

A CORUÑA | 2022 | MAYO | 18 y 19

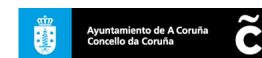


V CONGRESO INTERNACIONAL de SEGURIDAD INDUSTRIAL en PUERTOS V INTERNATIONAL CONGRESS of SAFETY in PORTS

ORGANIZA:



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//Afundación
Obra Social ABANCA

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PRESENTACIÓN - INTRODUCTION



Luca Fiorentini

- *Owner and CEO of the international consulting company TECSA S.r.l. (www.tecsasrl.it)*
- *Vice President of the Italian Association of Fire Engineering (SFPE-Italy)*
- *Chair of the Institute of Risk Management (UK) Italy Regional Interest Group*
- *Principal engineer exida L.L.C. (USA)*
- *Luca.Fiorentini@tecsasrl.it*



Lessons learnt from real cases of risk assessment in ports area

L. Fiorentini
TECSA S.r.l. (Italy)

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Maritime transport importance

Maritime transport is the backbone of the international trade and global economy. **Around 80% of global trade by volume are carried by sea** and are handled by ports worldwide (United Nations Conference on Trade and Development, UNCTAD, 2014)

Nowadays, the dependency of the EU and of developed countries on seaports for the trading of goods is very high. Imports and exports of goods to and from the rest of the world make up 75% of the trade, while intra-EU trade makes up 36%. **In Europe, over 300 ports are active in ro-ro, general cargo, liquid bulk, and/or dry bulk handling, and about 130 seaports handle containers**

The number of European ports handling containers is expected to increase in the following years.

In the EU, seaborne traffic represents 20% of the total transport. In 2015, EU ports handled around 3.8 billion tonnes, 1.3% more than in 2014. Rotterdam is the largest container port in Europe, with 11.6 million 20-foot equivalent units (TEUs) handled, followed by Antwerpen with 9.4 million TEUs and Hamburg with 8.8 million TEUs

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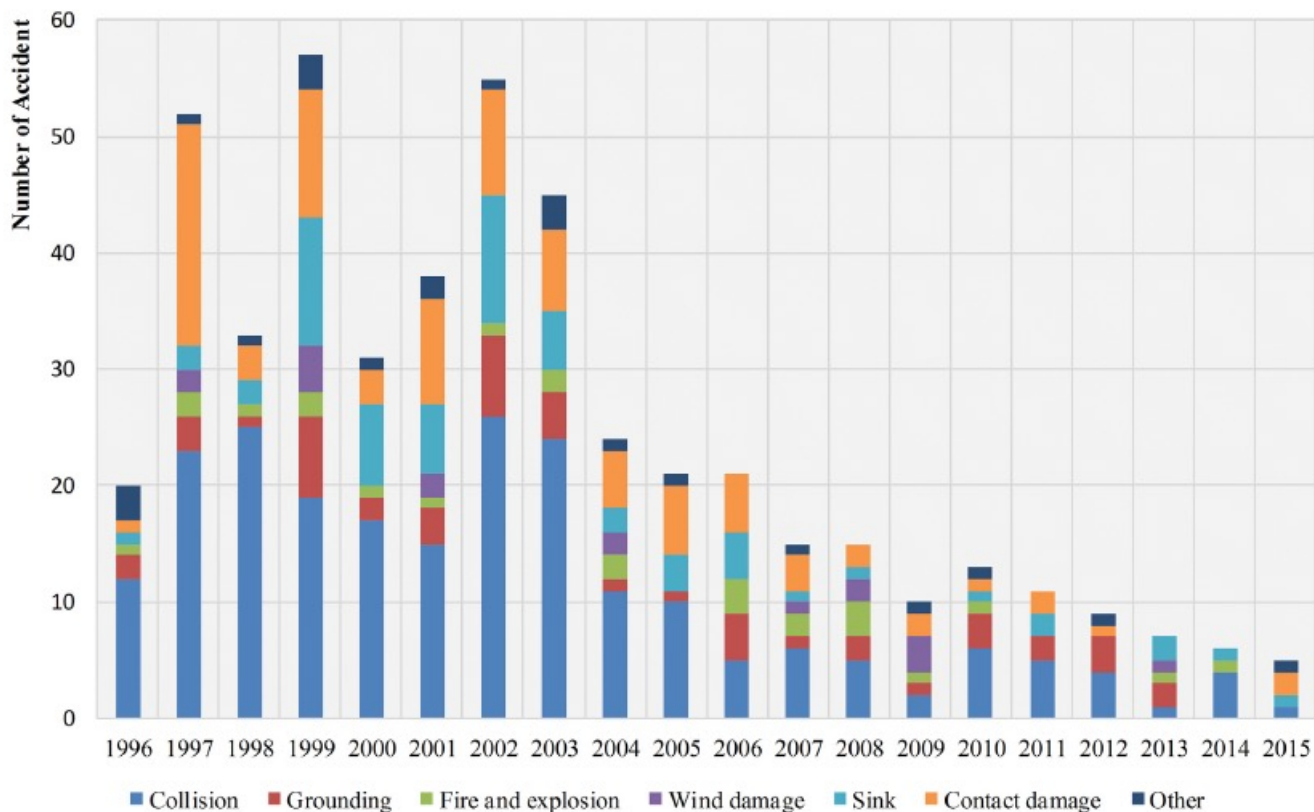


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Categories of accidents (1996-2015)



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Disruption importance: safety/assets and business continuity (supply chain)

A disruption of any kind in the working of a seaport system has the capability to bring about disastrous and cataclysmic consequences.

The danger of calamitous accidents in a port environment is mainly associated with the presence of hazardous cargo.

The hazardous cargo under specific situations and vulnerabilities and at certain magnitudes can result in leaks, fires and at certain magnitudes can result in leaks, releases, fire and explosions.



Ports must be resilient and be able to function as needed under both expected and unexpected conditions.

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Hazardous cargoes

In the shipping globalization context, the port construction of all countries in the world is in a period of rapid development.

As the global demand for petrochemical products soars, **the hazardous cargo throughputs of global ports are also growing rapidly.**

The varieties and quantities of flammable, explosive, corrosive, and toxic chemicals stored at ports are increasing day by day, and the hazardous cargo terminals and storage facilities are characterized by a large quantity, a wide distribution and an high risks.

These factors have led to increasing safety risks of port operations, and further led to frequent safety management accidents.

Therefore, it is **imperative to control the hazardous cargo accidents at ports.**

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Tianjin Port Accident (2015)

Tianjin Port caused serious casualties, property losses, environmental pollution and other negative impacts.

In terms of casualties and property losses, the accident caused 165 deaths, 8 missing and 798 injured and hospitalized, as well as damage to 304 buildings, 12,428 commercial automobiles and 7533 containers.

The accident caused the explosion, combustion, leakage and diffusion of at least 129 varieties of chemical substances. The explosion also ignited surrounding buildings and large quantities of ordinary goods such as cars and coke.





Investigation

According to the investigation report of the hazardous cargo explosion accident at Tianjin Port (SCIT, 2016), the causation factors of the explosion are primarily divided into four categories, namely,

environmental factors;

human factors;

management factors;

facility factors;

cargo factors.

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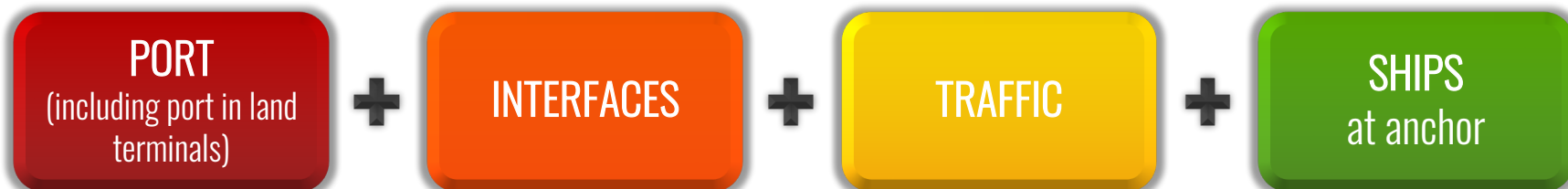
Port complexity

Within the shipping industry, ports have a significant role as they operate as the connection between sea and land, as well as with the hinterland, in order to be able to load and unload the transported products.

A port area is characterized by a wide range of activities: whereas some of these activities are common to the majority of industrial areas (e.g. big oil terminals, presence of rail and road traffic, chemical and petrochemical plants, general manufacturing and industry), there are several activities that are to be encountered exclusively in a harbour setting.

Aspects of navigation and ships: loading and unloading of goods, oil jetties, shipyards, the presence of fishing fleets, marinas, dredging, the building of port infrastructures, crowds for passengers, etc.

As a result, ports are complex organizations and source of potential risks of accidents due to the ship traffic and the multiple activities that are carried out there, including the significant growth in existing areas (congestion).



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Human factors

Among these instigating factors, the human factors is considered as the most prominent that counts for a huge portion of the overall accidents in the hazardous cargo maritime transport sector,

Their result revealed that mental fatigue, lack of adequate training, and inadequate supervision ha a critical role in accident causation.

The human factor is highly diversified when it comes to the instigation of hazardous cargo and maritime accidents. It involves the qualification, experience, training, mental and psychological state, use and abuse authority, errors and violations, definition and implementation of safety measures, the developed rules and measures, followed and implemented technological and physiological setup and the organizational composition on the part of involved employees.



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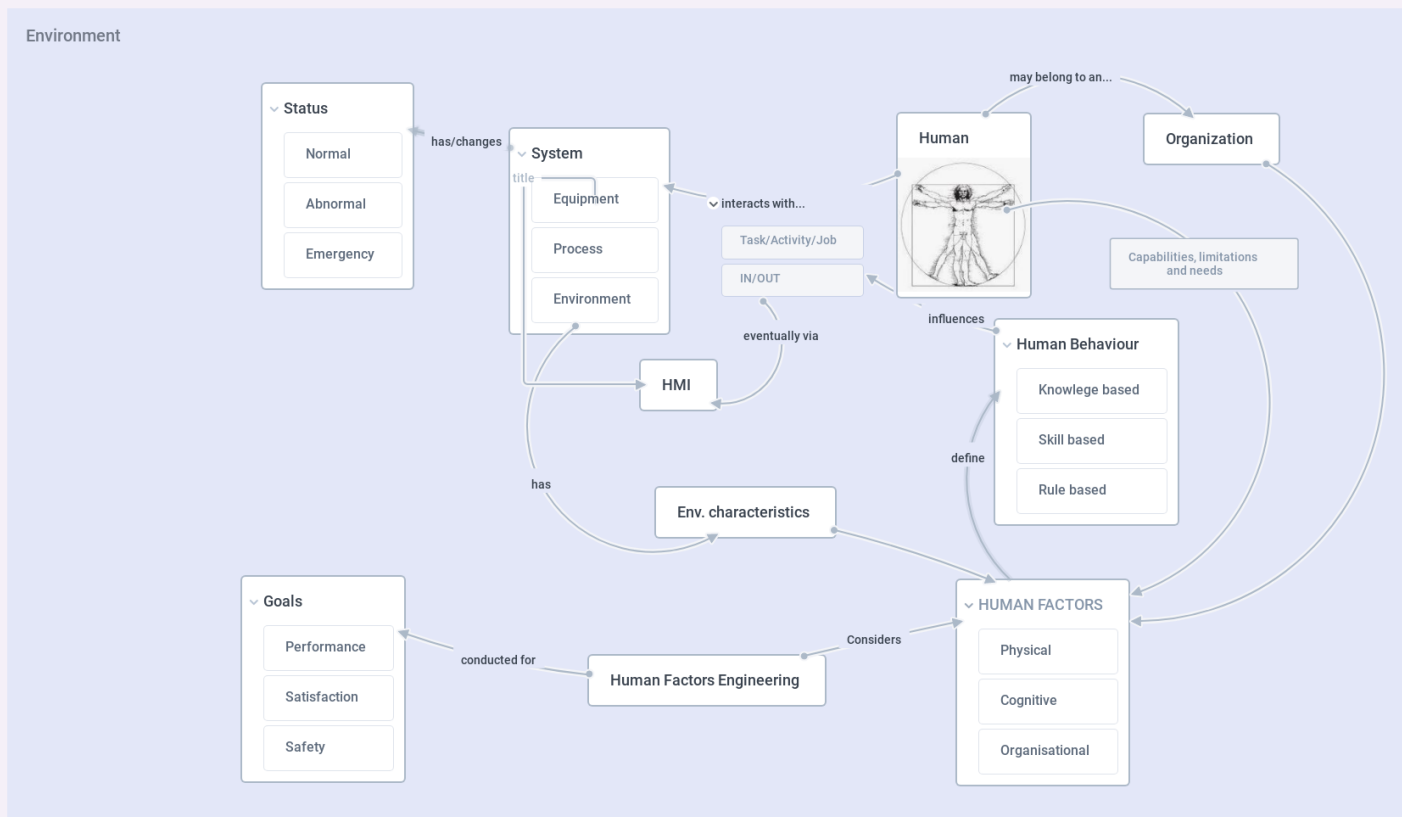
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Human factors

Socio-technical system



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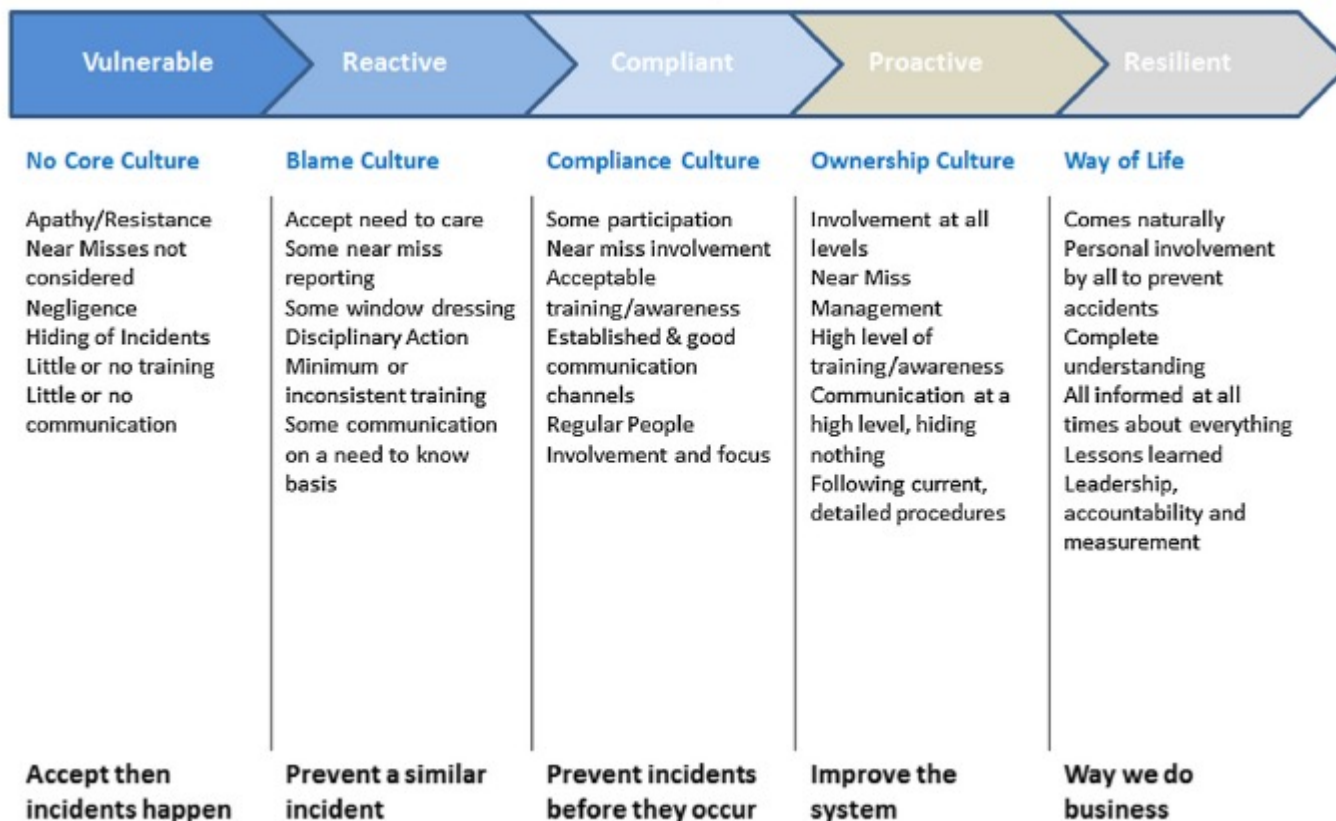


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Safety culture



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EU Directive 2012/18/EU, 4 July 2012, “Seveso III”, Requirements

Safety Management System applied to plant (Annex III)

- (12) Operators should have a general obligation to take all necessary measures to prevent major accidents, to mitigate their consequences and to take recovery measures. Where dangerous substances are present in establishments above certain quantities the operator should provide the competent authority with sufficient information to enable it to identify the establishment, the dangerous substances present and the potential dangers. The operator should also draw up and, where required by national law, send to the competent authority a major-accident prevention policy (MAPP) setting out the operator's overall approach and measures, including appropriate safety management systems, for controlling major-accident hazards. When the operators identify and evaluate the major-accident hazards, consideration should also be given to the dangerous substances which may be generated during a severe accident within the establishment.

Main pillars:

- **ORGANISATION AND PERSONNEL**
- **IDENTIFICATION AND EVALUATION OF MAJOR HAZARDS**
- **OPERATIONAL CONTROL**
- **MANAGEMENT OF CHANGE**
- **PLANNING FOR EMERGENCIES**
- **MONITORING PERFORMANCE**
- **AUDIT AND REVIEW**

Very similar in structure to the
OSHA (USA) PSM model

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EU Directive 2012/18/EU, 4 July 2012, “Seveso III”, Requirements

Safety Report (risk assessment) (Annex III)

- (15) In order to demonstrate that all that is necessary has been done to prevent major accidents, and to prepare emergency plans and response measures, the operator should, in the case of establishments where dangerous substances are present in significant quantities, provide the competent authority with information in the form of a safety report. That safety report should contain details of the establishment, the dangerous substances present, the installation or storage facilities, possible major-accident scenarios and risk analysis, prevention and intervention measures and the management systems available, in order to prevent and reduce the risk of major accidents and to enable the necessary steps to be taken to limit the consequences thereof. The risk of a major accident could be increased by the probability of natural disasters associated with the location of the establishment. This should be considered during the preparation of major-accident scenarios.

Minimum data and information to be considered:

- **IDENTIFICATION AND ACCIDENTAL RISK ANALYSIS AND PREVENTION METHOD**
 - MAJOR ACCIDENTS SCENARIOS AND THEIR PROBABILITY
 - CAUSES:
 - OPERATIONAL
 - EXTERNAL (DOMINO)
 - NATECH
 - CYBER
 - CONSEQUENCES
- **REVIEW OF PAST ACCIDENTS AND INCIDENTS (EVEN NEAR-MISSES)**
- **TECHNICAL PARAMETERS AND EQUIPMENT (DCS, ESD, ALARMS, ...)**
- **PROTECTION MEASURES**
- **EMERGENCY PLAN**

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EU Directive 2012/18/EU, 4 July 2012, “Seveso III”, Requirements

ROLE of the AHJ

19. ‘inspection’ means all actions, including site visits, checks of internal measures, systems and reports and follow-up documents, and any necessary follow-up, undertaken by or on behalf of the competent authority to check and promote compliance of establishments with the requirements of this Directive.

AHJ should **VERIFY** that the **Risk Reducing Factors (RRFs) DECLARED** in the Safety Report (by the Plant Owner) are valid and maintained during the **life-cycle** of the plant, by the support of the **Safety Management System** put in place. Declared PFD shouldn’t exceed data used in the risk assessment.

Two different inspections:

- On the **Safety Report content** (assumptions, results, risk mitigation plans);
- On the **Safety Management System** (major accidents risk from the safety report is kept under control during time?).

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EU Directive 2012/18/EU, 4 July 2012, “Seveso III”, Requirements

Article 10

Safety report

1. Member States shall require the operator of an upper-tier establishment to produce a safety report for the purposes of:

- (a) **demonstrating** that a MAP and a safety management system for implement P have been put into effect in accordance with the information set out in Annex III;
- (b) **demonstrating** that major-accident hazards and possible major-accident scenarios have been identified and that the necessary measures have been taken to prevent such accidents and to limit their consequences for human health and the environment;
- (c) **demonstrating** that adequate safety and reliability have been taken into account operation and maintenance or any installation, storage facility, equipment and infrastructure connected with its operation which are linked to major-accident hazards inside the establishment;
- (d) **demonstrating** that internal emergency plans have been drawn up and supplying information to enable the external emergency plan to be drawn up;
- (e) **providing sufficient information to the competent authority** to enable decisions to be made regarding the siting of new activities or developments around existing establishments.

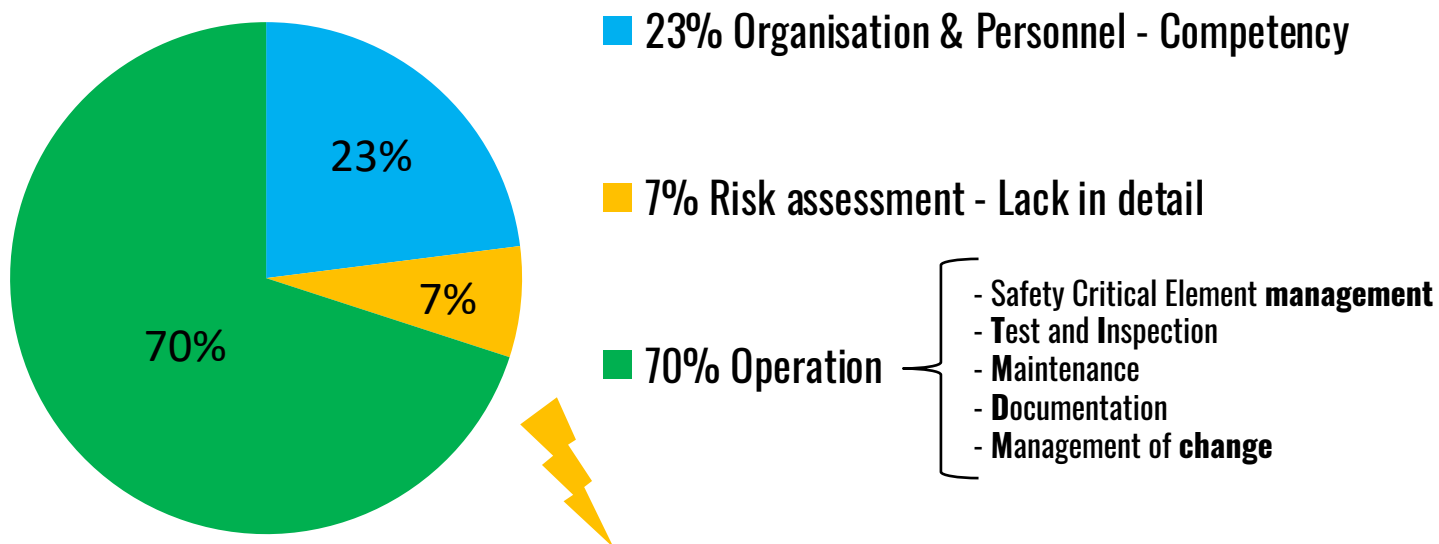
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Results of inspections in Italy (2016÷2019)



Problems rise in **OPERATION** rather than in **RISK ASSESSMENT**

Real problem is: **DEFENCE Vs OPERATION**

Be aware: safety issues are also business continuity/reputation problems

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Article 11

Modification of an installation, an establishment or a storage facility

In the event of the modification of an installation, establishment, storage facility, or process or of the nature or physical form or quantity of dangerous substances which could have significant consequences for major-accident hazards, or could result in a lower-tier establishment becoming an upper-tier establishment or vice versa, Member States shall ensure that the operator reviews, and where necessary updates the notification, the MAPP, the safety management system and the safety report and informs the competent authority of the details of those updates in advance of that modification.

MOC is a pillar of the **Safety Management System**.

AHJ should verify that **MOC** process is included and actuated for each plant modification and plant life-cycle **coincides** with the prevention / protection measures **life-cycles**.

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Integrated Port Safety Report (RISP)

A specific law (D.M. 293/2001), no more valid;

- Integrated port safety report for industrial ports (RISP):
 - Risk assessment
 - Procedures (to prevent) and Emergency Procedures (to mitigate)
 - Coordinated: owners, third-parties, authorities
- To be prepared by Port Authority and approved by a pool of AHJs
- To be used for the Port Emergency Plan

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Integrated Port Safety Report (RISP)

“RISP” structure:

A – Port and interfaces

B – Legislation (law, regulations)

C – Risk assessment

D – Emergency plan

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Risk assessment in RISP:

Risk assessment (frequency and consequences) should include:

- accidents from Seveso plants (Safety Reports)
- accidents during transfer operations between ship and land;
- accidents during vehicle loading/unloading operations;
- accidents during wagon loading/unloading operations railways.
- possible domino effects also in relation to the transit/transfer of hazardous substances
- recomposition of possible area hazards (including FN curves)

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Investigated ports



Venezia



Taranto



Cagliari



Augusta

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Port and interfaces



Overview of the Port of Venice

TERRITORIAL FRAMEWORK



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Port and interfaces

Port areas



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Port and interfaces

Companies list

| | Terminal | |
|---------------------------------|--------------------------|--|
| Porto Turistico | Terminal passeggeri | Stazione Marittima |
| | | San Basilio e Santa Marta |
| | Terminal navi da diporto | Riva Sette Martiri e Riva degli Schiavoni |
| | | Fondamenta delle Zattere |
| Porto Industriale e Commerciale | Terminal Petroliferi | Campo Briccole Punta della Dogana |
| | | Decal (Canale Industriale Sud) |
| | | Eni (Darsena Irom e San Leonardo) |
| | | Petroven (Darsena Petroven) |
| | | San Marco Petroli (Canale Industriale Sud) |
| | Terminal Industriali | Versalis (ex Polimeri Europa) |
| | | Alcoa trasformazioni (Canale Industriale Sud) |
| | | Cereal Docks Marghera (Canale Industriale Brentella) |
| | | Enel Produzione Fusina (Canale Industriale Sud) |
| | | Grandi Molini Italiani (Canale Industriale Ovest) |
| | | Idromacchine (Canale Industriale Ovest) |
| | | AFV Acciaierie Beltrame (Can. Ind. Nord) |
| | Terminal Commerciali | Simar (Canale Industriale Nord) |
| | | Centro Intermodale Adriatico |
| | | Colacem (Canale Industriale Sud) |
| | | Ilva (Canale Industriale Nord) |
| | | Multi Service |
| | | Terminal Intermodale Venezia (TIV) |
| | | Terminal Rinfuse Venezia (TRV) |
| | | Transped |
| | | Vecon |
| | | Venice Ro-Port Mos |

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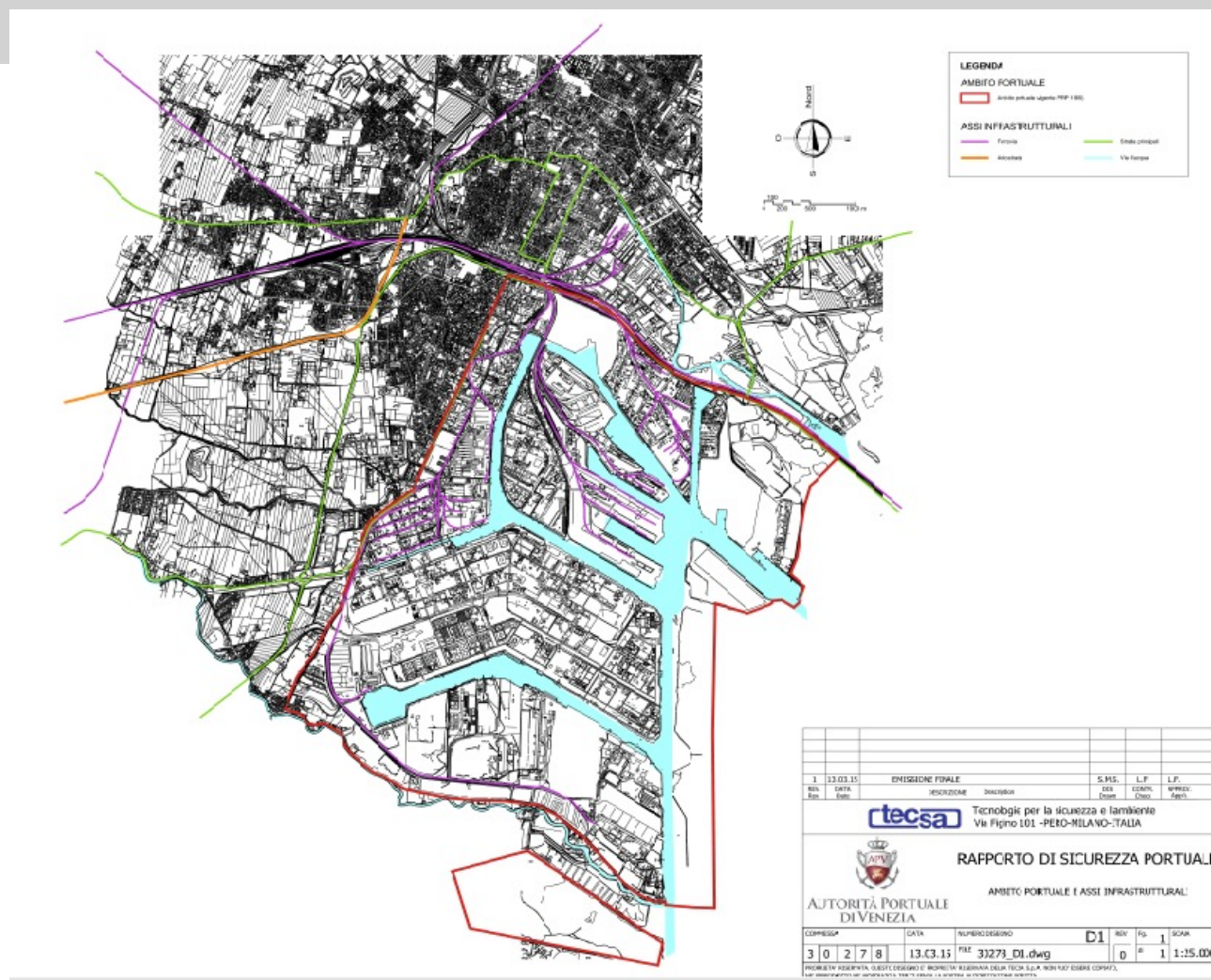


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Port and interfaces



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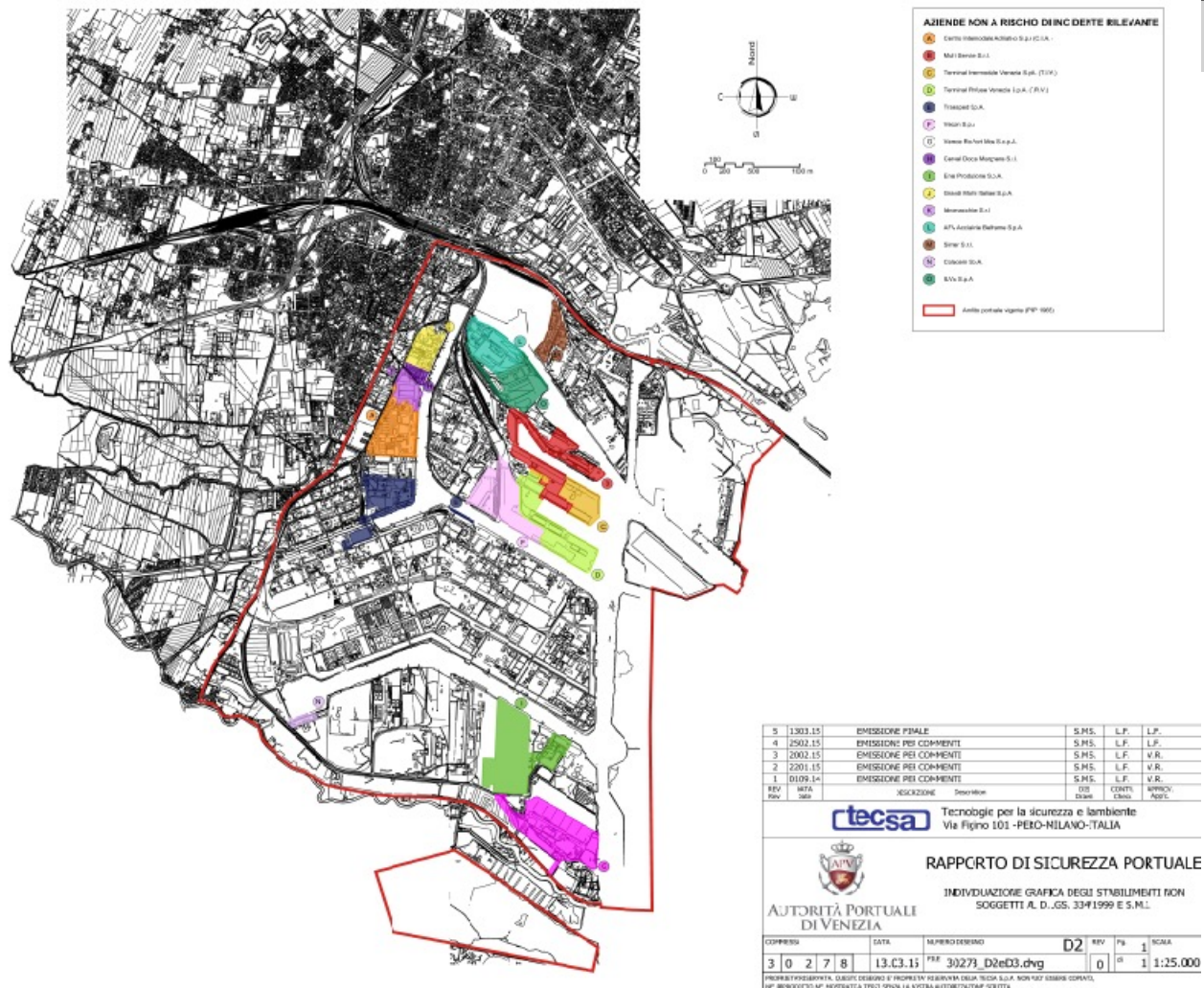


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Port and interfaces



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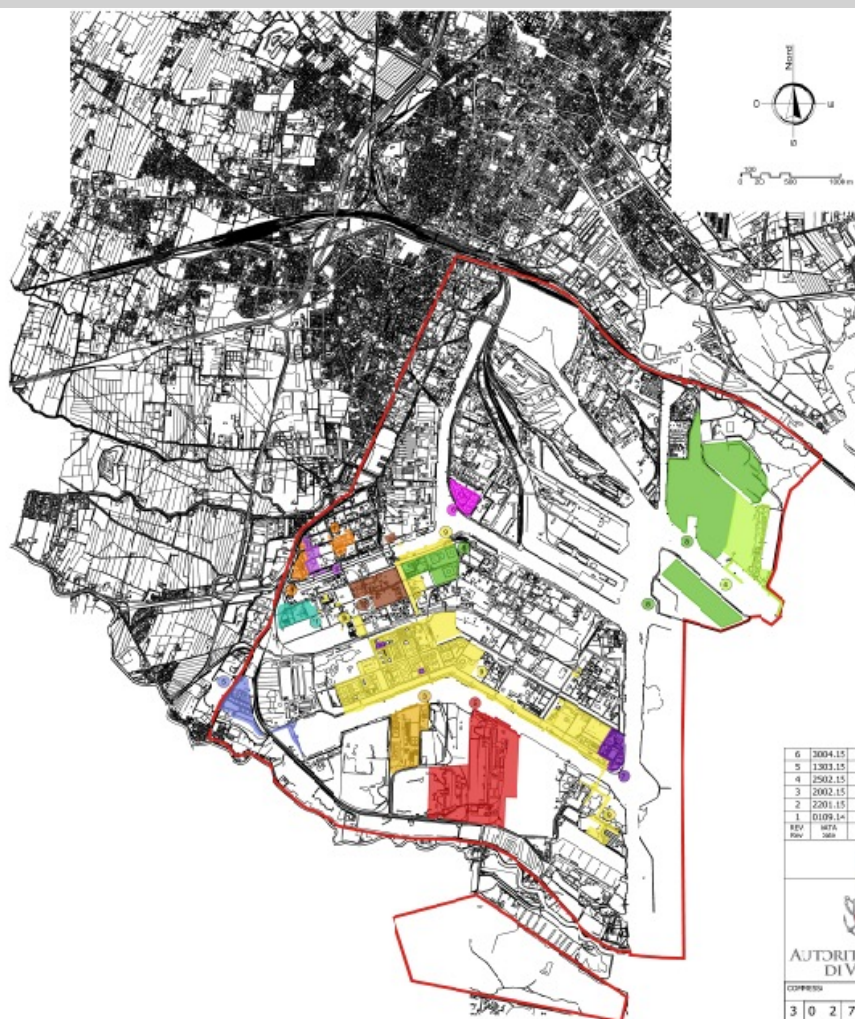
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A CORUÑA
18 y 19
Mayo 2020



Port and interfaces



AZIENDE A RISCHIO D'INCIDENTE RILEVANTE

- 1. SAPI - Polimeri Meridionali S.p.A.
- 2. ALCOA - Trasporti S.p.A.
- 3. BICAL - Bepco Container S.p.A.
- 4. Polimeri S.p.A.
- 5. San Marino S.p.A.
- 6. I.E.S. - Inter Cargo S.p.A.
- 7. WAGG S.p.A.
- 8. S.P.A. - Raffineria S.p.A.
- 9. Veneta S.p.A. - Polimeri S.p.A.
- 10. APROMAR S.p.A.
- 11. In CPM - Porto S.p.A.
- 12. SOLVAY SPECIALTY POLYMERS ITALY S.p.A.

Area portuale vigente (PPV 1982)

| | | | | | |
|---|---------|------------------------|--------|------|------|
| 6 | 3004.15 | EMERGENZA FINALE | S.M.S. | L.F. | L.F. |
| 5 | 1303.15 | EMERGENZA PER COMMENTI | S.M.S. | L.F. | L.F. |
| 4 | 2502.15 | EMERGENZA PER COMMENTI | S.M.S. | L.F. | L.F. |
| 3 | 2002.15 | EMERGENZA PER COMMENTI | S.M.S. | L.F. | V.R. |
| 2 | 2201.15 | EMERGENZA PER COMMENTI | S.M.S. | L.F. | V.R. |
| 1 | 0109.14 | EMERGENZA PER COMMENTI | S.M.S. | L.F. | V.R. |

| REV | DATA | DESCRIZIONE | DIS | CONTI | APPROV. |
|-----|----------|-------------|-----|-------|---------|
| 0 | 30.04.15 | | | | |



Tecnologie per la sicurezza e l'ambiente
Via Fagnola 101 - PERIO-ILIANO-ITALIA



RAPPORTO DI SICUREZZA PORTUALE

INDIVIDUAZIONE GRAFICA DEGLI STABILIMENTI
SOGGETTI AL D.LGS. 33/1999 E S.M.I.

| COMPRESO | DATA | NUMERO DESIGNO | D3 | REV | PS | SCALA |
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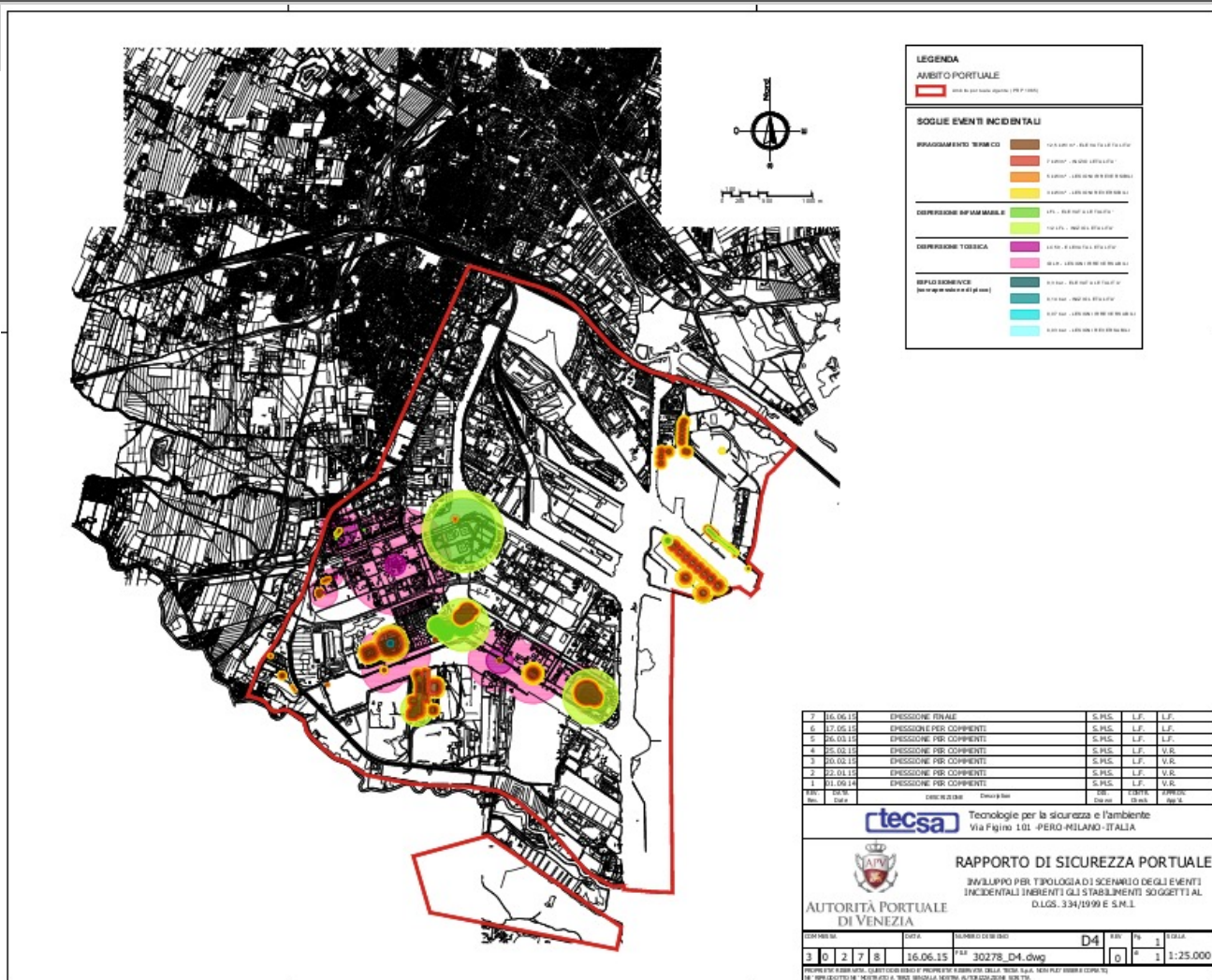


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Risk assessment



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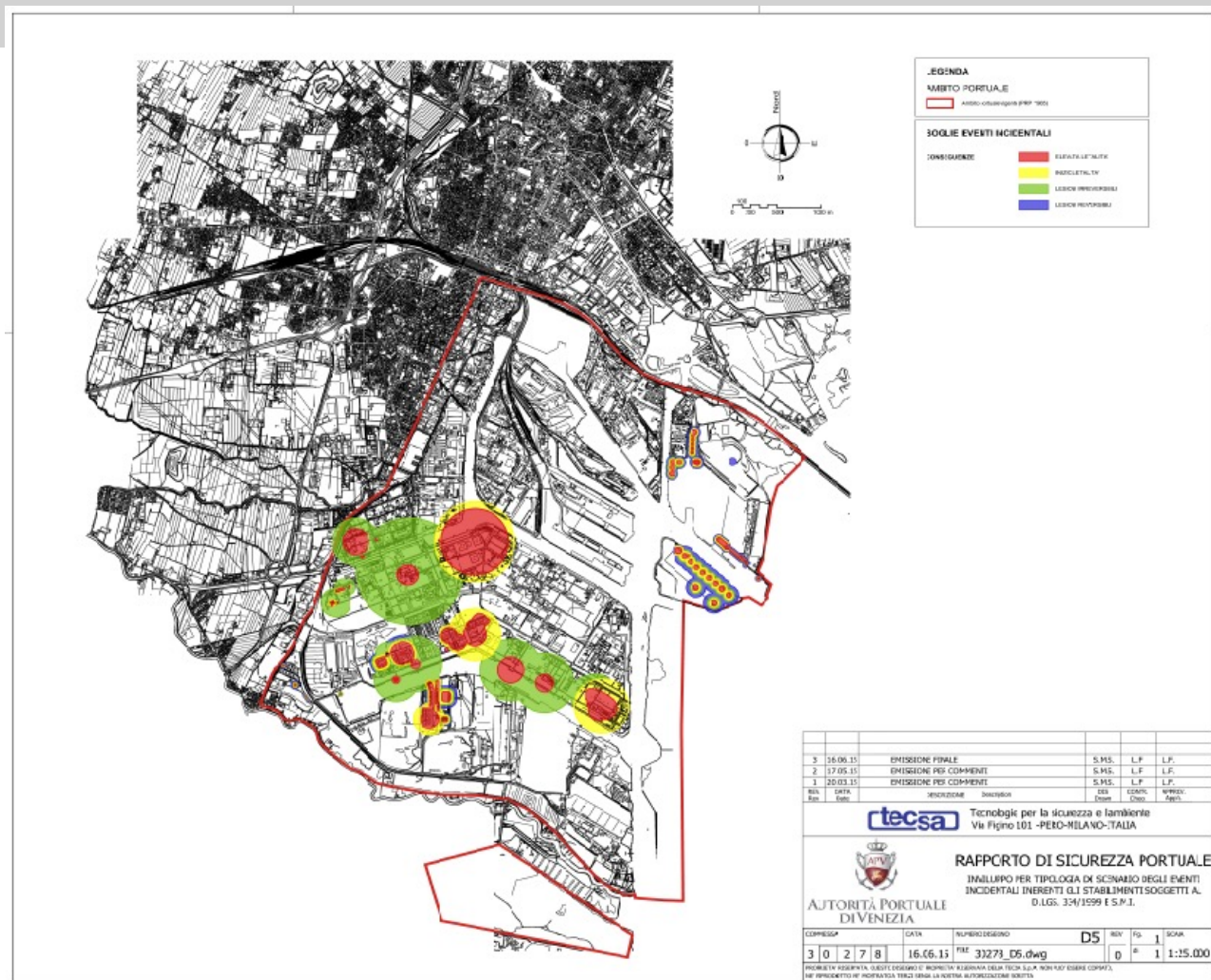


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Risk assessment



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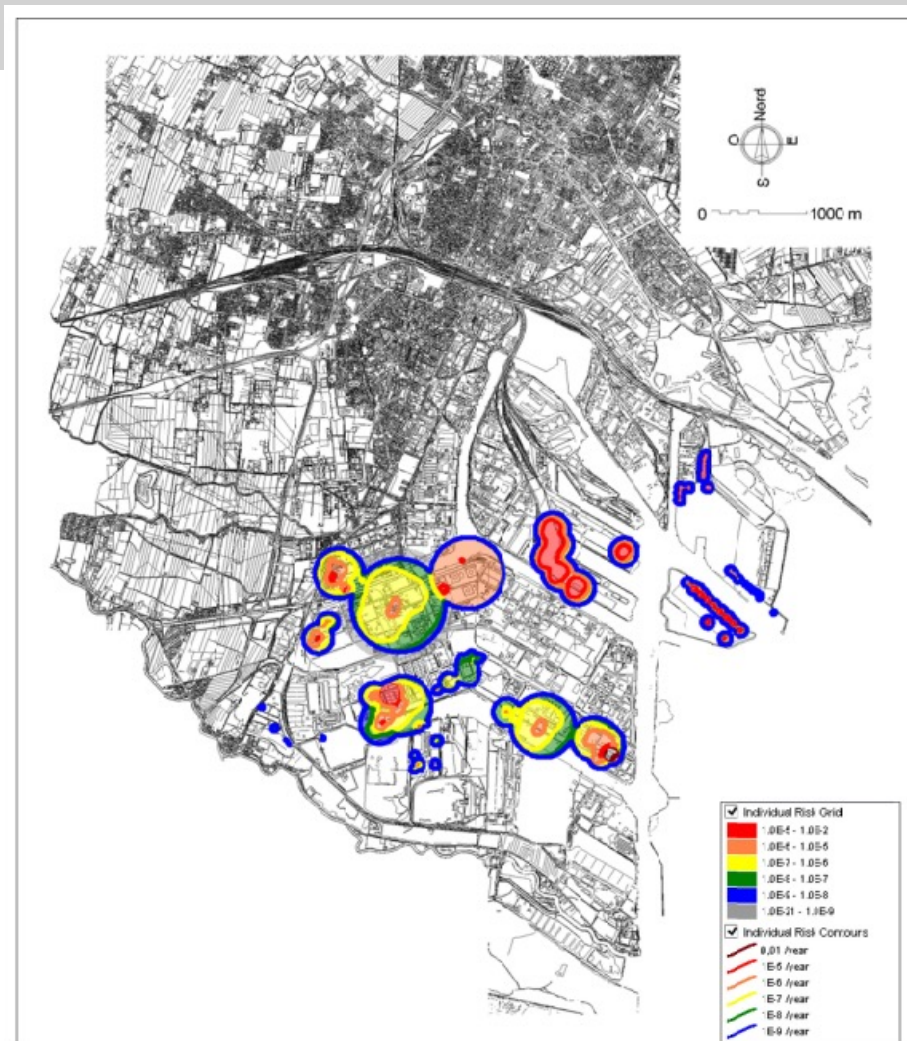
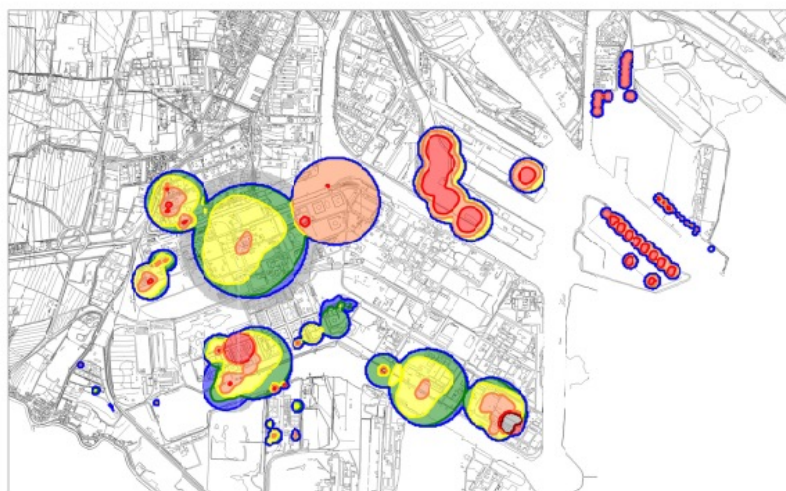


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Risk assessment



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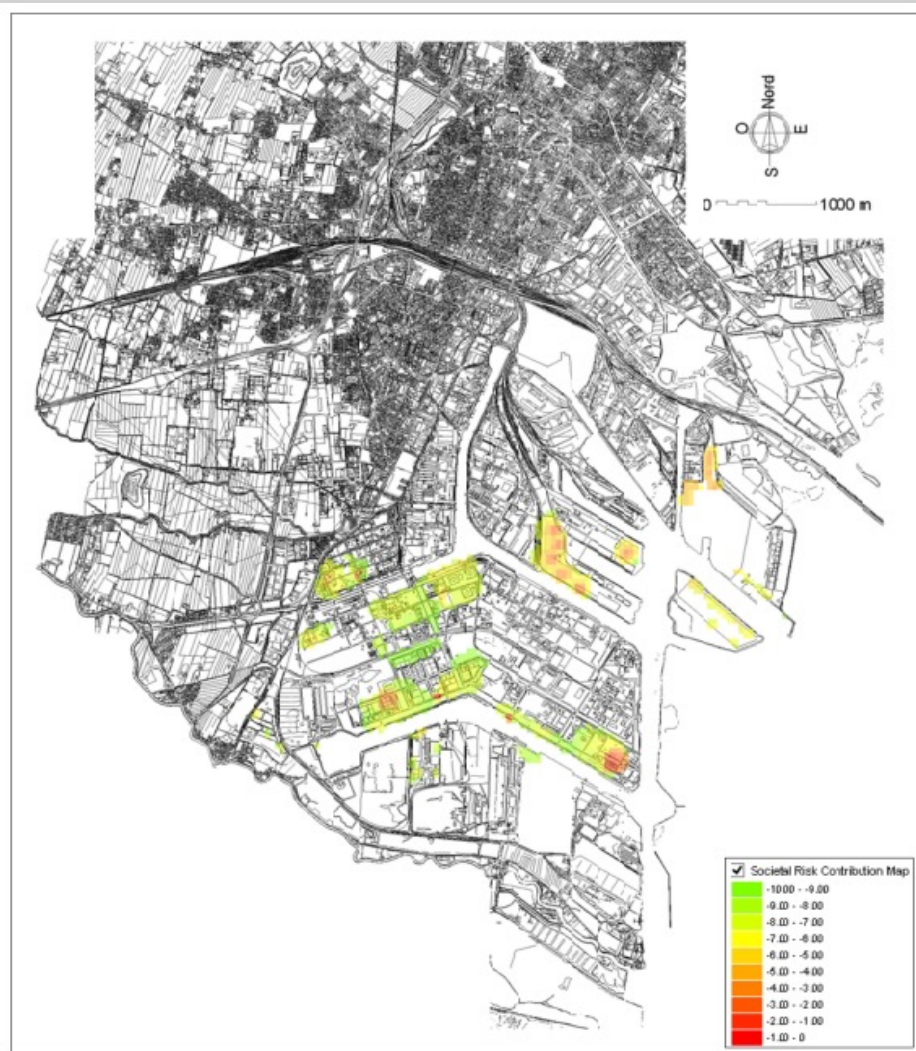


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Risk assessment



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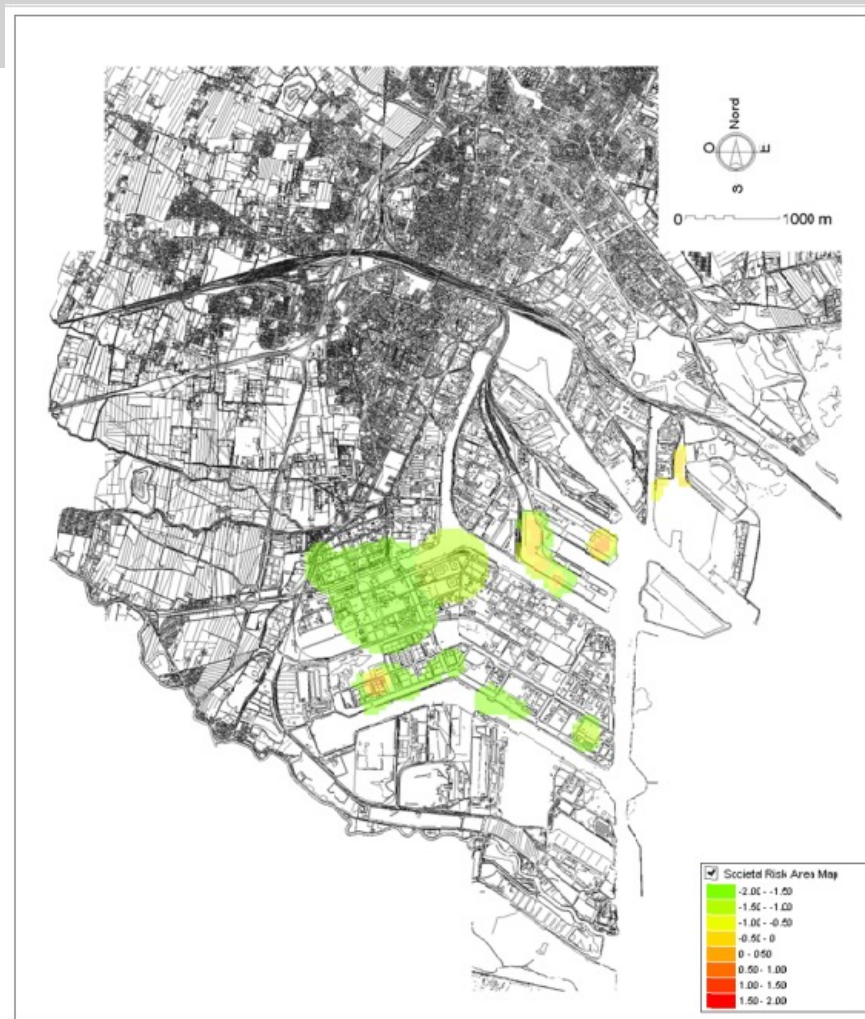


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Risk assessment



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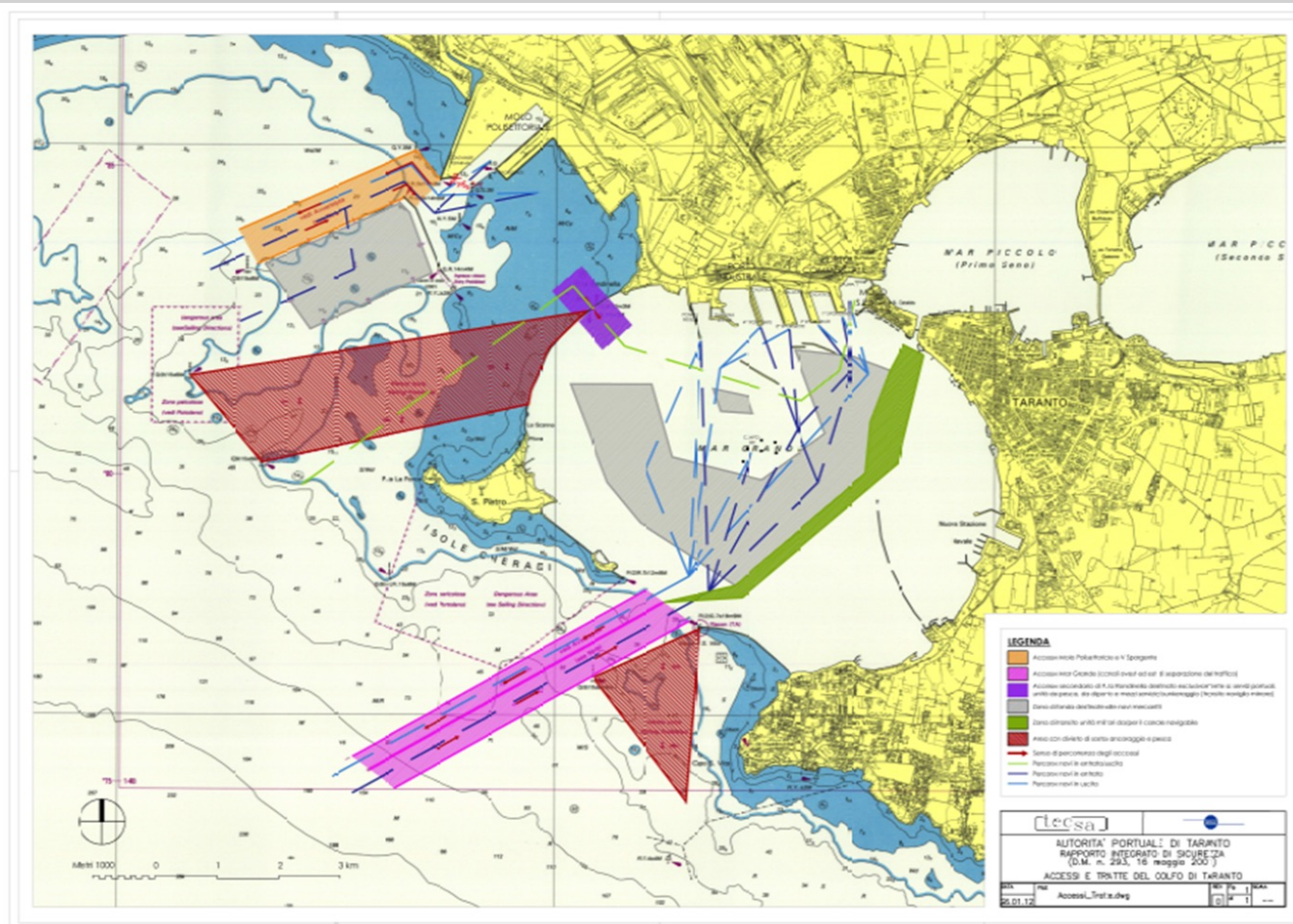
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Traffic risk assessment

Graphic recompositing of the naval traffic regulations in the Port of Taranto by virtue of the regulations in place prepared by the Port Authority.



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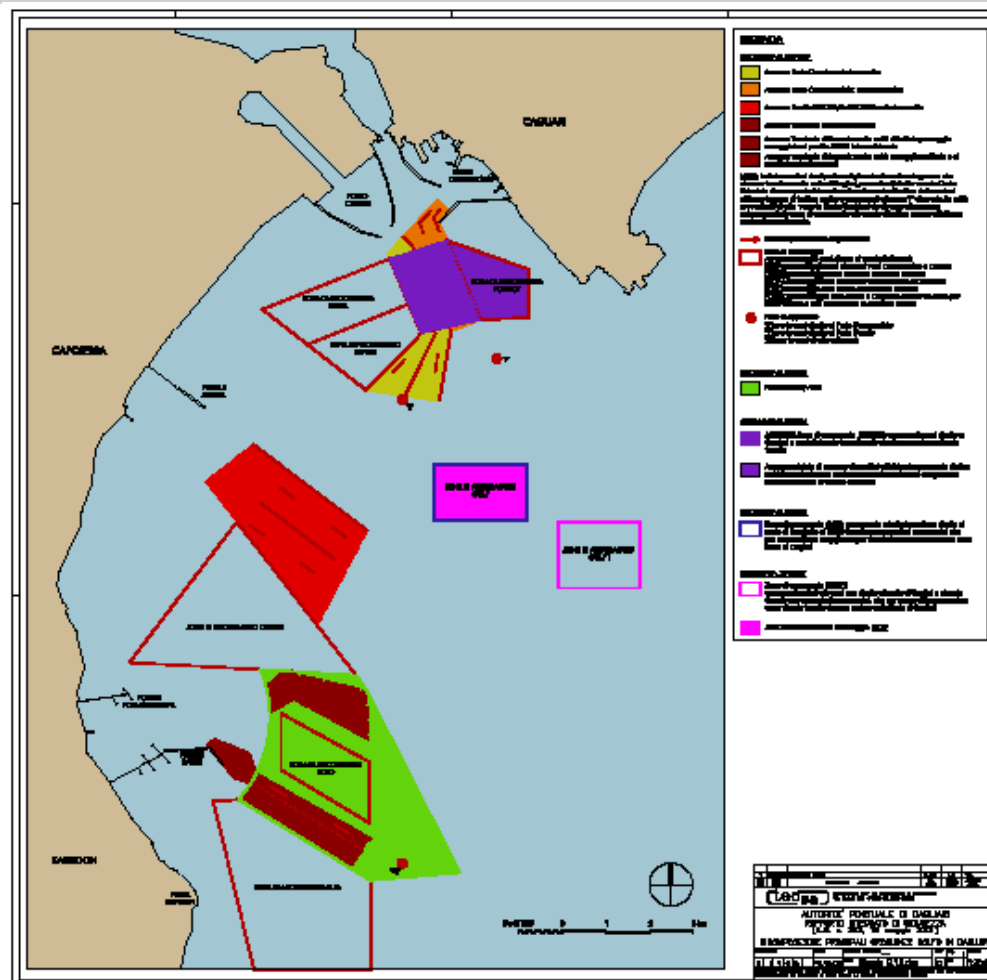


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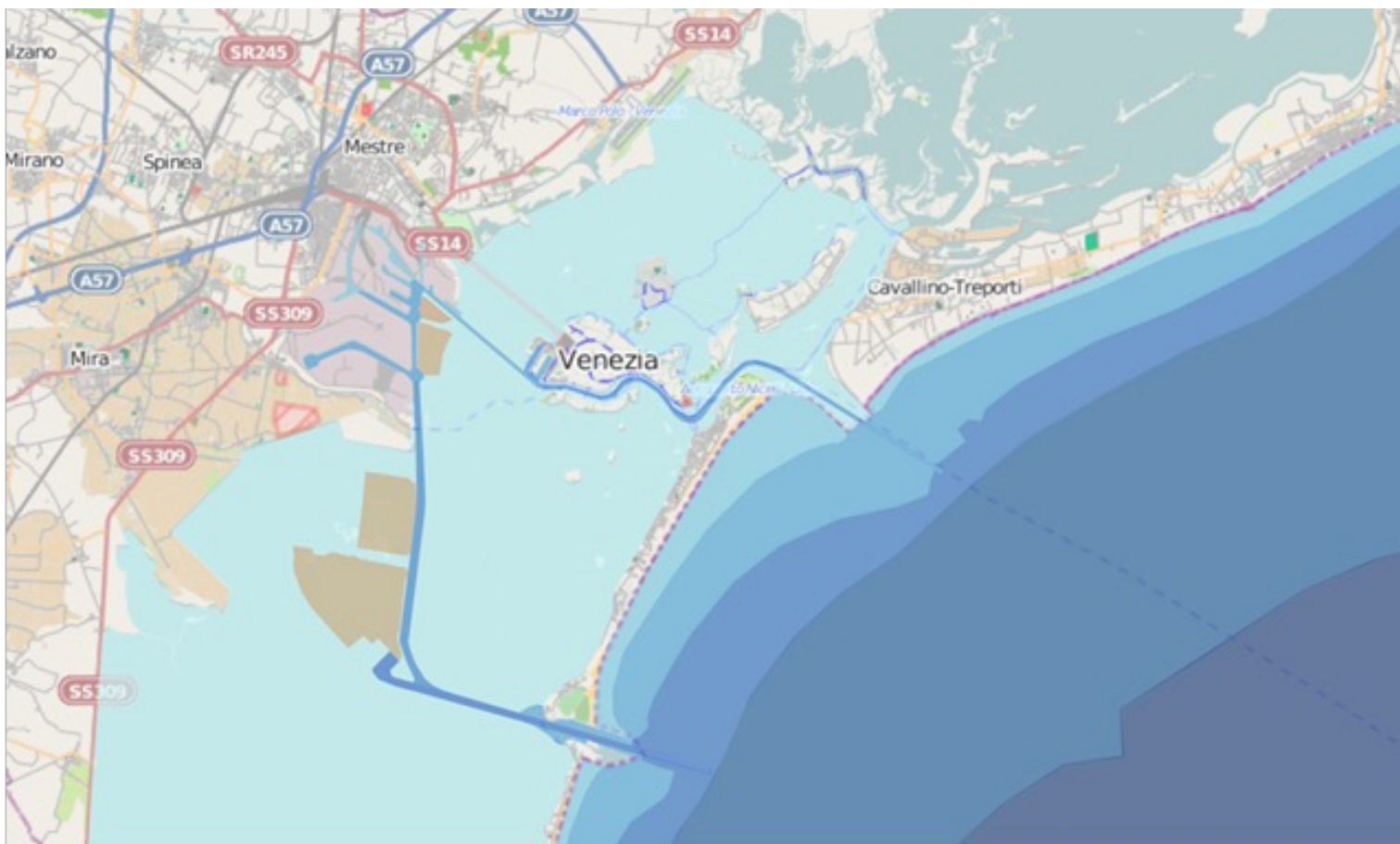
Traffic risk assessment



Traffic regulation in the Gulf of Cagliari, general overview



Traffic risk assessment



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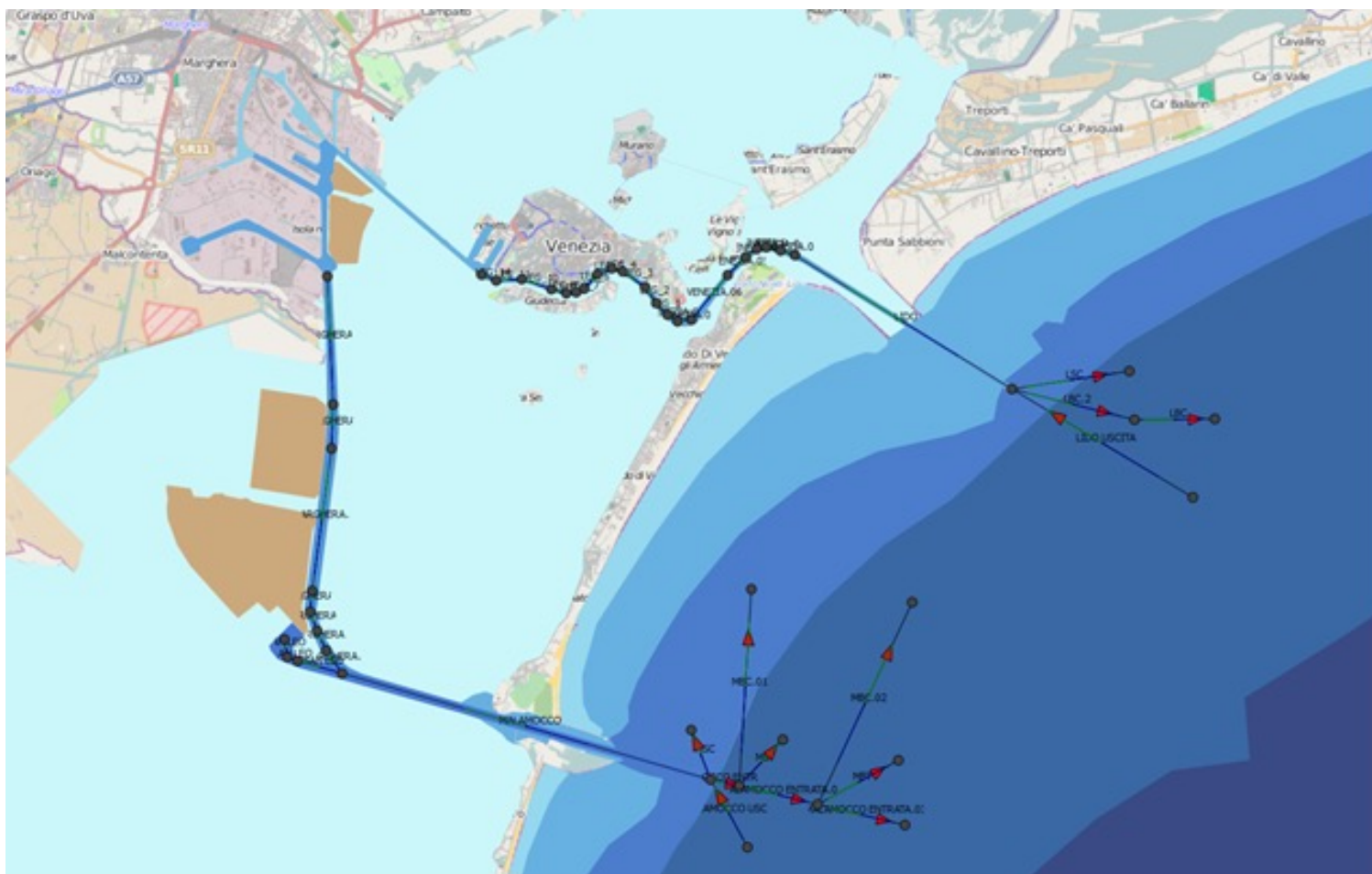


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Traffic risk assessment



Routes and waypoints

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Traffic risk assessment



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Traffic risk assessment

MATRICE DELLE COLLISIONI NELL'AMBITO PORTUALE DI VENEZIA

| | <i>Crude oil tanker</i> | <i>Oil products tanker</i> | <i>Chemical tanker</i> | <i>Gas tanker</i> | <i>Container ship</i> | <i>General cargo ship</i> | <i>Bulk carrier</i> | <i>Ro-Ro cargo ship</i> | <i>Passenger ship</i> | <i>Fast ferry</i> | <i>Support ship</i> | <i>Other ship</i> | <i>Sum</i> |
|----------------------------|-------------------------|----------------------------|------------------------|-------------------|-----------------------|---------------------------|---------------------|-------------------------|-----------------------|-------------------|---------------------|-------------------|------------|
| <i>Crude oil tanker</i> | 4,62E-04 | 5,44E-05 | 5,25E-04 | 1,98E-04 | 1,71E-03 | 1,32E-03 | 5,61E-04 | 1,04E-04 | 1,51E-05 | 2,29E-10 | 3,96E-06 | 3,72E-04 | 5,33E-03 |
| <i>Oil products tanker</i> | 5,42E-05 | 6,29E-06 | 6,06E-05 | 2,27E-05 | 1,96E-04 | 1,52E-04 | 6,54E-05 | 1,20E-05 | 1,72E-06 | 2,66E-11 | 4,47E-07 | 4,23E-05 | 6,13E-04 |
| <i>Chemical tanker</i> | 5,13E-04 | 5,96E-05 | 5,75E-04 | 2,19E-04 | 1,85E-03 | 1,46E-03 | 6,23E-04 | 1,13E-04 | 1,66E-05 | 3,35E-10 | 4,37E-06 | 4,01E-04 | 5,83E-03 |
| <i>Gas tanker</i> | 2,07E-04 | 2,39E-05 | 2,34E-04 | 8,78E-05 | 7,67E-04 | 5,86E-04 | 2,51E-04 | 4,69E-05 | 6,91E-06 | 9,36E-11 | 1,73E-06 | 1,67E-04 | 2,38E-03 |
| <i>Container ship</i> | 1,10E-03 | 1,27E-04 | 1,16E-03 | 4,56E-04 | 2,79E-03 | 3,09E-03 | 1,32E-03 | 1,79E-04 | 2,45E-05 | 4,37E-09 | 9,73E-06 | 6,08E-04 | 1,09E-02 |
| <i>General cargo ship</i> | 1,50E-03 | 1,73E-04 | 1,69E-03 | 6,41E-04 | 5,46E-03 | 4,13E-03 | 1,81E-03 | 3,36E-04 | 4,86E-05 | 5,12E-10 | 1,24E-05 | 1,18E-03 | 1,70E-02 |
| <i>Bulk carrier</i> | 5,70E-04 | 6,67E-05 | 6,49E-04 | 2,45E-04 | 2,15E-03 | 1,63E-03 | 6,82E-04 | 1,31E-04 | 1,91E-05 | 2,69E-10 | 4,86E-06 | 4,65E-04 | 6,61E-03 |
| <i>Ro-Ro cargo ship</i> | 7,43E-05 | 8,62E-06 | 8,00E-05 | 3,12E-05 | 2,10E-04 | 2,11E-04 | 8,93E-05 | 1,30E-05 | 1,90E-06 | 1,86E-10 | 6,62E-07 | 4,54E-05 | 7,65E-04 |
| <i>Passenger ship</i> | 7,77E-06 | 8,89E-07 | 8,57E-06 | 3,43E-06 | 1,86E-05 | 2,34E-05 | 9,72E-06 | 1,26E-06 | 1,88E-04 | 5,63E-05 | 7,12E-08 | 1,21E-04 | 4,39E-04 |
| <i>Fast ferry</i> | 1,64E-09 | 1,82E-10 | 2,08E-09 | 4,57E-10 | 2,56E-08 | 3,04E-09 | 1,98E-09 | 1,05E-09 | 3,39E-05 | 4,52E-06 | 2,07E-12 | 2,25E-05 | 6,10E-05 |
| <i>Support ship</i> | 4,85E-06 | 5,56E-07 | 5,46E-06 | 2,04E-06 | 1,81E-05 | 1,32E-05 | 5,82E-06 | 1,11E-06 | 1,65E-07 | 1,05E-12 | 3,66E-08 | 4,05E-06 | 5,54E-05 |
| <i>Other ship</i> | 2,34E-04 | 2,70E-05 | 2,47E-04 | 9,72E-05 | 5,92E-04 | 6,63E-04 | 2,83E-04 | 3,79E-05 | 2,19E-04 | 6,59E-05 | 2,03E-06 | 2,18E-04 | 2,69E-03 |
| <i>Sum</i> | 4,72E-03 | 5,48E-04 | 5,24E-03 | 2,00E-03 | 1,58E-02 | 1,33E-02 | 5,70E-03 | 9,75E-04 | 5,75E-04 | 1,27E-04 | 4,03E-05 | 3,65E-03 | 5,26E-02 |

COLABORA:



ORGANIZA:



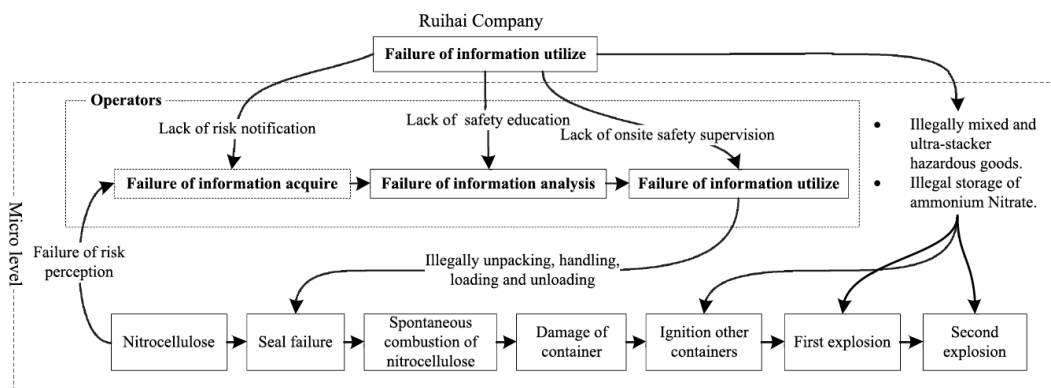
Puertos del Estado



GESTIONA:



Real investigation (e.g. Tianjiin)

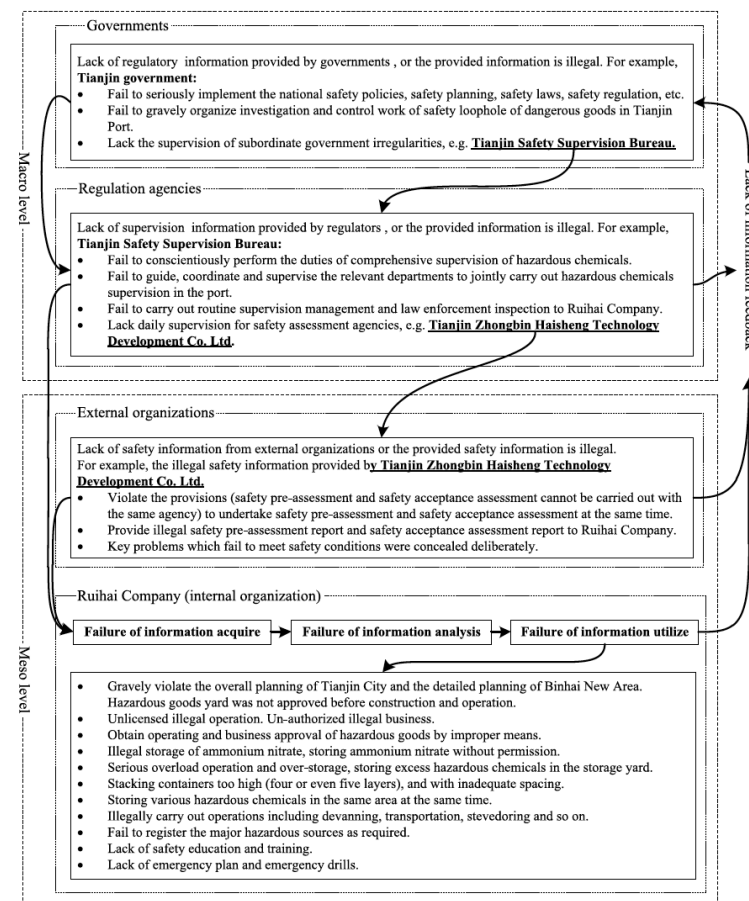


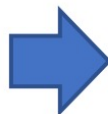
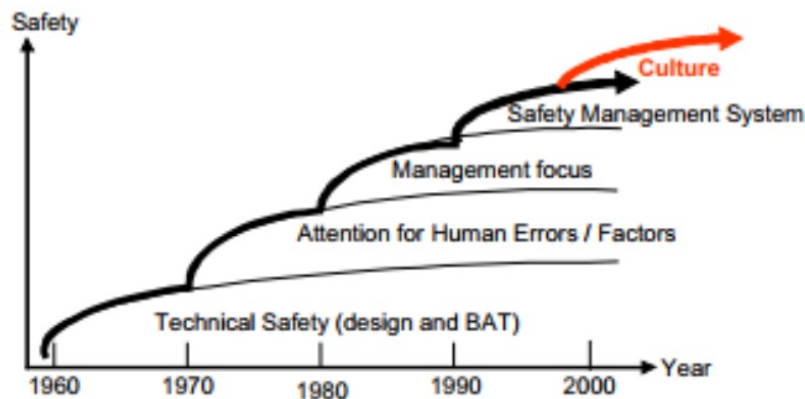
A new accident causation model based on information flow and its application in Tianjin Port fire and explosion accident

Chao Wu^{a,b}, Lang Huang^{a,b,*}

^a School of Resources and Safety Engineering, Central South University, Changsha Hunan 410083, P. R. China

^b Safety & Security Theory Innovation and Promotion Center, Central South University, Changsha Hunan 410083, P. R. China





Did we learn about risk control since Seveso? Yes, we surely did, but is it enough? An historical brief and problem analysis

Prerna Jain, Hans J. Pasman*, Simon P. Waldram, William J. Rogers, M. Sam Mannan

Mary Kay O'Connor Process Safety Center, Artie McFerrin Department of Chemical Engineering, Texas A&M University, College Station, TX, USA

COLABORA:



ORGANIZA:



Puertos del Estado

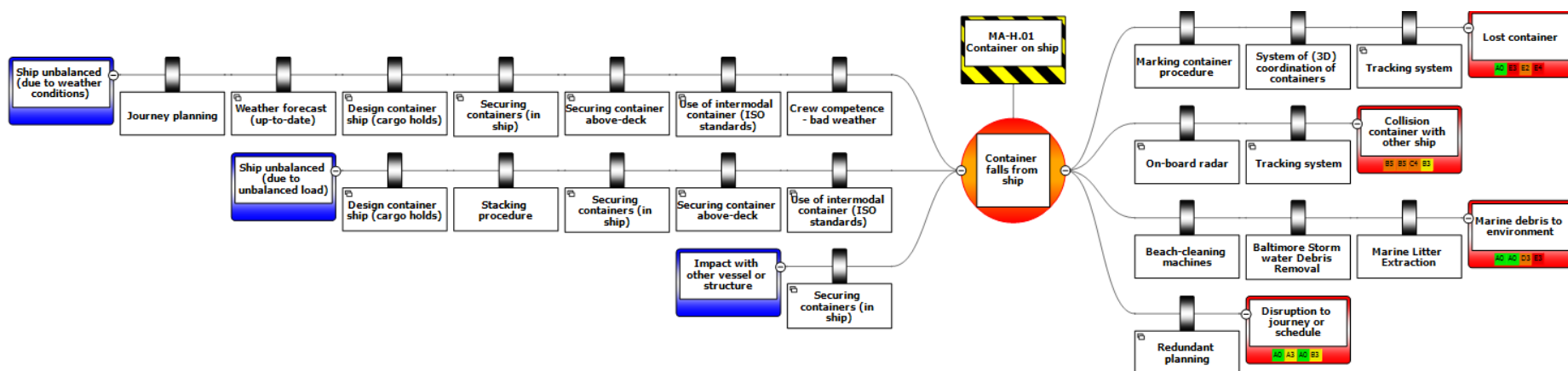


GESTIONA:





Bow-Tie: proposed approach



COLABORA:



ORGANIZA:



Puertos del Estado

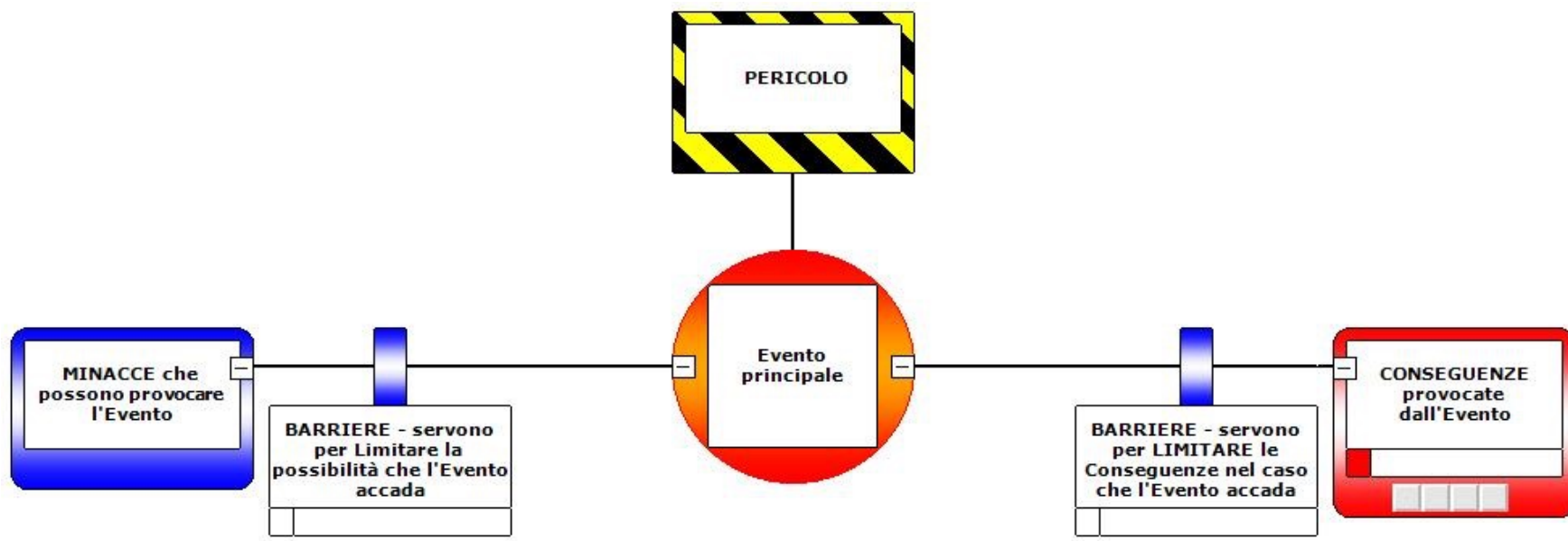


GESTIONA:





Bow-Tie: general structure



COLABORA:



ORGANIZA:



Puertos del Estado

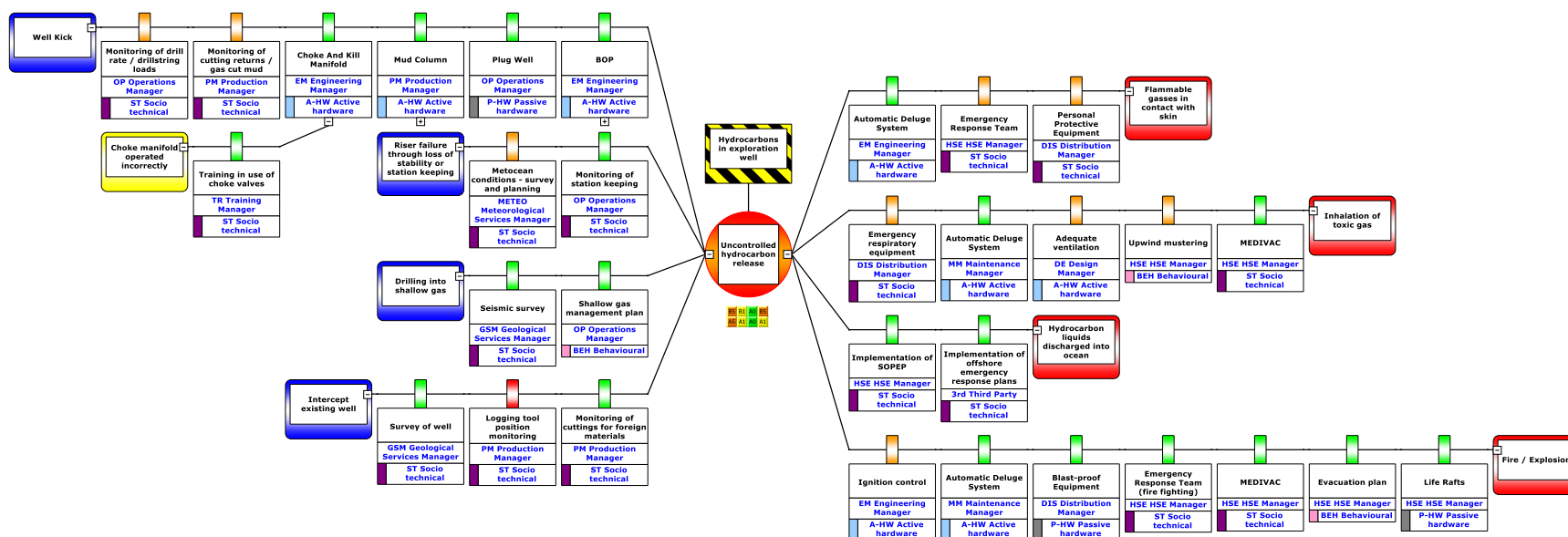


GESTIONA:



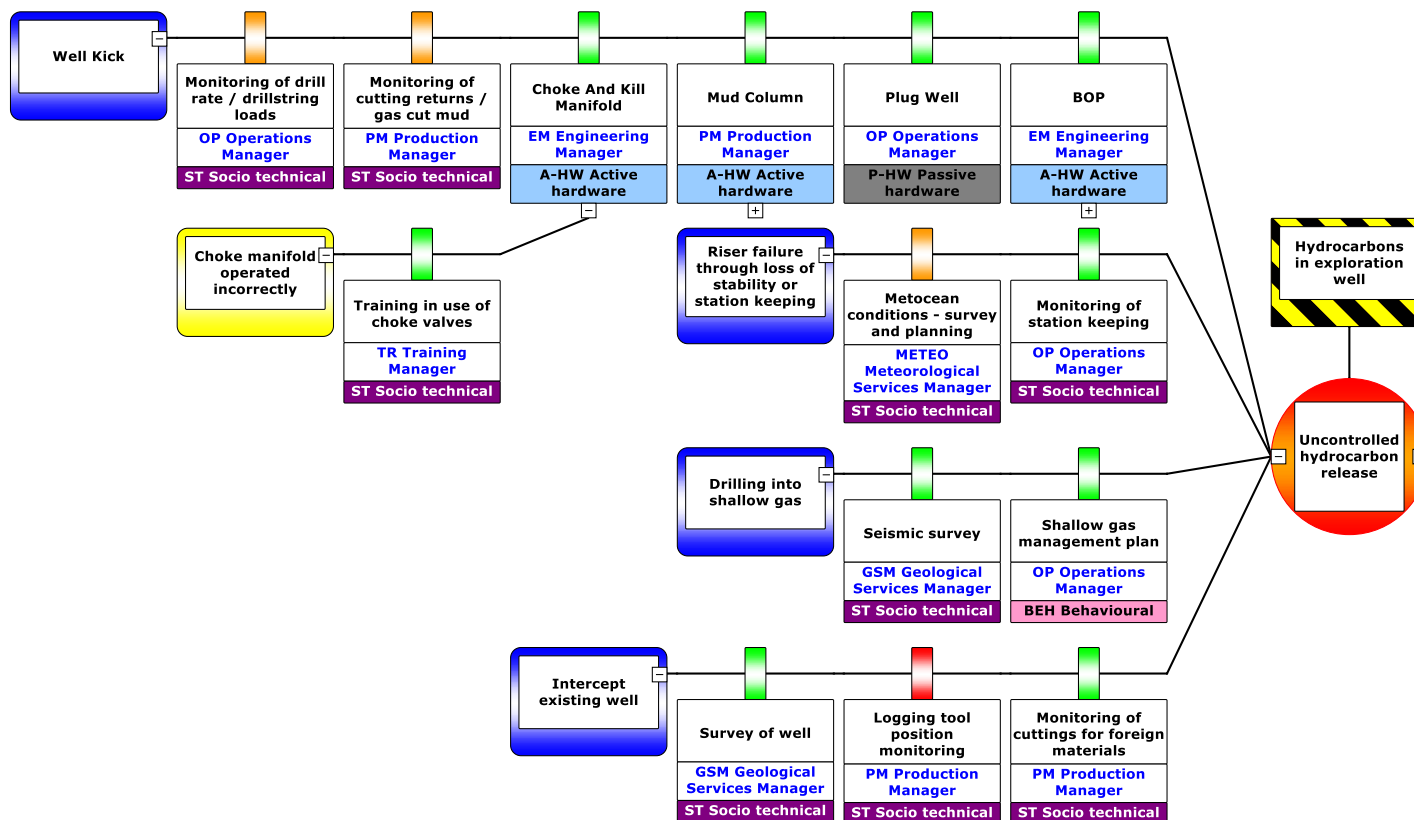


Bow-Tie: simple notation to deal with HF





Bow-Tie: preventive measures



COLABORA:



ORGANIZA:



Puertos del Estado

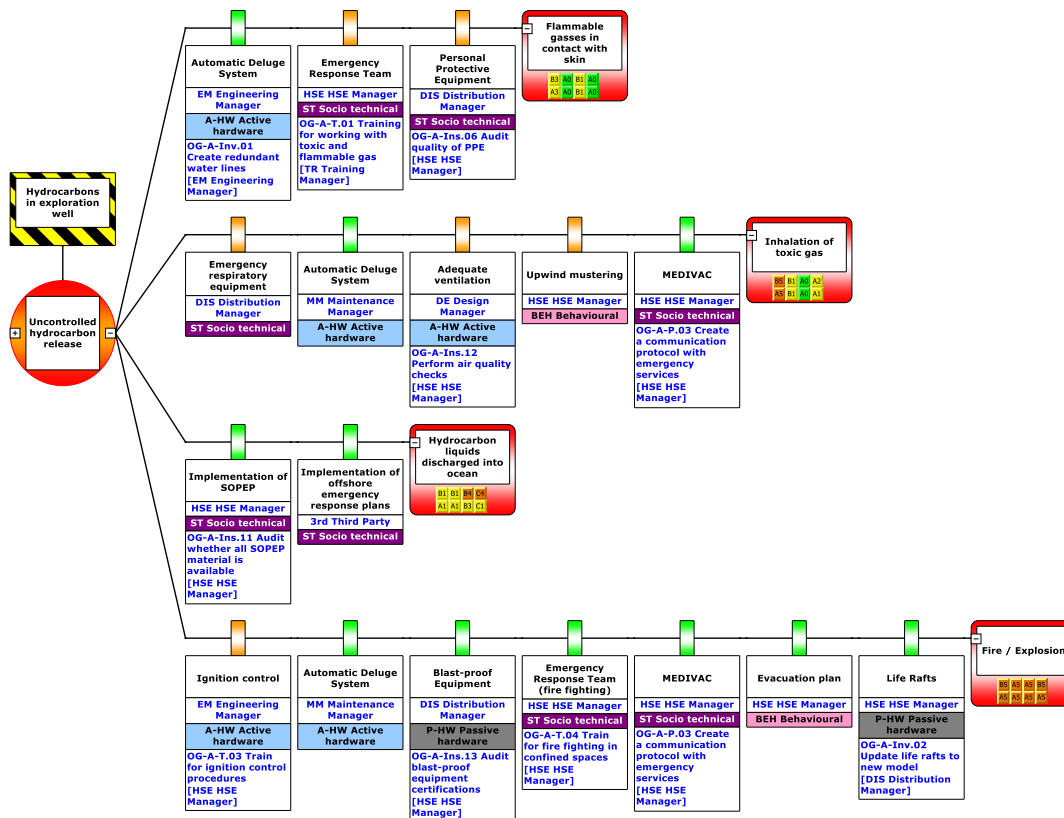


GESTIONA:





Bow-Tie: protection measures



COLABORA:

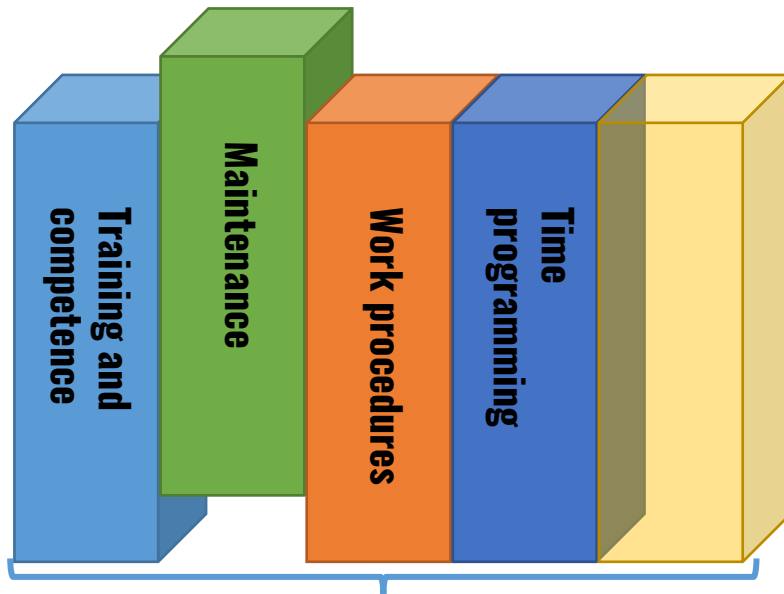
ORGANIZA:

GESTIONA:

pixeling
making your ideas work

Holistic composition towards a maturity model

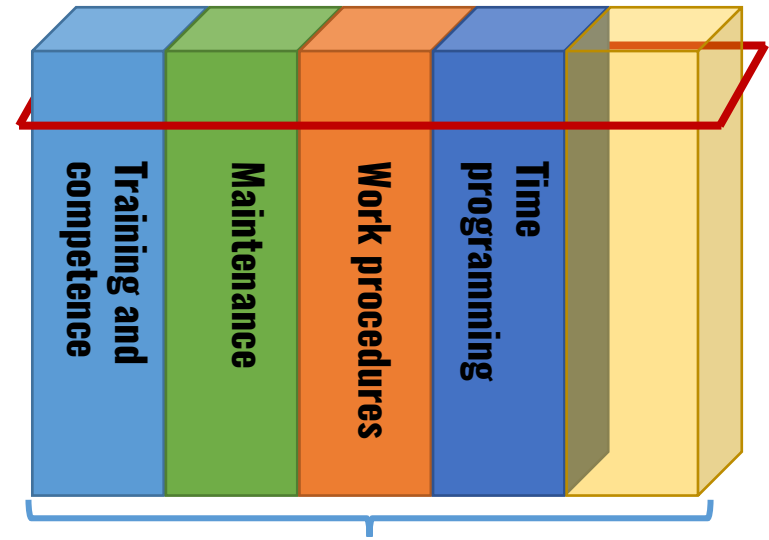
Performance standards - Traditional audit Vs. Barrier based inspection



Management system

SINGLE-FOCUS APPROACH

MORE RESOURCES NEEDED, SPECIALIZED TEAMS DO NOT EXCHANGE INFORMATION
DIFFICULT TO IMPLEMENT AND MANTAIN



Management system

PERFORMANCE BASED APPROACH

(ANALYSIS, DESIGN, OPERATION)
IT CAN INTEGRATE MORE RAGAGEPs IN A MATURITY MODEL

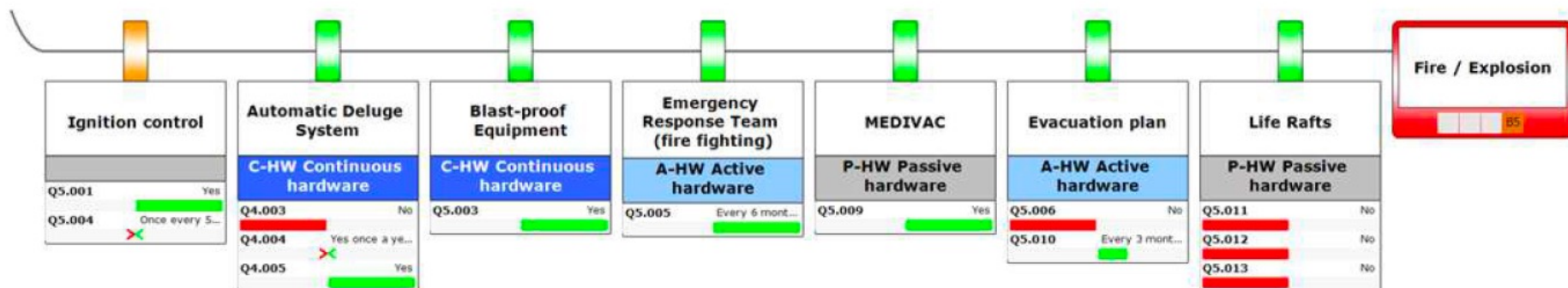
COLABORA:

ORGANIZA:

GESTIONA:



Barrier based audit



COLABORA:



ORGANIZA:



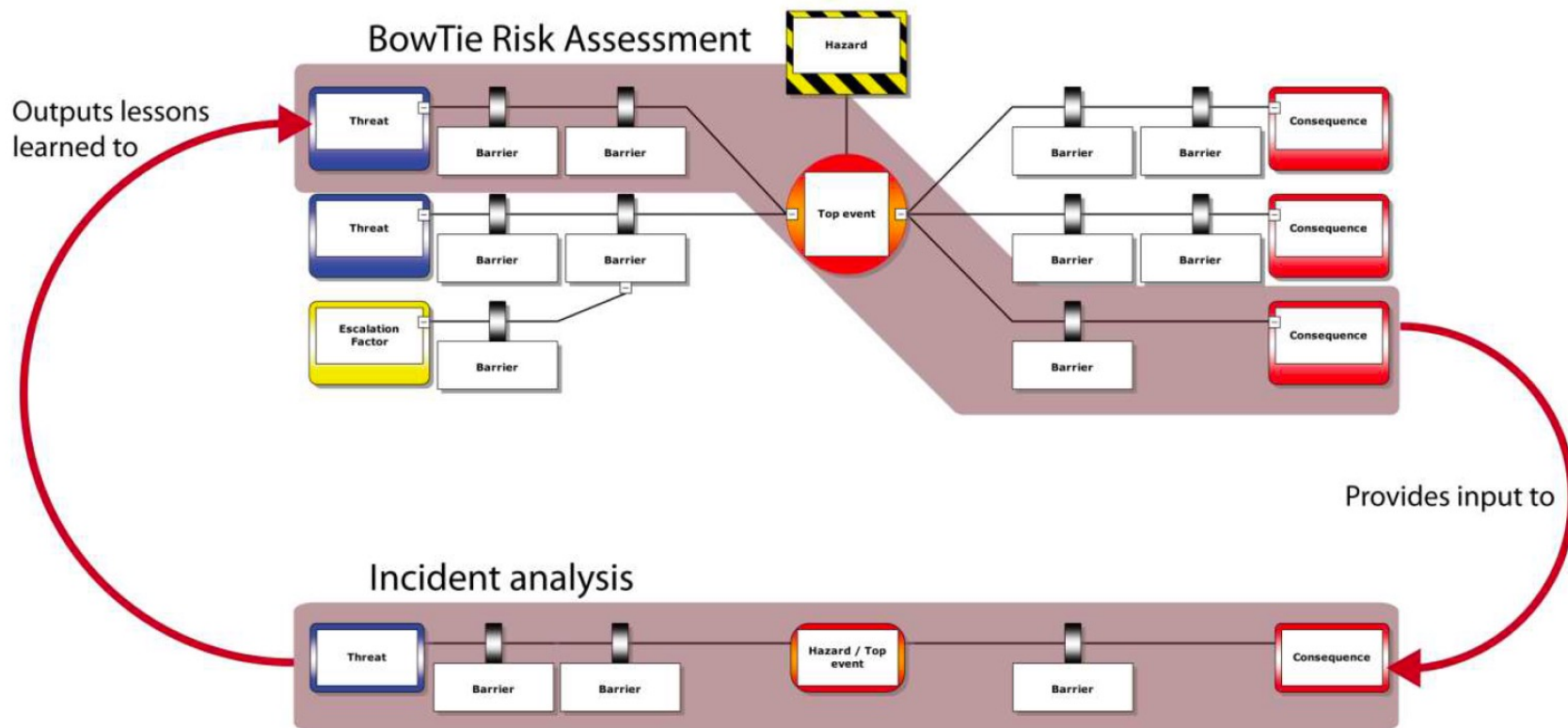
Puertos del Estado



GESTIONA:



Active-Reactive





Conclusions



Available online at www.sciencedirect.com



Safety Science 46 (2008) 221–229

SAFETY SCIENCE

www.elsevier.com/locate/ssci

Risk + barriers = safety?

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Received 13 November 2006; received in revised form 10 June 2007; accepted 11 June 2007

COLABORA:



ORGANIZA:



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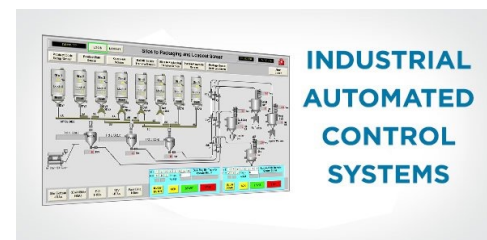
GESTIONA:





Emerging threats

- (Cyber)security



- Energy transition



- Terrorist attack



COLABORA:



ORGANIZA:



Puertos del Estado



GESTIONA:





V CONGRESO INTERNACIONAL de SEGURIDAD INDUSTRIAL en PUERTOS V INTERNATIONAL CONGRESS of SAFETY in PORTS

A CORUÑA
18 y 19
Mayo 2022



ORGANIZA:

Puertos del Estado



COLABORA:



CIP

Comisión
Interamericana de Puertos

//**Afundación**
Obra Social ABANCA

GESTIONA:

pixeling
making your ideas work