



## How do forest stakeholders perceive and cope with multiple risks?

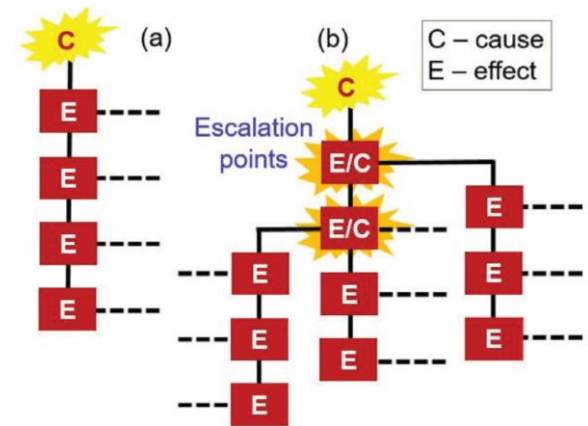
An exploratory survey in the Gascony forest

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(Inrae Bordeaux) and BSA students*

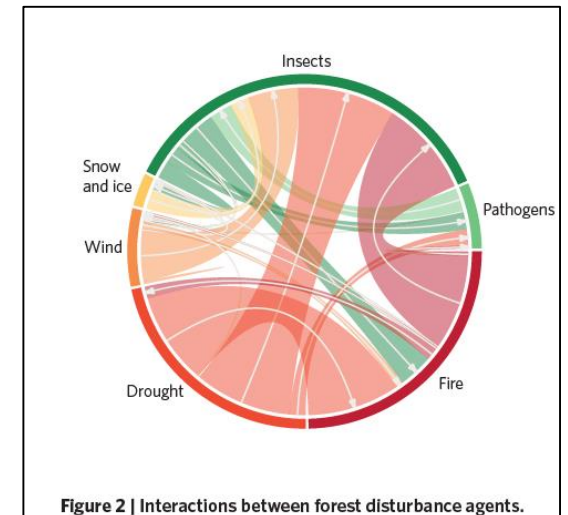
*IUFRO World Congress- Small-scale forestry group 3.08 side-event,  
Stockholm, 24th June 2024*

## What are multiple risks?

- Silo-based approach : a scientific expertise for each forest disturbance agents
- Multiple risk approach : (Seidl et al. 2017; Alexander & Pescaroli, 2019)
- Line of **toppling dominoes**, in which an impact is propagated through a series of different domains
- Risks are **differently connected**:
  - Coumpound (no direct links R1, R2)
  - Interconnected (R1<->R2)
  - Cascading (R1->R2->R3) ,
  - Natural-technological (R1N; R2T)
  - complex (R1<->R2, R3, R4->R5->R4)
  - With amplification effects and retroaction



Alexander & Pescaroli, 2019



Seidl et al 2017

## 2 – Objectives, Material & Methods

### Research questions

- Does it make sense to introduce socioeconomic and political risks in addition to biotic/abiotic risks?
- Which risk interactions do forest stakeholders perceive?
- What are the vulnerability paths by which risk cascades propagate?
- What strategies do they implement to prevent/stop cascading effects ?

### Hypothesis :

- Risk is a social construction -> Stakeholders perceive risks differently
- Selection of risk based on whose voice predominates (Douglas 1982)
- Competition for the “right” definition of the problem/risk, “the most important priority” and who/what is really at stake
- Subjective combinations/hierarchies of risks and unequal exposures to multiple risks

### Case study area :

- Gascony forest (1 million ha of Pinus pinaster) - 92% privately-owned

### A qualitative survey, semi-directive interviews (n=34) in 2021

- 3 groups : Forest owners, Wood industrialists and scientists



# 2 – Objectives, Material & Methods

## Macro-mapping of risk perception via stakeholders interviews (Desroches & Delmotte, 2015)

- Risk quantification by 4 criteria **Severity, Likelihood, Loss, Effort**
- Multi-hazards considered altogether and ranked according to a Likert-scale (1-5)
- Framework of acceptability (for decision support): acceptable, tolerable and unacceptable

		Severity				
		1	2	3	4	5
Likelihood	5	1	2	3	3	3
	4	1	2	2	3	3
	3	1	1	2	2	3
	2	1	1	1	2	2
	1	1	1	1	1	2

Hazards	Severity/ Likelyhood/ Loss / Effort			
	S	L	Lo	E
Fire	Increase in frequency/intensity of <b>forest fire</b>			
	Emergence of <b>Megafire</b> (>5000 ha)			
Abiotic risk	Increase in intensity and duration of <b>Drought</b>			
	Increase in intensity and frequency of <b>storm</b>			
Biotic risk	Increase in <b>pest</b> outbreaks			
	Increase in <b>grazing</b>			
	Emergence of <b>new pests</b> (nematod)			
Forest management	Less forest management			
	Intensification of forest management models			
	Diversification of forest management models			
Forest Economics	Bankruptcy of wood chain actors			
	Decrease in public economic supports to wood sector			
	Market instability (wood, energy, labour)			
Policies	Less support to forest public policies			
	Decrease of resources for risk prevention			
	Increase of social conflicts			



# 3 – Results

## All interviewees

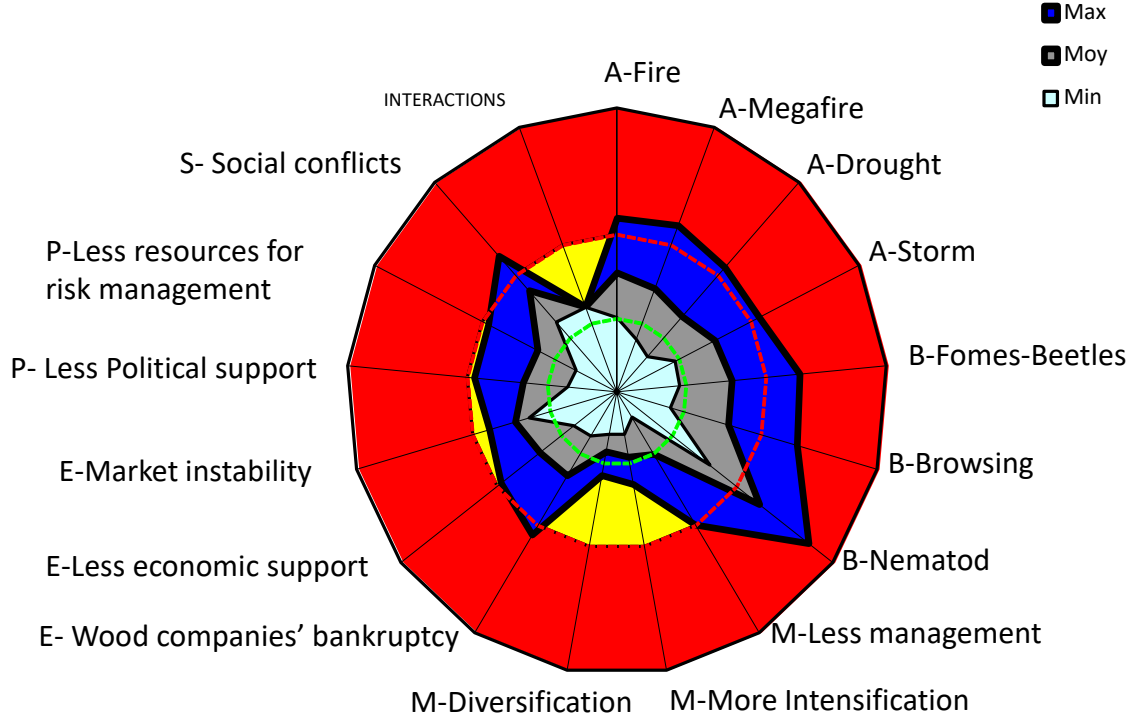
- “classic” biotic/abiotic risk are well identified

## New “potential” risks (uncited in 2013)

- Nematod
- Megafire

## Socio-economic risks

- It makes sense, as important as biotic/abiotic risks
- Social tensions (weak signals)
- Failure/bankruptcy of economic wood chain actors (Sawmills)



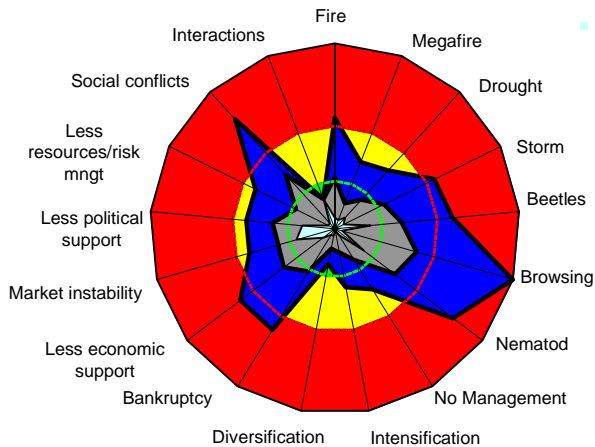
Level of perceived risk (light blue : weak risk, grey: mean risk, dark blue : high risk) and level of criticity (red : unacceptable, yellow : green : acceptable)



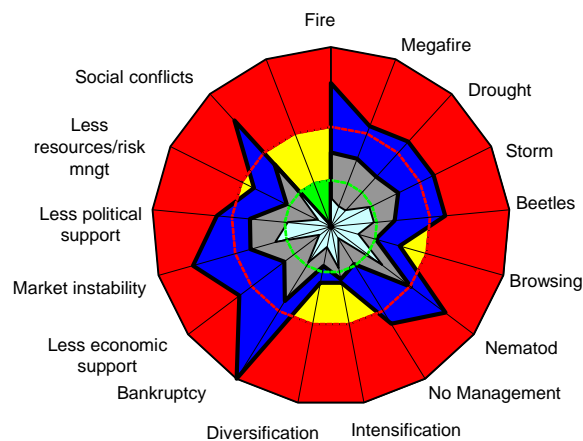
# 3 – Results

- A **differentiated perception** of what and who is at risk for **each group** of interviewees ;
  - Researchers focused on biotic/abiotic risks
  - PFOs and wood sector industrialists also **focused on other risks, at different scales, at different moment**
    - PFOs: browsing + social conflicts
    - Wood industrialists: fire, nematod, bankruptcy, market instability
    - Storm : catastrophe for PFOs at T0, opportunity for sawmills at T0, and vice versa at T+20 years

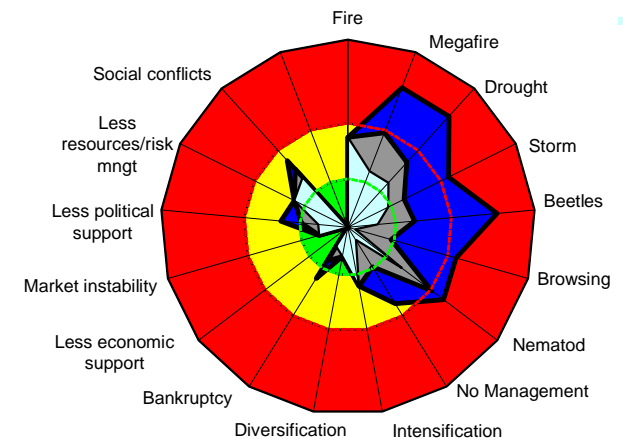
Forest owners



Wood industries



Researchers

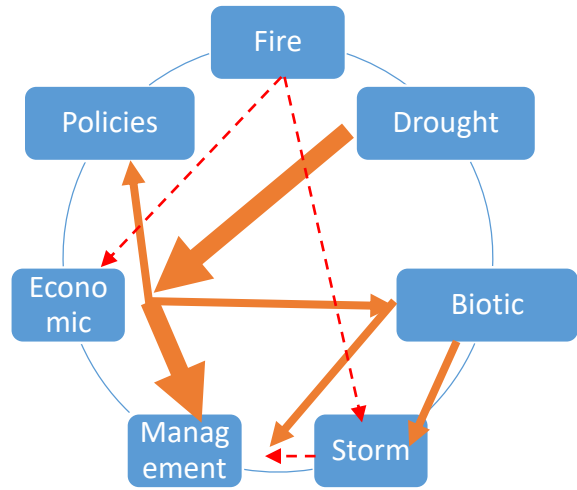


# 3 – Results

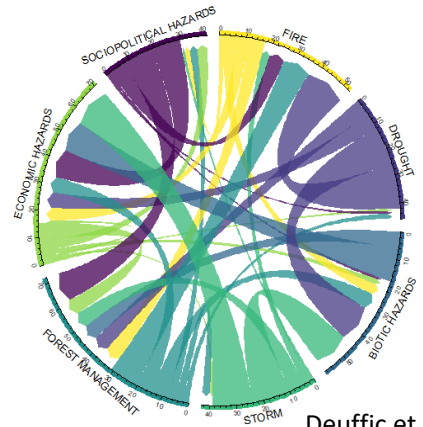
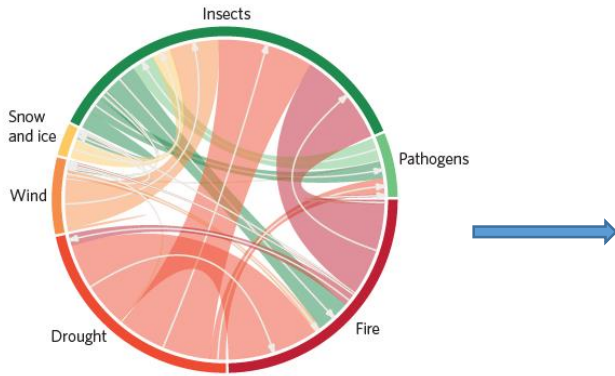
- Some combinations of cascading effects are **well identified**
  - 1) Drought->fire 2) Drought->beetles 3) Drought->Fire->beetles

Tab: Number of cited interactions

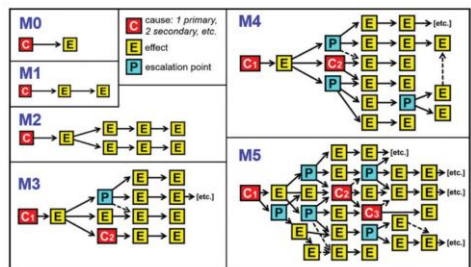
	FIRE	DROUGHT	BIOTIC	STORM	MNGT	ECONOMI C	SOCIO- POLITICS
FIRE	0	16	0	3	11	0	6
DROUGHT	0	0	0	0	2	1	1
BIOTIC	4	14	0	14	6	2	1
STORM	0	0	0	0	3	1	0
MANAGEMENT	6	6	6	6	0	6	11
ECONOMICS	5	6	12	15	6	1	11
SOCIO- POLITICS	2	0	0	1	3	4	0



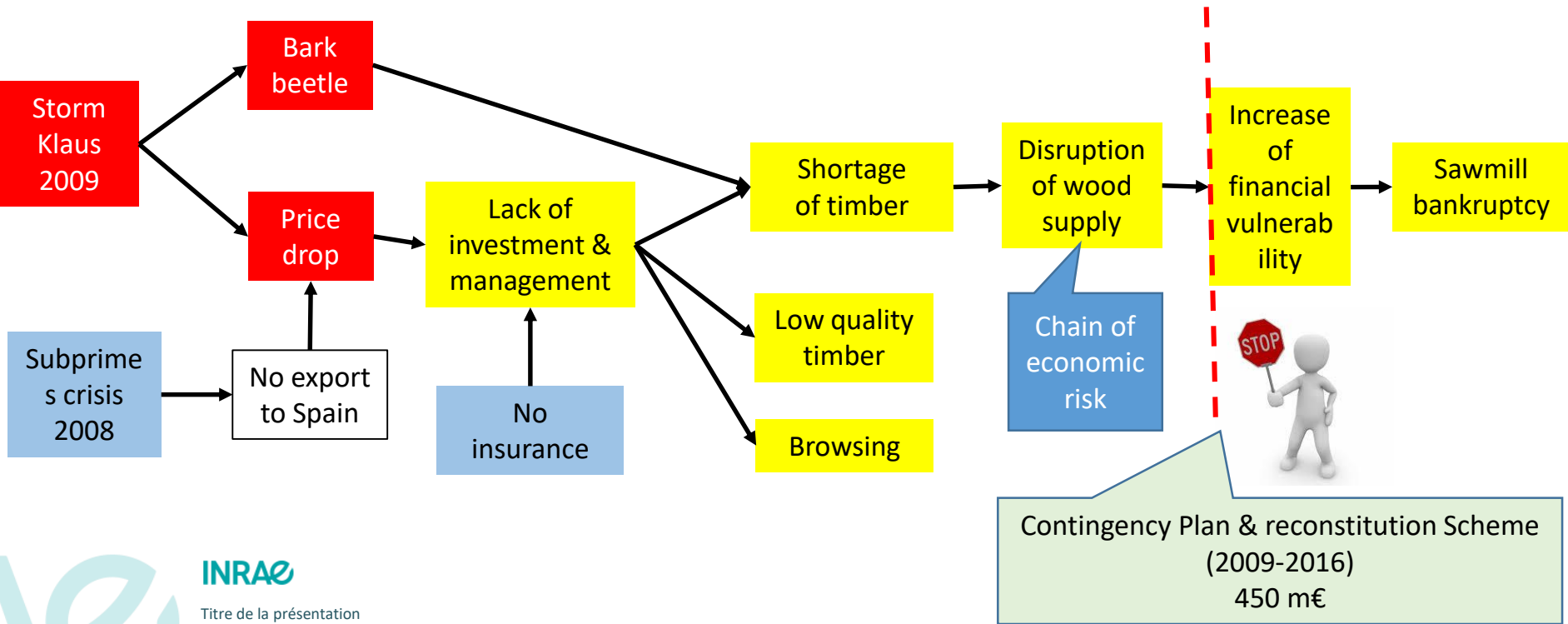
- **Make-sense for interviewees** to introduce **socio-economic agents/factors** : Abiotic/biotic interconnected to socio-eco political risks : (Storm->Biotic -> Economics)
- Socio-economic/political factors **generate their own interconnected risks**



# 3 – Results



« After a storm, we have to harvest toppling trees as quick as possible. Economic partners must be very reactive. Depending on their capacity to manage and to transform timber, there will have more or less impacts in terms of bark beetles outbreaks, and less pest outbreaks induce less economic problem in return (E05, Adrien, forest advisor).



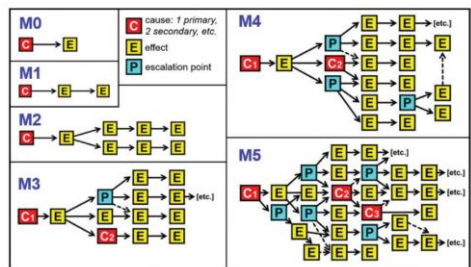
**INRAE**

Titre de la présentation

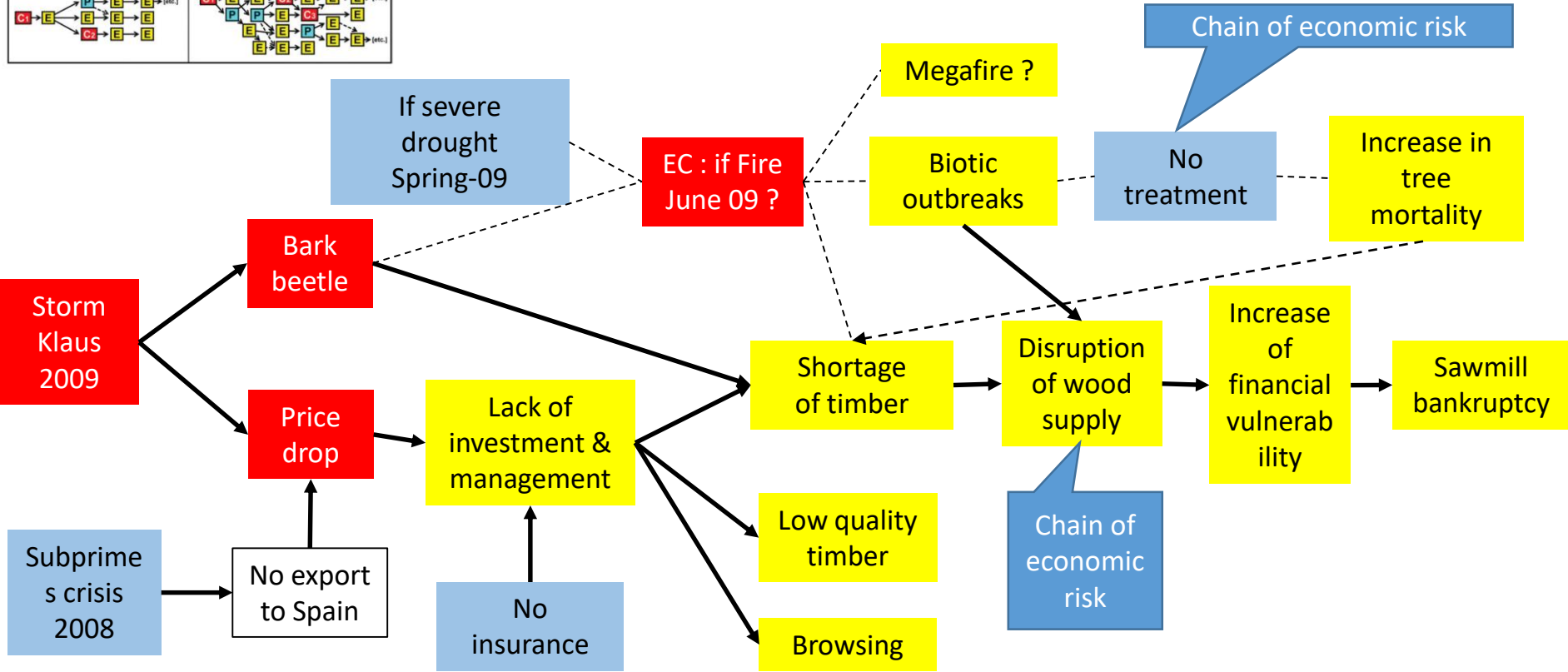
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# 3 – Results



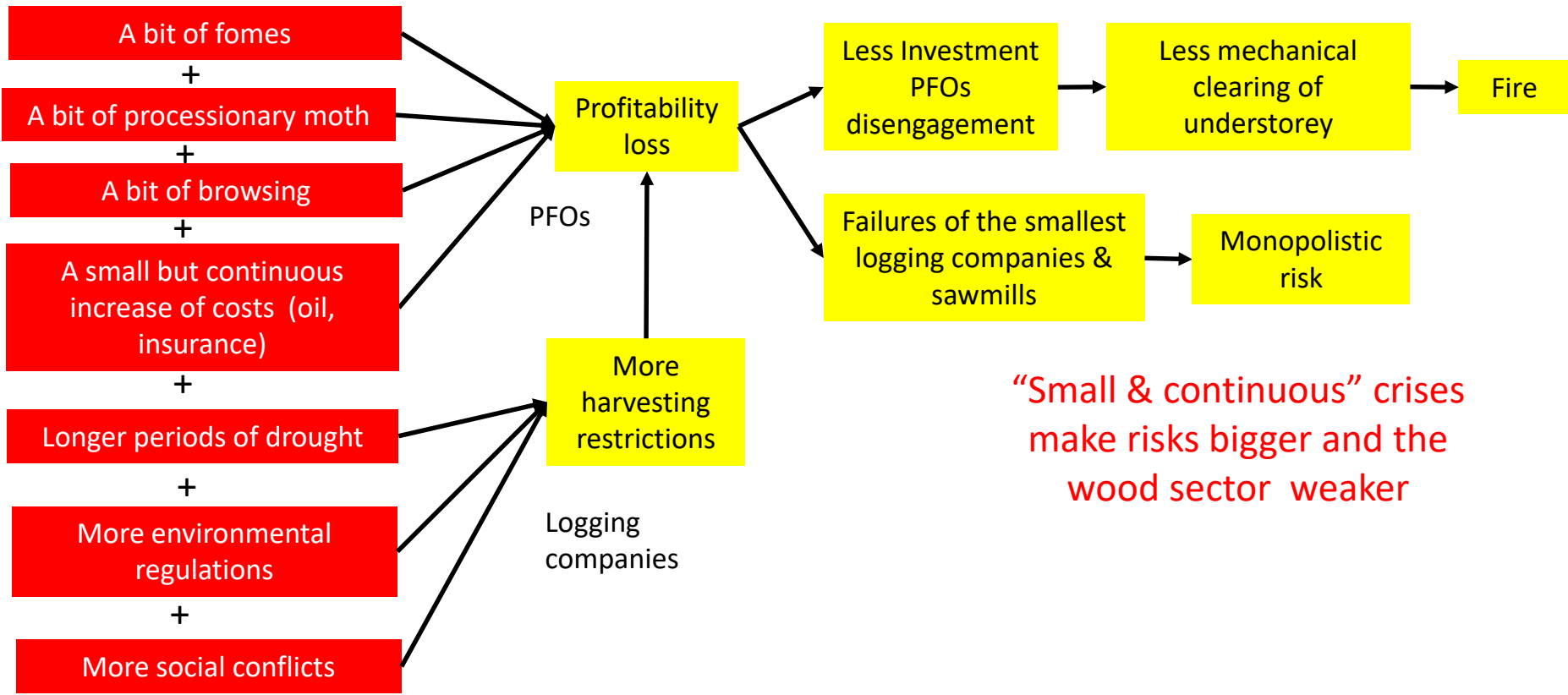
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Prophecy of doom or future scenario?



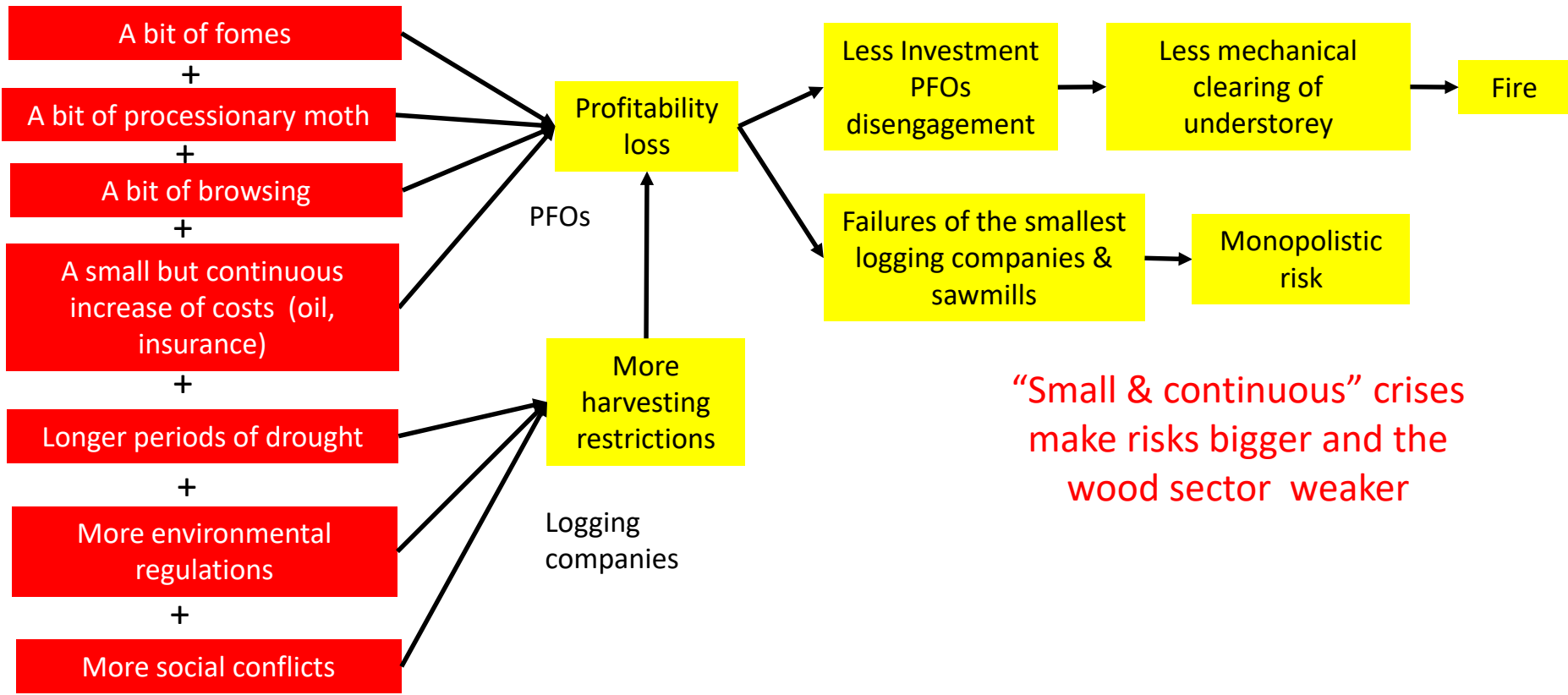
# 3 – Results



“Small & continuous” crises make risks bigger and the wood sector weaker



# 3 – Results



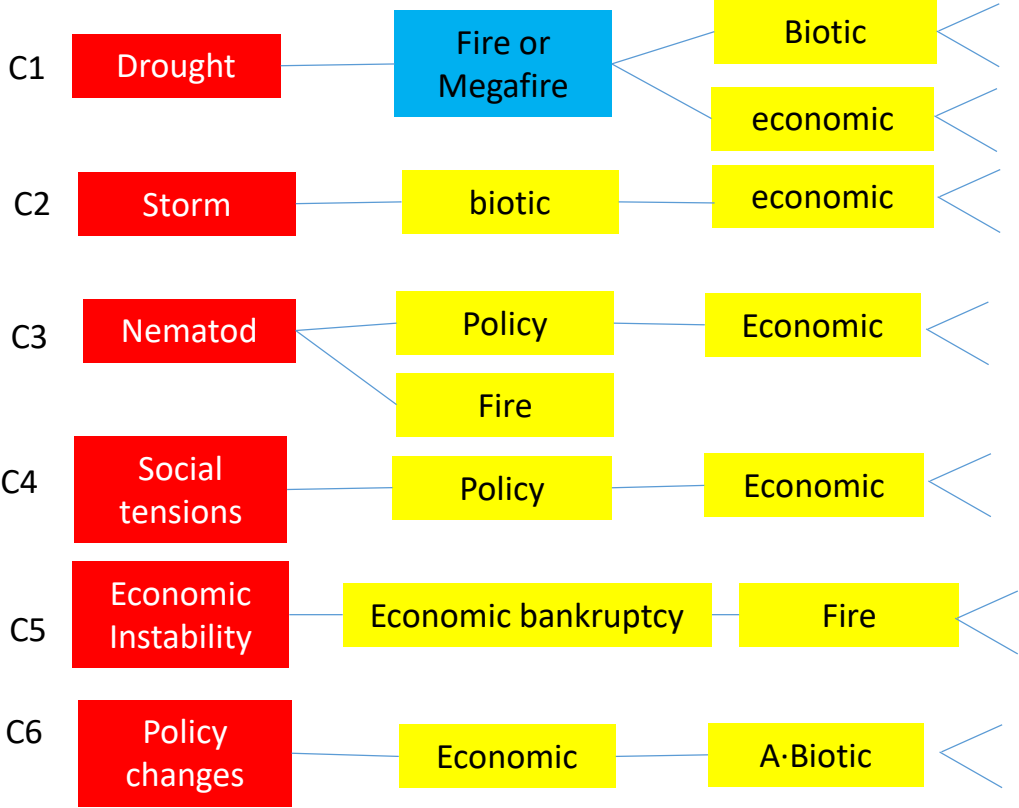
“Small & continuous” crises make risks bigger and the wood sector weaker



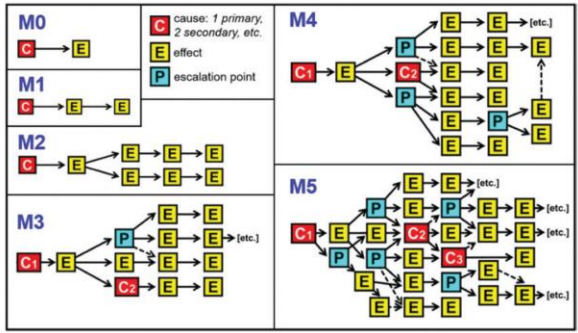
“A never-ending story”  
 Very rare hazard but very long-term impacts



# 3 – Results



## A typology of perceived multiple risks chains



- Likelihood (C3/C4 ?)
- Severity (C2/C3?)
- Additionality (C1+C2+C3+C6?)
- Priority (C1/C3?) and hierarchy of chain (C1>C2 or C3>C2?)
- Socio-political + economic motives may orientate strategies



# 3 – Results



**Several strategies:** combination of technical responses+ organisational + financial according to each interaction

**Goal:** prevention (diminishing likelihood) / protection (diminishing severity)

Field of intervention	Technical		Organisational		Financial	
	Prevention	Remediation	Prevention	Remediation	Prevention	Remediation
Interaction						
<b>Drought + biotic + fires</b>	Shrubs clearing	Tree species diversification	Fire prevention infrastructure		Insurance	
<b>Storms + Biotic + Economic</b>	Shortening stand rotation Broadleaves hedges	Scolytidae treatment	Wood storage		Insurance	Public assistance European funding
<b>Social conflicts + Economic</b>	Nature based practices		New governance	Information Communication		
<b>Nematods + Economic</b>	Mixed species	Genetics	Biocontrol	Dry kiln		Subsidies



## 4 – Conclusion

- **It makes sense for interviewees** to introduce **socio-economic hazards** in multiple risk analysis
- Added value of Risk audit (MCRA): **Hierarchy of risks** per categories of actors
- Identification and **typology of perceived chains** of interconnected risks
- **Next step (project Xrisks 2025-2030):**
  - to test risk chains with a quantitative survey
  - to introduce **new forest** users : may have different perceptions/priority of what is at risk (inhabitants, wood industrialists)
  - To identify **the most vulnerable actors** of the forest sector to multiple risks in order to allocate prevention and remediation supports and aids **more fairly**
  - To imagine **new governance and coordination modes** of prevention/remediation strategies to address multiple risks

