Disaster Resilience and Industrial Infrastructure for future

The business of sustainability

ERM

Introduction

- Industrialized societies depend on
  - the functioning of infrastructure services (electricity or telecommunications technology which also facilitate the operation of e.g. transport, health systems or sewage treatment.
  - Infrastructure systems can be interrupted or destroyed by a variety of threats such as natural hazards, human failure or terror attacks.

- The vulnerability assessment of Critical Infrastructures and the dependency of on these infrastructure services are essential.

- There is a two-way relationship between the concept of disaster risk reduction and quality of infrastructure design and construction methodology, which is not yet well explored.

- The focus in the sector is still very "asset based" which considers infrastructure as a discrete set of assets and risk assessments are thus undertaken on this basis and in many cases do not consider the wider implications on the systems as a whole.

Risk to Industrial Infrastructure

- The incorporation of lessons learned from post disaster assessments is usually reflected in updates to planning and development policies, regulations and codes;
- But does not appear to translate into a risk-based approach to planning and development of infrastructure and is still very asset focussed.

- Key Risks to industries from Natural Hazards:
  - Loss of structures (earthquake, Cyclone, floods, etc.)
  - Loss of Power Supply (earthquake, Cyclone, floods, etc.)
  - Availability of water (drought)
  - Hindrance to Operations (floods, epidemic)
  - Supply chain cut-off (earthquake, Cyclone, floods, etc.)
  - Transportation blockade (earthquake, Cyclone, floods, etc.)
  - Unavailability of workforce (floods, epidemic)
  - Others (wild fire, landslide, avalanche etc.)

Critical Infrastructure

- Looking at historic incidents, the critical infrastructures for industrial operations can be:
  - Power supply lines/ substations
  - Gas / fuel supply lines or storage
  - Water supply reservoirs/ canals/pipes
  - Manpower availability
  - Transportation (Road/ Rail/ Sea/ helicopter)
  - Bridges
  - Dams

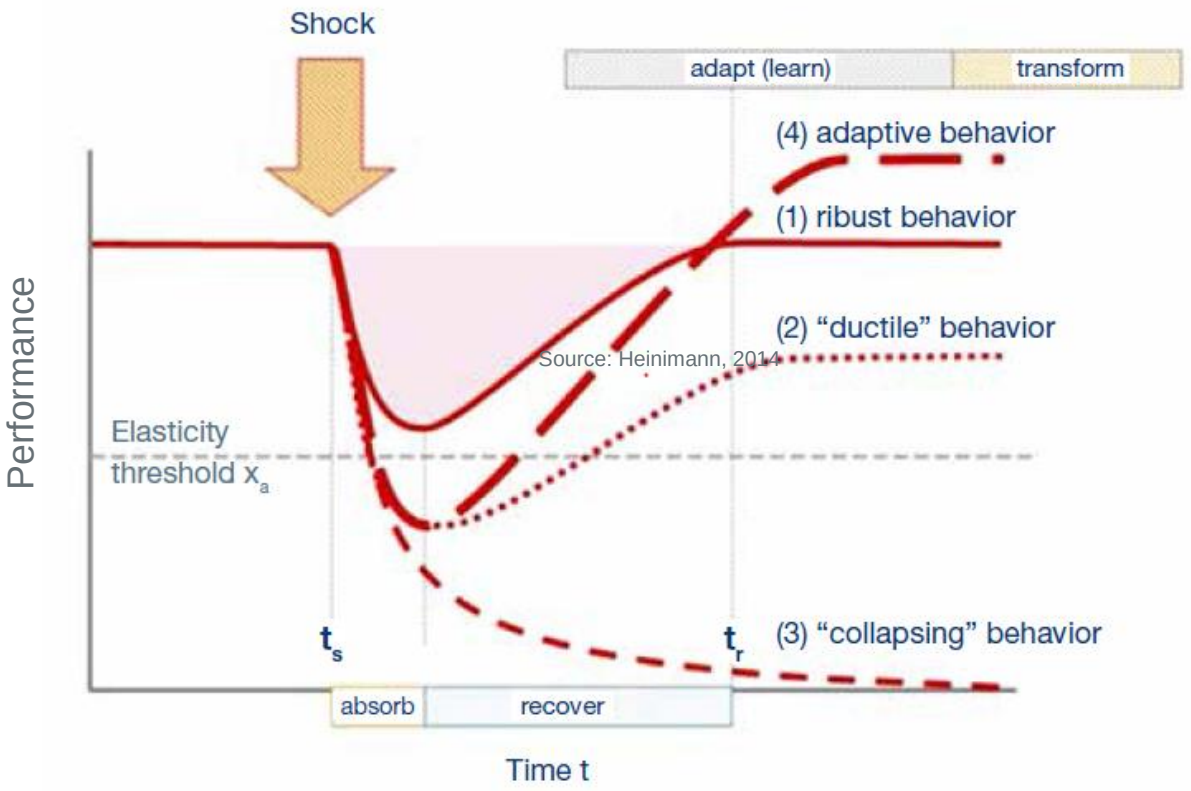
- Many of the issues have been dealt with by the industries through various measures in the past, however it was as back up against other reasons
  - Captive Power generations (poor power supply), fuel storage is always limited to few days
  - Reservoirs at sites (shortage of water in lean season)
  - Use of rail and road both for transportation
  - Use of local manpower / workers colonies

Incorporating Resilience

- Pre-empt the possibilities: incorporate Disaster Resilience at design and Planning Stage
- Identify alternatives for all vulnerable infrastructures
- Develop capacity to operate in absence of regular supply
- Improve efficiency on fuel, energy, water and other consumptions through regular audits and innovations;
- Decentralize where possible;
- Re-assess risks after regular intervals/ new developments;
- Train staff and management for emergencies;
- Develop recovery mechanism and verify effectiveness during normal operations;
- Learn from experiences from other geographies

Understanding Resilience

Resilience is the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.



Source: Heinimann, 2014

Four essential patterns,

(1) absorbing a shock without collapsing,

(2) recovering from a shock,

(3) adapting through self-organization and learning, and

(4) eventually transforming into a different system by altering structures, functions and feedback loops.

Source: Heinimann, 2014

Requirement

In order to support industries hit by natural disasters, the systems must be:

1. **Continuous**—operating safely throughout or restarting safely quickly post-disaster

2. **Robust**—not easily damaged in case of potential natural disasters

3. **Independent**—able to operate for a continuous period (in the order of days to weeks) post-disaster without relying on physical intervention from outside (local source of energy or sufficient storage, and with an appropriate local skills base to operate)

4. **Controllable—**able to be readily shut-down or with output adjusted depending on conditions

5. **Non-hazardous**—able to provide output in a way that does not cause an additional unwarranted hazard

6. **Matched to demand**—able to provide output in the form and quantity that is needed, in the location it is needed, when it is needed

Recent Examples

- Kalpakkam nuclear power plant withstood the giant waves, which engulfed its small township, home to India´s centre for atomic research.
- The plant shut down automatically after detectors tripped it as the water level rose.
- There was no release of radioactivity.
- The reactor was restarted 1 January 2005, six days after the catastrophic waves struck India´s east coast. (IAEA 2011).
- Although plant designers had not planned for a tsunami, they had taken cyclone storm surges into account and thus estimated comparable inundation levels (Sacchetti 2008).

Recent Examples

- Stubble burning in Punjab, Haryana, a man made hazard aggravated by meteorological conditions
- Resulted in shut down of power plants in Delhi NCR
- Affected truck transport movement through Delhi (indirectly affecting many industries)
- Faster expedition of Peripheral highways
- Avenues for consumption of stubble being explored
- Fines and punishments being considered

Recent Examples

- Dholera Special Investment Region- DMICDC

- **Water and Waste Water System**
  Zero waste discharge by treating 100% of the wastewater generated to tertiary standards for non-potable and industrial use. Smart metering and SCA have been implemented to minimise loss.
- **Solid Waste Management**
  Provisions are in place for 100% collection of solid waste and recycling of biodegradable solid waste to be treated for use as compost and to generate energy.
- **Storm Water Management and Rain Water Harvesting**
  Systems are in place to capture and utilise storm water runoff and the rain water harvesting system is implemented through an open earthen canal, which will allow aquifier recharge and reuse of water for irrigation.
- **Power Management**
  24/7 uninterrupted power supply provided. Smart grid, smart metering and monitoring has been deployed to minimise any loss. Policies to implement generation of renewable energy are in place.

Thank You

Read our latest sustainability report:
Read the 2017 report