Institute. For example, the Cape Flats Nature initiative employs urban township residents in leading biodiversity monitoring and management efforts, with the goal of preserving native plant communities and promoting ecologically- and socially-conscious tourism (Davis 2005). Another example is the Greening the Nation Programme, which seeks to create jobs, alleviate poverty, and build human capacity through engaging people in creating indigenous species nurseries and gardens at schools, street tree planting, greening of cemeteries, and other greening-related work (SANBI 2006). Similarly, through a joint Columbia University-UNESC O (2006) effort in Cape Town, a team of foreign and local specialists drawn from government and civil society are collaborating to create an urban biosphere reserve as a tool for socially inclusive and environmentally friendly forms of urban management. Although none of these projects is specifically described as building resilience, their integrated social equity and environmental objectives would indicate their potential in building a society able to bounce back from ongoing violence and conflict.

Conclusion

We have used a social-ecological systems framework to help understand the potential of urban community greening and other civic ecology approaches in building resilience and thus reducing risk in the face of disaster and conflict . Urban community greeners and other civic ecologists integrate place-based activities, such as planting community gardens or monitoring local biodiversity, with learning from multiple forms of knowledge including that of community members and outsiders, and with civic activism such as advocating for green spaces, for financial security, and for reduction of crime and violence. In so doing, they build human, social, natural, financial, and physical capital that becomes integrated into constructive, positive feedback loops. In this way, community greeners integrate diversity, self-organization, and learning to create the conditions that spawn resilience in the face of disaster and conflict.

Urban community greening, local biodiversity monitoring, and similar activities are tools that could become part of a larger civic ecology ‘tool kit’ for building urban resilience. Should relief and development NGOs, governments, international agencies, the scientific community, and community greeners work together to foster, implement, and assess the impact of civic ecology approaches as an adaptive co-management strategy before and after disaster, we will further our

understanding of how to build resilience in urban socio-ecological systems. Such action and research conducted as part of networks of diverse stakeholders both

embodies multiple definitions of social learning and can also draw from social learning theory. Ultimately, these research, adaptive co-management, and social learning efforts should be directed to helping policy makers understand the role of civic ecology tools in building resilience in cities both before and after a disaster or conflict.

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