

Industrial safety in the context of  
pandemics and exponential change

2021 SAF€RA joint call

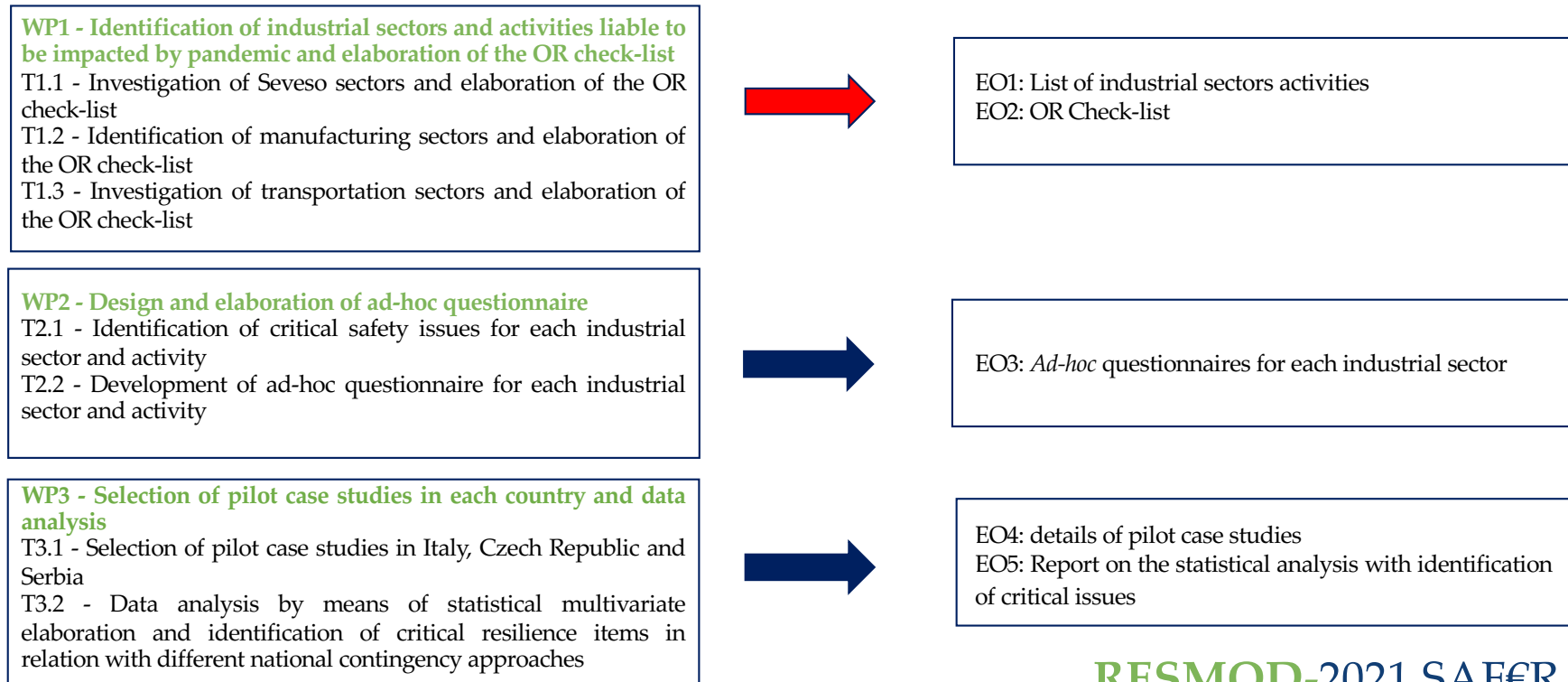
**RESMOD-**  
RESilience  
enhancement  
MODel

Workshop 7<sup>th</sup> June 2022 – Praha Czech Republic  
Vienna House Diplomat Hotel Hall Budapest



# RESMOD – RESilience enhancement MODel

## Task breakdown and expected outcomes



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### WP4 - Design of a Systemic Resilience Model (SRM)

T4.1 - Identification of the significant precursors of an accident or near miss under pandemic condition

T4.2 - Development of the Systemic Resilience Model (SRM)



EO6: List of significant precursors with indication of relative importance  
EO7: Conceptual model, design model and details of the SRM  
EO8: identification of a resilience indicator

### WP5 - Project management

T5.1 - Discussion with stakeholders

T5.2 - Dissemination

T5.3 - Meeting and reporting



EO9: Project management



# RESMOD – RESilience enhancement MODel

## T.1. elaboration of the OR check-list

The main components of Organizational Resilience, connected to the four cornerstone

Component	
Leadership and safety culture (LSC)	→ Mindful Action / Performance optimization (Anticipate, React)
Risk awareness (RA)	→ Preventative Control / Mindful Action (Monitor, Anticipate)
Communication and information flow (CI)	→ Adaptive innovation / Performance optimization (Learn, React)
Skills and competencies (SC)	→ Preventative Control / Performance optimization (Monitor, React)
Action–decision-making process (A)	→ Preventative Control / Adaptive innovation (Monitor, Learn)
External and internal circumstances (C)	→ Mindful Action / Adaptive innovation (Anticipate, Learn)

Each component is declined in specific sub-factors related to pandemics lesson learnt



# RESMOD – RESilience enhancement MODel

## T.1. elaboration of the OR check-list

### LEADERSHIP AND SAFETY CULTURE

- ✓ Higher level strategies, including health plan - ANTICIPATE
- ✓ Business continuity plan (activities essential for safety, recovery times, etc.) in the event of emergencies outside the plant - REACT
- ✓ Financial studies on organizational impacts of health emergency – ANTICIPATE

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## T.1. elaboration of the OR check-list

### RISK AWARENESS

- ✓ Identification of key sources of information on the epidemic, including trade associations, research institutes, experts - ANTICIPATE
- ✓ Identification of critical activities that cannot be suspended - MONITOR
- ✓ Identification of circumstances in which it may be necessary to suspend operations - MONITOR
- ✓ Possibility of remote process control (e.g., SCADA) – MONITOR
- ✓ Assessment of the effects on safety of the procedural changes introduced to meet the needs of the health plan - MONITOR
- ✓ Assessment of the safety impact of organizational changes, including selected staff and supply outage - MONITOR
- ✓ Assessment of collective and personal protective equipment – MONITOR
- ✓ Specific attention to work permits, with extension of measures also to third parties - MONITOR



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## T.1. elaboration of the OR check-list

### COMUNICATION AND INFORMATION FLOW

- ✓ Timely documentation of the activities carried out for health emergencies - LEARN
- ✓ Staff behavior observation system - LEARN
- ✓ Review of the response of the safety management system to the health emergency - REACT

# RESMOD – RESilience enhancement MODel

## T.1. elaboration of the OR check-list

### SKILL AND COMPETENCIES

- ✓ Identification of the necessary resources to support critical activities (people, processes, equipment) - MONITOR
- ✓ Define face-to-face and remote meetings - REACT
- ✓ Policies for employees infected or suspected of being infected - REACT
- ✓ Agile/flexible work policies and flexibility of working time, including permits, temporary leaves and travel restrictions - REACT



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## T.1. elaboration of the OR check-list

### ACTION – DECISION MAKING PROCESS

- ✓ Specific measures for a safe shutdown for a longer or indeterminate period of time, taking into account the degradation of hazardous materials - LEARN
- ✓ Measures for a safe restart after prolonged shutdown, including warehouses – LEARN
- ✓ Communications to personnel and other interested parties on the progress of the emergency and the repercussions on the management system - REACT
- ✓ Availability of individual and collective protection equipment - REACT
- ✓ Sanitation of work environment - REACT

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## T.1. elaboration of the OR check-list

### EXTERNAL AND INTERNAL CIRCUMSTANCES

- ✓ Analysis of the system's reactions to the pressures of the external context (evaluation of strengths and weaknesses) and sharing with all staff – LEARN
- ✓ Assigning responsibility for planning in the event of an epidemic - ANTICIPATE

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## T.2. identification of safety critical issues

The identified OR factors are grouped on the basis of the **Resilience need to which they respond:**

### ANTICIPATE

- A.1. Higher level strategies, including health plan
- A.2. Financial studies on organizational impacts of health emergency
- A.3. Identification of key sources of information on the epidemic, including trade associations, research institutes, experts
- A.4. Assigning responsibility for planning in the event of an epidemic

### MONITOR

- M.1. Identification of critical activities that cannot be suspended
- M.2. Identification of circumstances in which it may be necessary to suspend operations
- M.3. Possibility of remote process control (e.g., SCADA)
- M.4. Assessment of the effects on safety of the procedural changes introduced to meet the needs of the health plan
- M.5. Assessment of the safety impact of organizational changes, including selected staff and supply outage
- M.6. Assessment of collective and personal protective equipment
- M.7. Specific attention to work permits, with extension of measures also to third parties
- M.8. Identification of the necessary resources to support critical activities (people, processes, equipment)

### LEARN

- L.1. Timely documentation of the activities carried out for health emergencies
- L.2. Staff behavior observation system
- L.3. Specific measures for a safe shutdown for a longer or indeterminate period of time, taking into account the degradation of hazardous materials
- L.4. Measures for a safe restart after prolonged shutdown, including warehouses
- L.5. Analysis of the system's reactions to the pressures of the external context (evaluation of strengths and weaknesses) and sharing with all staff

### REACT

- R.1. Business continuity plan (activities essential for safety, recovery times, etc.) in the event of emergencies outside the plant
- R.2. Review of the response of the safety management system to the health emergency
- R.3. Define face-to-face and remote meetings
- R.4. Policies for employees infected or suspected of being infected
- R.5. Agile/flexible work policies and flexibility of working time, including permits, temporary leaves and travel restrictions
- R.6. Communications to personnel and other interested parties on the progress of the emergency and the repercussions on the management system
- R.7. Availability of individual and collective protection equipment
- R.8. Sanitation of work environment



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## T.2. identification of safety critical issues

For each relevant indicator, a **question** has been defined, with ranking **from 4 (Excellent) to 1 (Poor)**.

The questionnaire results and the factors prioritization are analyzed by the means of a **causal net** that aids in visualizing how different variables in a system are **causally interrelated**, as the SD Causal Diagram, adding the **likelihood of the causal relation**, as in the BNs.

**Causal Net methodology straddles the line between the causal diagram from System Dynamics and discrete-state Bayesian Nets.**

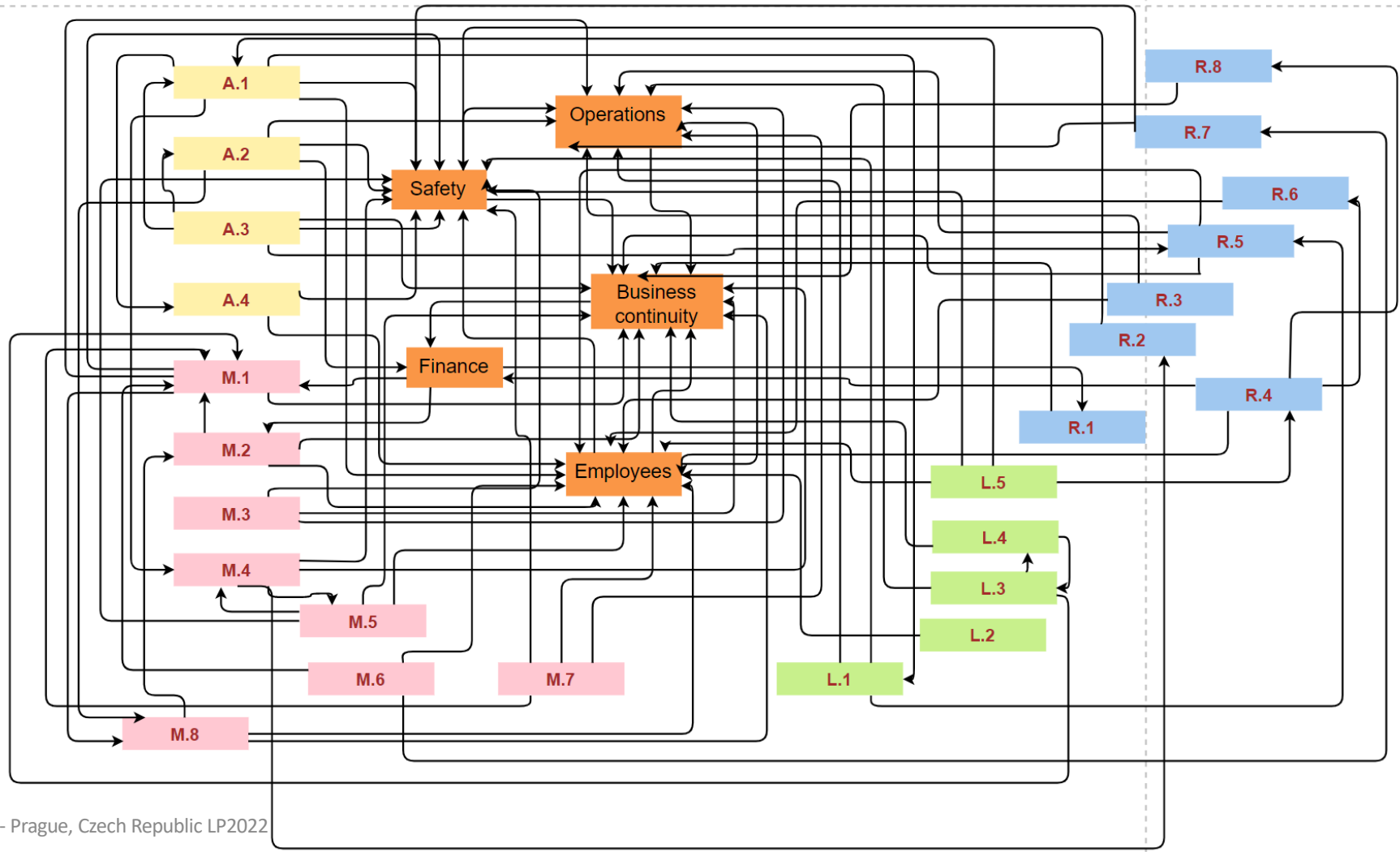
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## Case studies

In order to test the applicability of the proposed methodology, the proposed case-studies are two Seveso Upper Tier installation of Northern Italy, preliminarily selected

- A Chemical/Petrochemical storage facility
- A process plant





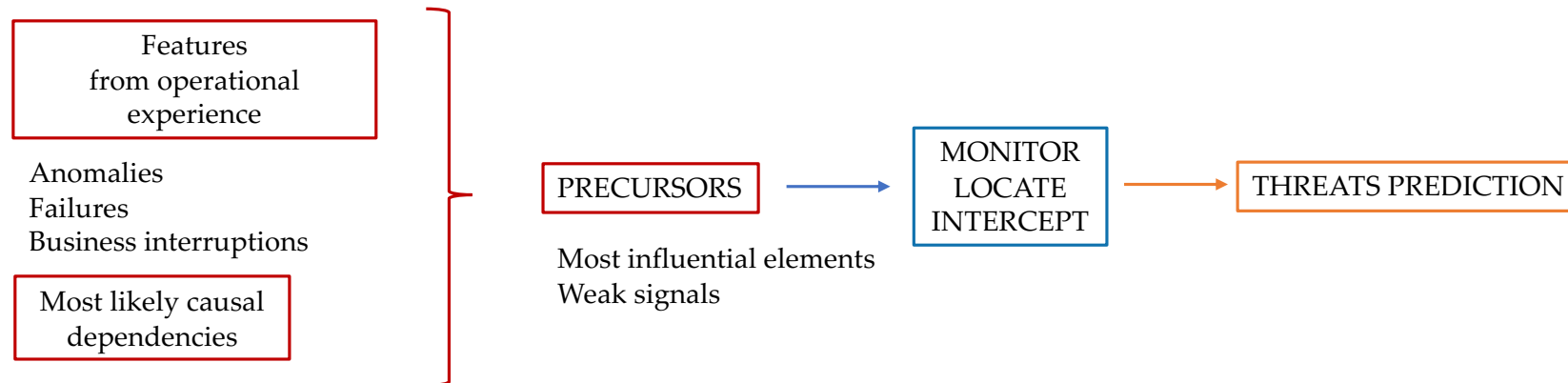
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To those information, Operational experience features are added, for identify the **precursors**.



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## Conceptual framework of Resilience Data Driven Model

