



# Performance Evaluation Model of Railway Operators Safety Management Systems

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# Introduction

**SMS = a necessity to be authorised**

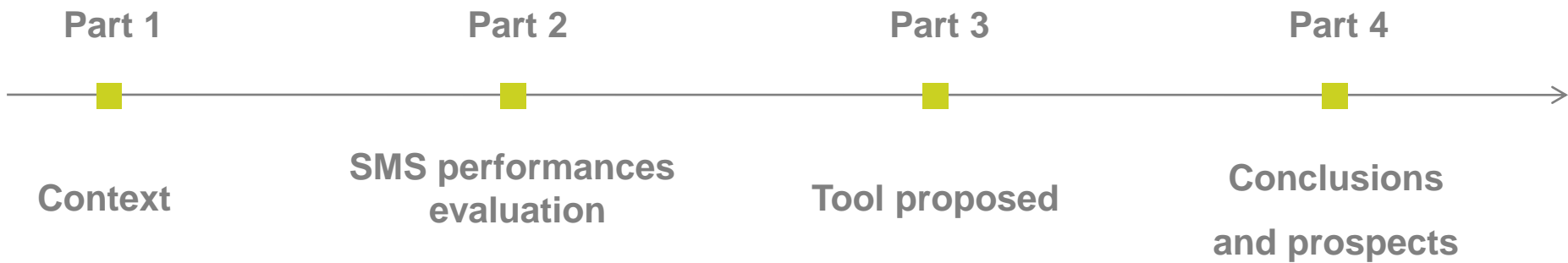
## Main themes:

- Leadership
- Support
- Continual improvement
- Operation



**Aim:** to guarantee a coverage of all risk inherent to operator activities and to improve continuously the safety management

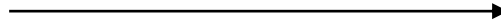
# Outlines



# Context



**SMS**



**Authorisation**

**Fact:** SMS must be checked and controlled during authorisation validity (5 years max.)

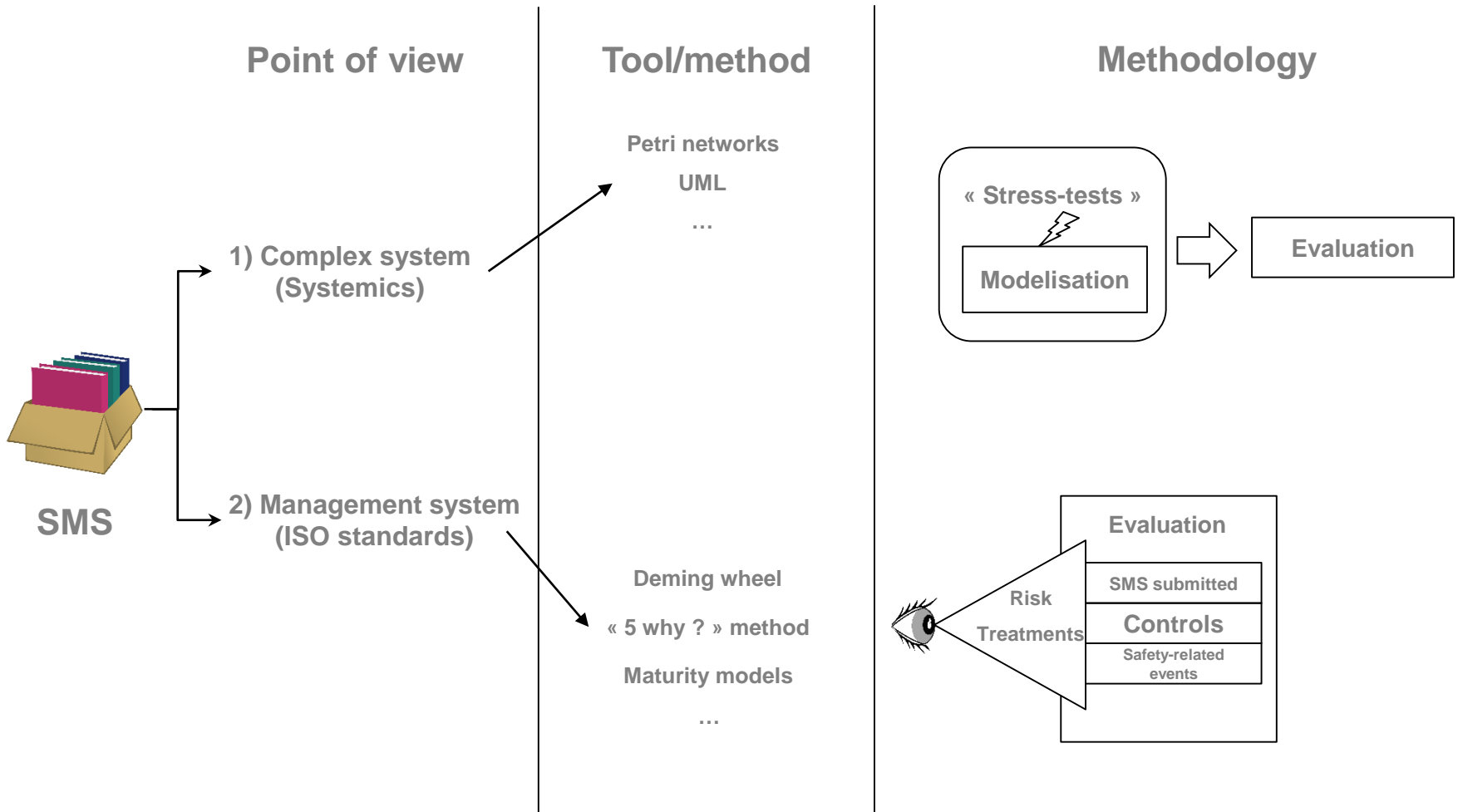
**Question:** How to evaluate the performances of railways operator SMS all along its life?

- A conformed SMS is it robust?
- How to prove it? On the basis of which criteria? Is pure conformity sufficient?
- How to assess safety culture through a set of procedures?
- Human factors? How to consider them in evaluation phase?

Investigation of evaluation means (RESYGESS)

# Context

SMS can be seen as:

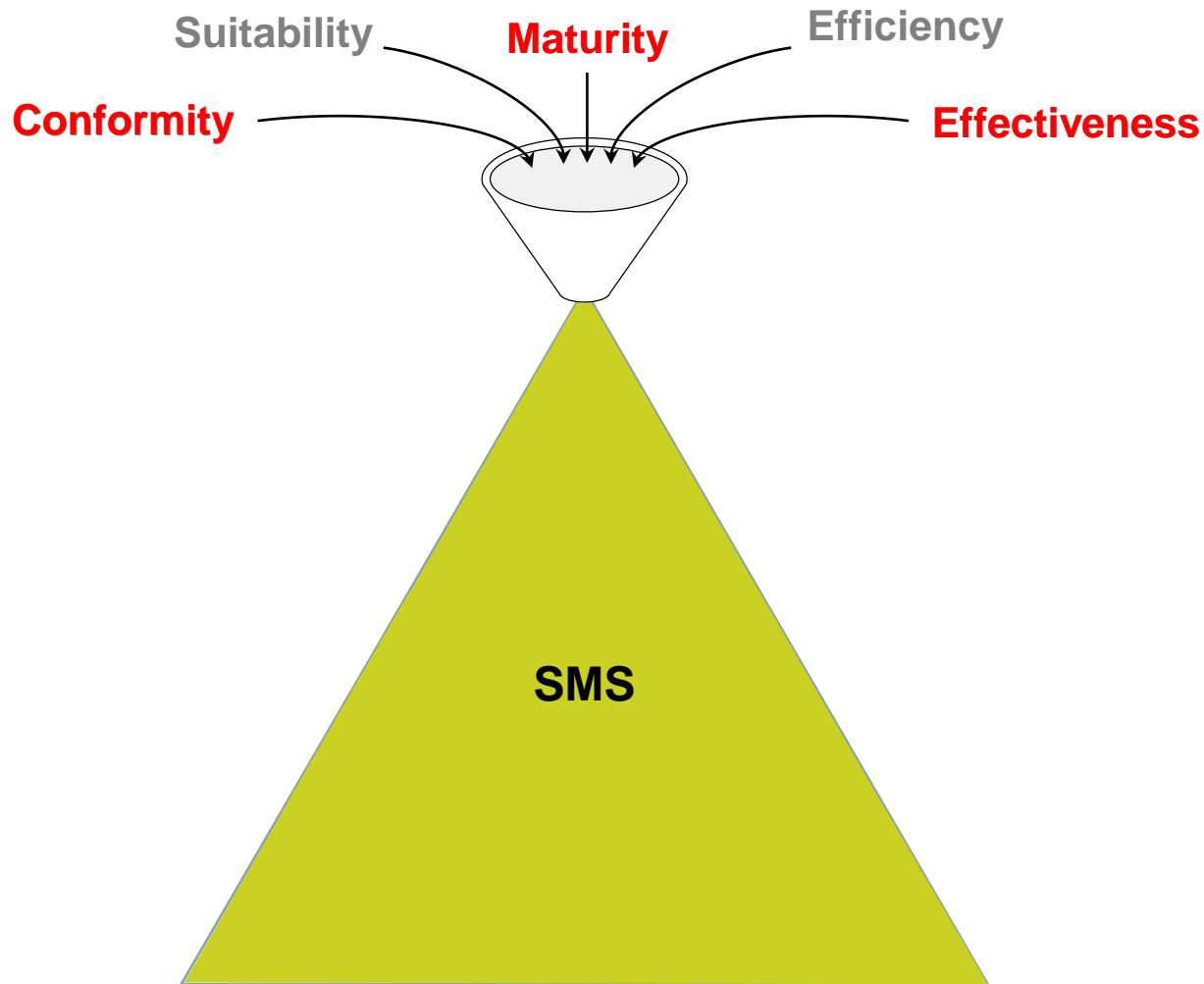


# Issues

- Issues about 1st point of view (SMS modelling)
  - ❑ Important number (several thousands for a national IM) of procedures within SMS
  - ❑ Interfaces and dependences between procedures
  - ❑ Different SMS structures for each operator
  - ❑ Human factors complex to model
  - ❑ Inexistence of direct modelling tool for SMS
- Long-term research topic

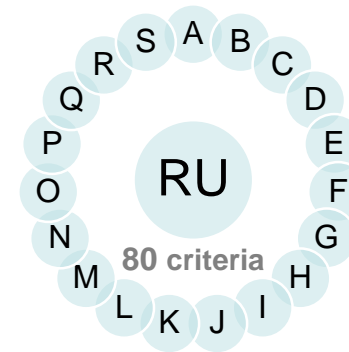
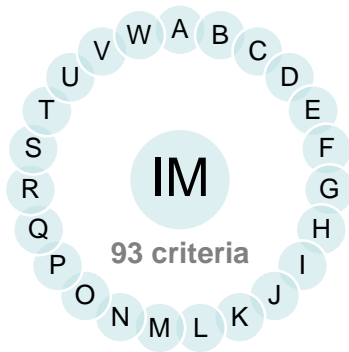
**Focus on 2<sup>nd</sup> point of view**

# Questioning about SMS evaluation



# Conformity

Evaluation based on lists of criteria (EU regulations 1158/2010 et 1169/2010)



Example of criteria:

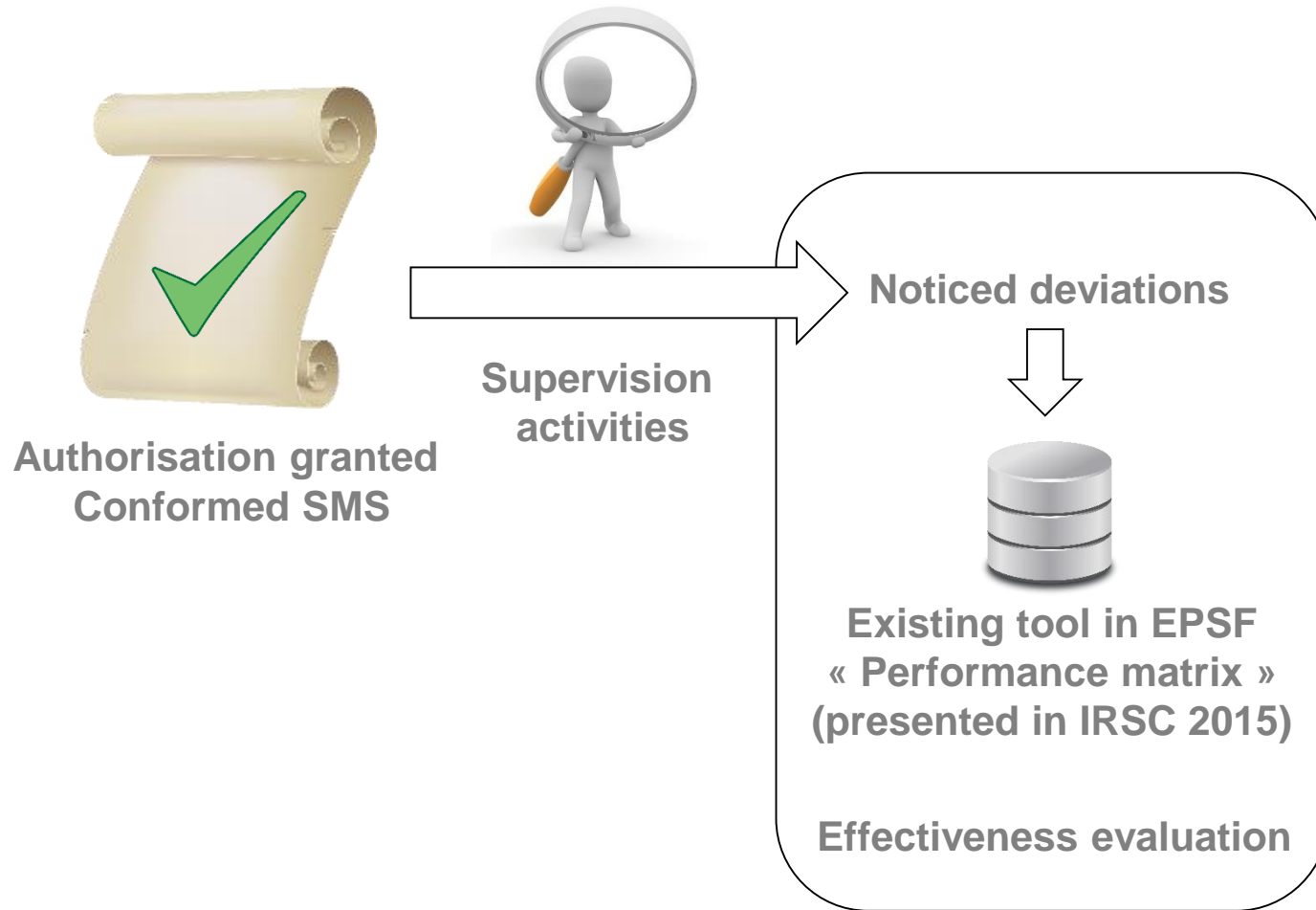
“S. PROVISIONS FOR RECURRENT INTERNAL AUDITING OF THE SAFETY MANAGEMENT SYSTEM

S.1 There is an internal auditing system which is independent and impartial and which acts in a transparent way”

**Remaining question:** The conformity with these requirements does not prove that the process set up is effective, or how it is effective?



# Effectiveness



# Maturity

## Maturity model coming from EUAR

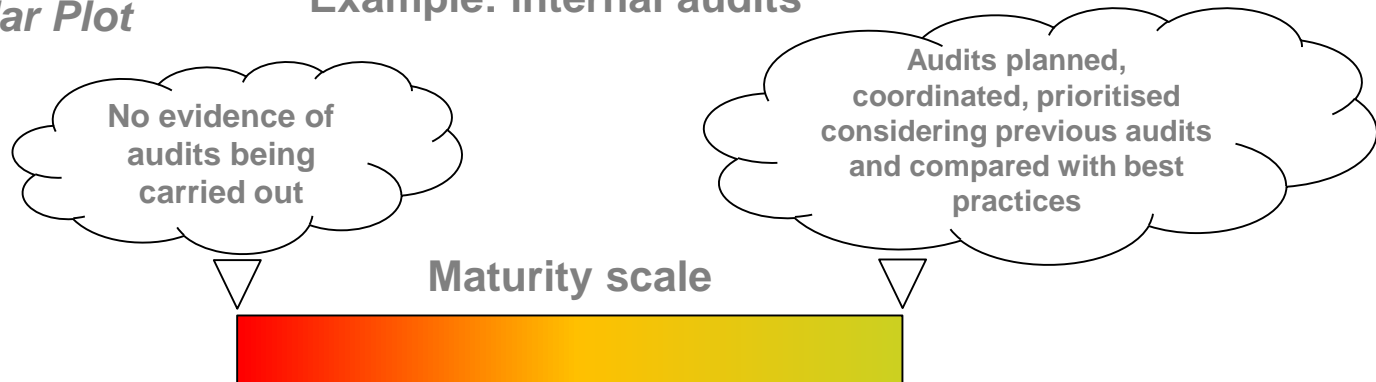


A Safety Management Capability Model for use by NSA's when forming views on the adequacy of an RU or IM Safety Management System



**Radar Plot**

### Example: internal audits



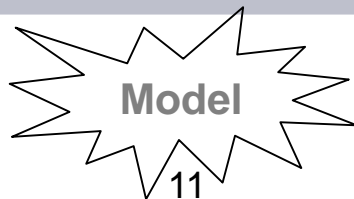
- Make easier information exchange between each NSAs and NSA / EUAR
- Based on PDCA model and EUAR SMS Wheel
- Provide NSA with a simple model which allow them to make an opinion
- Model for RU/IM self-assessment
- 5 levels (from « Basic » to « Excellence »)

# Overview of SMS evaluation

## SMS performance evaluation

SMS performance attributes	Indicator(s)
Conformity	<ul style="list-style-type: none"> <li>- Number of criteria to satisfy (requirements)</li> <li>- Non conformities detected during supervision activities</li> </ul>
Effectiveness	<ul style="list-style-type: none"> <li>- Deviations from submitted SMS</li> </ul>
Maturity	<ul style="list-style-type: none"> <li>- Properties coming from EUAR maturity model</li> </ul>

Tendency on 5 years



## Safety-related events evaluation

Occurrence

Gravity

Tendency on 5 years

Possible adjustments:

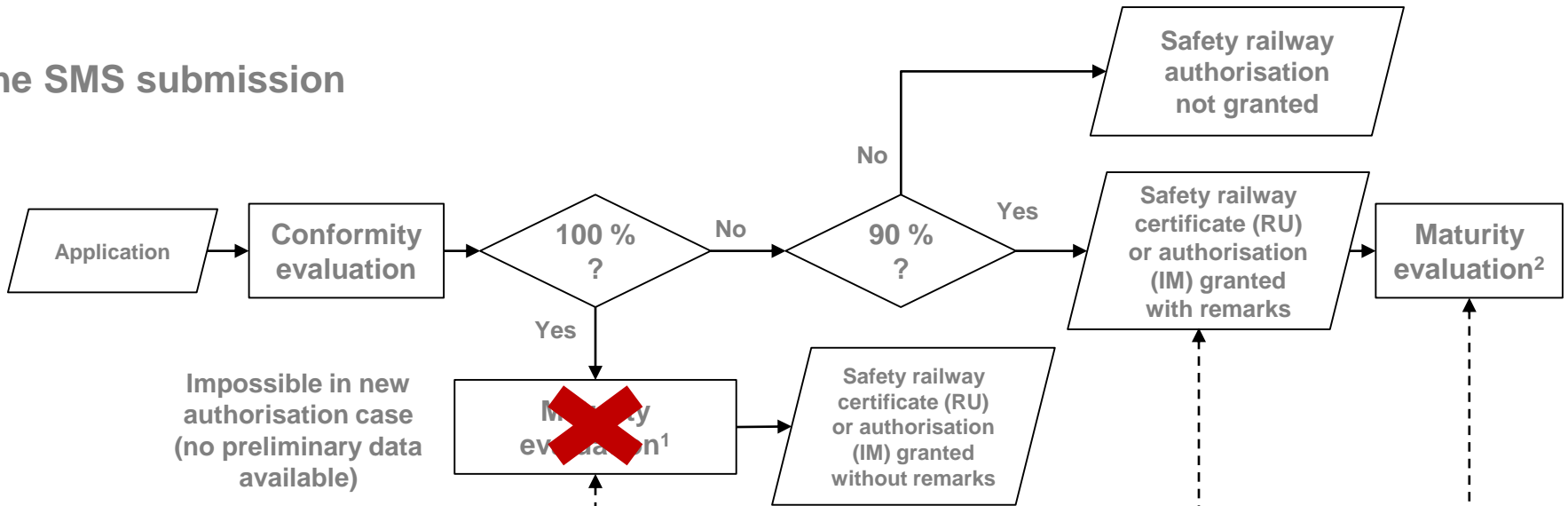
- Revision of conformity, effectiveness and maturity (on a part or on entire SMS)
- A warning point placed on concerned part of SMS



# Evaluation tool proposed



## At the SMS submission

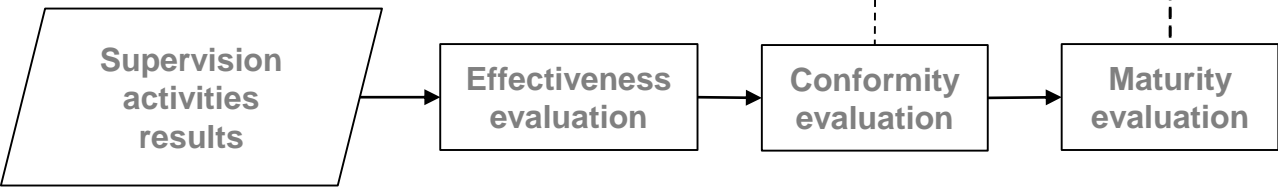


Impossible in new authorisation case (no preliminary data available)

<sup>1</sup>based on previous authorisation and supervision activities performed during the validity of previous authorisation

<sup>2</sup>based on remarks

## After issuing authorisation



→ Immediate data flux  
 - - - Data flux for next renewal demands

# Tool presentation (1/2)

## Part 1: « Identity card » of operator

Logo	Name	Operator name	Year	Nb cases	Nb audit	Deviations not cleared	Deviations not cleared / nb audit	Thousand km-train	Nb events	Events / thousand km
	Autorisation type	Safety certificate	2014	1	0	0	0	9,2	4	0,435
	Delivery date	09/12/2014	2015	1	1	0	0	94	2	0,021
	Starting commercial date	14/12/2014	2016	0	3	6	2	192	4	0,021
	Activity	Freight	2017	0	0	0	0	0	1	0,000
	Area of activity	All national network	2018	0	0	0	0	0	0	0,000
Operator information			Supervision information				Safety-related events information			

# Tool presentation (2/2)

## Part 2: Conformity / Effectiveness / Maturity

		Authorisations and controls		Controls only														
Process		Conformity		Maturity		Effectiveness					Nb safety-related events regarding gravity							
		Calculate	Delete	Calculate	Delete	7	5	3	1	-1	Cote	Effectiveness out of 5	G3	G4	G5	G6		
		Ratio of satisfied criteria (%)	Conformity out of 5			SP	MD	Re	WP	MP								
Leadership	2014	100	5								0							
	2015	96	↓ 4	2		0	2	8	0	0	34	1	0	0	0	0	0	
	2016	74	↓ 1	2	→	0	3	13	6	0	60	1	0	0	0	0	0	
	2017										0							
	2018										0							
	Tendency	98	3,333333333	2		0	8	21	6	0	94	1	0	0	0	0	0	

Theory

Real life

Conformity, maturity and effectiveness results about a RU (freight and dangerous goods transport)

Consideration of safety-related events (gravity 3 to 6)



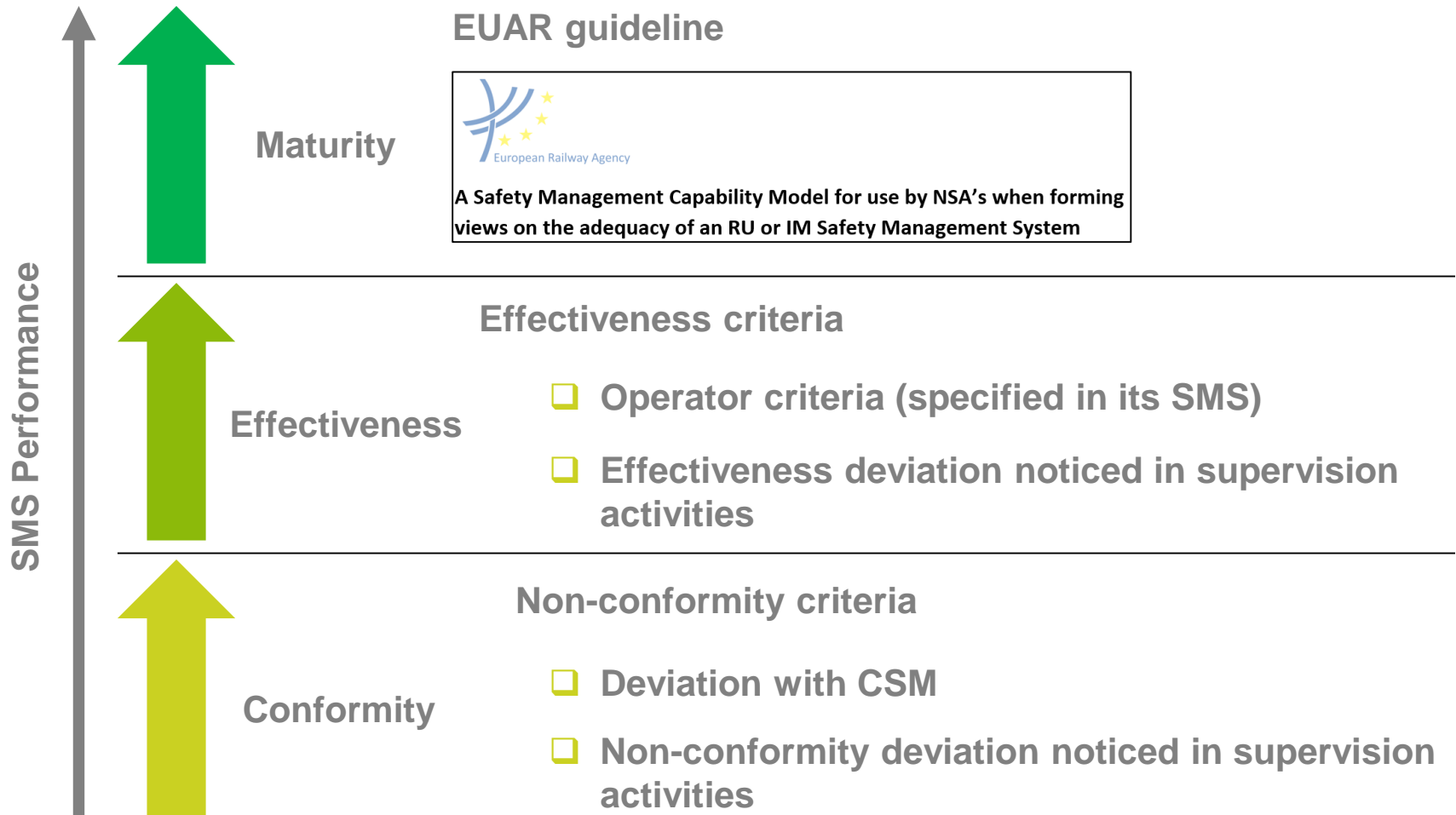
Investigators

### Development of actions:

Possible notation adjustments (no safety related events => revise upwards CEM?)

Future audits on concerned part of SMS (leadership)

# Another point of view of SMS performance evaluation



# Conclusions and prospects



SMS = the safety core of an organisation

Procedures within SMS are the common assessment basis between operator and NSA

SMS → complex to apprehend, model and assess because of its « organisational » nature

SMS → Human factors are omnipresent

**PURE CONFORMITY IS NOT ENOUGH: NEED TO GO DEEPER**



Model based on the combination of effectiveness and maturity in addition to conformity

**BUT...**

A model remains... a model, so safety related events must be considered in mirror  
The tool helps the investigator by rationalizing data but can't replace his opinion and sensibility



Current state: tool is in validation phase (real examples)

Future state:

- Shared tool with other NSAs and EUAR
- Self-assessment tool for RU/IM ?
- Development of a formal tool





**Thank you for your  
attention**