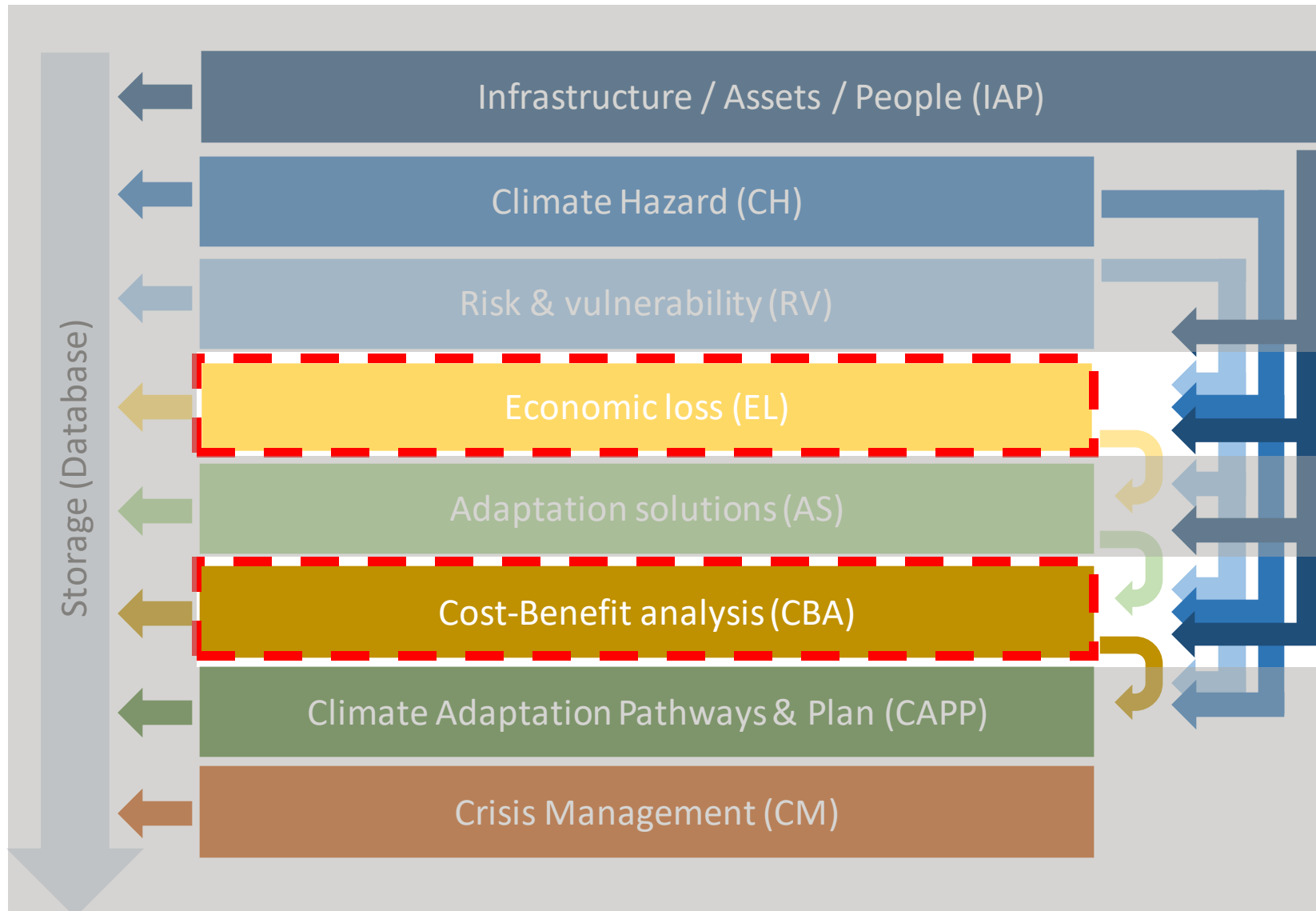# MODULE 3, 6

Ruben VALSECCHI

Economic loss (EL)

In a nutshell

Estimation of the economic losses related to the occurrence of a certain hazard on a specific asset.

The aim of M3 is to assess the actual situation of the assets. The actual losses are defined through the evaluation of the Expected Annual Loss (EAL) by the combination of the three main aspect of the risk assessment, such as hazard, vulnerability, and exposure.
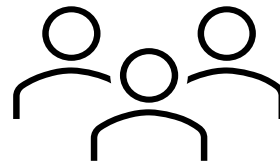
TERMINOLOGY

Determining "losses" means to estimate the scale of the consequences of an event
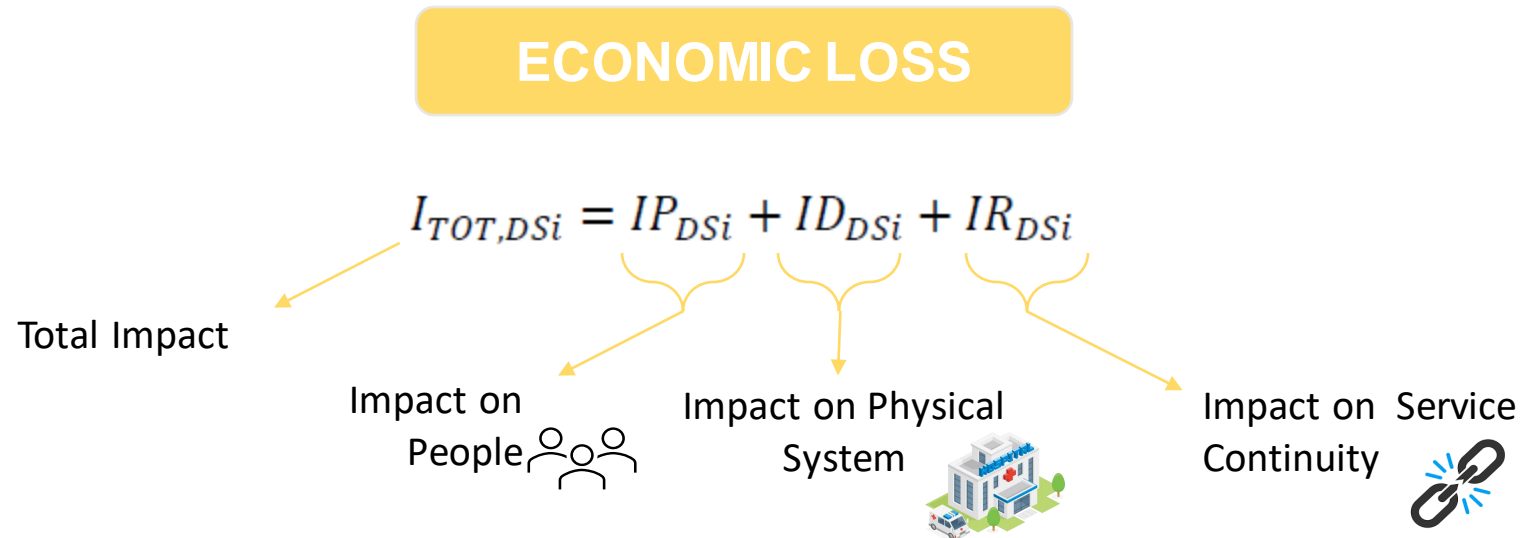
Impact on **PHYSICAL SYSTEM**

Impact on **PEOPLE**

Impact on **SERVICE CONTINUITY**

TERMINOLOGY

ECONOMIC LOSS

$$I_{TOT,DSi} = IP_{DSi} + ID_{DSi} + IR_{DSi}$$

Total Impact

Impact on People

Impact on Physical System

Impact on Service Continuity

The economic loss is a function of several data:

- **Physical characteristics** (Asset dimension, Year of construction, Construction cost, Avg. people inside the asset, etc…)

- **Context data** (Closest asset, Influence area, Regional GDP, Regional population density, etc…)

- **Resilience indicator** (Preparation, Internal resourcefulness, External resourcefulness)

**Infrastructure /
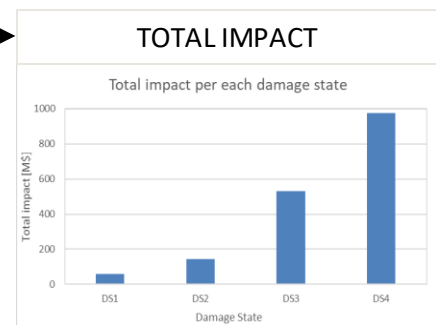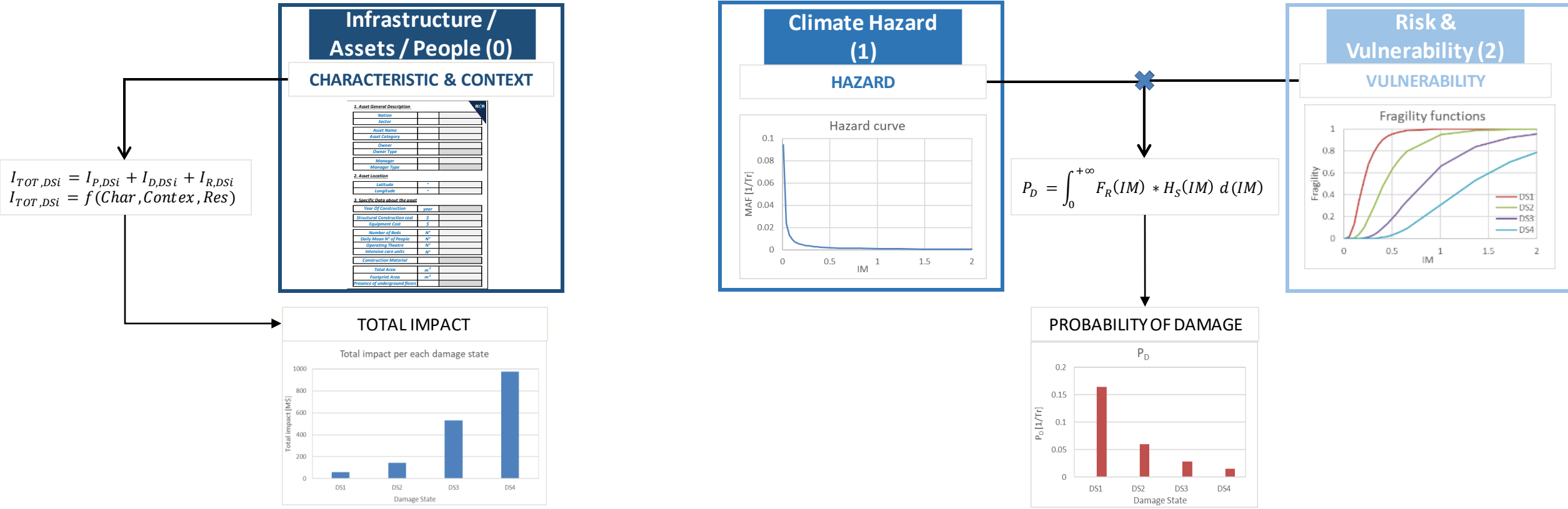Assets / People (0)**

CHARACTERISTIC & CONTEXT

1. Asset General Description

Nation		
Sector		
Asset Name		
Asset Category		
Owner		
Owner Type		
Manager		
Manager Type		

2. Asset Location

Latitude	°	
Longitude	°	

3. Specific Data about the asset

Year Of Construction	year	
Structural Construction cost	$	
Equipment Cost	$	
Number of Beds	N°	
Daily Mean N° of People	N°	
Operating Theatre	N°	
Intensive care units	N°	
Construction Material		
Total Area	m^2	
Footprint Area	m^2	
Presence of underground floors		

$$I_{TOT,DSi} = I_{P,DSi} + I_{D,DSi} + I_{R,DSi}$$
$$I_{TOT,DSi} = f(Char, Contex, Res)$$

TOTAL IMPACT

Total impact per each damage state

Module 3/6

$$I_{TOT,DSi} = I_{P,DSi} + I_{D,DSi} + I_{R,DSi}$$
$$I_{TOT,DSi} = f(Char, Contex, Res)$$

Infrastructure / Assets / People (0)

CHARACTERISTIC & CONTEXT

Climate Hazard (1)

HAZARD

Risk & Vulnerability (2)

VULNERABILITY

$$P_D = \int_0^{+\infty} F_R(IM) * H_S(IM)\, d(IM)$$

TOTAL IMPACT

PROBABILITY OF DAMAGE

$$I_{TOT,DSi} = I_{P,DSi} + I_{D,DSi} + I_{R,DSi}$$
$$I_{TOT,DSi} = f(Char, Contex, Res)$$

Infrastructure / Assets / People (0)

CHARACTERISTIC & CONTEXT

Climate Hazard (1)

HAZARD

Risk & Vulnerability (2)

VULNERABILITY

$$P_D = \int_0^{+\infty} F_R(IM) * H_S(IM) \, d(IM)$$

TOTAL IMPACT

$$\sum_{i=1}^{n} \frac{(I_{TOT,DS(i+1)} - I_{TOT,DSi})(P_{D_{i+1}} - P_{D_i})}{2}$$

PROBABILITY OF DAMAGE

Economic loss (3)

EXPECTED ANNUAL LOSS

Infrastructure / Assets / People (0) — These modules take the asset characteristics and context information from M0

Climate Hazard (1) — These modules take the hazards characterization from M1

Risk & vulnerability (2) — These modules consider the asset vulnerability defined in M2

CONNECTIONS WITH OTHER MODULES

MODULE 3 I/O

INPUT

| Infrastructure / Assets / People |
| Climate Hazard |
| Risk & vulnerability |

1. Asset Characteristics list

2. Hazard type & characterization

3. Asset Vulnerability information

OUTPUT

1. Current EAL of the Asset