PIANC French Section

PIANC Mediterranean Days

and Conference «Port of the future» by Cerema

25 to 27 october 2023 in Sete France

Climate change minimization in port developments located in sensitive and complex areas

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MAIN SOURCES

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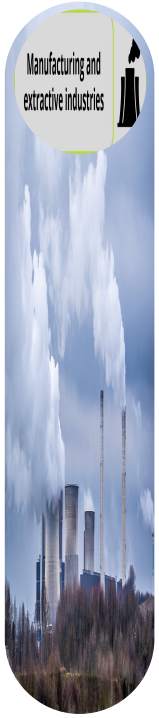

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STATE OF THE ART

Conventional systems

Air quality monitoring provides information regarding the status of present air quality. It helps in evaluating the existing policies and their effective implementation *(Sunil et al., 2014)*

Innovative systems

In many cases, the overall system uses Internet of Things (IoT) technology to control and manage large assemblies of measurement devices (Low Cost Sensors).
The main problem related to the use of LCS is their accuracy and repeatability *(Michalski et al., 2022)*

critical issues!

Air quality monitoring in complex areas is still a challenge for the modern community, in relation to the ***lack of standardized or univocally defined and universally recognized systems and procedures*** *(Zheng et al., 2016)*

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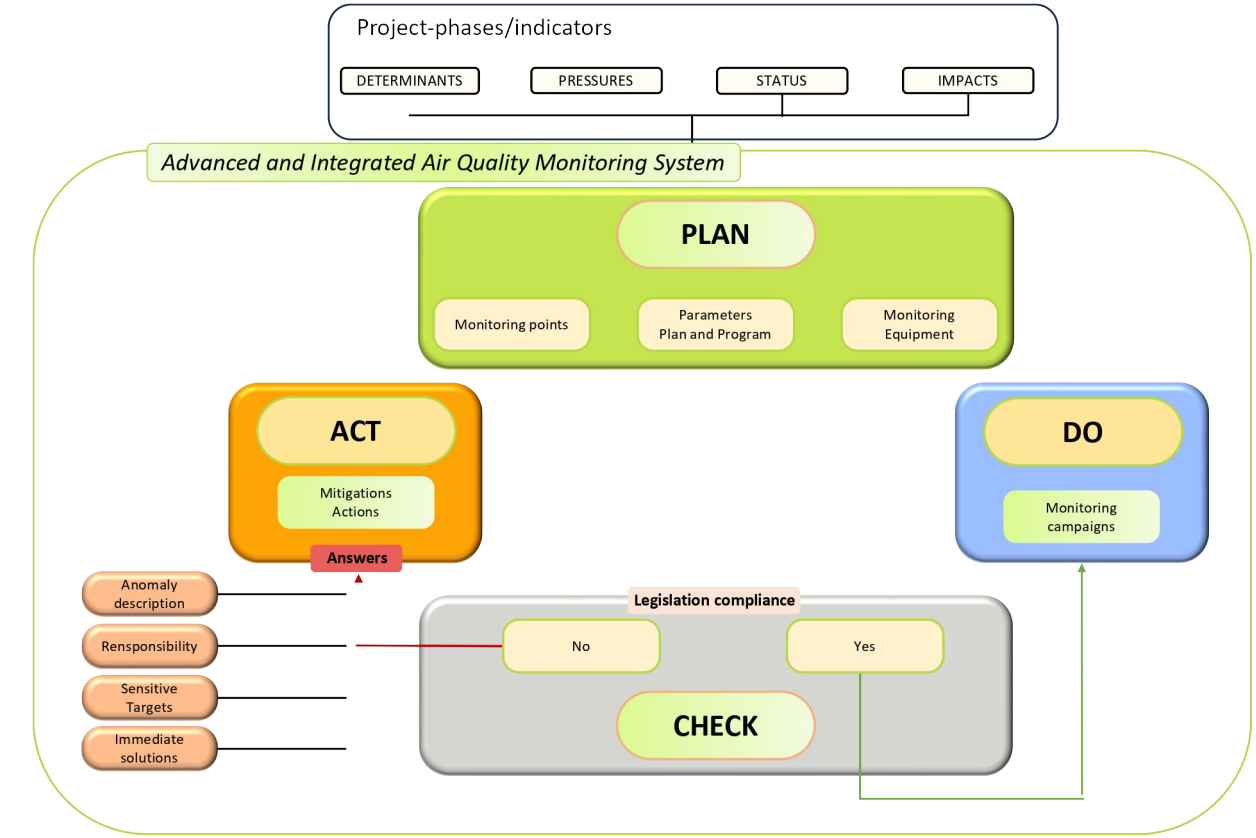
Scope and Objective

Development of an **advanced and integrated Air Quality Monitoring System** (***aiAQMS***)

Application and **validation** of the *aiAQMS* on a real case study, located in a complex and sensitive area

- ✓ reduction of environmental impacts
- ✓ overcome the existing lack of information and the highlighted critical issues


Project-phases/indicators
DETERMINANTS
PRESSURES
STATUS
IMPACTS
Advanced and Integrated Air Quality Monitoring System
PLAN
Monitoring points
Parameters
Plan and Program
Monitoring
Equipment
ACT
Mitigations
Actions
Answers
DO
Monitoring
campaigns
Anomaly
description
Rensponsibility
Sensitive
Targets
Immediate
solutions
Legislation compliance
No
Yes
CHECK

PORT OF SALERNO: SITE AREA

Italy – Campania - Salerno

Total surface area: 1.700.000 m^2
Cargo handled pro year: 14.326.847 t
Passengers (2019): 865.000
4 piers: Manfredi, Levante, Ponente and Trapezio

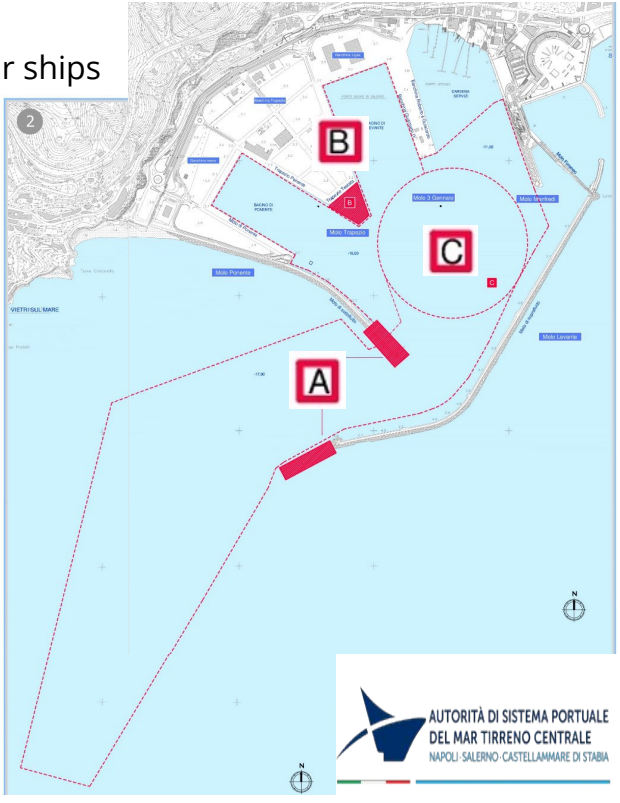
PORT OF SALERNO: *enhancement works*

Three macro-interventions:

- A ***enlargement*** of the port entrance
- B ***extension*** of the Molo Manfredi
- C ***deepening*** of the seabed

Main objective of works: to allow host larger ships

Start of the works: 2020
Subject to the EIA (Environmental Impact Assessment) procedure



PLAN: *program and parameters*

Phase	Phase duration	Campaign		Total number of campaigns
		Frequency	Duration	
AO	4 monts	2 months	30 days	2
IO	24 months	half-yearly		4
PO	24 months	half-yearly		4

Table: Monitoring campaigns

Parameter	Acquisition criteria	Mediation period	Concentration
PM10	24 hours	24 hours	**50 µg/m³**
	24 hours	Annual	**40 µg/m³**
CO	Average hourly value	24-hour hug hog the 8-hour moving average	**10 mg/m³**
NO_2	1 hour	1 hour	**200 µg/m³**
		1 hour (measured over 3 consecutive hours)	**400 µg/m³**
		Annual	**40 µg/m³**
NO_X	1 hour	Annual	**30 µg/m³**
SO_2	1 hour	1 hour	**350 µg/m³**
		1 hour (measured over 3 consecutive hours)	**500 µg/m³**
		Daily average	**125 µg/m³**
		Annual	**20 µg/m³**
Benzene (C_6H_6)	24 hours	Annual	**5 µg/m³**
O_3	1 hour	1 hour	**180 µg/m³**
		24-hour hug hog the 8-hour moving average	**120 µg/m³**
Arsenic	24 hours	Annual	**6,0 ng/m³**
Cadmium			**5,0 ng/m³**
Nichel			**20,0 ng/m³**
Benzo(a)pyrene	24 hours	Annual	**1,0 ng/m³**

Table: List of the monitored air pollutants

PLAN: *monitoring points and stations*

6 monitoring points

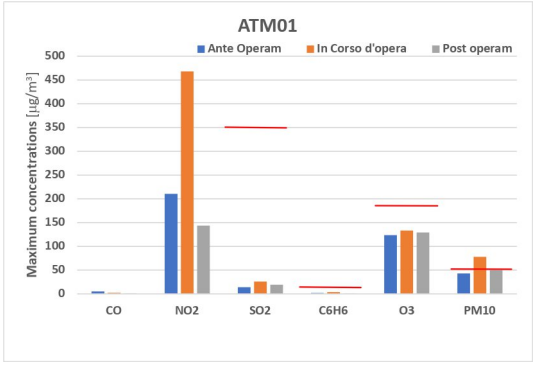
(3 within the port area,
3 outside the port area)

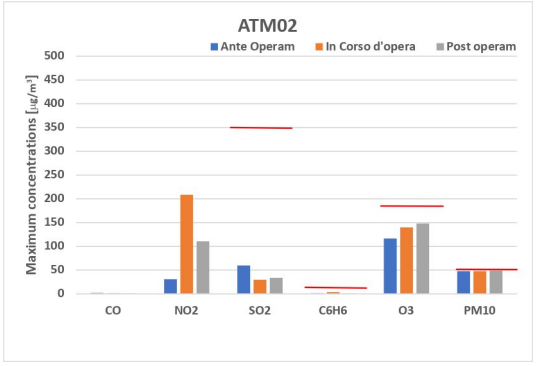
<u>Monitoring equipment:</u>

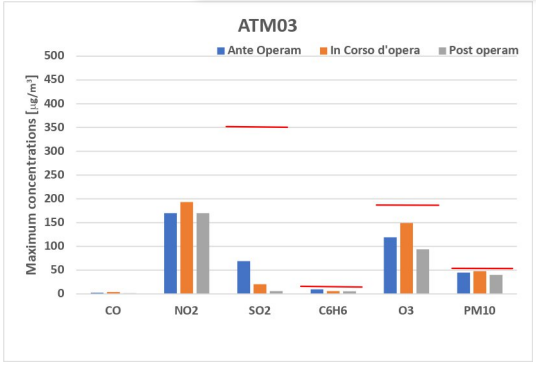
Fixed air quality **Monitoring Stations**
(ATM01, ATM02, ATM03)

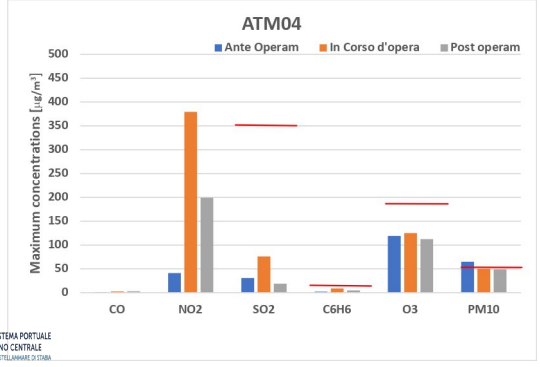
Mobile Monitoring Laboratory called
"**seedAIR**"
(ATM04, ATM05, ATM06)

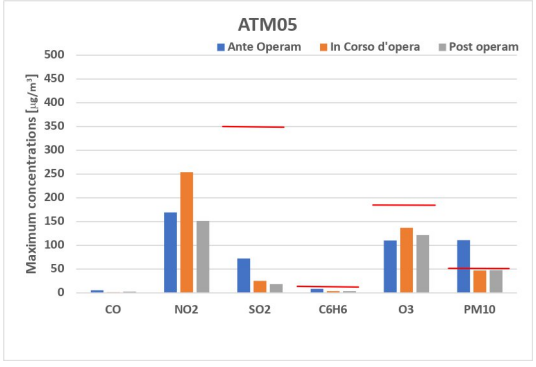
CHECK: *results and discussions*

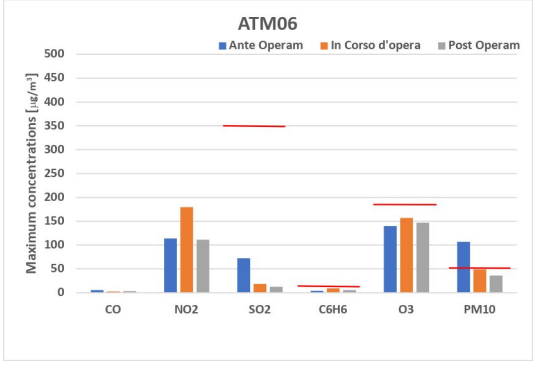












ACT: *actions*

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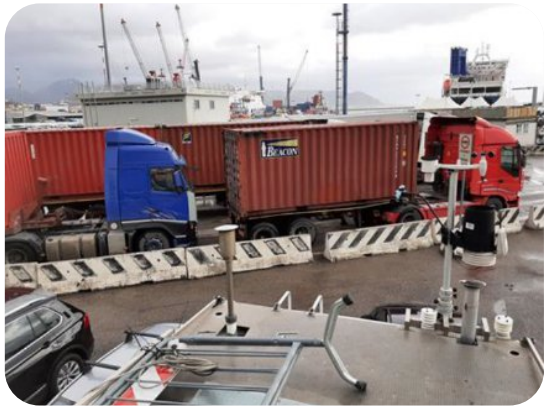
- avoid traffic jams;
- turn off the engine when the vehicle is stationary;
- opening additional entrance/exit gate



CONCLUSIONS

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Development and application of an ***advanced and integrated Air Quality Monitoring System (aiAQMS)*** for the air quality control in a complex area.

Results obtained highlight the importance to build a tailored advanced and integrated Air Quality Monitoring System in order to **avoid negative effects on the human health and the environment** and to **identify immediate mitigation actions in case of exceeding of the limits**.

Implementation of Air Quality Monitoring System is necessary to ensure environmental protection and the addition of a Spatial Information System would provide transparency of the acquired data.