INTRODUCTION

Change Agent is one who intervent to faccitate Change. Though role of Urban planner has been Changing from administrator to facilitator, manager and mediator , every role require significant empowerment to understand and steer the Change as per the set priorities and interventions for a cycle breaking endeavor. Cycle braking endeavor may be a prescriptive or collaborative from to enhance institutional and community resilience. Many corporate are adopting this with a Change Management core group comprised of senior associates to identify opportunity and endeavor of Change. This Paper is based on Change process management in urban system and continuous, collaborative learning for adaptation within a perspective framework of Disaster risk management.

MAINSTREAMING DRRM PLANNING EDUCATION

World is becoming increasing complex and interconnected, magnifying the losses due to disasters. Mileti (1999) states that disaster losses are the result of interaction among multi agents of the system and subsystem which may be the Earth’s Physical system, Human system and the Constructed system. Cities are in continuous process of evolution through process of self-organization and emergence and, which require system approach to understand and deal with the uncertainty in an trans –disciplinary environment. Present way of planning and decision making particularly for dealing with urban system in any spurting catastrophic or natural origin, suffers from inherent lacuna for insufficient analytical, normative and anticipatory knowledge together with domination of action oriented knowledge.

Planning education started as interdisciplinry field and now requirestrans– disciplinary tools to be at par with the understanding of the advancement in related aspects which are life and blood of the Urban system. Disasters (Natural or anthropogenic origin) are the Physical manifestation of unsustainable behavior or action from any of the interconnected component system. It build up a common consensus that something is inherently wrong in our ‘system, though not necessarily in
planning of human settlements, but failure in understanding the inter – connectedness and its cumulative impact amplified further over the years by other weak elements in the interconnection. Self-Organization is the part to achieve resiliency. System Approach through mathematical modeling, simulation optimization and synthesis of interdependent urban phenomenon, capture the major” locks in “and constraints in adaptability and self-emergence. In recent years the concept of ‘resilience’- the capacity of human and physical systems to respond to extreme events- has become increasingly prominent in disaster research. As it is understood that built environment cannot be disaster proof, focus is to enhance capacity to recover after event of the urban system. These can be measured in many ways.

**Physical Impact:** Number of victims in proportion to total population to be high , but this approach has limited applicability as particular for megacities, impacted population could be small in proportion or they may be many small event with large cumulative impact but overlooked by Municipal or National authorities and international actor.

**Networking Impact:**Disasters which are significantly causing disruption and dislocation within the urban system including economic function of the city , its political regime and infrastructural integrity.

**Economic Impact:**Fluctuation in Urban income, local rates of inflation and unemployment, changes in contribution of urban activities to National Gross Domestic Product.

**Political and Social Impact:**Changes on crime rate, Period of military control etc.

**Infrastructural Integrity:**Impact on infrastructural integrity is indicated by number of dwellings, industrial premises, hospitals, schools, sewers, roads and electricity, cables destroyed / damaged by the event.

**WHOLE SYSTEM APPROACH**

From the classical viewpoint a system is a combination of two or more elements, when every element of the whole influences a behavior of other elements and the behavior of each element influences the behavior of the whole (Bertalanffy, 1969; Forrester, 1975). Traditional analysis focuses on separating the individual pieces of what is being studied; in face the word “analysis ‘actually come from the root meaning “ to break into constituent parts “ Systems thinking in contrast , focuses on how the thing being studied interacts with the other constituents of the system – a set of elements that interact to produce behavior – of which it is a part.

Parallel versus whole system approach
Problem solving versus preferred future approach
Understanding past and present as a basis of exploring future
Overcoming resistance to change
Open system planning
Link all ecosystems; the city is a system too, having inputs of energy and materials. (Pater Newman, Elsevier 1999) The main environmental problems (and economic costs) are related to the growth of these inputs and managing the increased outputs. By looking at the city as a whole and by analysing the pathways along which energy and materials including pollutants move, it is possible to begin to conceive of management systems and technologies which allow for the reintegration of natural processes, increasing the efficiency of resource use, the recycling of wastes as valuable materials and the conservation of (even production of) energy Benson and Twigg (2007) have published a very useful set of guidance notes for development of organization that relate to the mainstreaming of disaster risk reduction. It provide short, practical brief, supplementing more general guidelines on programming, appraisal and evaluation tools.

A resilient built environment should be designed, located built, operated and maintained in a way that maximises the ability of built assets, associated support systems (physical and institution) and the people that reside or work within the built assets, to withstand, recover from and mitigate for, the impacts of extreme natural and human – induced hazards (Bosher, 2008, p)

The challenge of disaster risk reduction is largely a matter of how to apply existing knowledge (about investment, adaptation and reducing the ‘implementation shortfall’) rather than generating new knowledge per se the research challenge, therefore is grounded in the process of technology transfer and diffusion. (Lee Bosher and Andrew Dainty)

A socio technology transfer and is required to solve shared risk problem. Burby (2001) argued need of collaborative governance and characterized hazard mitigation as “policy without public “based on studies of policies having little public concern for natural hazards.

The key point is that resilience is a measure of stability in the face of shocks to the system. It assumes stochastic environment: that the system is subject to a regime of shocks. Indeed, this is the starting point for the most recent development is the theory of resilience in joint economy systems.

Concept of sustainability – Levin et al. (1998) argue that resilience offers helpful way of thinking about the evolution of social systems partly because it provides means of analysing, measuring and implementing the sustainability of such systems. This is largely because resilience switches attention away from long – run equilibrium, and towards the system’s capacity to respond to short- run shocks and stresses in a constructive and creative way.

Marks argued (DOI 2004) Resilience as an alternative to bipolarity, where systemic thinking introduces circularity as a basic concept. This involves seeing project and organizations from a viewpoint which is quite different from the traditional one. “Circularity “ means that the output of a process is re – used as an input to that process (directly or indirectly). This creates a causal linkage, for which we then have two options: Either, more of one factor / variable also increases the other (for example: increased product quality increases staff self – confidence). Or, more of one factor / variable leads to a decrease in the other (for example: increased qualification of machine operator
resilience Engineering acknowledges disasters as disruption, which are the initiating events leading to catastrophes based on to any intrinsic or external error. As has already been remarked, the concept of resilience has been defined in two rather different ways. One refers to the properties of the system near some stable equilibrium (i.e. in the neighborhood of a stable focus or node). This definition, takes the resolution, takes the resilience of a system to be a measure of the speed of its return to equilibrium. The second definition refers to the perturbation that can be absorbed before the systems are displaced from one state to another. This definition, due to holling (1973, 1986, 1992), does not depend from on whether a system is at or near some equilibrium. It assumes that ecological systems are characterized by multiple, locally stable equilibrium, and the measure of a system’s resilience in any one local stability domain is the extent of the shocks it can absorb before being displaced into some other local stability domain. Perturbation may induce the system to change from one attractor (stability domain) to another, or not. If not, the system may be said to be resilient with respect to that perturbation. By the Holling definition, the resilience of an ecological system is a measure of its self – organization without undergoing the ‘catastrophic’ and possibly irreversible change involved in crossing the threshold between stability domains.

Resilience has its roots in the study of natural – ecological – systems. According to Holling (1973), systems that maintain their integrity and remain stable when subject to disturbance is the measure of a system’s resilience; that is, the system’s ability to make a smooth transition to a new stable state in response to the disturbance caused by the earthquake.

Cities complex systems consisting of numerous elements with interrelated functions. The city system consists of people forming a community, society where people live and work together, an infrastructure that is composed of building, roads, bridges, and network for water, energy and data. Such a system is vulnerable to disturbance from natural hazards and terror attacks. The resilience of a city to disasters, natural or man –made depends on the architectural structures, population concentrations, and interconnected infrastructure systems, these attributes also put then at high risk to floods, earthquake, hurricanes, and terrorist attacks (Goods chalk 2003). In order to create disaster resilient cities, Gottschalk derive characteristic or principles of resilient systems that need to be taken into account for design and management of cities.
Box 1: Widavsky’s Principles of Resilient Systems

- **The Homeostasis Principle**: Systems are maintained by feedbacks between component parts which signal changes and can enable learning. Resilience is enhanced when feedbacks are transmitted effectively.

- **The Omnivory Principal**: External shocks are mitigated by diversifying resources requirements and their means of delivery. Failures to source or distribute a resource can then be compensated for by alternatives.

- **The High Flatness Principal**: The faster the movement of resources though a system, the more resources will be available at any given time to help cope with perturbation.

- **The Flatness Principle**: Overly hierarchical systems are less flexible and hence less able to cope with surprise and adjust behavior. Top heavy systems will be less resilient.

- **The Buffering Principle**: A systems which has a capacity in excess of its needs can draw on this capacity in time of need, and so is more resilient.

- **The Redundancy Principle**: A degree of overlapping function in a system permits the system to change by allowing vital functions to continue while formerly redundant elements take on new functions.

Source: Peeling

**Redundancy**: systems designed with multiple nodes to ensure that failure of one component does not cause the entire systems to fail

**Diversity**: multiple components or nodes versus a central node, to protect against a site specific threat

**Efficiency**: positive ratio of energy supplied to energy delivered by a dynamic system

**Autonomy**: capability to operate independent of outside control

**Strength**: power to resist a hazard force or attack

**Interdependence**: integrated system components to support each other

**Adaptability**: capacity to learn from experience and the flexibility to change

**Collaboration**: multiple opportunities and incentives for broad stakeholder participation
ADAPTIVEDISASTER RISK REDUCTION AND MABALEMENT

The purpose of disaster risk management is to change the future, not to explain the past- Dan Borge
As described in EMA’s manual (2002), Planning for Safer Communities, land use planning for natural hazards “ LAND useplanning can play key part in reducing current and future community risk. Responsible management of the environment and its resources, and flexible and responsive development can prevent or mitigate negative impacts. Land use planning requires the balancing of many, often competing, interests: private sector needs, public policy requirements, equity, long term economic development, environmental conservation, amenity and community safety and wellbeing.” It is based to develop a more responsive approach to the management as Linkages, cause and effects of disasters are complex and continue to change. Therefore, disaster management must be adaptive. An adaptive management cycle has five critical steps:
- Identify what we know
- Identify what’s changing
- Take action and preventive initiatives
- Evaluate and set priorities.
- Adapt and modify

Useful learning must result in change and adaptation. Making change through ‘learning’ must become routine Agencies and communities should learn together to respond fast and with better outcome. Uncertainty and change are the major factors that drive the need for adaptation. Managers can tackle uncertainty head – on by being ‘actively ‘adaptive and deliberately taking action that explore by designing the reality.

ADAPTIVE MANAGEMENT AND LEARNING

Ideally, management is adaptive, not or disconnected. Effective managers continually assess and learn from their changing operating environment by environment. They then match or adapt their responses to this reality.
Uncertainty and change are the major factors that drive the need for adaption. Management can tackle uncertainty head – on by being ‘actively adaptive and deliberately taking action that explore by designing the effects of alternative thinking and action.
Establishing and promoting a culture of adaptive management requires the investment and support of programs in modeling, prediction – making, monitoring, evaluation, knowledge management and learning. Victoria’s fire agencies have a good basis built though a culture of debriefing at operational and community levels.
This culture will be strengthened and extended through specialist units, broader staff commitment and inclusion of the community.
Cities and Regions are self-Organizing, complex open system: Much of the Urban Development research has accepted the system science as an indispensable methodological tool for the multi agent based modeling, simulation and gaming, and where the knowledge and streaming of evolving data is yet a challenge. Model of Complexity by Allen (1997) and Self Organization and the city by Portugail J.
are the influential monograph. Kou XueHuiFeng (2004) gave three dimensions of Urban System Engineering (USE) which are governed by three knowledge foundations and their outcome is given in Table 1. First, it is necessary to identify the key subsystems involve; that is, those subsystems whose relationships and interactions define and give special character to the overall system.

Table 1

<table>
<thead>
<tr>
<th>S.No</th>
<th>Three Dimensions</th>
<th>Governing Knowledge</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Urban System</td>
<td>Complexity of self-Organization</td>
<td>Emergence of pattern</td>
</tr>
<tr>
<td>2.</td>
<td>Urban Logic</td>
<td>Management and Control</td>
<td>Positive and Negative feedback</td>
</tr>
<tr>
<td>3.</td>
<td>Urban Institutions</td>
<td>Institutional Analysis</td>
<td>Organizational Learning and Adaptability</td>
</tr>
</tbody>
</table>

Adapted from dong and feng

Fig.1: Communication and collaborated Learning in Resilience Development
The basic System elements – subsystems – are shown in Fig. 1. The linkages in the model, represented by the arrows, are intended to provide a general representation of the interactions involved in achieving the tradeoffs necessary when working toward a balanced policy outcome that is acceptable and can be implemented.

Effective decision making and learning in a world of growing dynamic complexity requires leaders to become systems thinkers – to develop tools to understand the structures of complex systems. The paper aims to clarify the relationship between systems thinking and organization performance.

**COMPLEXITY SCIENCE AND CHAOS THEORY**

Nobel Laureatellya Prigogine in his much accolade research proclaimed that – A self Organizing system produces “ Order out of Chaos “ (Prigogine and Stengers 1984). Complexity science is a scientific Endeavour to explain and understand large systems. It refers to large system as complex adaptive systems (CAS) Which have multiple interconnected elements and have the capacity to change and learn from experience. There is a shift in Whole World’s view from rational to where technical, social, economic and environment are rationally viewed, to an emerging one from their interconnectedness. Santa Fe Institute, New Mexico derived six characteristics of complex based on simulation of complex networks.

- There is no central control;
- There is an inherent underlying structure within system
- There is a feedback in the system
- There is a non – linearity, things do not happen in cause and effect manner
- Emergence is the outcome of the system which happens without planned intent;
- The system is non-reducible. This means that system behavior cannot be understood by looking at one part or element
- Implication of chaos theory offers an alternative perspective for the organization and management of a system after a cataclysmic event or crisis.
- Little things do matter – small and insignificant details can come back later to create bigger than life crisis.
- Long term predictions necessary for crisis are difficult to make and short term prediction are more feasible and necessary for crisis are vulnerability assessment.
- Bifurcations represent key turning points where crisis can be brought under control or can escalate out of control.
- There are hidden patterns (attractors) in causes of crisis and the way they are managed.
- A certain amount of order and disorder is natural and even healthy for the organization.
- Cause of crisis or the event may be more difficult and sequentially connected till amplified: chaos of theory based on complexity holds that simplistic linear thinking is not feasible to find the cause in case in case of disasters.
Positive and negative feedback mechanism sets the operation mechanism Negative feedback gives direction for regulations where as positive feedback amplifies devotions from initial conditions, away from equilibrium and safe operating levels.

Concept self-organization reminds that things are changing constantly, whether management realizes and get ready for it or not. Chaos theory hold that type of new pattern and order that will emerge, will depend on priorities of management. Thus from this view point change emerges from within the organization, only influenced by the factor of outside environment, we call context. (page 228-231, ch 11 crisis management in new strategy landscape; Crandall William, Parnell john, ) sage 2009

INRERACTIVE GOVERNANCE AND PLANNERS ROLE

Study of the literature brings forth the need of enabling community environment for sustainable preparedness and Hazard Mitigation Planning. Zenghong Tang (2009) through his analysis of five case studies in linking planning theories found the disconnect between Participation and Natural Hazard Mitigation and explored the research gap for efforts in building interest of the community in Hazard Mitigation critic though the targeted education programmer and by connecting mitigation policies with the concern to quality of life.

Public participation has become a central element of planning activity over the last decades. The planning literature has given considerable attention to participation in theory and practice, discussing its benefits for democratic governance, its multiple goals and criteria for assessing success. Although planning academic and processes often fail, the field of participation evaluation lags behind. This paper explores how often, why and how planners evaluate participation in practice. There is lack of research on planner’s role model and stakeholders for reduction in damages and losses in Hazard Mitigation Planning. Technically sound hazard mitigation in plan can only be successful though long – term partnership among planners and stakeholders. Initiative on the part of planner is significant as a citizen can – not their own. Planners Role has been observed under three categories –

Technical Role which is more in isolation from others, primarily collecting and analyzing information and proving objective advice. 
Political /Bureaucratic role where planner encourage participation strategically only from particular groups. 
Collaborative Role Planner – focuses on bringing together stakeholders representing face - to – face dialogues to collectively address shared problems.

Mobilization role orientation has a positive correlation with public participation levels, as expected from planners intentionally fostering opportunities for stakeholder’s participation. The negative correlation comes in when small set of techniques used to shere information with the community Mark Stevens and others examined 65 development projects subjected to Natural Hazard Mitigation Planning and found that level of participation from the local
community depends on the planner invites the citizen to participate and which is critical to success of hazard mitigation planning.

Many times Planners substitute their own judgment in Hazard Mitigation Planning, considering citizens are generally incapable of making meaningful contribution in it. Yes Hazard researchers observe that hazard mitigation planning involves multiple layers of government with overlapping and sometimes conflicting responsibilities and priorities. Planners have to target both community at large as well as specific group individuals. Gods chalk and other have envisioned a collaborative Hazard mitigation Planning process that integrates technical planning activities, Public Participation activities together with the Political activities.

**Structure of Community Participation for Interactive Governance**

Interactive governance is described as a way of conducting policies with involvement of citizens, social organizations, and enterprises in early stage of policy making. Process management is very important in gating the desired outcomes in community participation though the interactive decision making and involvement of stakeholders. 73rd and 74th Constitutional amendment Act, 1992 designated Process of policy formulation though Community participation approaches, but still approaches and modes of participation tremendously very and thereby its outcome in development of policy framework.

JurianEdelenbos, Erik Hansklijn (JPART2005) assessed structure of community Participation on the basis of its effects on the outcome and its implementations in two dimensions; first as width of the Participation which is the degree to which each member of the community is offered to participate. For example the invitation policy of municipalities as how often they send the invitation, information and accessibility to different sectors. And secondly the Depth of Participation which determines the influence of citizens opinion in shaping and realization of the outcomes and degree to which citizens have the opportunity to determine the final outcome of the interactive process. It can be categorized in following stages –

**Informing the Stakeholders**: To a large degree: politicians and administration determine the agenda for decision making and inform those involved. They will not use the opportunity to invite interested actors to have input on policy determine the is particularly a “no impact participation “

**Consulting the Stakeholders**: To large degree, politicians and administration determine the agenda but regard those involved as a useful discussion partner in the development of policy. Politicians do not, however, commit to the results of this discussion. This is an approach of “no outcome participation

**Advising the Stakeholder**: In principle politicians and administration determine the agenda but give those involved the opportunity to raise problems and formulate solutions. These involved
actors play a full – fledged role in the development of policy. Politicians are committed to the results in principle but may deviate (if accounted for) from them in the final decision making. This approach has full involvement and participation role of the stakeholders in formulation of opinion, but implementation of outcome symbolizes it as more a “if and buts Participation”

**Co-producing the Solution Approach:** Together politicians, administration, and those involved determine a problem solving agenda in which they search for solution together. Politicians are committed to these solutions with regard to the final decision making, after having tested this outcome in terms of a priority conditions. Here the outcome of the participatory efforts in the policy formulation depends on a short trial, result of which could have different version and one way for total rejection participation efforts.

**Co-deciding:** Politicians and administration leave the development and decision making of policy to those involved, and the civil service provides an advising role. Politicians simply accept the outcomes. The results of the process have an immediate binding force. This becomes the most effective modes of participation through a motivated team efforts for smooth and joint decision – making.

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**Fig. 2: Depicting Outcome of Participatory Decision Making**

- **Informing the stakeholder**
- **Consulting the Stakeholders**
- **Advising the stakeholders**
- **co-producing the solution**
- **co-deciding**

*Source: Author*
TECHNIQUES

S Brody (2003) argued that choice of techniques used to transmit information to and from local citizen, determine the degree of participation in hazard mitigation planning. Using bi – variate and multi – variate correlation analysis, the author found that the total number of techniques used has a positive correlation with total number of stakeholder group involved. Planners information transmission techniques such as :

- Goal Setting Workshop
- Community Forums Q
- Citizen Advisory Committee
- Citizen Sub Committee

CONCLUSIONS

Self-organization begins with opportunity of interaction among community in disaster stricken context where based on mutual sharing of knowledge, people try to find solution within their capabilities. Information driven evolutionary design can produce self-organizing systems that are as reliable as traditionally engineered verifiable systems and as resilient as homeostatic biological organisms.

The interaction of city dynamic and uncontrolled urban growth leads to over exploitation of natural resources and intensified use of land, development deficit urbanization which also enhances vulnerability to localized natural disaster together with the induced climate changes. Adaptation to climatic change and disaster risk can – not be isolated from the existing problem of the urbanization. There by it is crucial to establish the missing link between development and disaster through multi-dimensional approach in which investment and impetus will be directed towards technologies which are clean and safe from probability of failure. Participatory approach leading to achievement of community resilience is more sustainable. A well-defined process of community participation is necessary in effort of vulnerability reduction and further Hazard Mitigation Planning not only for sustainability but also for wider application so to avoid creating new vulnerabilities.

In the above context, it has been empirically establishes that the planner has a role to understand the plans and policies for better translation of development goals and setting the priorities within the framework of long term sustainability. Among other on one way planners have to be careful to reduce
the negative impacts and vulnerability due to ill planned developments, secondly give new orientation to urban planning for achievement of resilient cities through community empowerment in terms of knowledge sharing and decision – making. Planning Education requires re – orientation for inducing and enhancing resiliency in urban system particularly for the concerning issues of disaster risk reduction which needs to be dealt in an integrated manner. Urban systems require a multi – pronged approach for assessment of urban metabolism and scaling vulnerability induced by it through development dynamics, capacity building for self-organization through emergence and empowerment evolution through continuous participatory roles. Understanding their interconnection with the tools of system thinking may lead to resiliency and sustainable disaster mitigation.

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