



ArcDR3 Initiative

Architecture and Urban Design for
Disaster Risk Reduction and Resilience

GRAND SYLLABUS
EVOLUTIONARY REGENERATIVE SYSTEMS
for Ecologically, Sociologically and Technologically Resilient Cities



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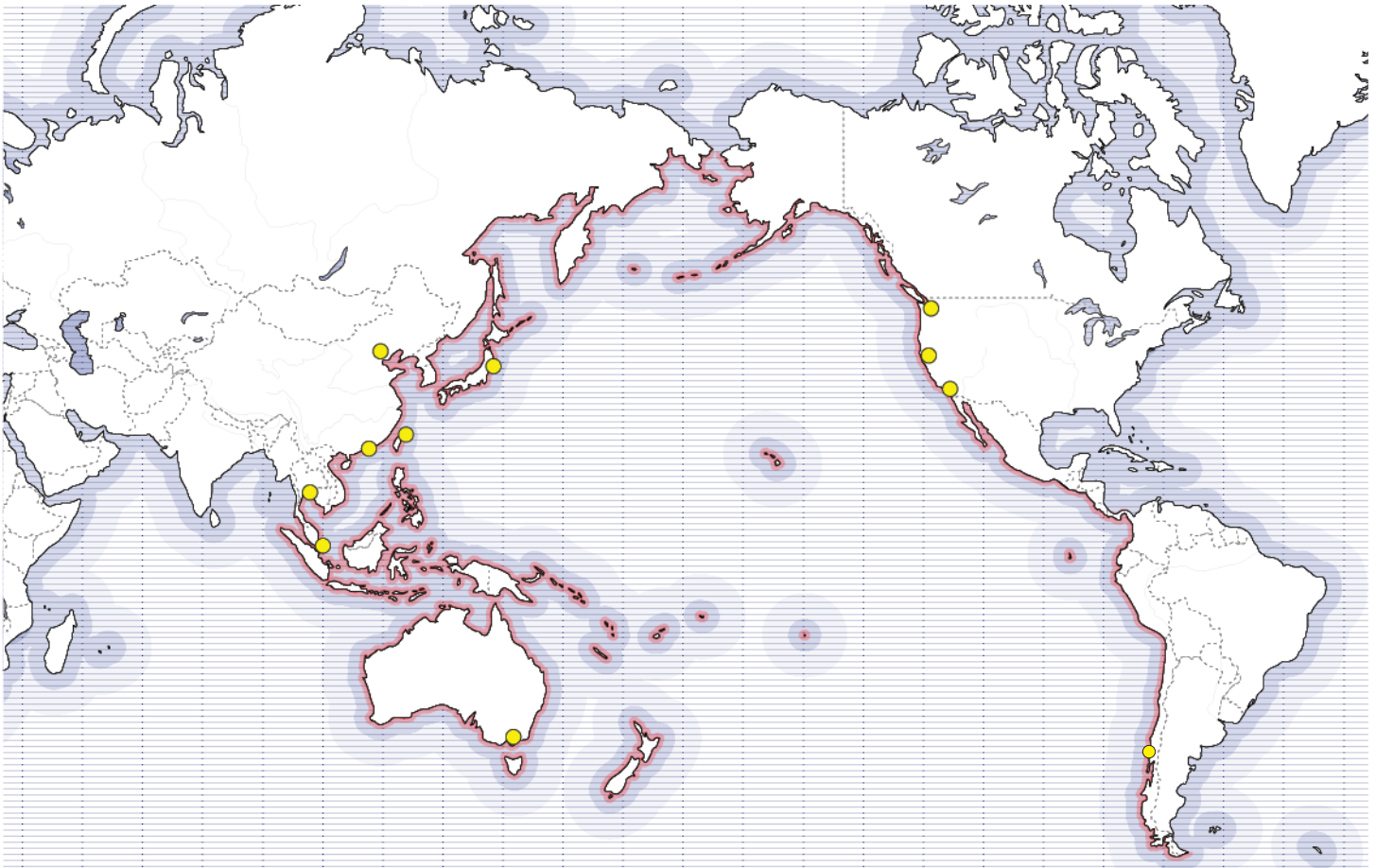
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Map of Pacific Rim and Participating Universities

The history of humanity reflects myriad examples of survival in the face of natural and man-made disasters, and over many years scientists, engineers and scholars of such events have accumulated much knowledge to help elucidate disaster related phenomena, structures, and systems. However, there are limited scenarios in which experts find the opportunity to apply this knowledge at a large scale in the field of reconstruction or construction that anticipates future events. To bridge such gaps the International Research Institute of Disaster Science (IRIDeS) at Tohoku University, Japan and xLAB at University of California Los Angeles (UCLA) have established the ArcDR3 Initiative.

As a platform, the joint initiative draws from an international network of professional and educational partners including those from participating organizations of the Association of Pacific Rim Universities (APRU), in a region with constant seismic activity exposing its inhabitants to severe risks and related dangers.

To this end, the experimental educational project will share, store and utilize ideas created and implemented by participating universities under the umbrella of a Grand Syllabus to be adopted and modified by each

participating institution in its local context.

The Grand Syllabus establishes a common framework within which the local syllabi of the ArcDR3 initiative are developed, outlining the background, theme, and conditions for local syllabi, and an appendix of relevant sections of the Sendai Framework for Disaster Risk Reduction 2015-2030. Based on this document, each participating institution will develop its local, context-specific design studio syllabus for the 2020-2021 academic year.

Culminating projects will be discussed in conferences, shown in exhibitions, and compiled into a publication.

A. EVOLUTIONARY REGENERATIVE SYSTEMS (ERS) FOR ECOLOGICALLY, SOCIOLOGICALLY AND TECHNOLOGICALLY RESILIENT CITIES

Across the globe, 21st century cities face a growing number of technological, social, and environmental challenges. An increased intensity of global risk establishes an urgency and opportunity to redefine strategies for designing buildings, cities, and environments. For urban systems to respond to various challenges, unpredictable events, and uncertain durations of after-effects, it is necessary to develop both malleable planning strategies and tactical redundancies.

The ArcDR3 Initiative Grand Syllabus takes its inspiration from the Sendai Framework seeking to propel it forward using a collaborative approach to architectural education to demonstrate visionary design possibilities. The goal of the initiative is to contribute cutting edge design thinking towards the development of an international standard for risk reduction in the urban environment. At the conclusion of this initiative, ideas formulated by participating universities will be shared with the Japanese Ministry of Economy, Trade and Industry with a view towards establishing the content for a new disaster risk reduction certification for the International Organization for Standardization (ISO.)

In a broad sense, while resilience serves as the theme for the ArcDR3 Initiative, it is up to date understandings of the term that must be visualized for this initiative. For if resilience is defined as...

- i. the capacity to recover quickly from difficulties; toughness;
- ii. the ability of a substance or object to spring back into shape; elasticity

...then such definitions suggest ONLY resistance to change and/or return to a previous state. However, given that today's changes unfold at unprecedented speeds with great degrees of unpredictability, resilience must be better defined as the capacity to respond and adapt to change, whether as sudden shock or a long-term trend. Between the scientific approach of calculating risk and understanding the impossibility of predicting the future, resilient design must balance in the space between the predicted and the unpredictable as a complex form of adaptivity. A compelling thematic for this kind of thought is captured in the phrase Evolutionary Regenerative Systems for Ecologically, Sociologically and Technologically Resilient Cities.

As Nel, du Plessis and Landman have noted with regards to complex adaptability, "(p)lanning for dynamic cities is a perennial problem that continues to grow in importance in a rapidly changing world." Hence there is urgent need for strategies that anticipate "urban change through a complex adaptive systems approach." Such processes are both regenerative and evolutionarily so. They include "(1) describing the system through setting boundaries and identifying the properties of the system, (2) identifying the patterns of change across scales and (3) mapping the change over time."

Thinking along these lines enables urban designers to firstly prepare for "the complexities of urban change and secondly, (setting) a foundation to engage with the challenge of developing alternative sustainable development models that are able to deal with the reality of complex, dynamic and interconnected urban systems and to cope with change and uncertainty in ways that build positive resilience and support regenerative design and development." Darren Nel, Chrisna du Plessis & Karina

Landman (2018) Planning for dynamic cities: introducing a framework to understand urban change from a complex adaptive systems approach, *International Planning Studies*, 23:3, 250- 263, DOI: 10.1080/13563475.2018.1439370

To this end each proposal must address context-specific Ecological, Sociological and Technological dimensions in order to deliver profound, contemporary urban design ideas that expand the understanding of resilience as a mechanism that is mutually evolutionary and regenerative.

Proposals will be developed at two scales (Systemic and Prototypical) and will respond to key Priorities for Action identified in the Sendai Framework.

B. THREE LENSES FOR THE DESIGN OF EVOLUTIONARY REGENERATIVE SYSTEMS

With a holistic goal in mind, ArcDR3 participants will design ERS for risk and resilience through one or a combination of the following lenses:

Technology

Resilient, threat-resistant systems are characterized by suppleness, flexibility, and redundancy by interfacing with a changing array of objects, populations, and environmental situations.

Society

Urban systems that mitigate challenges and maximize opportunities created by shifts in the global population must pay particular attention to dynamic environments that can accommodate the diverse changes present in the near future.

Ecology

A resilient urban ecology enables multiple types of ecosystems to coexist and interface with each other. How can local considerations contribute greater to a global risk management system?

A. PROPOSAL PROCEDURES

Faculty will outline a locally specific set of issues and concerns to explore in the studio, operating within the framework outlined in the Grand Syllabus. Participating institution teams will include engineers, architects as well as experts from relevant disciplines in the humanities and sciences.

The challenge to participating teams is to realize bold, interdisciplinarily conceived urban design proposals that smartly tackle 'Local and National Level' key points identified in two of the 4 Priorities for Action for Disaster Risk Reduction laid out in the Sendai Framework. By engaging with Sendai Framework Priorities number 3 and 4 and acknowledging the influence of Sendai Framework Priorities number 1 and 2, participating teams will develop proposals with both local and global impact. In order to guide development of local syllabi, participants should address and expand upon the 7 key points outlined in section 3D of this document.

As previously outlined, participating teams will demonstrate ideas at 2 scales of urban design:

- i. Systemically, in the form of a large-scale network
 - ii. Prototypically, at the scale of a smaller node in the network in the form of a constructed environment
- Programmatic components for each proposal will be derived from the key institutions and user groups identified in the 4 Priorities for Action of the Sendai Framework.
 - Participants are encouraged to engage with similar local or regional bodies and existing user groups, and to address their programmatic requirements;
 - Participants are also encouraged to hypothesize new user groups and their programmatic requirements.
 - Engagement with 'Local and National level' key points must demonstrate universal relevance in terms of ideas at Regional and Global levels.

B. THE SENDAI FRAMEWORK 4 PRIORITIES FOR ACTION

Participants are asked to produce visionary proposals for Evolutionary Regenerative Systems that are informed by Sendai Framework Priorities 1 and 2 and targeted to the tangible dimensions of urban design identified in Sendai Framework Priorities 3 and 4.

Priority 1: Understanding disaster risk

"Policies and practices for disaster risk management should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment. Such knowledge can be leveraged for the purpose of pre-disaster risk assessment, for prevention and mitigation and for the development and implementation of appropriate preparedness and effective response to disasters."

Priority 2: Strengthening disaster Risk governance to manage disaster risk
"Disaster risk governance at the national, regional and global levels is of great importance for an effective and efficient management of disaster risk. Clear vision, plans, competence, guidance and coordination within and across sectors, as well as participation of relevant stakeholders, are needed. Strengthening disaster risk governance for prevention, mitigation, preparedness, response, recovery and rehabilitation is therefore necessary and fosters collaboration and partnership across mechanisms and institutions for the implementation of instruments relevant to disaster risk reduction and sustainable development."

Priority 3: Investing in disaster risk reduction for resilience

"Public and private investment in disaster risk prevention and reduction through structural and non- structural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment. These can be drivers of innovation, growth and job creation. Such measures are cost-effective and instrumental to save lives, prevent and reduce losses and ensure effective recovery and rehabilitation."

Priority 4: Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation, and reconstruction

"The steady growth of disaster risk, including the increase of people and assets exposure, combined with the lessons learned from past disasters, indicates the need to further strengthen disaster preparedness for response, take action in anticipation of events, integrate disaster risk reduction in response preparedness and ensure that capacities are in place for effective response and recovery at all levels. Empowering women and persons with disabilities to publicly lead and promote gender equitable and universally accessible response, recovery, rehabilitation and reconstruction approaches is key. Disasters have demonstrated that the recovery, rehabilitation and reconstruction phase, which needs to be prepared ahead of a disaster, is a critical opportunity to "Build Back Better", including through integrating disaster risk reduction into development measures, making nations and communities resilient to disasters."

C. PROGRAMMATIC MATTERS OF CONCERN

Participants are asked to pay attention to the programmatic components and matters of concern identified in Sendai Framework Priorities number 3 and 4 as well as to envision alternative, perhaps unprecedented ones. Among these areas are the following suggested infrastructural and institutional typologies identified in Sendai Framework Priorities 3 and 4:

- i. Consideration of the protection “or support the protection of cultural and collecting institutions and other sites of historical, cultural heritage and religious interest;”
- ii. Consideration of “community involvement, integrated with livelihood enhancement programmes, and access to basic health-care services, including maternal, newborn and child health, sexual and reproductive health, food security and nutrition, housing and education, towards the eradication of poverty, to find durable solutions in the post-disaster phase and to empower and assist people disproportionately affected by disasters;”
- iii. Consideration of “new and existing critical infrastructure, including water, transportation and telecommunications infrastructure, educational facilities, hospitals and other health facilities, to ensure that they remain safe, effective and operational during and after disasters in order to provide live-saving and essential services;”
- iv. Consideration of the establishment of “community centres for the promotion of public awareness and the stockpiling of necessary materials to implement rescue and relief activities;”
- v. Consideration of “the relocation of public facilities and infrastructures to areas outside the risk range, wherever possible, in the post-disaster reconstruction process, in consultation with the people concerned, as appropriate;”
- vi. Consideration of “strengthen(ing) the capacity of local authorities to evacuate persons living in disaster-prone areas;”
- vii. Consideration of the enhancement of “recovery schemes to provide psychosocial support and mental health services for all people in need.”

D. DIRECTIVES

i. What is an ‘Evolutionary Regenerative System’?

Participants are asked to define their understandings of transformative resilience to expand the knowledge and discourse base of inter-university discussion. In addition, it will be useful (but not required) to define the fol-

lowing terms: risk, hazard, vulnerability, preparation, mitigation, response.

ii. What is the Local/Regional Hazard to be addressed?

Participants may choose a single hazard (ie. earthquake, flood, tsunami, fire, etc) or the intersection of multiple hazards and vulnerabilities (ie. poor investment in infrastructure for flood protection in low income areas).

ii. What are the Project Scales?

Participants should work with both a large scale (systematically, in the form of a large-scale network) and small scale (prototypically, at the scale of a smaller node in the network in the form of a constructed environment).

iv. What are your Strategic Definitions?

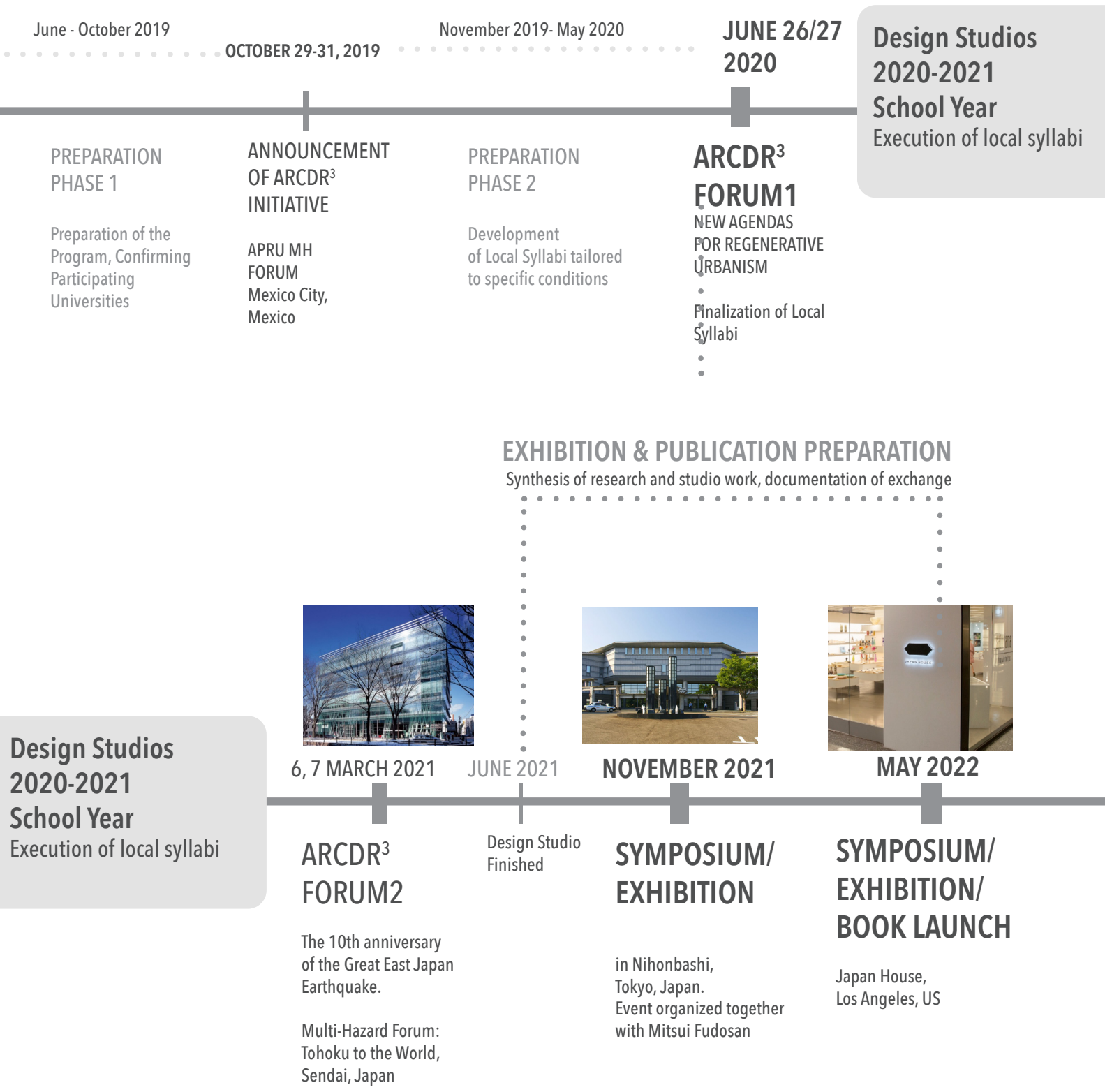
Participants should define a specific strategy for the studio to approach the hazards. The strategy is meant to focus the studio work on a specific approach, design method, or technical specification.

v. What is the impact of your Site Selection?

Sites should be near the area of the university and be particularly vulnerable to the selected hazards. Sites may be multi-scalar (ie city as a whole for large-scale, specific neighborhood, block or plot of land for small scale.)

vi. What is the proposal’s level of engagement with reality?

The studios should not produce tabula rasa projects, but rather have a specific engagement with the political, social, economic, and environmental reality of the site and greater context. As proposals are also meant to be visionary, it is important to establish the degree to which the local syllabus defines the engagement with reality.



Sendai Framework for Disaster Risk Reduction 2015-2030

The Sendai Framework for Disaster Risk Reduction (2015–2030) is an international document which was adopted by UN member states between 14th and 18th of March 2015 at the World Conference on Disaster Risk Reduction held in Sendai, Japan and endorsed by the UN General Assembly in June 2015. It is the successor agreement to the Hyogo Framework for Action (2005–2015), which had been the most encompassing international accord to date on disaster risk reduction. The Sendai Framework sets four specific priorities for action: (1) Understanding disaster risk; (2) Strengthening disaster risk governance to manage disaster risk; (3) Investing in disaster risk reduction for resilience; (4) Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction

On Resilience

Defining resilience more precisely is complicated by the fact that different fields use the term to mean slightly different things. In engineering, resilience generally refers to the degree to which a structure like a bridge or a building can return to baseline state after being disturbed. In emergency response, it suggests the speed with which critical systems can be restored after an earthquake or a flood. In ecology, it connotes an ecosystem's ability to keep from being irrevocably degraded. In psychology, it signifies the capacity of an individual to deal effectively with trauma. In business, it's often used to mean putting in place backups (of data and resources) to ensure continuous operation in the face of natural or man-made disaster (p7, Zolli, A., Healy, M.A., 2012). Among them, noted disaster scientists Davis and Alexander defined the following: “Resilient recovery is robust and enduring. It has mechanism for solving problem particularly about the appointment of resources....It turns survivors into active protagonists” (p.255, Davis, I., Alexander, D., 2016).

Resilience is a multifaceted concept with many autonomous subsystems to turn surrounding resources into a good situation and a dynamic one with positive feedback for catching up to changing of the situation as follows. Paradoxically, resilience is often also enhanced by the right kind of clustering - bringing resources into close proximity with one another. But it's a special kind of clustering, one whose hallmark is density and diversity - of talent, resources, tools, models, and ideas. It's this kind of clustered diversity that ensures the resilience of innovation hubs like Silicon Valley and old-growth forest alike. These principles—tight feedback loops, dynamic reorganization, built-in counter-mechanisms, decoupling, diversity, modularity, simplicity, swarming, and clustering—form a significant part of the tool kit for systemic resilience. (p.12, Zolli, A., Healy, M.A., 2012)

Association of Pacific Rim Universities (APRU) Multi-Hazards Program

As one of the most disaster-prone regions in the world, frequent natural hazards - from tsunamis to floods to volcanic eruptions - threaten the lives and livelihoods of millions of people around the Pacific Rim and result in catastrophic destruction and damage. The losses and impacts that characterize disasters have much to do with the exposure and vulnerability of people and places as they do with the severity of the hazard event. While natural hazards cannot be eliminated, by sharing best practice, knowledge, and research, we can better understand risks and minimize the threat to human life. Over the past decade, the Multi-Hazards Hub hosted by Tohoku University in Sendai, Japan has worked to harness the collective capabilities of APRU universities for cutting-edge research on the shared threat of natural hazards facing the region. Of the top 100 institutions globally by scholarly output on natural disasters, APRU produces 23% of the publications and 28% of the citations. APRU collaborates with its members and partners to understand how academics, policy leaders, government, and communities can work together to facilitate disaster risk reduction and recovery. Whether it is enhancing the reach of the Sendai Framework or sharing expertise to mitigate the danger in countries most vulnerable to disaster risks, together we can build a more resilient Asia Pacific.

World Bosai Forum

The World Bosai Forum proposes solutions from various points of view to enable disaster risk reduction in Japan and overseas, and aims to promote the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030 while learning from each other and creating new values. The first World Disaster Reduction Forum (2017) was led by Tohoku University and Sendai City, with a diverse group of stakeholders (United Nations, international organizations, governments, private sectors, media, NGOs, citizens, universities

and research institutes). We have brought in concrete solutions to reduce disasters, sharing information, discussed, and promoted the creation of a field to generate new collaborations.

The second World Bosai Forum (November 9-12, 2019) will address the Global Target E” in the Sendai Framework for Disaster Risk Reduction 2015-2030 that aims to achieve significant increase in the number of countries by 2020 with holding national and regional disaster management strategies. We will share many detailed contents to seek for better reconstruction which contains structural (hard), non-structural (soft) and human-oriented (heart) measures. We will also share how to deal with climate change which is getting more serious in recent years, how to apply advanced technologies such as AI or IoT technology in disaster risk reduction

International Research Institute of Disaster Science (IRIDeS)

This institute was established in April 2012 at Tohoku University, which experienced an unprecedented disaster called the Great East Japan Earthquake. While bringing together the wisdom of Tohoku University and contributing to the reconstruction and rehabilitation of the affected areas, we are promoting the world's most advanced research on natural disaster science while collaborating with universities and research institutions both in Japan and abroad. The IRIDeS creates a new academia of disaster mitigation that subsumes the lessons from the 2011 Tohoku earthquake and tsunami disaster and the findings of the world-leading research into our societies with the aim of establishing the social systems responding promptly, sensibly and effectively to natural disasters, withstanding the adversities with resilience, passing and exploiting the lessons to the forthcoming disaster management cycles.

xLAB

xLAB is an international think tank initiative that examines architecture's elastic boundaries and considers new possibilities through interdisciplinary collaboration in the study of the future built environment. It is set within the Architecture and Urban Design Department at the University of California, Los Angeles (UCLA). xLAB hosts the xLAB Summer Program, where students from top architecture schools around the world to perform collective research around a specific theme. The themes have been Community (2017), Mobility (2018), and Resilience (2019). It is held in collaboration with The University of Tokyo, Shinkenchiku-sha (Japan Architect Publication) and The National Museum of Emerging Science and Innovation (Miraikan).

Contact

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