



– La Démarche de prévention –

Interdependencies and Domino Effects between Lifeline Networks

**Benoît ROBERT
Luciano MORABITO**

OTTAWA – November 10th 2005



**NSERC
CRSNG**

- Plan of the Presentation -

Plan of the Presentation

- Centre risque & performance*
- Project**
- Approach : Démarche de prévention**
- Methodology**
- Concrete Results**
- Conclusion**
- Questions**

– Centre risque & performance –

- ❑ Created in 2000 by Benoît Robert**

- ❑ Study Areas :**
 - ❑ Interdependences between Infrastructures (Lifeline Networks – Critical Infrastructures) ;**
 - ❑ Vulnerabilities of Infrastructures ;**
 - ❑ Dominos effects**
 - ❑ Emergency measures planning**

- ❑ Academic activities :**
 - ❑ Courses, Seminars, Scientific committees**

– Project –

❑ **3 Objectives :**

- ❑ **Develop a new methodology of risk management based on the interdependences between Lifeline Networks ;**
- ❑ **Develop concrete risks management tools allowing to prevent domino effects regardless of the events likely to generate failures ;**
- ❑ **Increase knowledge on problematic related to the interdependences between interrelated infrastructures.**

4 Stages :

- Characterization of socio-economic environments ;**
- Characterization of Lifeline Networks ;**
- Identification and characterization of interdependences between Lifeline Networks ;**
- Creation of a space of cooperation between Lifeline Networks.**

– Démarche de prévention –

❑ Based on principles 15, 18 and 19 of the 1992 Rio Declaration :

❑ Principle 15

« In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. »

❑ Based on principles 15, 18 and 19 of the 1992 Rio Declaration :

❑ Principle 18

« States shall immediately notify other States of any natural disasters or other emergencies that are likely to produce sudden harmful effects on the environment of those States. Every effort shall be made by the international community to help States so afflicted. »

❑ Based on principles 15, 18 and 19 of the 1992 Rio Declaration :

❑ Principle 19

« States shall provide prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse transboundary environmental effect and shall consult with those States at an early stage and in good faith. »

□ Statement :

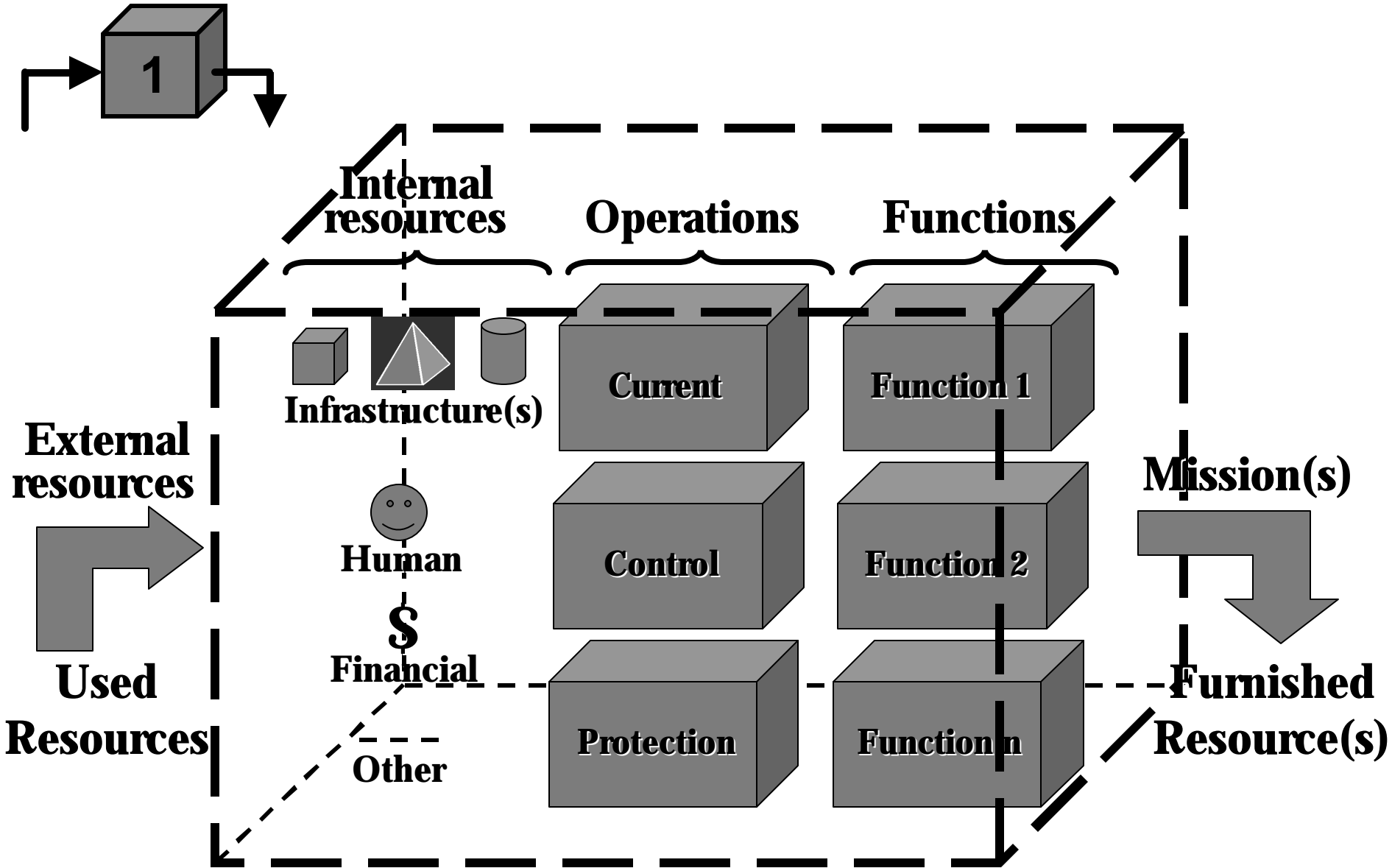
The entities which interact into the same socio-economic environment, must establish a space of cooperation in order to anticipate the whole of the harmful consequences generated by potential failures of one or more of the entities.

A proactive approach of risk management must take into account the evolutionary state of the entities to communicate relevant information necessary to the planning of efficient, effective and reasonable protection measures.

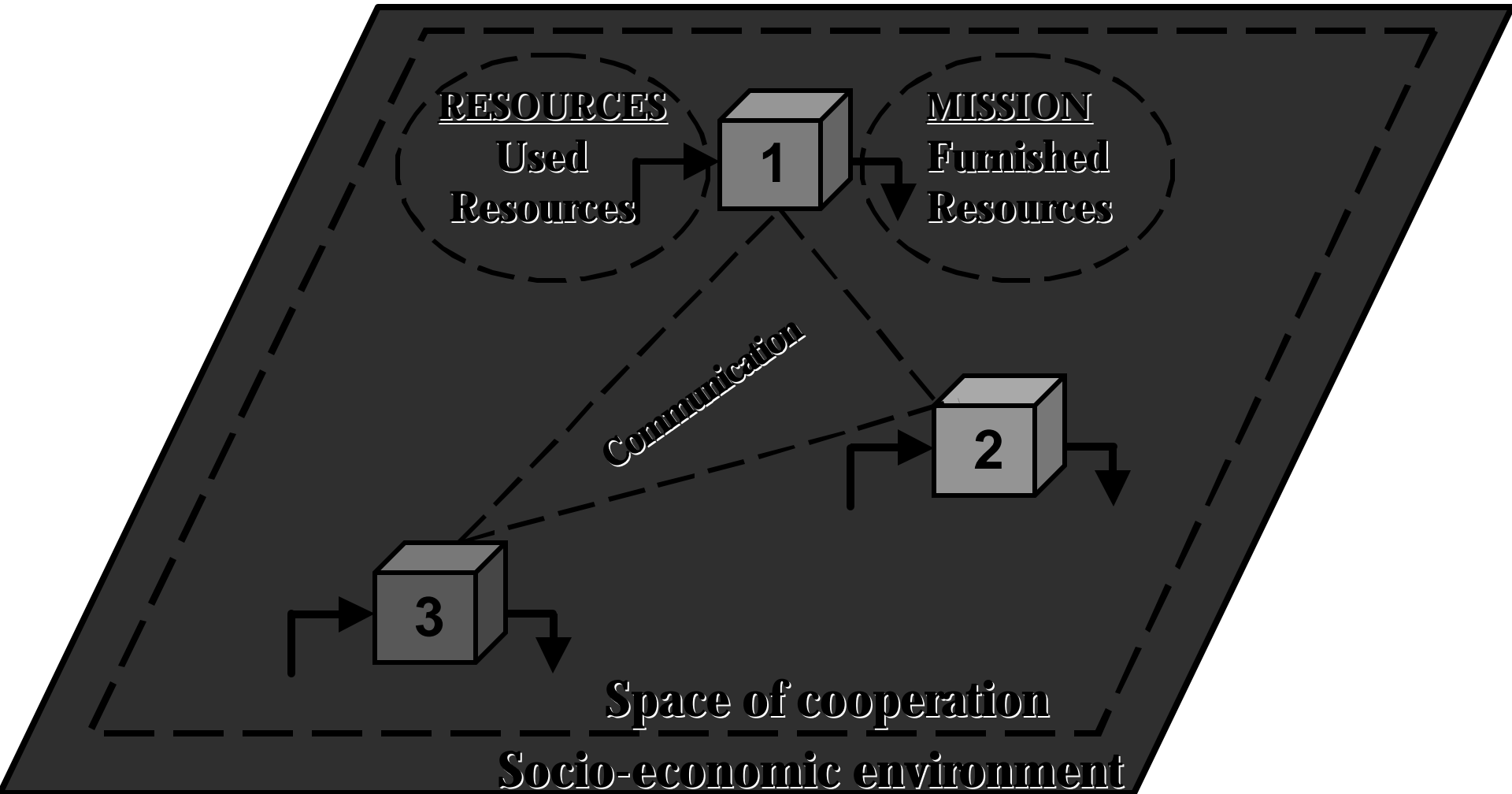
- Methodology -

Complex System

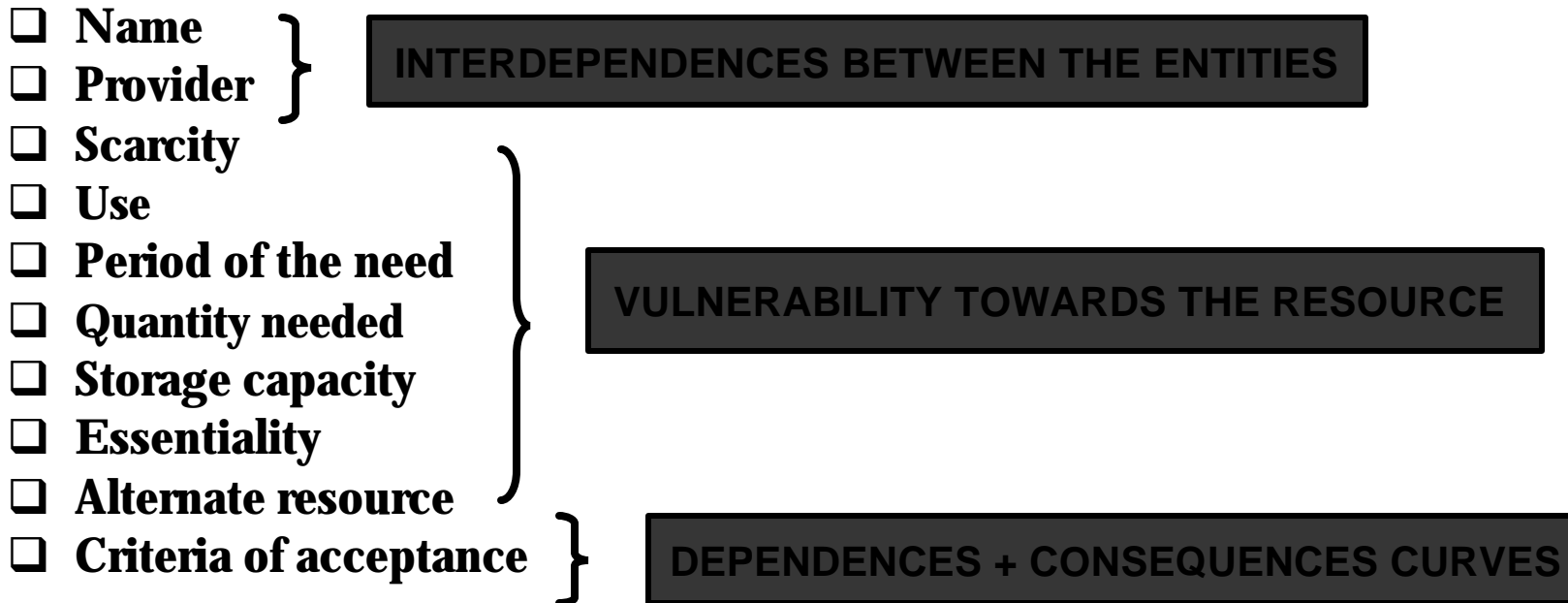
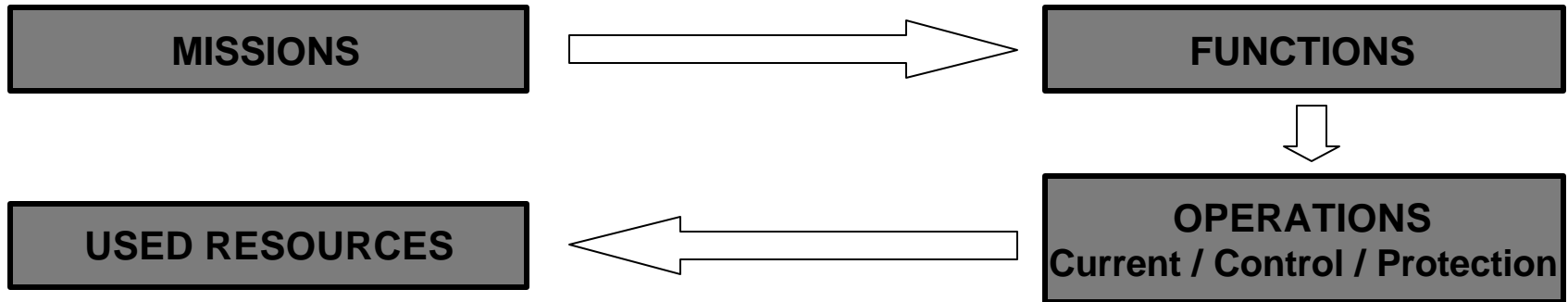
Methodology



Methodology



Methodology

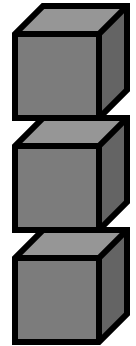


**Evaluation of the interdependences between
Lifeline Networks**

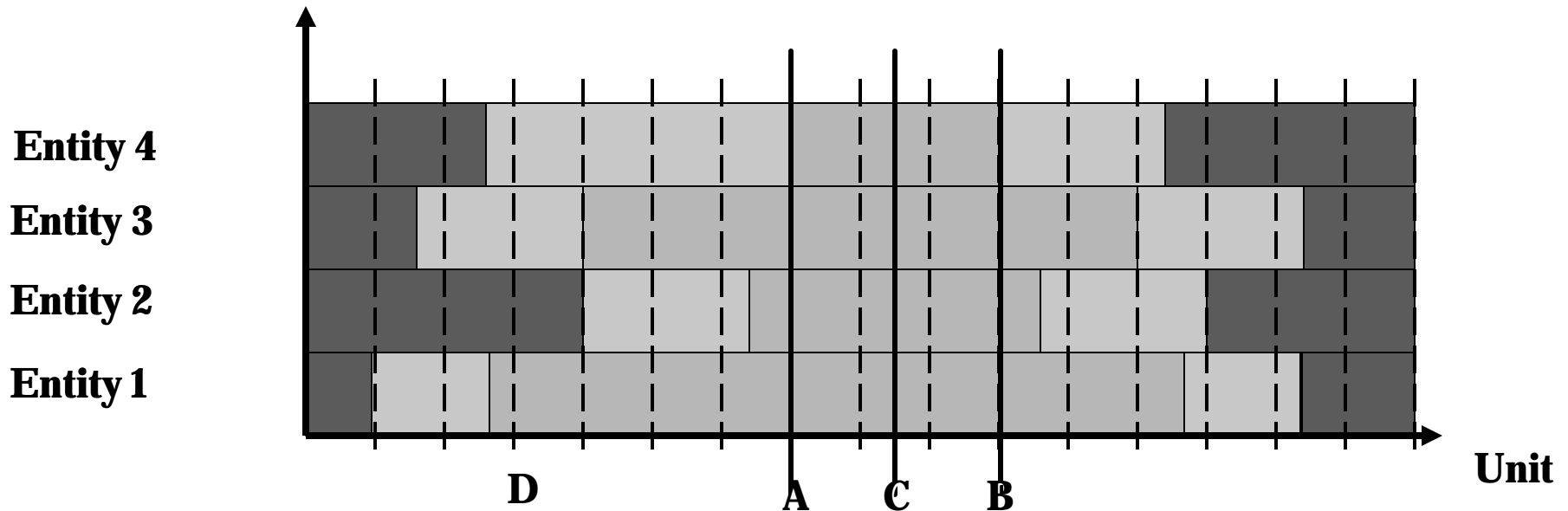
DEPENDENCY CURVES

Criteria of acceptance of the resources

- Zone of optimal functioning**
- Zone of failure functioning**
- Zone of not-functioning**

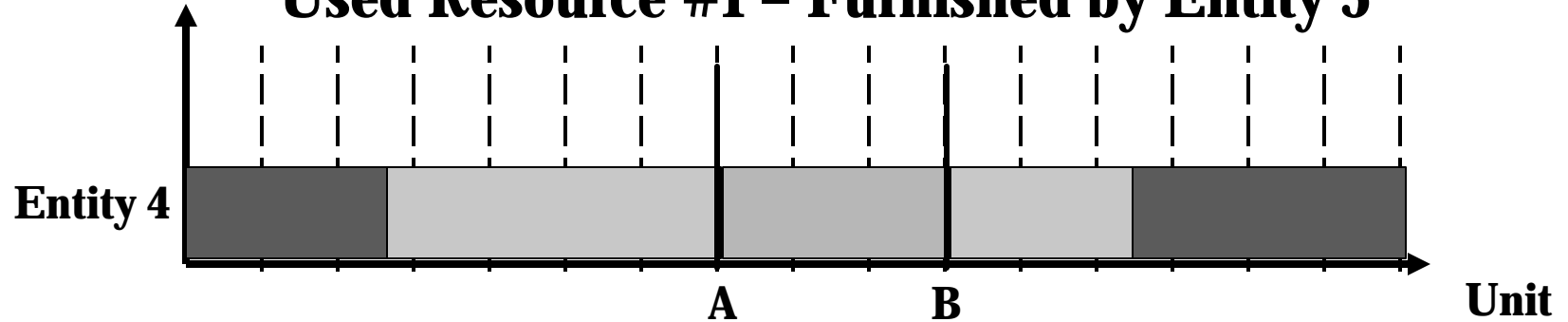


Used Resource #1 – Furnished by Entity 5

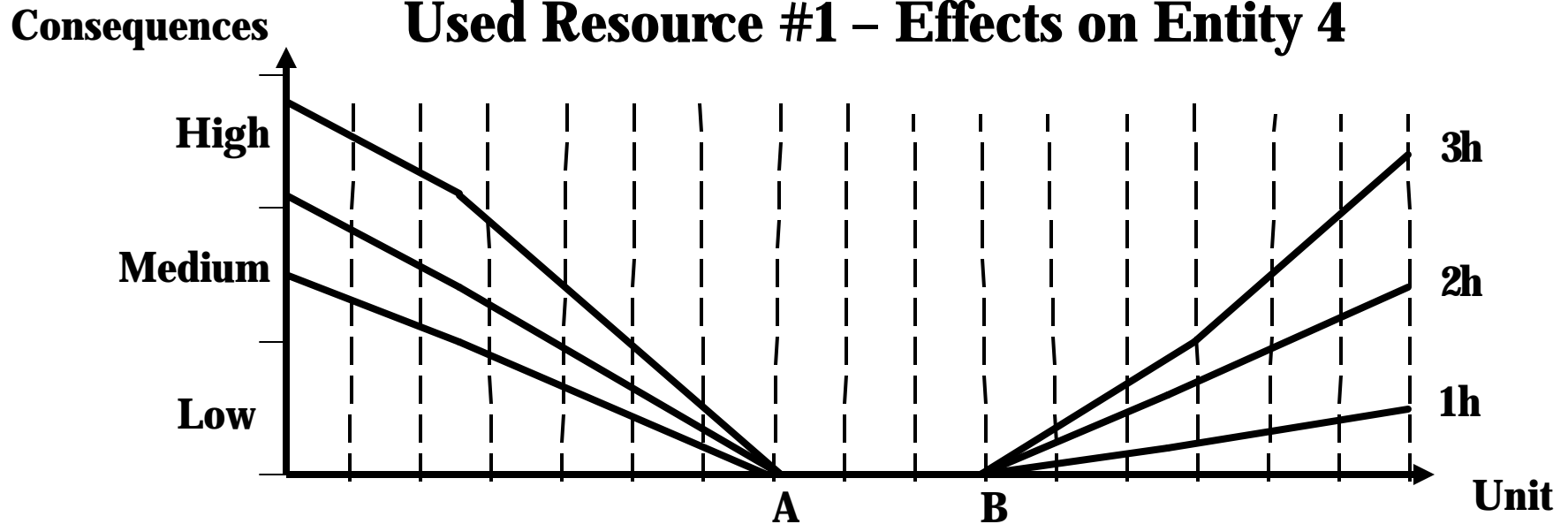


CONSEQUENCES CURVES

Used Resource #1 – Furnished by Entity 5



Used Resource #1 – Effects on Entity 4



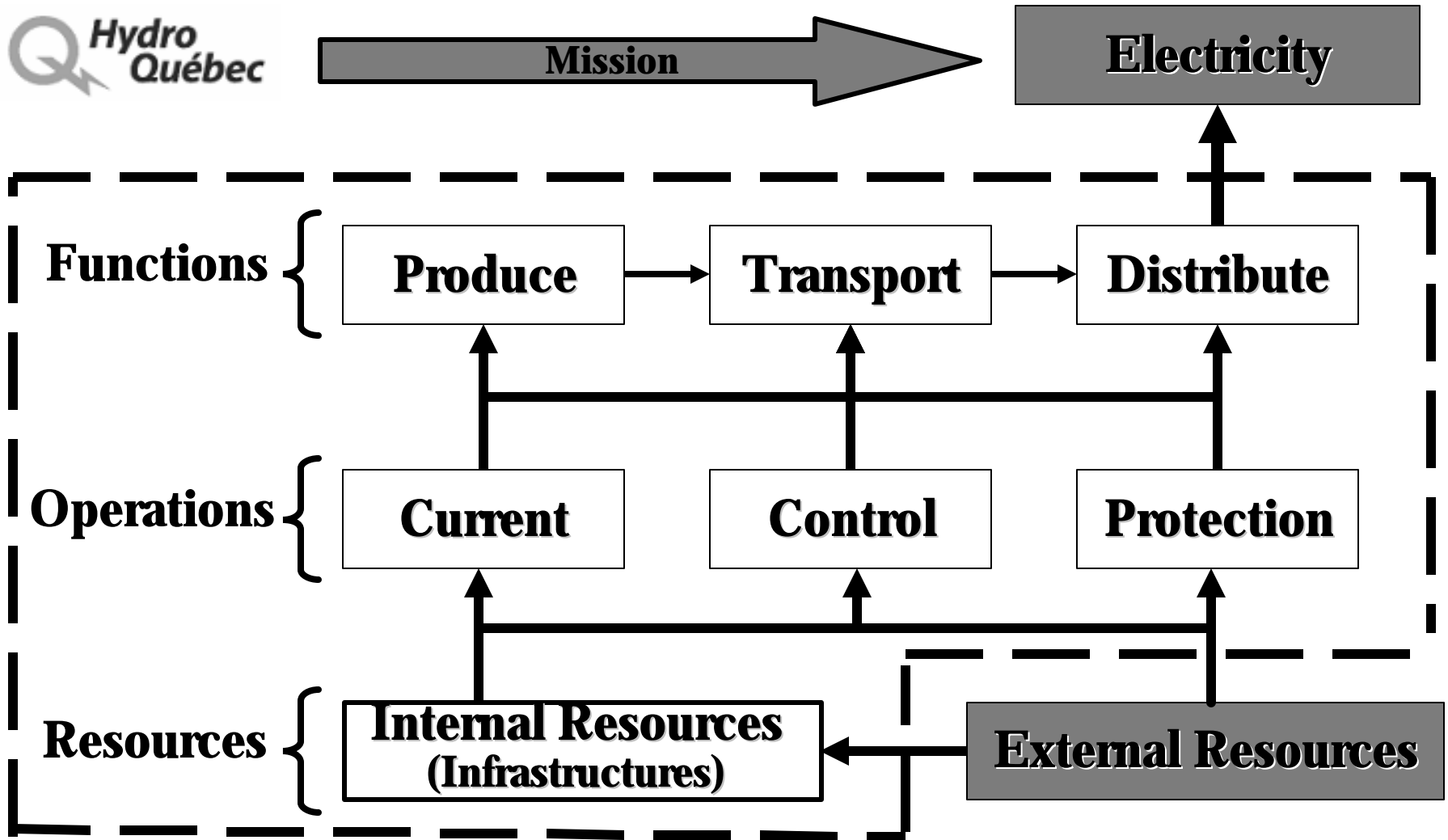
- Concrete Results -

□ Characterization of the Environment :

Downtown Montreal



The image shows a map of Downtown Montreal with several logos and images overlaid. The logos include: Montreal (with a fleur-de-lis symbol), Transports Québec (with a fleur-de-lis symbol), Bell (with the slogan "Et bien simple."), Hydro Québec (with a stylized 'Q'), and GazMétro (with the slogan "la vie en bleu"). Images include a concrete pump truck, two traffic lights, and a large letter 'H' in a box. The map shows streets like Camillien-Houde, Vanier, Mansfield, University, René-Lévesque, Ville-Marie, Notre-Dame, Saint-Denis, and Viger. The St. Lawrence River is visible at the bottom.

□ Identification of the external resources :



❑ Interdependences Matrix :

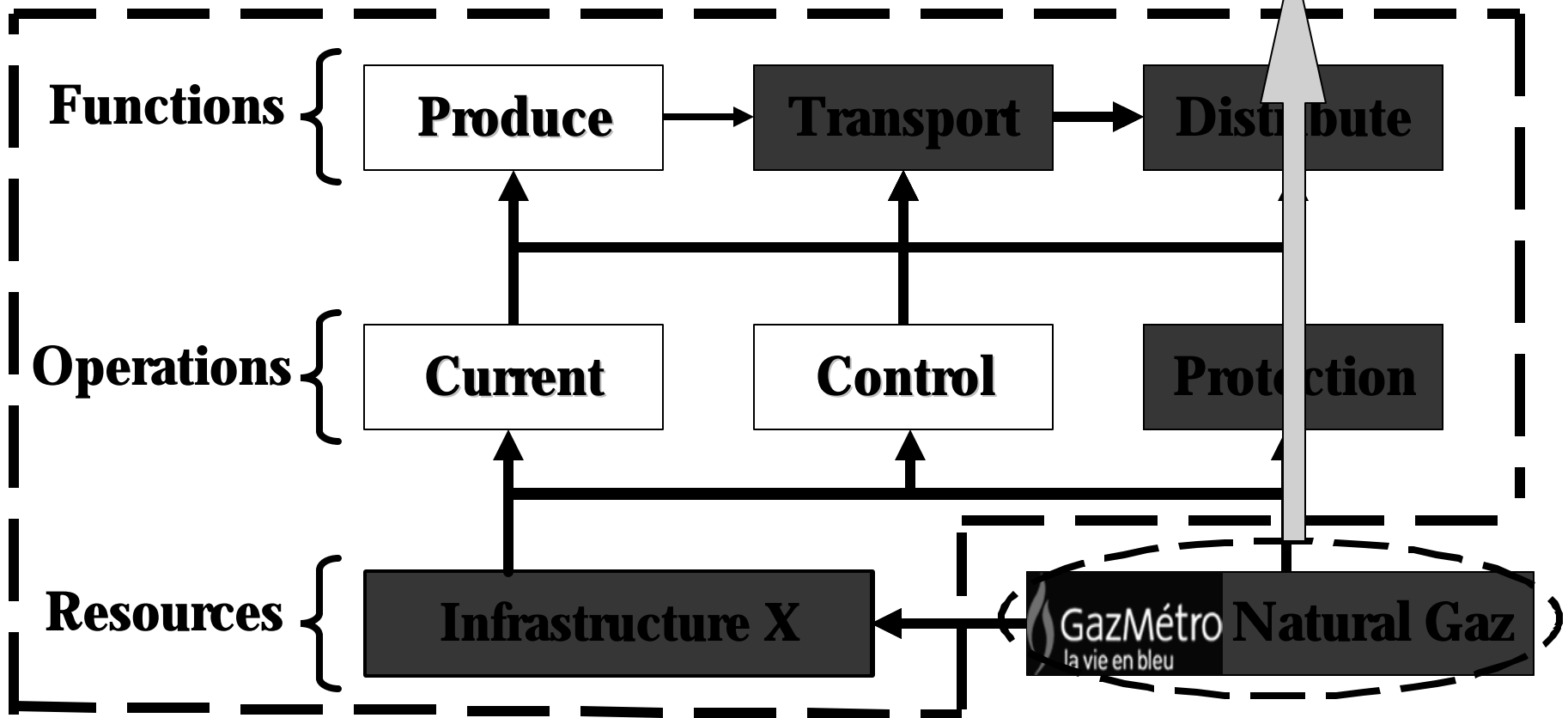
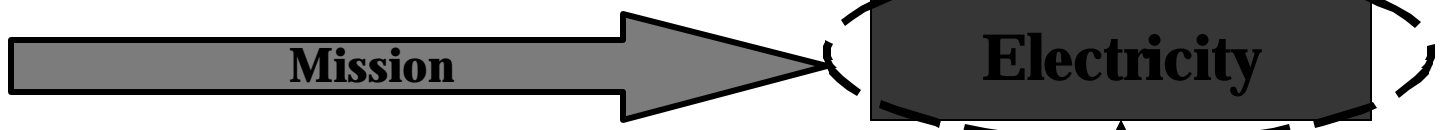
- **Resource** : Natural Gas
- **Provider** : GazMétro
- **User** : Hydro-Québec
- **Mission** : Electricity
- **Function** : Transportation
- **Operation** : Protection
- **Infra** : Infrastructure X
- **Scarcity** : High (1 provider)
- **Use** : Power Generation
- **Period of the need** : Power Breakdown
- **Quantity needed** : N/A
- **Storage capacity** : None
- **Essentiality** : High in period of need
- **Criteria of acceptance** : N/A
- **Alternate resource** : None

Hydro Québec		Transports Québec 			Montréal 		
C	P	C	C	P	C	C	P
		✓			✓		
	✓						
		✓			✓		
✓					✓		
	✓	✓					

Concrete Results

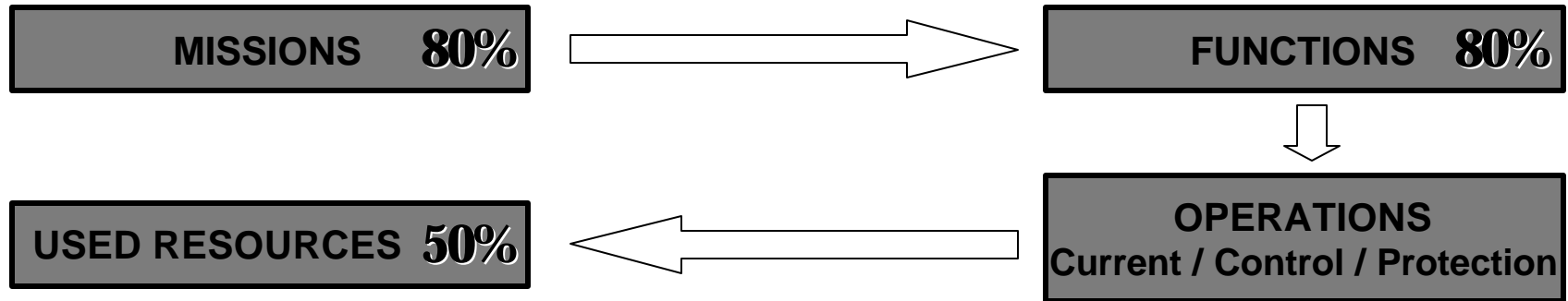
❑ Example :

Vulnerability ← ||| ?



- Conclusion -

Conclusion



**Evaluation of the interdependences between
Lifeline Networks**

25%

Questions

