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Lowering Vulnerability Using the Asset-Access-Time Method

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This paper develops the asset-access-time (AAT) model. The model has three variables: assets, access, and time. *Assets* are resources (economic, physical, human and institutional) available to households, communities and governments. *Access* is the ability to use the assets after a disaster event occurs. *Time* is a dynamic variable influencing when an asset is available to a user and influences its asset value. The combination of the three variables and how they are linked to classes of people, institutions, and places is discussed. Section 1 develops the model components in a linear and rational fashion and provides some examples. Section 2 describes how this model can be adapted to meet local requirements through an example in El Salvador. The model can be used to build a disaster resilience profile. This paper is part of a larger exploration of "asset-based mitigation," a process of vulnerability reduction through pre-disaster investments in asset protection. Policy implications for disaster management using this method are developed.

Keywords: assets, access, mitigation, vulnerability, disaster recovery, capacity building, participatory risk assessment, resiliency

1. Lowering Vulnerability Using the Asset-Access-Time Method

The world needs to build as much disaster resilience as it can. In 2008 nearly 85% of the 214,000,000 victims of the 354 different disasters worldwide were likely to live in low or moderate per capita income countries [1]. Resilience is a way in which people can resist, absorb and recover from a disaster [2, 3].[1] Kahan, et al., have suggested creating "resilience profiles" for key functions within critical systems, and other researchers such as Rubin [4] note that broad knowledge of what to do is still lacking today; and, thus, the ability to act remains deficient. This paper is an attempt to provide guidance on the "what-to-do" question by providing a "how-to-do" method of pre-event assessment and presents one soft resilience method: the asset-access-time (AAT) model. This method can also be considered part of broader international efforts at "participatory risk assessment" where people become educated to their immediate and community conditions and begin to take actions for improvement.

The AAT is a type of "resilience profile" as it requires an inventory of household or community assets and an analysis of their risk profiles when subject to a disaster event.[2] This paper has two parts. Part I develops the model components in a linear and rational fashion, providing some examples. Part II describes how this model can be adapted to meet local requirements. The example presented occurred in El Salvador. This paper is part of a larger exploration of "asset based mitigation" that sees pre-disaster investments in asset protection as a means of vulnerability reduction.

1.1. Conceptual Framework

The term vulnerability is used in this paper as a function of a household's or community's asset endowment and ability to resist and recover from a disaster (this is usually measured in physical, economic and social terms). For example, the number of buildings restored to use after an earthquake event, the number of days for businesses to resume operations, or the time period for reuniting families and friends after a disaster. The general conceptual model used for the study is an elaboration on work completed by other researchers on vulnerability, community assets, "claims" and access following disasters [5, 6].

Vulnerability exists prior to and after a disaster. In both instances the controlling variable is capacity, which is the ability to resist or cope with the disaster impacts in terms of damage (personal or physical) or the extent of possible recovery (total or partial). Capacity may be measured at the household or collective (community) levels. After the occurrence of a disaster, how much impact does the event have on the ability of a household or community to return to something resembling pre-disaster status? The answer to this question varies depending on the measures

1. Disaster resilience is broadly defined as the capacity of a community to (1) survive a major disaster, (2) retain essential structure and function, and (3) adapt to pre- and post-disaster challenges for improvement and transformation. Resilience can take two forms: soft and hard strategies and actions. Soft resilience consists of education risk assessment, risk avoidance practices, improving institutional relations, and building social capital. Hard resilience strategies consist of changes to or in the built environment that lower risk from a hazard event. Each form attempts to lower the impacts of and prompt rapid recovery from a disaster event.

2. AAT is also a tool for use in pre-disaster planning as it includes post event assessment and operations.

used to establish household recovery [7, 8]. Neither researchers nor practitioners have established a single measure of recovery. In general, if the return to pre-disaster status is quick and accomplished with minimal disruption, then vulnerability is low and resilience is high. If it takes a long time to recover or it is not possible to recover at all, then vulnerability is high and resilience is low. So the policy dimension is how to move communities from high to low vulnerability status (depending on the measurement scale) and what resources are required.[3]

The asset-access approach starts with a core notion that each household, and collectively a local community or a city (municipality), has a basic bundle of assets (a collection of resources that can be inventoried and defined in operational terms). The assets can be grouped into categories such as:

- Physical/material objects (tractors, houses, infrastructure systems, etc.)
- Financial instruments (cash money, savings, insurance, credit, etc.)
- Human capital (leadership skills, trade skills and professional skills, etc.)
- Institutional relations and capital (contracts or agreements with local governments for services, such as fire, police, water and power and membership in non-governmental groups and faith based groups).[4]

This asset bundle will vary from place to place and time-to-time based on differences in modes of production, culture and political structure. For example, in the river valleys of Honduras, self-managed village early flood warning systems are part of the human capital asset base and require only technical assistance updates from regional or national governments.

Asset groupings are dynamic rather than static. The assets within each grouping are subject to change over the short run, be it the quality of the local transport system or the amount of cash or equipment reserves kept by the local city government. Some parts of the asset bundle may be located apart from the household or community (such as insurance policies and savings accounts).

A key aspect of the model is that assets themselves are subject to vulnerability and are not fixed resources. Assets need to be continuously examined as to their utility to the user after a specific type of disaster. Using this approach, the household, community or local government can assess each asset category in terms of amount and ease of access to it after a specified type of event (for example, a large flood that lasts for days), and the time needed to utilize the asset (e.g., when would it be available for use). This would establish the basis for a risk analysis for any asset, such as the loss of cash-money kept on site as happened to the Grameen Bank in the 1998 Bangladesh floods. The core nature of an asset is that it is something that is valued (such as cash money, trucks, or trained personnel) because it has some use (utility). If it cannot be used, the resource is less valued or its loss lessens the value of other resources. This is illustrated by two transport sector examples.

In the 1994 Northridge earthquake in Los Angeles, California, USA, a section of the elevated (above grade) east-west Interstate 10 freeway (10 total lanes) between the city of Santa Monica on the west and downtown Los Angeles to the east, collapsed to the ground. This resulted in enormous traffic congestion and economic loss to business and commerce due to disruption of the Interstate 10 as a transportation asset to the larger metropolitan area. People and businesses did not have access to the asset and needed it as they were losing money, time, and jobs from the disruption to business. This need resulted in a contract for repair of the freeway section with a private construction company that was tied to extensive incentives for early completion of the work. Working 24 hours each day, the private construction company replaced the freeway span in just 66 days and earned a $13,800,000 bonus that was justified by the asset being accessible to the people of Los Angeles [9].

The second example occurred in December 1999 in the Venezuelan state of Vargas that borders the Caribbean Sea. More than 911 millimeters of rain fell in three days. This caused severe flooding and mudslides and blocked all the main roads into the state. All public facilities, including water, electricity, phone lines, and land transportation (roads and bridges), disappeared under water, mud, and debris. There were no supplies of food and water for months, and most of the population had to be evacuated. Widespread looting and sacking occurred, forcing the military to implement martial law for more than one year. The transportation system had no asset value to the people of Vargas due to fact that all the major roads leading into the state could not be used. Seven years later, at least 10 percent of the roads in Vargas remain blocked.

These examples illustrate the essential elements of the AAT approach. Assets as resources are valuable if they can be used (accessed) in a time period useful to the affected populace. Assets have no, or lesser, value if they cannot be used when needed. In making vulnerability assessments, we have to understand the types of assets a community possesses and has access to before and after a disaster event and when (the time factor) they can utilize the assets.

The AAT model is a dynamic method that can lead, for example, to establishing an index (or scale) of community resiliency by ranking the assets and giving them weights in the index. This model is being put forward as an alternative to the strategic planning model, which utilizes the strengths, weaknesses, opportunities, and threats assessment method (SWOT). The difference is that the AAT is simpler to use and is based on the households' or groups' understanding of their circumstances. The model can be

3. Some measurements scales such as the Social Vulnerability Index (SoVI) do not account for capacity per se due to their reliance on population profile characteristics such as age, economic status, etc. Some SoVI variables, however, could be said to be proxies for capacity (for example, age).
4. These categories could also be named social capital, finance capital and political capital.

Table 1. General set of asset classes and subcategories.

Asset Class	Financial	Physical	Social
Sub Categories	Bank accounts	Equipment	Personnel
	Insurance	Supplies	Family
	Cash on hand		Skill sets/ability to do
	Stocks of goods		Leadership
	Ownership of property		Political

used to measure "capacity," the ability to utilize an asset when it is available.[5]

Assets, the first element, represent the stock of wealth that can be used to accomplish a discrete task. There are tangible assets such as land, capital, and savings. There are also intangible assets such as social capital; for example, health and education provide the internal empowerment to accomplish concrete tasks. The relative value of the assets also may change from country to country, but all communities do possess assets that can be ordered, grouped, and identified.

Claims, as an asset subset, can be defined as the direct legal rights to resources (such as paid insurance policies) or a perceived right to an external resource such as government assistance to help rebuild the community or town (subject to various conditions). Claims represent potential assets that can be utilized. If claims become assets when the community needs them most, then vulnerability decreases in the recovery process. Claims by themselves, however, may not be of value if they are not processed when most needed. This leads to the concept of access.

Access, the second element, is the ability to obtain the use of assets in the recovery process and hopefully to lower household and community post-event vulnerability either in the short or long run. The ability to use an asset has inherent value, as it is a statement of control. The loss, or gain, of assets presents a rebalancing of local and sometimes personal control. In general, creating control over assets at the most local of levels (household) promotes the greatest degree of social equity. Generally, claims are processed through formal state supported networks, such as insurance programs or national systems of recovery assistance (for example, FEMA in the USA). This creates a need to establish ways in which community networks communicate effectively with these other networks in order for them to be of any benefit. Based on his studies of the Mexico City and Los Angeles earthquakes, Inam [10] points to the need for well-established routines to facilitate claim processing. These routines represent pre-event institutional arrangements that are well known and locally accepted, such as the mutual aid agreements used in California (USA) cities to secure resources from other cities during a hazard event. Claims can also be developed from accepted ideology such as "human rights," where the constraints of legal frameworks are second to humanitarian beliefs.

The third element in the model is time. Time is essential. It is when a household or community has access to an asset that really matters. Time possesses implicit value. If someone needs their home rebuilt and it takes three years to do so, then the asset value (in socio-cultural terms) is far less than market value (in commodity exchange terms). In the Los Angeles Interstate 10 example, the freeway was considered part of the city's critical infrastructure and each day it could not be used inflicted additional economic and environmental damage on the city. Research on recovery generally calls for a two-year or less time period for home reconstruction [11]. Inam suggests that rapid action is one of the five most important institutional outcomes for successful recovery [10]. Time is always important as the type of assets provided for successful recovery vary in their time component. For example, the asset of economic stability (i.e., jobs) requires a different timeframe than does the asset of basic shelter. But the integration of time with assets has received little attention in the research literature in either conceptual thinking or applied terms [20].

The access-asset-time model has particular relevance for poorer communities doubly challenged by the threats of natural hazards and the daily struggle with poverty. This dual vulnerability burden (surviving on a daily basis and being at high risk to hazard events) is well known in the international hazard reduction literature [6, 12]. Assets of poor communities are generally concentrated where they live as they have less savings and no insurance per se. When a disaster hits an area of poor people, they are more affected than those who can call in resources from outside the area. The 2010 7.0 Haiti earthquake is an example of extended physical damage to the poor as well as the decreasing ability of the government to act as a sovereign state. The Haitian people's suffering was heightened by delays in international aid due to limited access to the country's one airport and the damage to the main port. Access became the issue.

It makes practical sense that the more assets a family or community has, the easier it is to recover from a disaster event or mitigate the impact of a future event. Socioeconomic status does matter. Adding the time variable (in the short, medium and long term) makes the asset approach dynamic and more robust as an analytic tool. A generalized scheme for the asset classes is shown in **Table 1**.

5. The capacity approach was used to assess progress of recovery in the town of Ocotal, Nicaragua, in 2001, after it experienced severe flooding that damaged more than 20% of the city's houses.

Table 2. Asset classes/subcategories and access probability.

Asset Class	Access Probability
FINANCIAL	
Sub Category	
Insurance	Low for immediate use
Cash on Hand	High for immediate use
Bank Accounts	Moderate for immediate use (depending on bank)
Employment Salary	Variable (depending if business is operating immediately after a disaster event)

1.2. How This Model is to be Used in Practice

A household, community group, or local government would develop asset classes they find useful and understandable and then subsets within these categories to detail the asset categories. A general set of asset classes is shown in **Table 1**.

Each class and subcategory can have metrics to measure or assess the asset size, amount or distribution (in spatial or group terms). For example, in measuring the subcategory of Equipment in **Table 1**, the number of trucks, tractors, or bulldozers, and their capacities could be listed. Another level of analysis might include the location of this equipment and its condition. Following this approach, a table of transport mobility assets is built and available to the user (for example, ready-to-use, in need of maintenance, inoperable). A household's asset table will look different from that of a community group (such as a faith-based organization), where the social asset class would include the membership and various skills related to leadership roles. There can be a series of asset tables developed that establish pre-event status. To the basic asset table, a second variable is added: access.

1.3. Access

Access is what is required to get the use of an asset class and its subcategories. For example, if a household has an insurance policy, the terms of the policy must be met (for wind, water, seismic damage, and payment of deductibles) before access to the insurance funds are granted. Poor households are not likely to have an asset such as insurance, and assistance would need to come from the government or the non-governmental, faith-based sectors, which is the case for many flood and tsunami victims in the US, Asia and Central America. Getting to use an asset, in some cases, may require that special skills need to be available. For example, to use a bulldozer requires a skilled operator. However, a hazard event may prevent a skilled operator from being available to use the asset. In the 2008 Southern California (USA) fires, many fire-fighting aircraft could not be used because of winds blowing through canyons. The aircraft asset simply could not be accessed. The 2010 Magnitude 8.8 earthquake in Chile damaged many major bridges and roads leaving trucks filled with supplies unable to get to victim locations during the emergency stage. This brings up the need to make some probability estimates of having an asset available for use.[6] **Table 2** is an example of how the assess probability could be addressed by applying a simple low, medium and high probability score. The importance of the access factor is highlighted in the following examples.

During the early stages of the emerging Katrina disaster in New Orleans, the city government had a fleet of school buses available to use to evacuate people from the city. These were physical assets. However, as the storm came through the city and the levees broke, the parking area for these buses flooded and then there was no access to them. Thus, the asset becomes useless to the local government and the community. The probability of accessing the buses would have been high if they had been moved to higher ground and there were enough drivers available to operate them. This was not the case.

When Hurricane Mitch struck the country of Honduras in 1999, all of the bridges within the country were damaged or destroyed, making the movement of emergency relief supplies impossible, except by helicopter and air support. All the trucks and equipment needed to stop damage and address emergency conditions were useless in the short term.[7] If a household, community group or government cannot access the assets when needed, the relief and recovery effort suffers and vulnerability increases among disadvantaged groups.

1.4. Time

The third, and most innovative, element in the model is time. Time is important in understanding the notion of how assets become useful and to whom. In practical terms, any asset that can be used when needed is valuable. The value of any asset that cannot be used when needed must be discounted. Discounting can be readily observed in the 2010 Haiti earthquake where the Port au Prince city power generating system could not be placed back in service due to poorly secured and damaged generator platforms.[8] Of course for those with the least assets,

6. The Fritz Institute sponsored research in San Francisco to determine where the most vulnerable people in the city resided and then programmed bundles of relief supplies in locations near the major clusters of vulnerable people. This is a direct attempt to improve access when needed.
7. For the first three days after Hurricane Mitch, the majority of local governments operated independently of the central government. This experience built strong leadership experience at the local level and was a useful skill later on in the recovery process.
8. Statement by Eduardo Fierro, structural engineer, member of the EERI field assessment team to Haiti in a public lecture, University of California, Berkeley, February 1, 2010.

Table 3. Asset+Access+Time.

Asset Class	Access Probability	Time and Probability
FINANCIAL		
Sub Category		
Insurance Claim	Low for immediate use	Medium probability and medium to long-term access
Cash on Hand	High for immediate use	High probability and immediate access
Bank Accounts	Moderate for immediate use (depending on bank)	Short term
Employment Salary	Variable (depending if the business is operating immediately after a disaster event)	Short to medium term

value declines quickly when not readily available. In disaster recovery theory, time takes on different meanings and dimensions. The National Academies Report [13] on the human dimensions of disaster notes that "social time" is nonlinear and multidirectional and is experienced differently by individuals and entities of various types. In a disaster event, many decisions must be made in a short period of time and thus the capacity of the political and governance system to make decisions in a timely manner does influence the outcomes. Inam's analysis of the 1985 Mexico City earthquake points to a strong in-place capacity to have decisions made quickly throughout the institutional environment. This led to positive outcomes for people impacted by the event.

Comerio [11], writing on the housing component of recovery, recommends that permanent housing be provided no later than two years after an event. Yet Renaissance Village, the large trailer park that housed many of the 2005 New Orleans Katrina evacuees, operated for four years before it closed in May of 2008. Most of the Renaissance Village families still struggle to establish a life for themselves, even though the government provided shelter for them. In the 1998 mountain floods in the Mexican state of Veracruz, government aid to villagers took so long to arrive that able-bodied men left the agricultural areas for jobs in the north, leaving behind families who could no longer farm the land by themselves. While the families in Veracruz had a "claim" (legal and moral) on the federal and state governments for assistance, the timing of the claim became the critical factor in the recovery equation, not the size or amount of the asset itself.

Operationalizing the time factor can be a complex task. For simplicity in this paper, the time factor can be thought of in simple descriptive terms such as short, mid and longterm. The user (household, local government, etc.) is left to define an appropriate period (days, weeks, months, etc.) After disasters, time is not simply linear. It takes on other dimensions based on perception and need (such as being rescued within 72 hours). The need to view recovery as a series of periods separated by transitions (phases of adjustments) has been noted by researchers [14]. The adjustment phases occur as more resources are made available. City form giving decisions (spatially, which areas for rebuilding for example) occur as, or after, the restoration phase is coming to a close. A time factor is added to the asset and access factors and shown in **Table 3**.

Each subcategory can be assigned a probability of occurrence related to a disaster event. For cash on hand (in one's possession), the probability is high and access to it is immediate. For subcategories such as insurance (private or public), the probability varies according to the type of policy and the process for establishing the claims. In the Katrina event, payment for housing repairs to event victims went through a complex establishment of ownership procedures and building permit disputes. It took time that was not a function of need, but of structural failure of the insurance and regulatory systems. Johnson's [15] analysis of the experiences of three USA cities (Los Angeles, Grand Forks and New Orleans) with recovery funds demonstrates the impact of time and claims. While substantial funds were made available within 3 to 6 months in Los Angeles and Grand Forks, a substantial lag is evident in the case of New Orleans.

2. Application and Adaptation

The AAT model has moved from the conceptual to the applied stage. There has been one attempt to operationalize it, and this experience demonstrates the model's adaptability. Mario Lungo [14], the Director of the Office of Metropolitan Development and Planning, City of San Salvador, El Salvador, used the AAT model in 2002 as a training tool for local neighborhood councils. This was part of an overall program to strengthen local risk reduction capacity within the disaster-prone (earthquake, landslide, flooding) San Salvador metropolitan area [16, 17]. The existing training program had been using the strategic planning method by making lists of local strengths, weaknesses, opportunities, and threats (SWOT) at the neighborhood and community levels. SWOT had not been effective as its business orientation proved problematic for local people to understand and take actions upon. SWOT's operational difficulty lies in the lack of operational guidance on how to use the lists generated and convert them into actions. It also assumes that the local council had resources to invest to take advantage of the opportunities that existed.

Table 4. Asset-access models – sample community probability (San Salvador example).

Asset Class	Period	Period	Period
	Short-term probability	*Medium-term probability*	*Long-term probability*
Investments		High	
Demands (claims)	Low	Low	High
Reserves: materials or capacities to act in social and human terms	Low	Moderate	
Social Capital includes training, collective skills, and linkages	High	High	

2.1. Adaptation

Lungo adapted the AAT model to use a system of organizing a set of valued resources. His approach was guided by the belief that the probability of access to assets is best understood within a socially derived historical context, where rationality may be attenuated to other interests. To him, culture, political economy, and traditional control did matter. He also believed that "capacity" was a key variable that transformed analysis into actions (initiatives for social betterment). His views would have assisted in the recovery of New Orleans after Katrina had they been properly understood and acted upon. The adapted model used in San Salvador began with three asset classes: investments (human, individual, physical and collective), demands (of different types, such as regular supplies of potable water) and reserves (material and monetary) (see **Table 4**). Investments are viewed as resources allocated to subcategories of the asset class over time. Each subcategory had a different resource distribution strategy that reflected the dominant political economic reality.

The Lungo model version was simplified again into two components: capacity (access) and assets. These two components can include issues of much complexity. Within capacities can be found human capital and social capital. The first can be associated with individual capacity or that of the family unit, while the second can be associated with collective capacity that is derived by agreement on an ordered system of behavior. The complexity and analytical potential of concepts such as social capital has been widely discussed and developed through practice [18].[9] How major actors create assets (public institutions, NGO's, private business) becomes part of the analysis in the Lungo model as does scale (moving from the neighborhood to the metropolitan levels).

Neighborhood teams representing different areas of the San Salvador metropolitan area were able to use the model to conduct local assessments by going block to block and making inventories to identify asset types that needed access strengthening and asset types that were acceptable to them in terms of the hazard types faced by the community (which include flood, landslide and seismic). For areas that needed strengthening, they devised strategies to address the need from the local and municipal levels mostly in terms of capacity (access). Lungo called these needs "challenges," which were constructed by developing alternative futures for the communities based on hazard risk and social reality and testing them against an evolving historical context [19]. Lungo translated the linear AAT model into one that made sense to the people with which he was working. In this respect, his approach could result in partial solutions within a specific context. In José Cecilio del Valle, a very physically and economically vulnerable neighborhood, choices were made to remain in that location and to upgrade the construction standards. Through collective labor practices and technical assistance, youth brigades learned to build safer houses that were allocated to families through a system of risk assessment.

2.2. Summary Discussion

The AAT model is an attempt to place the "capacity" concept closer to the forefront of the disaster management debate. The notion of capacity needs to be broadened to include all sectors of society which have interests in protecting themselves and members of their immediate and extended households. There is a need to understand how capacity is constructed by public, private, and civil society, and how it might be productively shared. Recent efforts in San Francisco, California, by the Fritz Institute to provide training to faith-based groups in hazard preparedness illustrate the value of social capital approaches, or soft resilience strategies. Households living in the newly constructed apartment towers in Kobe, Japan, are required to make lists of building residents so they know whom they live near in case of a disaster event and can help these people if the need arises. In Caracas, Venezuela, the fire department provides disaster preparedness training to community groups in the illegal settlement areas because the municipal government does not have the resources to help these neighborhoods in a time of disaster. All of this is a form of expanding the definition of who is capable of being a first responder and defining their role.

The AAT model's contribution lies in its internal logic and its ability to adapt to a variety of recovery challenges. It can be used to identify where the gaps in preparedness planning are, to examine what is needed at different spatial levels (block, neighborhood. community, etc.), or to support the access to assets when they are needed most. Further research on this topic would include more case studies examining the differences in assets and access in communities experiencing similar types of events, such

9. The 2,000,000 Japanese youth who came to help with the Kobe recovery created a new concept of how society uses human assets and also influenced the way the government approached recovery in the intermediate term.

as flooding or cyclones. For example, the small town of Greenburg, Kansas, USA, has become a model for rapid recovery based on green development and sustainability. Its long-term recovery plan is an actual set of projects that inform the allotment of funds and local resources, such as land allocation and building codes.

Asset vulnerability is a research area that requires more investigation. In the US, the combination of public funds (state and federal) and private insurance has made most communities whole after disasters, at least in financial terms. This has not come without some social costs and changes in institutional responses. Poor people, whose few assets are spatially concentrated, are functionally more vulnerable than other social or business classes in society. Some thinking on what type of social policy best serves their needs is required. Some application of portfolio risk management to local assets might yield some interesting findings related to which strategies to pursue to lessen loss or to increase access in a reasonable period of time. Questions such as "how do your asset and access strategies relate to the risk they are likely to face" come to mind. Very little research has been undertaken that examines the question of scale. Are there differences between what happens at the neighborhood level versus the city level versus the metropolitan level? Understanding metropolitan scale assets and capacities are essential because they are capable of supporting lower levels on the scale. The interdependencies between assets and access in terms of the current mechanisms need to be explored and analyzed to learn how to enhance capacity through improved linkages and protection mechanisms. Finding ways to improve access to whatever asset base exists is a central research need.

As was stated in the beginning of this paper, all of this opens up research into what can be called "asset-based mitigation" that examines how different asset classes can be strengthened in order to lessen impact and speed recovery. There is a need to include social and economic resistance along with physical resistance to the analytic mix. Further research in these areas would accomplish most objectives of any disaster resiliency scheme.

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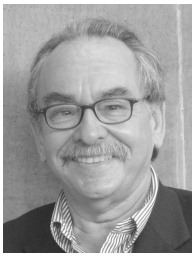

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Brief Career:
Joined Cal Poly in 1998 as Head of the Department of City and Regional Planning. From 1977-1997 was Professor of Planning at the University of New Mexico. From 1971-1976 taught at the University of California, San Diego. Fulbright Fellow (1994), Japanese Society for the Promotion of Science Fellow, Kyoto University (2008).
Consultant on the Preparation of the State of California Multi-Hazard Mitigation Plan and the Caracas, Venezuela District Preparedness and Mitigation Plan. Has taught internationally in Brazil, Mexico, and China. Team member preparing an Environmental Management and Risk Reduction Plan for the Mayan Ruins in Copan, Honduras.

Selected Publications:
• Contemporary Urbanism in Brazil: Beyond Brasilia (2009), University Press of Florida; "Recovery from Disasters: Challenges for Low Income Communities in the Americas," 2005. In S. Mandelbaum and Aubrecht, L. (Eds.), The Network Society: Challenges for Planning. London: Routledge. 2005. The Elements of Master Planned Communities. Real Estate Review. (co-authored with Jerry Sturmer). 2009, Urban Risk Reduction's Role in Sustainable Development. 2006. Natural Hazards Observer. Vol.XXX. No.4. March.

Academic Societies & Scientific Organizations:
• The American Institute of Certified Planners
• American Planning Association
• JICA Expert on Hazards Planning