UnivPM
Università Politecnica delle Marche
Scienze
DiSVA - Dipartimento di
Scienze della Vita e dell'Ambiente

Baltic Symposium on Societal Resilience

Emergency threshold index: a way to measure the community disaster resilience

Fulvio Toseroni M.Sc

January 27 - Riga Technical University

Education and Culture DG
Lifelong Learning Programme
ANDROID
DISASTER RESILIENCE NETWORK

WE TALK ABOUT

- ✓RESILIENCE AND DISASTER RISK REDUCTION
- ✓WHY MEASURE RESILIENCE
- ✓PHASES ON AN EVENT
- ✓COMMUNITY DISASTER RESILIENCE FRAMEWORK
- ✓A FORMULA TO MEASURE COMMUNITY RESILIENCE

UnivPM
Università Politecnica delle Marche

RESILIENCE AND DISASTER RISK REDUCTION ???

Critical steps: 1994 . . . 2005 . . . 2009

ENGINNERING

1858 *Rankine*
"Strenght and ductility"

ECOLOGY

1973 *Holling*
"adaptability and absorption"

PSYCHOLOGY

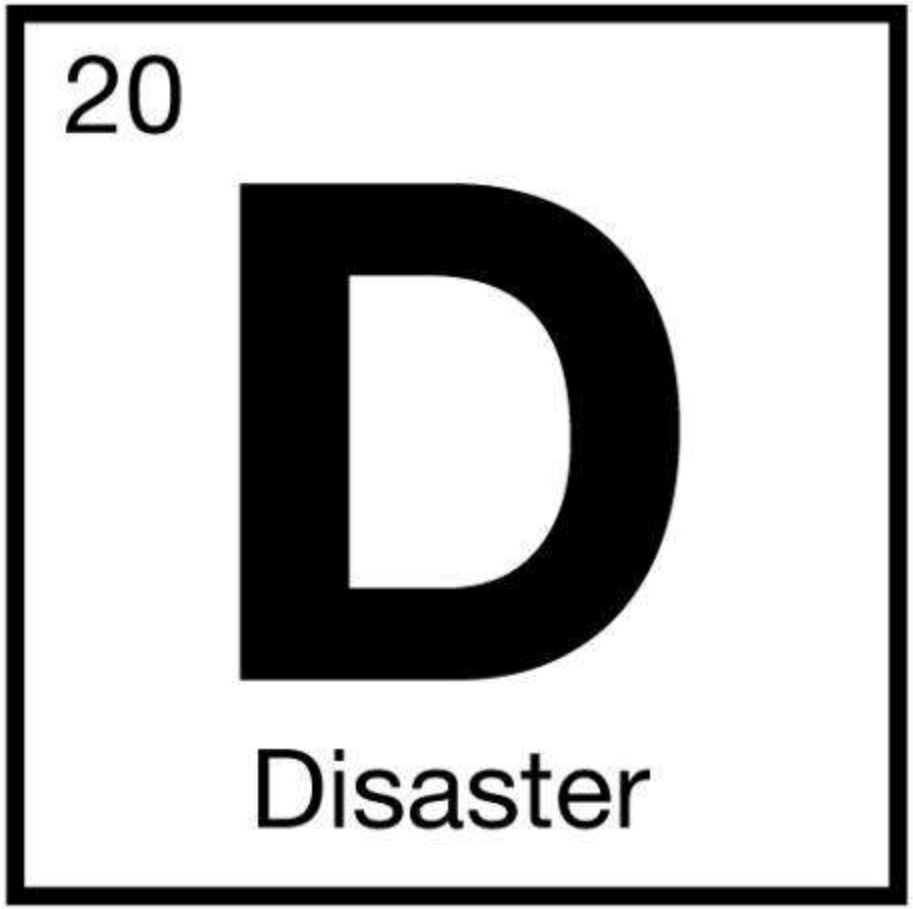
1984 *Garmezy*

"Competence and resourcers"

In this field, Resilience has been defined as "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions." (ISDR, 2009).

The force of a human society under stress is the capacity to plan facilities to endure disasters and preserving integrity (consistency) and ability to adapt a disasters for reduce impact (ductility)
[ALEXANDER 2012]

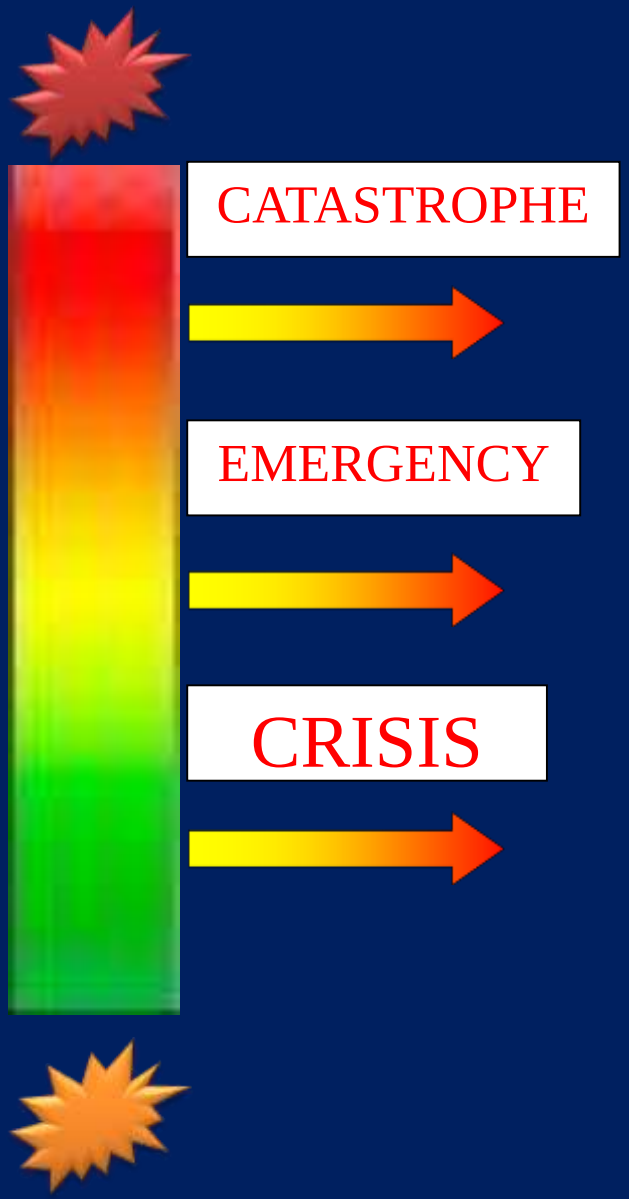
A NEW FORMULA…



…FOR A NEW PERSPECTIVE!

WHY MEASURE RESILIENCE COMMUNITY?

HOW CAN EVOLVE AN EVENT…OR NOT…



A big event, when the normal resources available are insufficient to face and resolve the event. We lose the control of event.

An event (natural, anthropic, predictable unpredictable) where factors Time and available Resources have a central role to face the situation, avoid further crises and resolve hazard situations or bad evolution of the event.

A balance system (static, dynamic, natural or anthropic) stressed by one or more factors (inside or outside of system)

CORE HYPOTHESIS

The resilience's measurement of a territorial system, through the indexing of its key factors, will allow identification of its "emergency threshold".

COMMUNITY DISASTER RESILIENCE FRAMEWORK

the emergency threshold of a region is given by the rapport between the parameters of the extreme event and those of the social-economic context.

The emergency threshold value indicates the limit beyond which the territorial system loses stability.

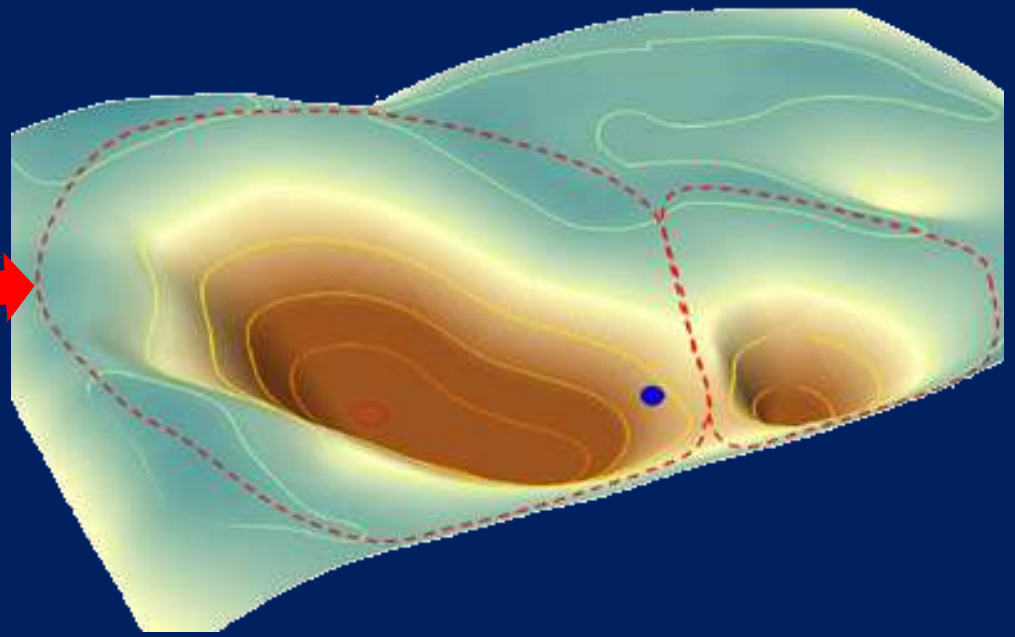
A territorial system can be made less vulnerable through a more effective equilibrium between actions of resilience and resistance.

The resistance actions reduce the primary vulnerability (structural), the resilient actions minimize the secondary (functional) and deferred vulnerability (socio-economics).

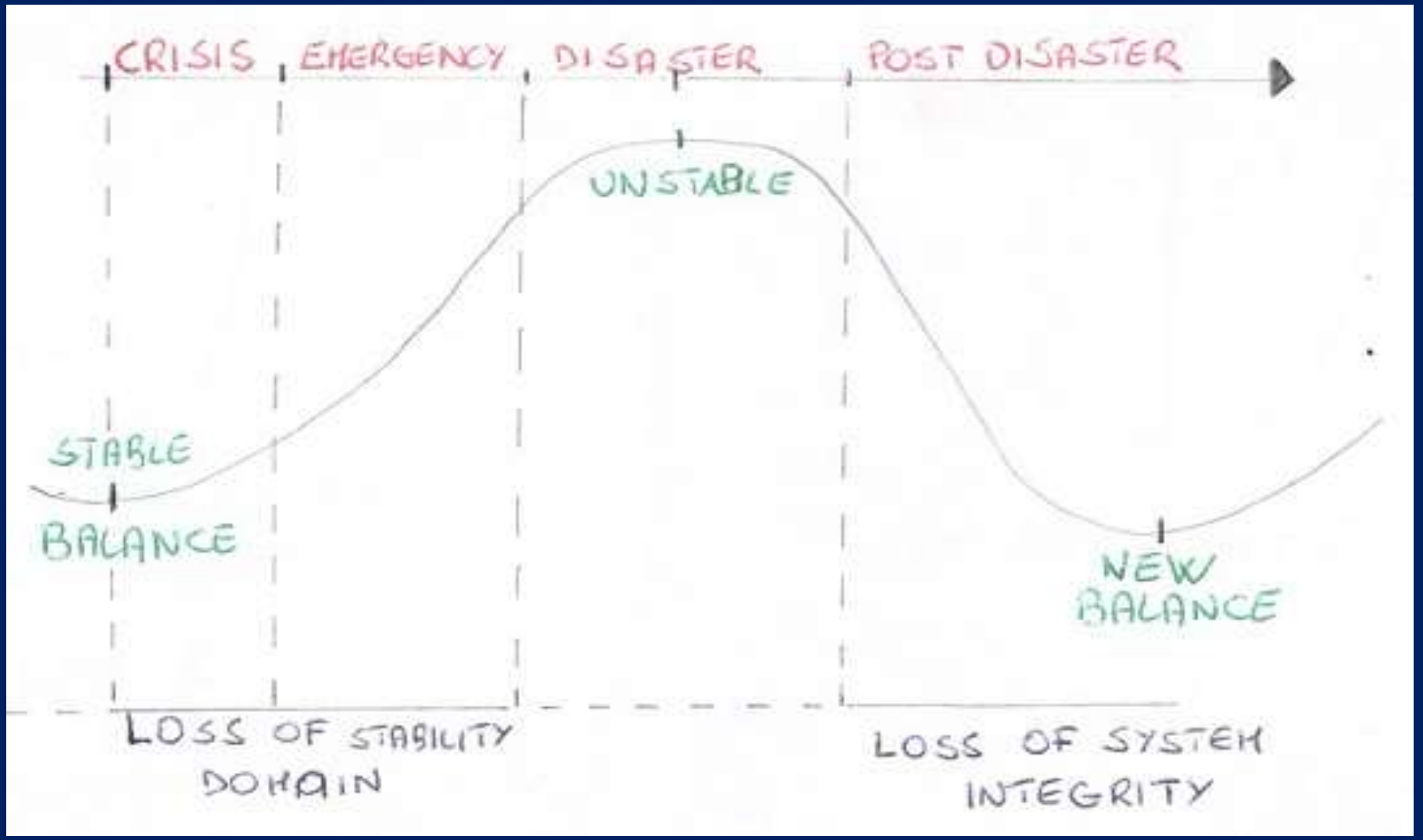
Emergency Threshold Index (ETi)

The definition of an emergency threshold index (ETi) helps to define the limit of a territorial system to sustain the impact of an extreme event, and suggest strategies to enhance/elevate such limits (reinforce the territorial system).

Emergency Threshold Index (ETi)

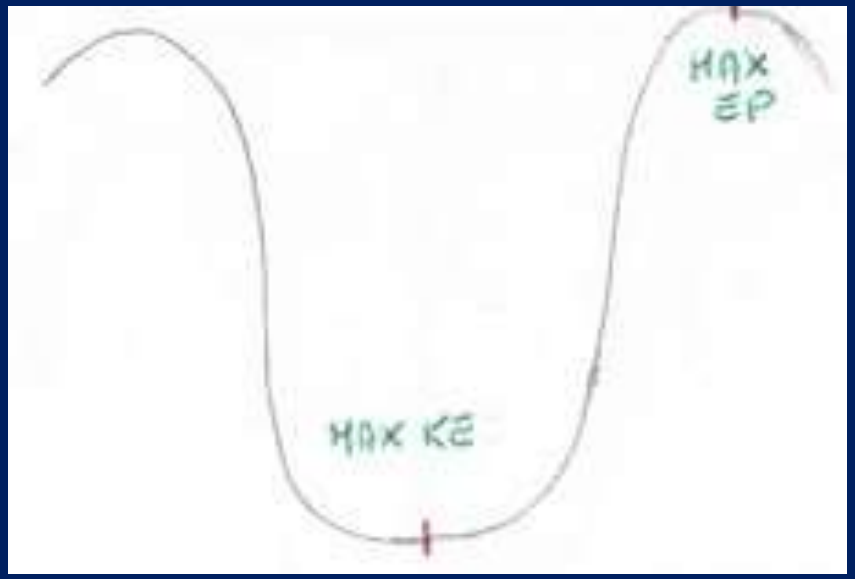


BETWEEN CRISIS AND CATASTROPHES



ENERGY, VULNERABILITY AND CAPABILITY, IS THERE A COMMON POINT ?

ENERGY



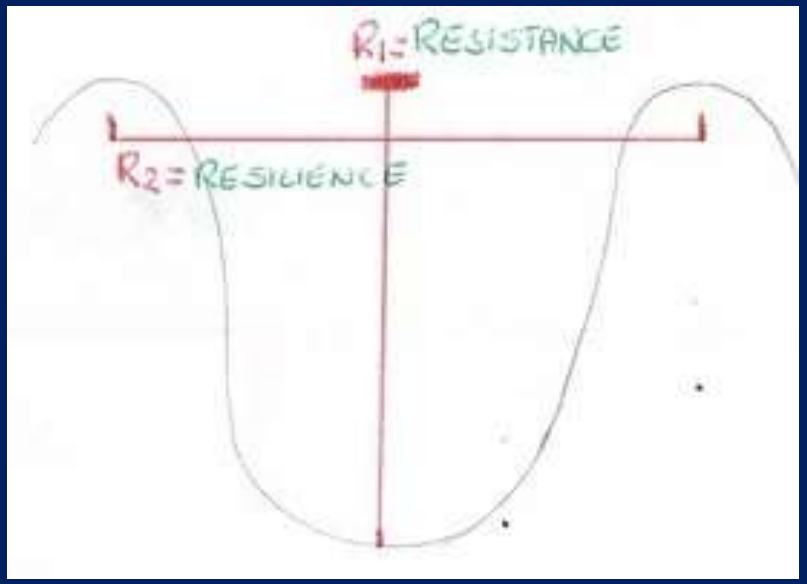
Energy = Ke + Ep = Constant (Ce)

where:

Ke = Kinetic energy and,

Ep = Esponential energy.

CAPABILITY



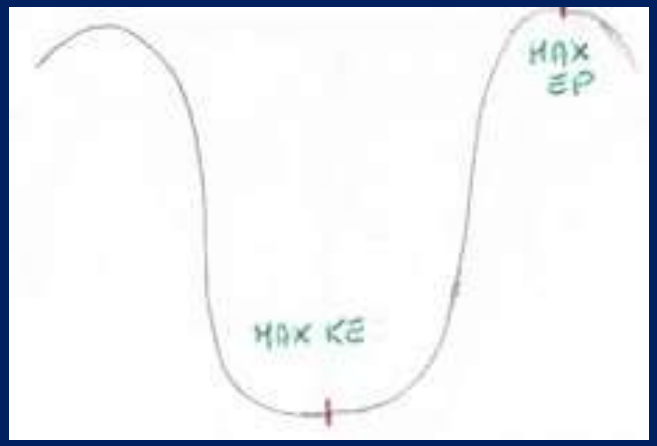
ΔC = ΔR1 + ΔR2 = Constant (Cc)

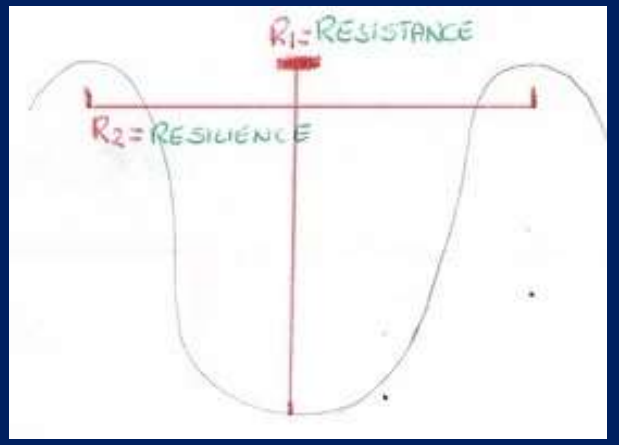
where:

R1 = resistance

R2 = resilience

IS IT A PROBLEM OF ENERGY… OR RESOURCES ?



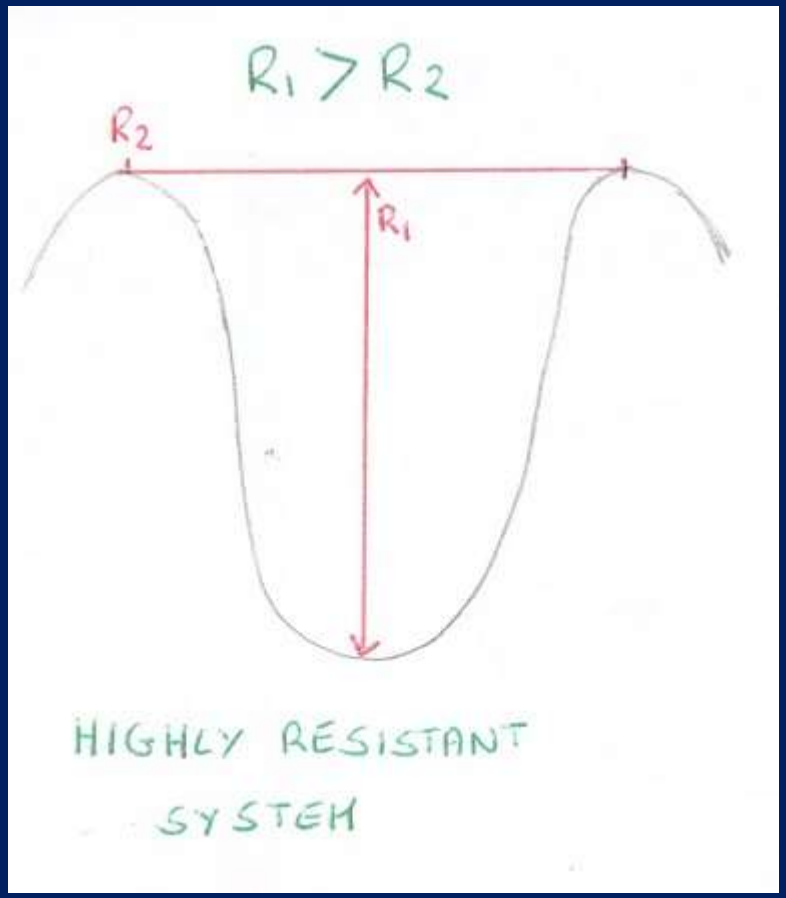


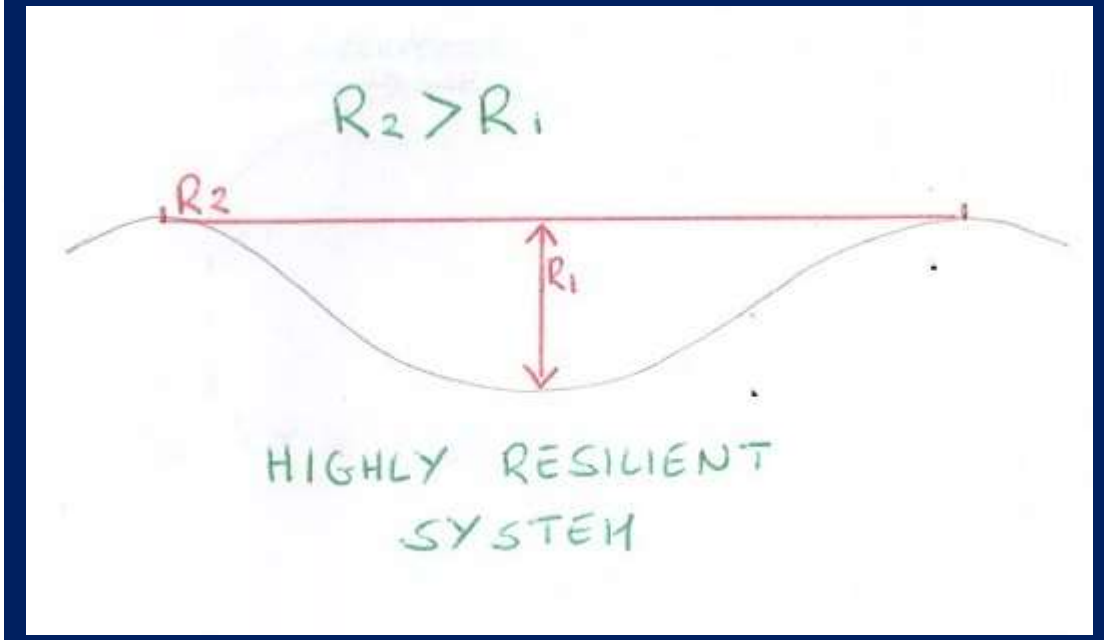
Cv = Emergency Threshold index = Cc

IF Cc > Ce = the system is protect

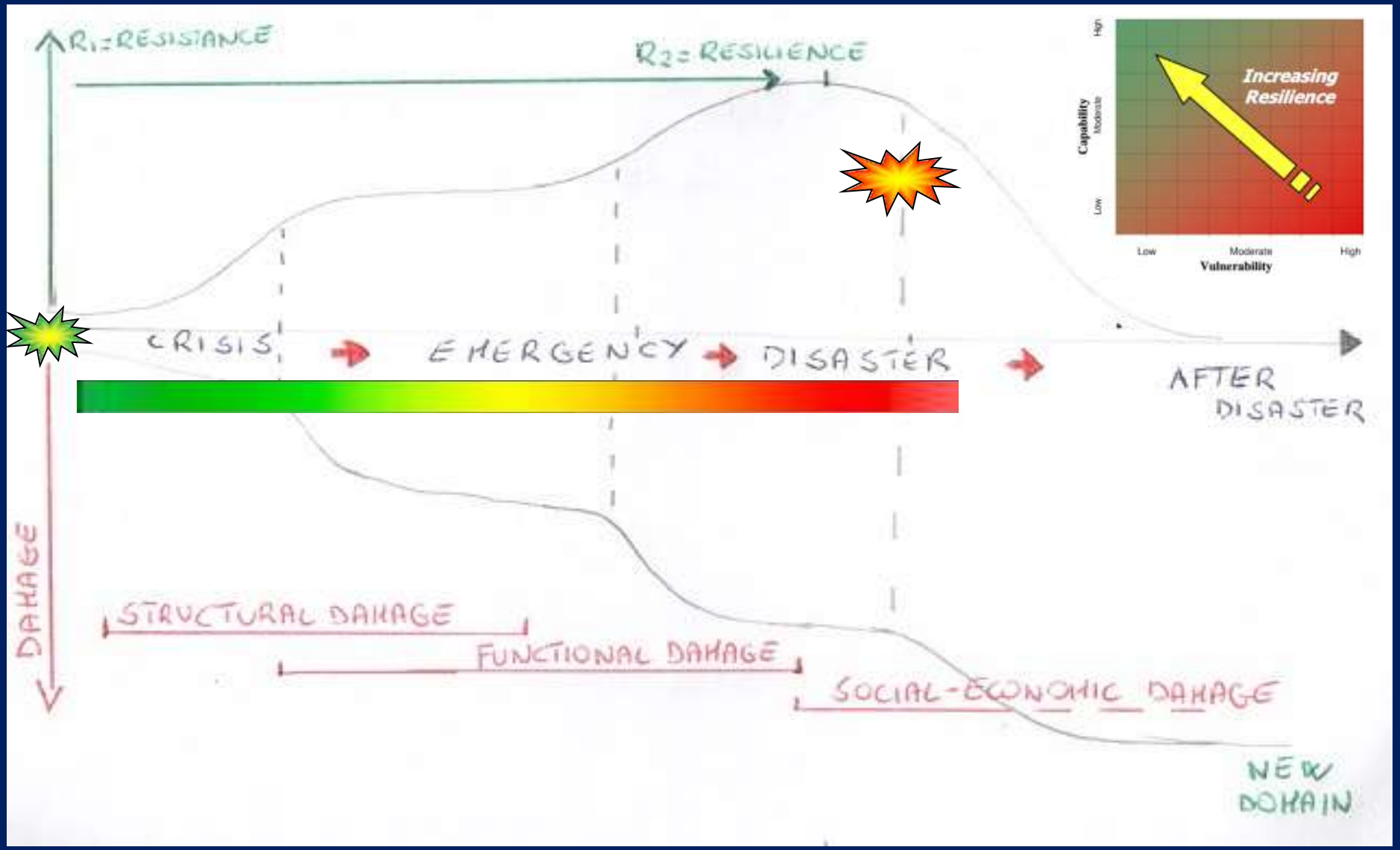
IF Cc < Ce = the system is vulnerable

IS IT BETTER A RESISTANCE SYSTEM, RESILIENT…OR…?

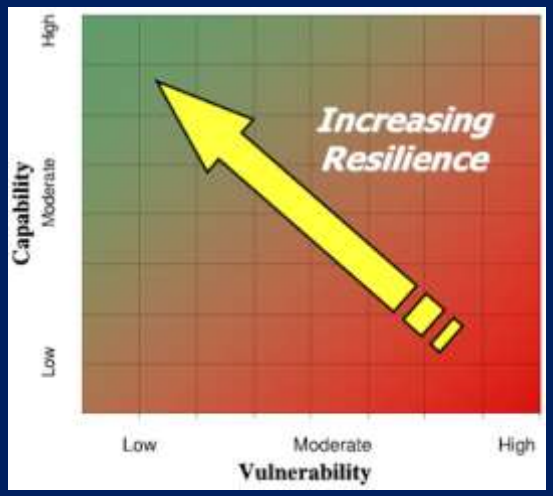




FINAL OVERVIEW



Emergency Threshold Index (ETi)



ETi = + Δ Resources (capability)

Crisis **Emergency** **Catastrophe**

A NEW FORMULA FOR A NEW APPROACH

EVENT = F · D = HAZARD (H)

DAMAGE EXPECTED (DeX) = H · V → **RISK = H ·V· E**

EmC (Emergency Context) = Dex / O

$$\text{Emergency Threshold Index (ETi)} = \frac{DEx}{CDRI \cdot O} \cdot E$$

F= frequency;
D = Danger;
H = Hazards
V= Vulnerability

E= Exposure;
O = Organization = Coordination · Communications · Resources
CDRi = Community Disaster Risk Index

CONCLUSIONS

WHY WE WANT MEASURE RESILIENCE

Index (qualitative and quantitative) for a development of mitigation actions. The target is to maintain low the severity by an extreme event impact.

Operating-conceptual tool for an harmonic and overall development of preparedness, planning and emergency management.

Evaluation tool for the territorial resilience to support the safeguard and environmental development policies.

Tool for activities evaluation of pre and post event, for a better use of available resources.

UnivPM
Università Politecnica delle Marche

REFERENCES

ALEXANDER D.E., *Resilience and disaster risk reduction: an etymological journey*, in Nat. Hazards Earth Syst. Sci, 2013.

Il cambiamento climatico, Milano, Muenchener Ruck Italia, 2009

HOLLING, C.S., *Resilience and stability of ecological systems*, in *Annual Review of Ecology and Systematics, 1973, n.*4, pp.2-23.

MAYUNGA J.S.,*Understanding and Applying the Concept of Community Disaster Resilience: A capital-based approach*, Munich, [s.n.],2007.

Natural Catastrophes 2012, Munchen, Münchener Rückversicherungs-Gesellschaft, 2013.

STANGANELLI M., *A new pattern of risk management: The Hyogo Framework for Action and Italian practice*, in "Socio-Economic Planning Sciences", n.42, 2008, pp. 92–111

UN, *IDNDR*, resolutions 42/169 (1987), 43/202 (1988), 44/236 (1989), 56/195 (2001).

UN,*S trengthening of the coordination of humanitarian emergency assistance of the United Nations*, in risoluz. 46/182 del 19/12/1991, New York, 1991.

UN– GENERAL ASSEMBLY, *United Nations Millennium Declaration*, 2000, New York.

UN– ISDR, *Living with risk, a global review of disaster reduction initiatives,* [s.l.],UN Sales Pubblication, 2004.

UN–ISDR, *Hyogo Declaration,* in World Conference on Disaster Reduction, Kobe, 2005.

UN, *Yokohama Strategy and Plan of Action for a Safer World - Guidelines for Natural Disaster Prevention, Preparedness and Mitigation* in World Conference on Natural Disaster Reduction, Yokohama, 1994.

THANK YOU FOR YOUR ATTENTION !!!
Be careful! We must be RESILIENT!

Fulvio Toseroni

Polytechnic University of Marche
Life and Environment Science department
PhD course: civil protection and environment

mail: **f.toseroni@univpm.it**
skype: **fulvio tose**

Education and Culture DG
Lifelong Learning Programme

ANDROID DISASTER RESILIENCE NETWORK

FOCAL POINT

EVENT = F (Frequency) · D (Danger) = Hazard (H)

RISK = H V E (Exposure)

DAMAGE EXPECTED (DeX) = H · V

EmC (Emergency Context) = Dex / O (Organization)

O = Coordination · Communications · Resources