

# **Natural Disasters Management: a Systemic Approach**

By

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# Outline

- Introduction
- A systemic disaster management system (SDMS) model
- Conclusions

# Introduction

- **Systemic** is not the same as Systematic
- Systematic implies to be 'methodical' or 'tidy'
- **Systemic** implies being able to see events as products of the working of a system
- System may be defined as a whole which is made of parts and relationships

- 'failure' may be seen as a product of the working of a system

And within that

- life, injury, property & economical loss as results of the working of a system

## **The Aim:**

to construct a sufficient structure for a disaster management system

## **The Approach Adopted:**

apply concepts of systems to the construction of a disaster management system.

## **Draws on:**

{1} *Systemic Safety Management System (SSMS)*

{2} *The Viable System Model* of Stafford Beer

{3} *The Failure Paradigms Approach* of Joyce Fortune & Geoff Peters

Stafford Beer created what he called a ***Viabile System Model***, which is centred on five basic functions and inter-connections.

By *Viabile* he meant able to maintain a 'separate existence'.

Fortune & Peters created ***Paradigms*** as templates for comparison with the real world. For example, the 'communication paradigm'. (Also several Human Factors paradigms)

# The key characteristics of the SDMS

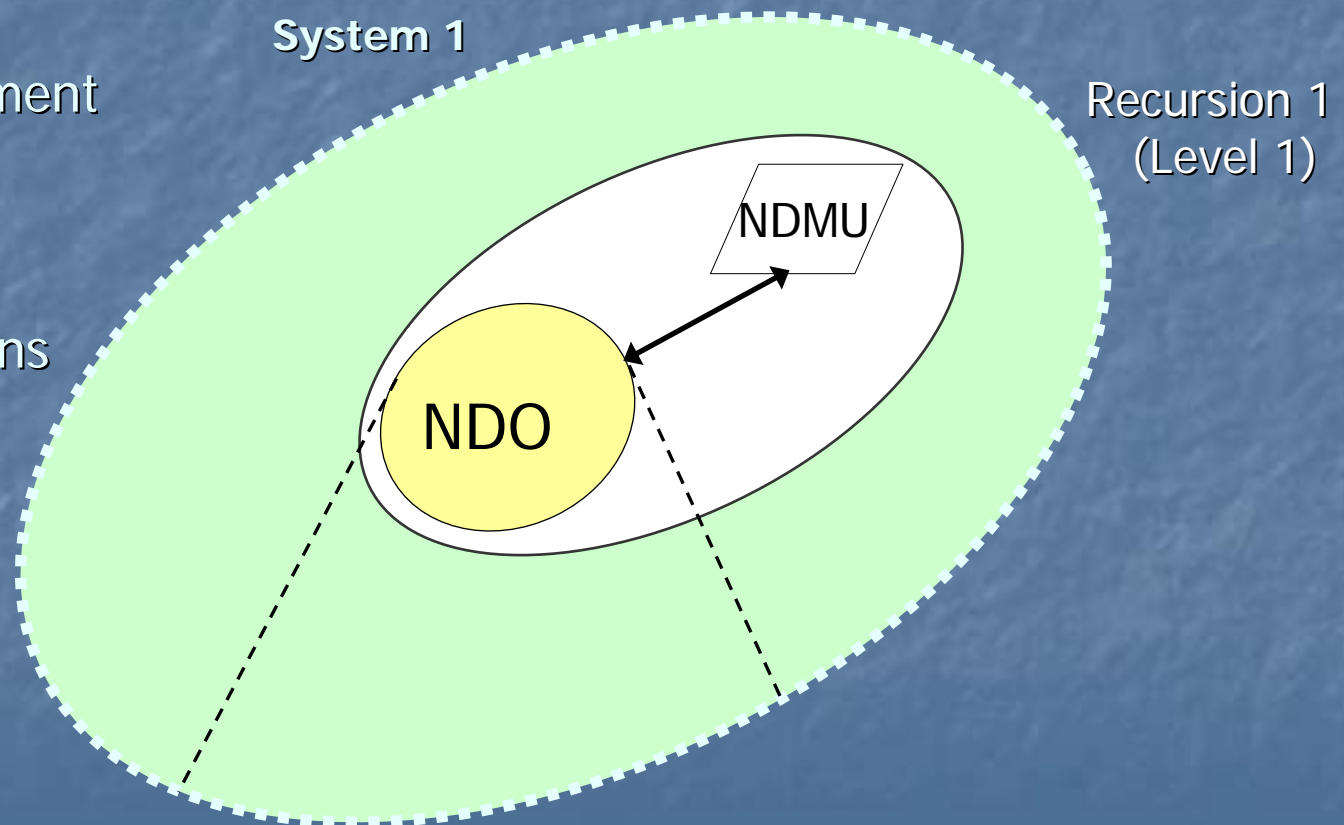
- A recursive structure (i.e. 'layered') and relative autonomy
- The SSMS and Its 'Environment'
- A structural organization which consists of a 'basic unit' in which it is necessary to achieve five functions associated with systems 1 to 5.
- Concepts of *Viability*, MRA (Maximum Risk Acceptable) and acceptable range of risk
- Four principles of organization
- 'Paradigms' are intended to act as 'templates' giving essential features for 'human factors' and for effective communication & control.

# Recursive structure of the SSMS

- *Recursion* may be regarded as a 'level', which has other levels below or above it

NDMU= National  
Disaster Management  
Unit

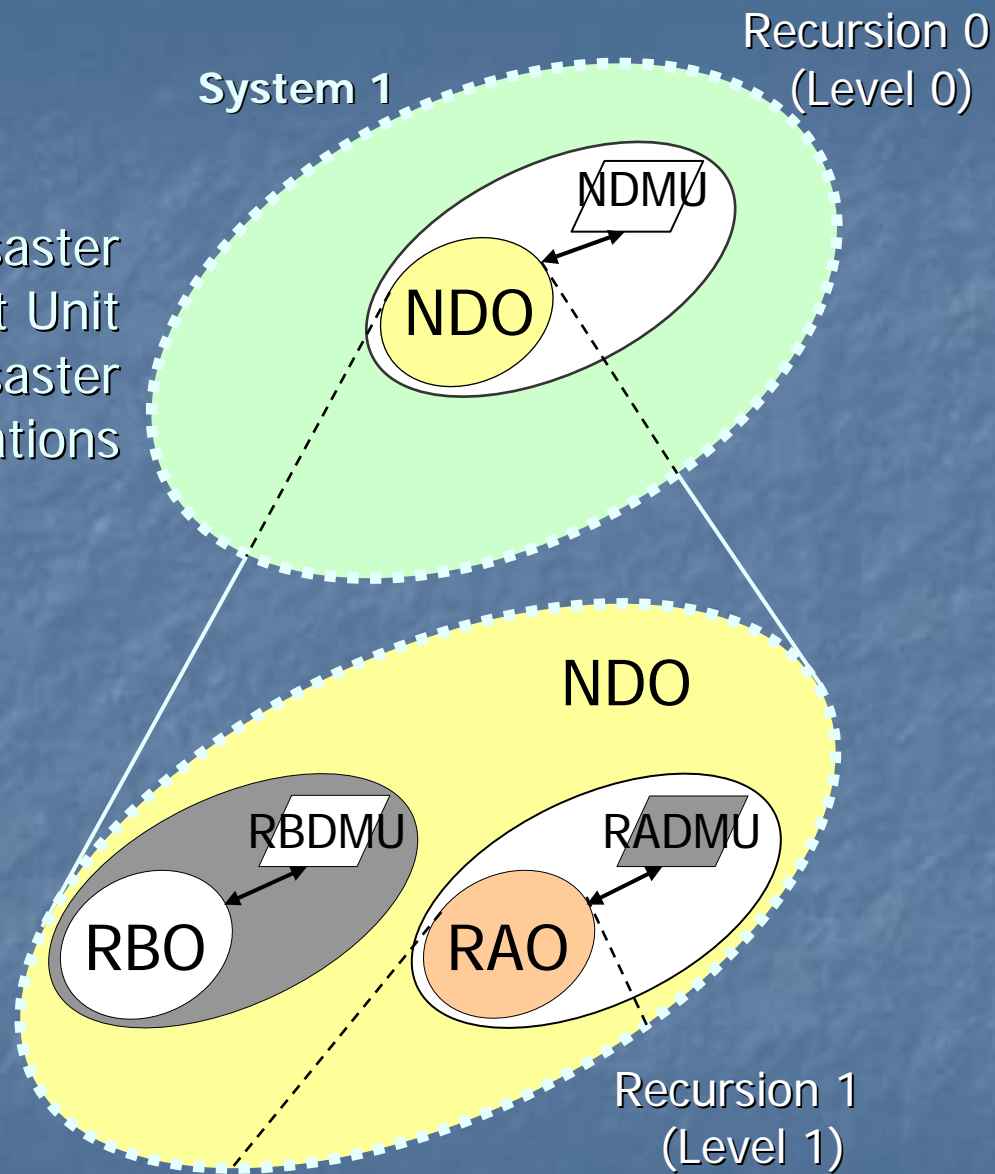
NDO= National  
Disaster Operations



NDMU= National Disaster Management Unit  
NDO= National Disaster Operations

RADMU= Region-A Disaster Management Unit  
RAO = Region-A Operations  
RBDMU = Region-B Disaster Management Unit  
RBO = Region-B Operations

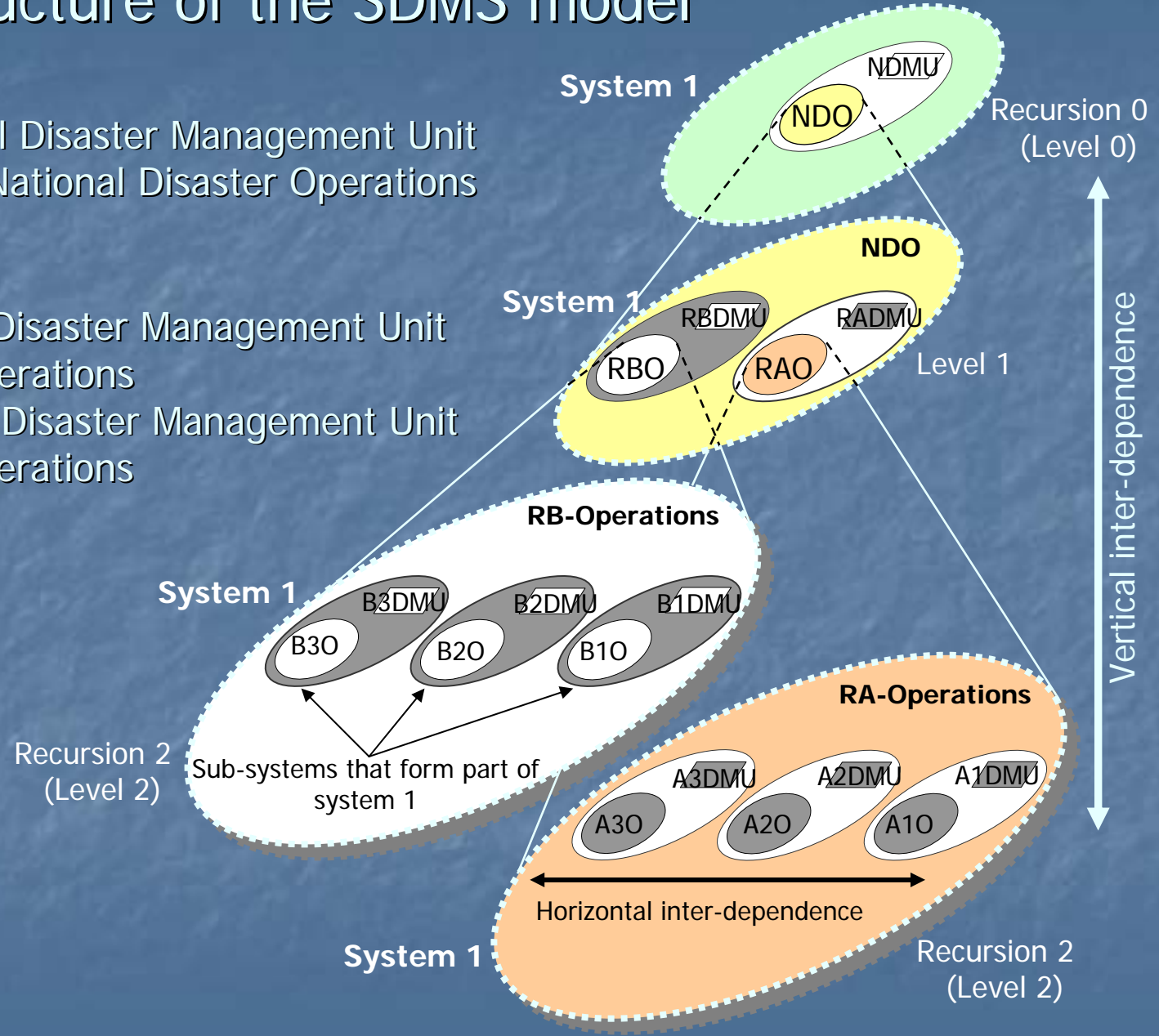
System 1



# Recursive structure of the SDMS model

NDMU= National Disaster Management Unit  
 NDO= National Disaster Operations

RADMU= Region-A Disaster Management Unit  
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 RBDMU = Region-B Disaster Management Unit  
 RBO = Region-B Operations



COUNTRY LEVEL

REGION LEVEL

SUB-REGION LEVEL

VILLAGE/  
COMMUNITY LEVEL

System 1

System 1

System 1

System 1

Recursion 0  
(Level 0)

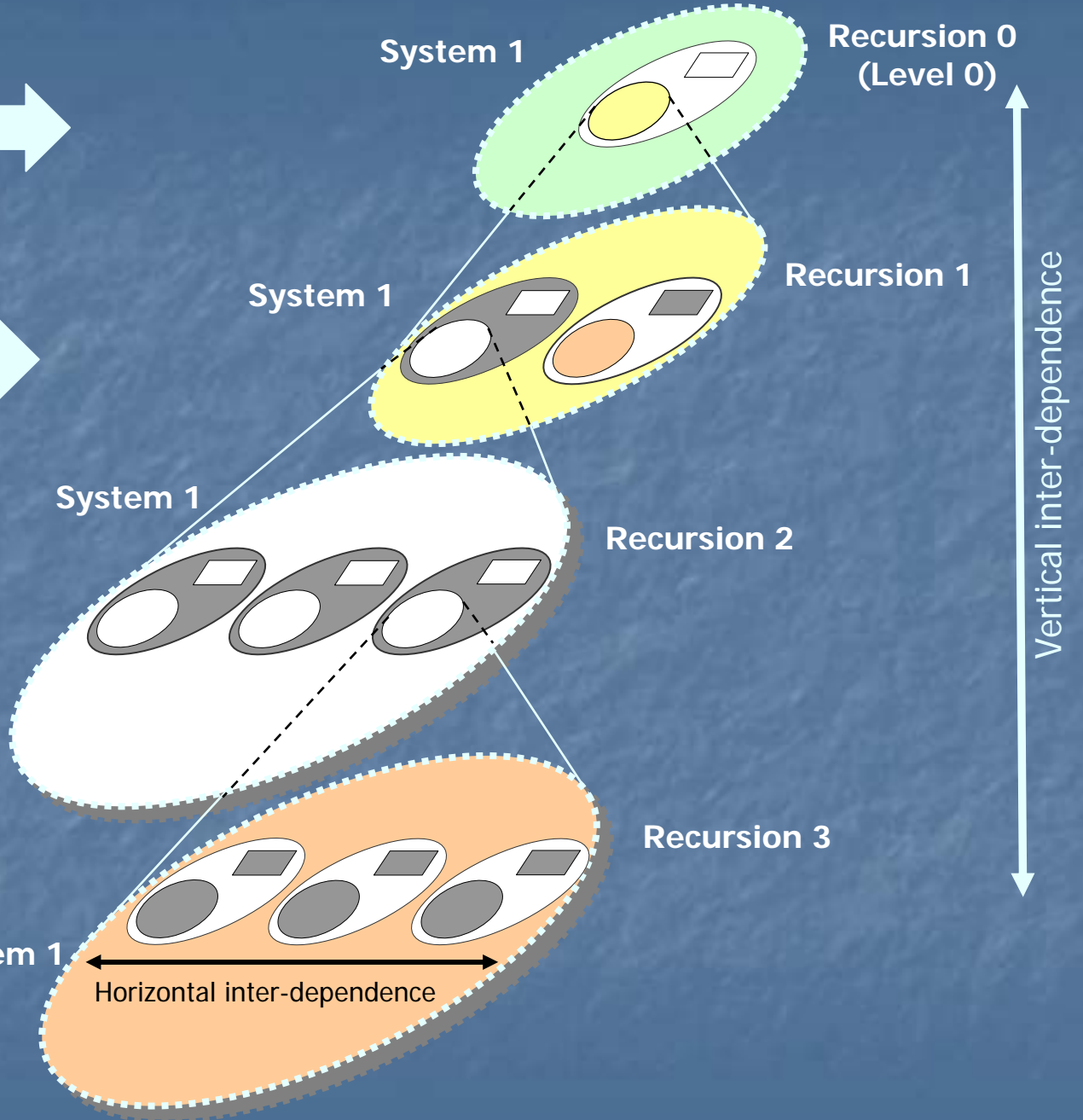
Recursion 1

Recursion 2

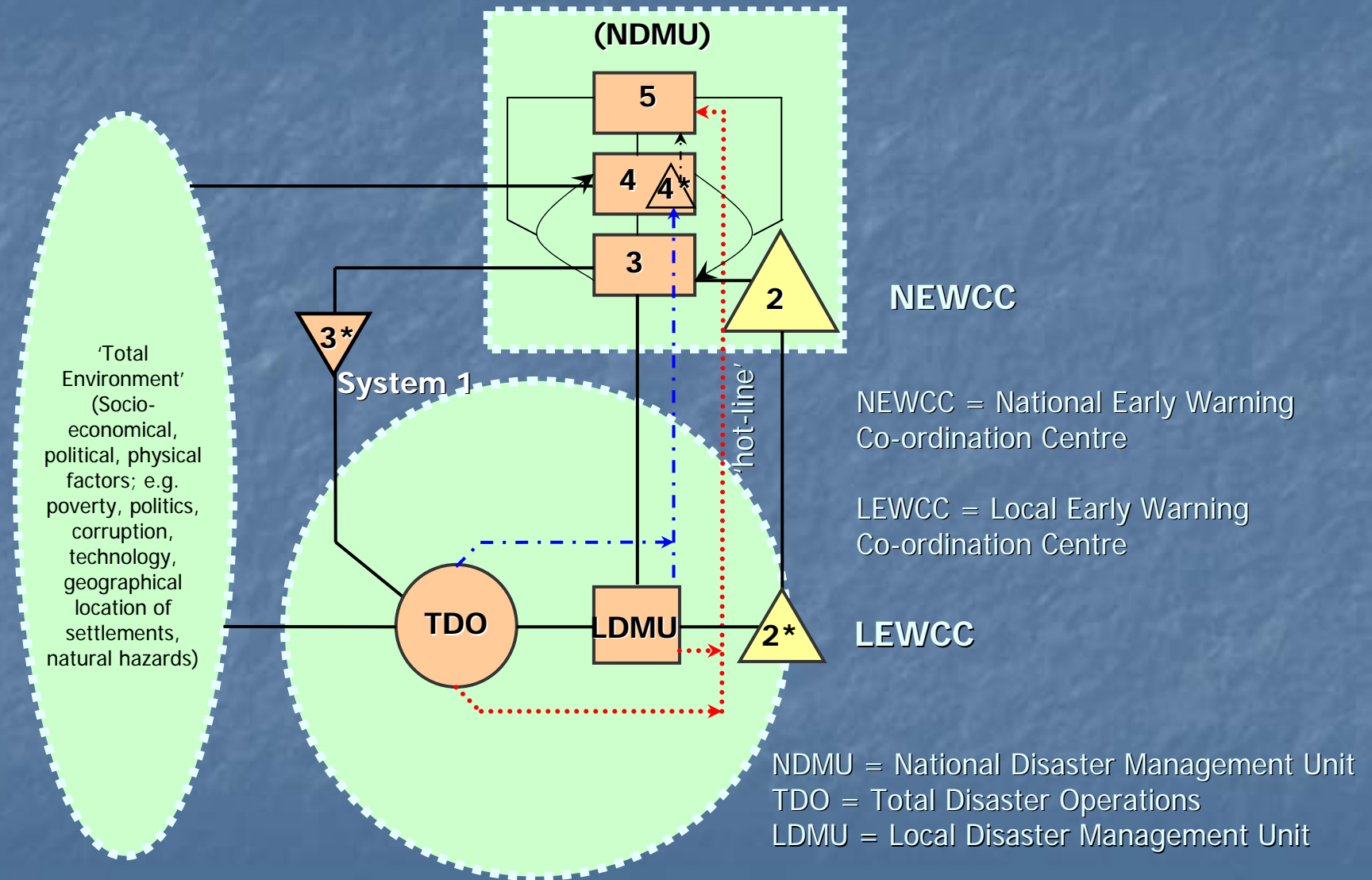
Recursion 3

Horizontal inter-dependence

Vertical inter-dependence



# The structural organization of the SDMS Model



# The 'environment'



Environment

'Environment' may be understood as being those circumstances to which the SDMS response is necessary.

'Environment' lies outside the SDMS but interacts with it; it is the source of circumstances that threaten the system;

(poverty, politics, corruption, technology, geographical location of settlements, natural hazards)

## **System 1: Disaster- policy implementation**

implements safety policies in the organization's operations. System 1 consists of one or more operations; i.e. it might be de-composed on a basis of geography. For example, system 1 might be broken down into zones, regions, communities, etc.

## **System 2: Disaster-TEWCC**

coordinates all the activities of the operations that form part of system 1 (see Fig. 1) and in relation to the 'total environment'. Furthermore, it also coordinates other local early warning coordination centres (LEWCCs).

## **System 2\*: Disaster-LEWCC:**

is part of system 2 and it is responsible for communicating advance warnings to other early warning coordination centres and to key decision makers in order to take appropriate actions prior to the occurrence of a major natural hazard event.

### **System 3: Disaster-functional:**

is directly responsible for maintaining disaster risk within an acceptable range in system 1 on a daily basis. It ensures that system 1 implements the organization's safety policy. It is also responsible for allocating the necessary resources to system 1 to accomplish the organization's disaster prevention plans. (e.g. Allocation of resources for the training of personnel who will help to evacuate people from the affected areas due to a natural disaster; such as an earthquake or hurricane, etc. )

### **System 3\*: Disaster-audit:**

is part of system 3 and its function is to conduct audits sporadically into the operations of system 1. System 3\* intervenes in the operations of system 1 according to the safety plans received from system 3. The revisions of the adequacy and the functioning of the engineering services and fixed installations that may be used in case of a natural disaster (e.g. shelters, electricity supply systems, water supply systems) are examples of the action of system 3\*.

## **System 4: Disaster-development:**

is generally concerned with the 'total environment' and its function is to conduct research and development (R&D) for the continual adaptation of the disaster management system. By considering strengths, weaknesses, threats and opportunities, system 4 can suggest changes to the organization's safety policies.

## **System 4\*: Disaster-confidential reporting system**

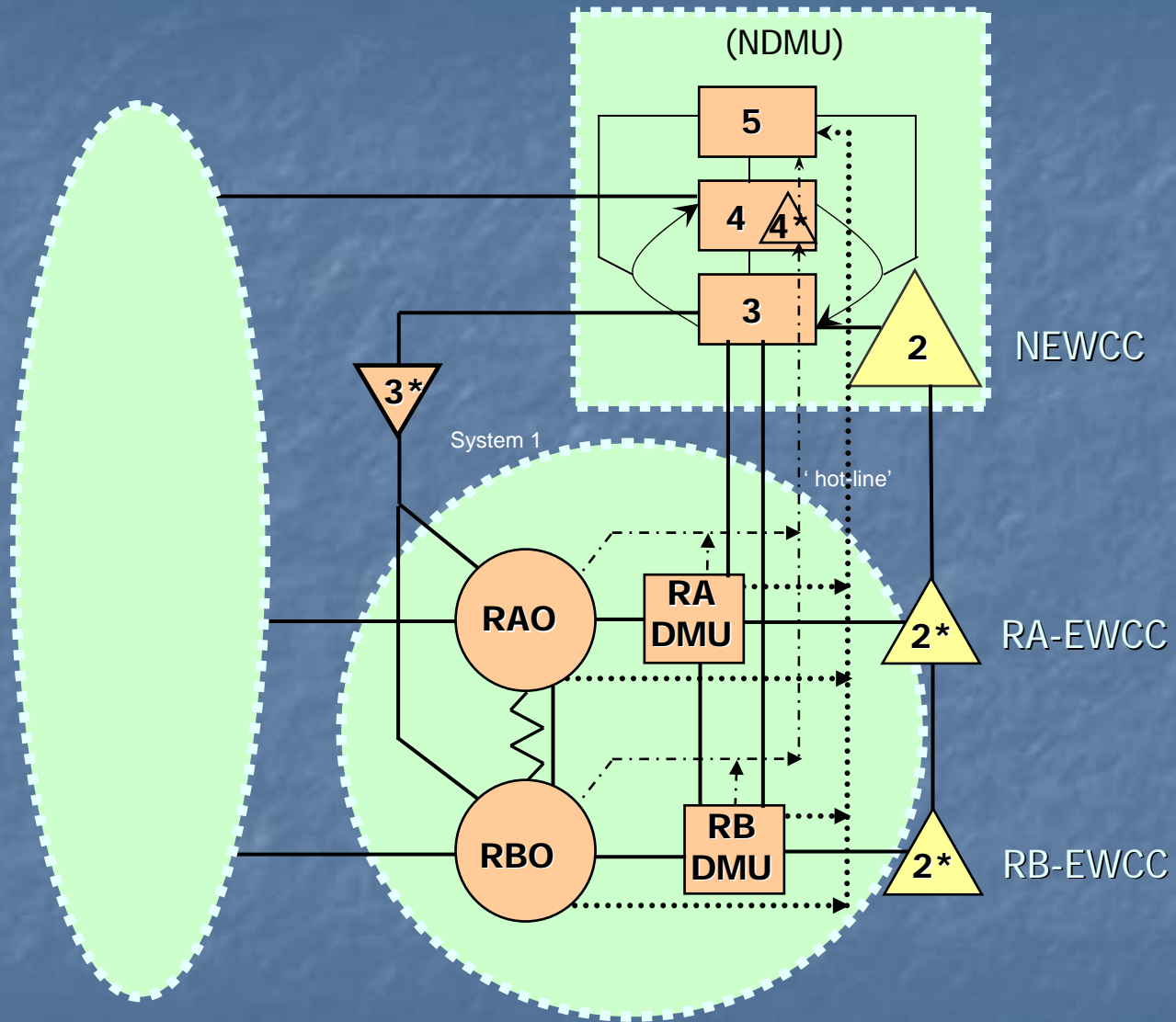
is part of system 4 and it is concerned with confidential reports or causes of concern from any person of the public about any aspects, some of which may require the direct intervention of system 5. An example of system 4\* may be a confidential report regarded to looting of shops, private houses, hospitals, schools, universities, banks, etc.

## **System 5: Disaster-policy:**

is responsible for deliberating safety policies and for making strategic decisions. System 5 also monitors the activities of system 4 and system 3. An example of system 5's policies is to address the prevention of injuries/deaths from natural disasters. These policies should also promote the culture of prevention throughout the organization and amongst the people, local governments, etc.

### **{i} 'Hot-line':**

Fig. 1 shows a dash line directly from system 1 to system 5, representing a direct communication or 'hot-line' for use in exceptional circumstances; for example, during an emergency.



# Viability of the SDMS

***Viability*** has been given a probabilistic interpretation

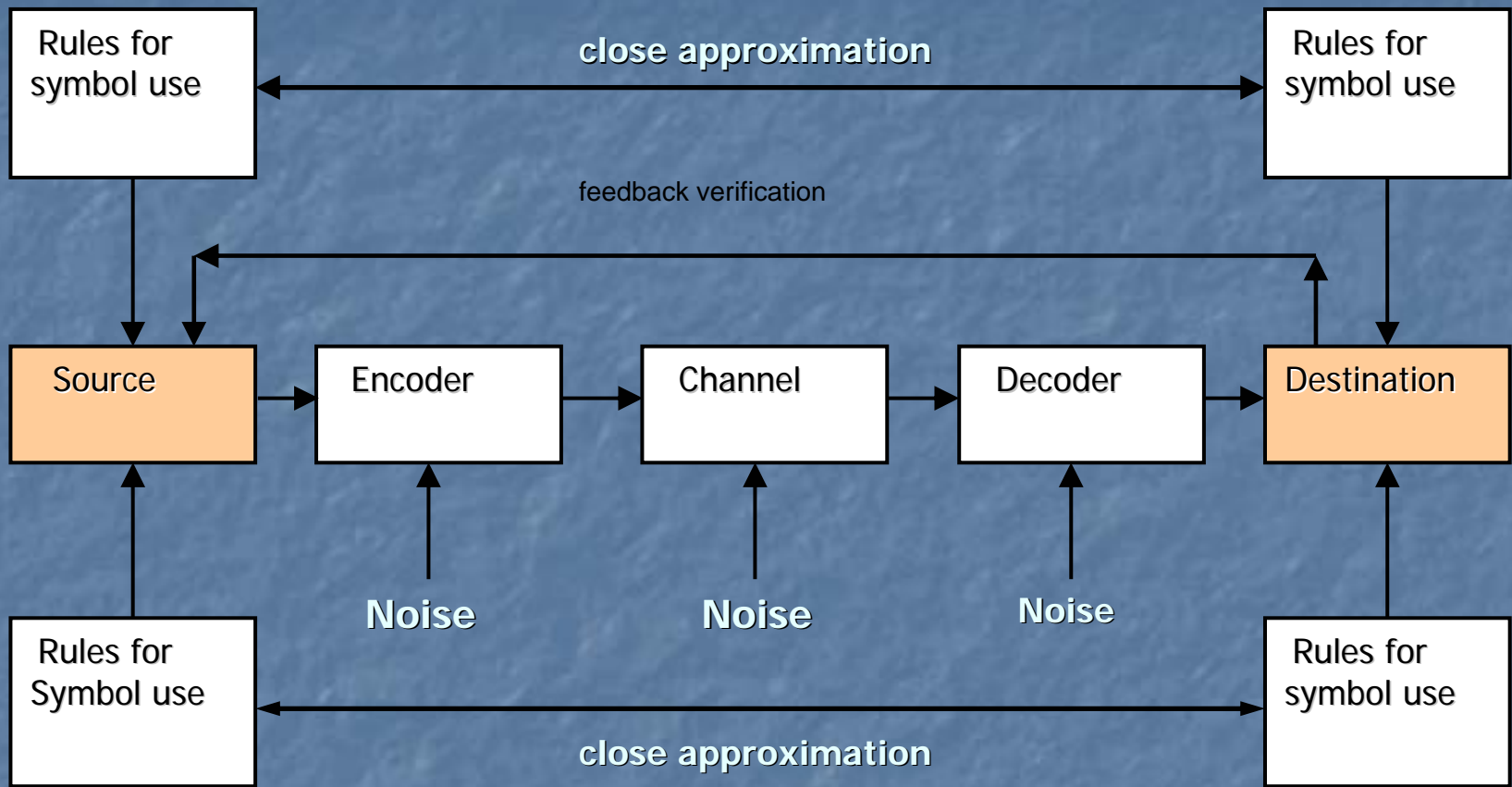
*Viability = P (the SDMS has the capacity to maintain the risk within an acceptable range for a stated period of time).*

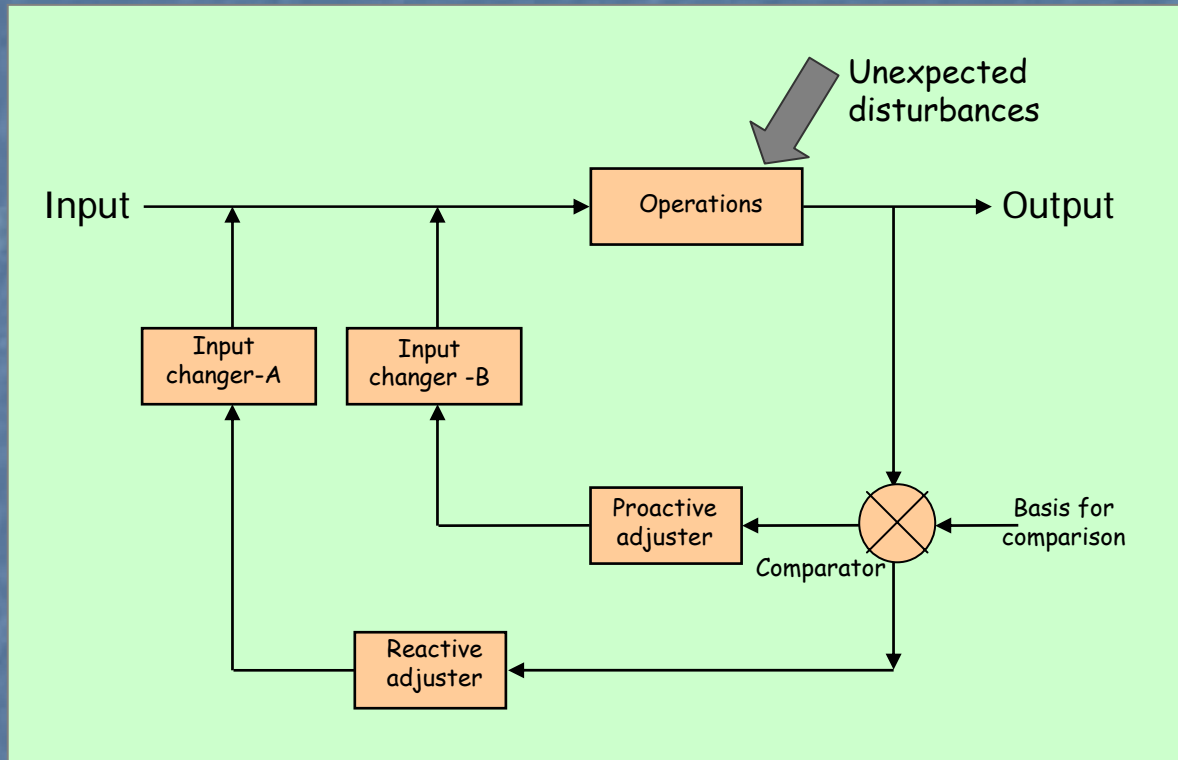
# Paradigms for Communication and control

## Communication

Communication is vital in the management of disasters. The communication paradigm is intended to help to identified weaknesses of the SSMS; i.e., links missing, inadequate, etc.

A communication paradigm has been suggested by Fortune and Peters (1995).





## Control Paradigm

# Conclusions

- A Systemic Disaster Management System (SDMS) model has been put forward.
  - The SSMS aims to maintain disaster risk within an acceptable range whatever that might be.
  - If the features of the model; i.e. the systems, their associated functions, and the channels of communication are in place and working effectively then the probability of failure should be less than otherwise.
  - The idea of the *viability* of a SDMS has been introduced

- The model is capable of being applied proactively in the case of a new system or an existing one as well as reactively.
- In the latter case a past disaster may be examined using the SDMS model. In this way, lessons may be drawn from past failure.
- It may also be employed as a 'template' to examine an existing 'DMS'.
- It is hoped that this approach will lead to more effective management of disaster risk.