Methodology and proposal for development of an updated set of H2020 industrial emissions indicators

Mohamad Kayyal, Ph.D.
SEIS Project expert – industrial emissions

May 2018

1. Background

The final declaration of the UfM Ministerial meeting on Environment and Climate Change, held in Athens on 13 May 2014, undertook to address outstanding data needs by applying the principles of Shared Environment Information Systems (SEIS) in line with the commitments under the Barcelona Convention and the NAPs, also contributing to its regional integrated monitoring programme. On this basis, and further to the strategic orientations given at the 2014 Ministerial in Athens, a work programme for the H2020 second phase has been developed and approved by the H2020 Steering Group meeting held in Barcelona on 17 December 2014. Within this work programme, the envisaged activities of the Review and Monitoring (RM) component, co-chaired by EEA and UNEP/MAP, are organised around the following four key objectives:

1. To enhance optimal national information systems allowing for systemic production of indicator-based reporting and sharing of data;
2. To expand the existing H2020 priorities with a particular focus on water, solid waste and industrial emissions, including hazardous waste and marine litter;
3. To ensure the sustainability of the governance setup of the H2020 review processes; and
4. To encourage the integration of outcome of the H2020 review in the policy making process at regional and national level.

In order to support the work of the H2020 RM group, an ENI South Support Mechanism, funded by the EU, was established. The support mechanism is intended to ensure proper linkages with the agreed work programme of H2020 for the second phase of work (2015-2020). The review and monitoring component of the work programme for 2015-2020 anticipates the preparation of the second indicator-based H2020 assessment report by April 2019.

In this document, a conceptual approach is presented for developing an updated set of indicators building-up on the current H2020 industrial emissions indicator (IND 6) identified in phase I of the ENI SEIS project. This is followed by a proposed set of updated indicators for monitoring impacts of industrial emissions on the Mediterranean marine environment.

This project is funded by the European Union

2. Conceptual approach for elaborating industrial emissions indicators

The updated set of industrial emission indicators has to provide a snap shot of the achievements of existing initiatives for pollution prevention and control, and the on-going interventions for addressing key environmental issues affecting the Mediterranean marine environment. For that purpose, five key aspects are considered for the indicators:

- Complementarity to existing indicators established by initiatives and programmes such as Barcelona Convention reporting system, IMAP, NAP, Regional Seas, MSSD, SCP, SDG, SCP, etc.;
- Fulfilment of the requirements stipulated in the legally binding decisions adopted under Article 15 of the LBS Protocol of the Barcelona Convention;
- Linkage to the obligations and indicators of the Basel Convention on the control of transboundary movements of hazardous wastes and their disposal;
- Linkage to the obligations and indicators of the Stockholm Convention on persistent organic pollutants;
- Relationship to planned operational targets and investment measures included in the updated NAPs of the Mediterranean countries; and
- Linkage to key environmental issues identified in the updated list of hotspots (2015).

In order to analyse each of the aforementioned aspects, the following key points are assessed:

- Survey of existing indicators from Regional Seas Programme (RS),[1] IMAP, NAP, SCP and particularly from MSSD and SDG, in addition to indicators of the Basel and Stockholm Conventions, and determination of where synergies exist for the updated set of H2020 industrial emissions indicators.
- Survey of relevant monitoring and reporting requirements of ECAP decisions; legally binding regional plans under the LBS Protocol of the Barcelona Convention; and obligations of the Stockholm and Basel Conventions.
- Review of common operational targets; priority investment measures; efficiency and effectiveness of current institutional and legal frameworks; and status of updated hotspots in 2015 as specified in the updated NAPs of the Countries.

Based on the results of the aforementioned assessment, the key issues to be addressed in the industrial emissions indicators are identified, and an updated list of H2020 indicators is formulated as a proposal for further discussion and approval by the Countries.

[1] The Governing Council of the United Nations Environment Programme endorsed the regional approach to controlling marine pollution several times before UNEP brought together a task force of scientists and officials to shape a Plan of Action for the Mediterranean, adopted in its final form in Barcelona in February 1975. Since then, 143 countries participate in 18 Regional Seas Conventions and Action Plans; one of which is the Mediterranean. http://www.unep.org/regionalseas/

a) Survey of existing indicators from related conventions, programmes and initiatives

A close examination of the "existing indicators" from the Regional Seas Programme, [1] H2020, IMAP, NAP, MSSD, SDG, in addition to the Basel and Stockholm Conventions, suggests the following:

- "State" indicators deal with concentrations of pollutants, trends, levels, occurrence, origin, etc. These are addressed principally by H2020/NAP, IMAP and the Regional Seas Programme, in addition to the Stockholm Convention.[2]
- "Pressure" indicators deal with amounts and quantities of generated wastes, release of toxic substances, etc. These are addressed mainly by H2020/NAP, SDG and MSSD, in addition to the Stockholm and Basel Conventions.
- "Response" indicators deal with the amounts of treated wastes and type of treatment, in addition to existing legal frameworks. These are addressed principally by Barcelona Convention Reporting system, MSSD, H2020/NAP and SDG, in addition to the Stockholm and Basel Conventions.

[2] Subject addressed in outcome indicator 3 of Article 1 of the Convention under the heading "Protecting human health and the environment."

Therefore, it is concluded that:

- There is a good set of indicators addressing marine pollution "state" principally under the MAP system. Hence, these can be considered as complementary to any updated set of H2020 indicators.
- The present indicator addressing the "release of toxic substances and nutrients" under the current H2020 initiative does provide the necessary data and information on "pressures" impacting the Mediterranean marine environment. Therefore, this indicator provides the necessary framework for selecting priority substances reflected in the legally binding decisions for developing this indicator.
- The indicators related to "response" measures, particularly the MSSD and SDG indicators, are limited only to treatment of generated wastes and related quantities. Expanding on the scope of these indicators to cover other areas of response is needed, particularly in relation to pollution prevention and control measures stipulated in the Basel and Stockholm Conventions. In that respect, it is emphasized that the SDG indicators are to be regarded as the main drivers for updating the scope of the industrial emissions indicators. SDG indicators are a measure of the strength of economic activities which represent at the same time the drivers of pollution generation and environmental pressures on the marine and coastal ecosystems. As these economic activities contribute to the wealth of the Mediterranean countries and to the social well-being of its people, both of which constitute two of the three pillars of sustainable development, it is anticipated that the updated indicators should lead to an effective monitoring process capturing the principle of sustainable development, while promoting at the same time the creation of functional synergies among all stakeholders.

b) Survey of requirements of the legally binding decisions under the LBS and Hazardous Wastes Protocols of the Barcelona Convention and the Stockholm and Basel Conventions

Relevant legally binding decisions on industrial emissions under the LBS Protocol of the Barcelona Convention (UNEP/MAP system) include:

- Decision IG.19/8: Regional plan on the elimination of Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Mirex and Toxaphene.
- Decision IG.19/9: Regional plan on the phasing out of DDT.
- Decision IG.20/8.1: Regional plan on the reduction of inputs of Mercury.
- Decision IG.20/8.2: Regional plan on the reduction of BOD_5 in the food sector.
- Decision IG.20/8.3: Regional Plan on the elimination of Alpha hexachlorocyclohexane; Beta hexachlorocyclohexane; Hexabromobiphenyl; Chlordecone; Pentachlorobenzene; Tetrabromodiphenyl ether and Pentabromodiphenyl ether; Hexabromodiphenyl ether and

Heptabromodiphenyl ether; Lindane; Endosulfan, Perfluorooctane sulfonic acid, its salts and perfluorooactane sulfonyl fluoride.

As can be inferred, the key pollutants addressed by these decisions include persistent organic pollutants (POPs), mercury, and BOD_5 from the food sector. The requirements and commitments stipulated in these decisions can be classified into two groups:

- Requirements entailing the establishment of institutional structures and legal frameworks by the Countries in order to ensure that:
  - BOD related discharges into water are monitored.
  - Releases of mercury into water, air and soil from all activities are monitored.
  - National ELVs for mercury emissions from other than Chlor-Alkali industry are adopted.
  - Metallic mercury is prohibited from re-entry into market.
  - Import and export of POPs (unless under special provisions) are prohibited.
  - Stock piles consisting of POPs are identified to the extent practicable.
- Requirements entailing the implementation of pollution prevention and control measures to ensure that:
  - Inputs of mercury emissions from all sectors are reduced.
  - Mercury containing wastes are isolated and contained to avoid potential contamination of air, soil or water.
  - Total releases of mercury (to the air, the water and to the products) from existing Chlor-alkali plants are progressively reduced until their final cessation.
  - Environmentally sound management of metallic mercury from decommissioned plants is achieved.
  - Inputs of POPs into the marine environment are eliminated.
  - Wastes of POPs are handled, collected, transported and stored in environmentally sound manner.
  - POPs are disposed such that the persistent organic pollutant content is destroyed or irreversibly transformed.
- With reference to the Hazardous Wastes Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal, relevant requirements include:
  - Measures to prevent, abate and eliminate pollution of the Protocol area which can be caused by transboundary movements and disposal of hazardous wastes.
  - Measures to reduce to a minimum, and where possible eliminate, the generation of hazardous wastes.
  - Measures to reduce to a minimum the transboundary movement of hazardous wastes.

- Regarding the Basel Convention on the control of transboundary movements of hazardous wastes and their disposal, relevant obligations address:
    - Generation of hazardous wastes and other wastes.
    - Disposals which did not proceed as intended.
    - Reduction and/or elimination of the generation of hazardous wastes and other wastes (including wastes subject to the transboundary movement).
    - Disposal and recovery facilities operated within the national jurisdiction.
- On the other hand, the relevant requirements of the Stockholm Convention on persistent organic pollutants address:
    - Protecting human health and the environment.
    - Assessing measures to reduce or eliminate releases from intentional production and use.
    - Assessing measures to reduce or eliminate releases from unintentional production.
    - Assessing measures to reduce or eliminate releases from stockpiles and wastes.

Accordingly, it is concluded that the updated set of indicators should provide data and information on:

- The type of environmental management measures implemented by industrial facilities for reduction and/or elimination of the generation of wastes, and the operation of disposal and recovery facilities, with the aim of informing H2020 on the required investment measures for funding and support; and.
- The ability of countries to establish necessary institutional structures and legal frameworks for enforcement of measures for pollution prevention and control by industrial facilities.

c) Survey of countries' environmental priorities stipulated in the updated NAPs

Priorities for reducing impacts on the Mediterranean marine environment have been identified by the Countries in the updated NAPs with respect to:

- Operational targets to meet deadlines set by SAP-MED/ legally binding requirements;
- Priority investment measures;
- Change in status of pollution hotspots from 2002 to 2015, and key environmental issues; and
- Abilities of the existing institutional and legal structures in the Countries to meet the legally binding requirements.

Regarding the operational targets, two common targets were identified by at least seven Mediterranean countries as follows:[3]

- Reduce by xx% of BOD discharged to the Mediterranean Sea.

[3] Synopsis of updated NAPs: Hotspots, sensitive areas, targets, measures, indicators and investment portfolios. UNEP(DEPI)/MED WG.426/3 (2016)

- Reduce discharge of hazardous substances from industrial plants (apply BAT/BEP) by xx% or dispose in a safe manner.

Regarding priority investment measures, three common measures were identified by at least seven countries as follows: [3]

- Build/ expand/ upgrade industrial wastewater treatment plants;
- Build/ expand/ upgrade hazardous waste landfill facility; and
- Remediate contaminated industrial sites.

Concerning status of pollution hotspots, the Mediterranean Sea registered 120 pollution hotspots in 2002 spread across 18 countries. In 2015, this number had dropped to 28 hotspots and 40 high risk areas. Principal industrial pollutants identified in the updated hotspots are nutrients for southern countries; phosphogypsum and hazardous wastes in Tunisia; highly toxic chemicals in Israel, heavy metals, POPs and PAHs in the Balkans. In response to this situation, 117 projects have been either planned or under implementation across the Mediterranean in order to control industrial emissions and prevent their adverse impacts on the environment.[4]

Regarding capacities of the current institutional and legal structures in the countries, the "mid-term evaluation of SAP/NAP implementation" indicates that over 85 percent of national laws address requirements for monitoring, permitting, inspection and application of sanctions; however, supporting institutional structures for enforcement of permitting and compliance are only found in two thirds of the countries.

Accordingly, it is concluded that the updated indicators should provide data and information on:

- The extent to which countries have built/ expanded/ upgraded industrial wastewater treatment plants;
- Status of pollution hotspots with special focus on hazardous waste landfill facilities and contaminated sites; and
- Capacities of the current institutional and legal structures.

with the aim of informing H2020 on the type of measures to be funded for reducing impacts of industrial emissions on the Mediterranean marine environment.

3. Proposed set of updated H2020 industrial emissions indicators

The development of an updated set of indicators that serves to inform H2020 on the necessary measures to be funded for reducing impacts of industrial emissions on the Mediterranean marine environment should take into consideration the following issues:

[4] According to UfM's database on "Pollution Reduction Projects' Regional Selection Tool." http://ufm.net.mytempweb.net/WasteWaterProjects.aspx

- The scope of existing "status" indicators is sufficiently covered under the MAP system (IMAP). However, there is a need to consider the status of pollution hotspots with special focus on hazardous waste landfill facilities and contaminated sites.
- The scope of "pressure" indicators is sufficiently covered under the current H2020 indicator addressing the "release of toxic substances and nutrients." The current indicator aggregates various priority pollutants identified in SAP-MED and the legally binding decisions. It also covers those identified in the updated hotspots, particularly nutrients and toxic substances.
- The scope of existing "response" indicators can be expanded to cover not only treatment of generated wastes and related quantities, but also preventive environmental management measures implemented by industrial facilities including the building/ expansion/ upgrading of industrial wastewater treatment plants.
- Finally, additional indicator(s) can be formulated for informing about the capacities of the current institutional structures in the Countries for carrying out their mandate in inspections and enforcement of implementation of measures for pollution prevention.

By taking into account the aforementioned issues, we propose in Table 1 an updated set of H2020 industrial emissions indicators and related sub-indicators. These indicators complement those proposed by other programmes and initiatives, particularly the SDGs. They address the requirements of the legally binding decisions on industrial emissions under the UNEP/MAP system, and the Basel and Stockholm Conventions. In addition, they can be associated with key environmental issues identified in the updated hotspots. In fact, the updated indicators are in line with the operational targets and priority investment measures identified by the Mediterranean Countries in their NAPs. They address the release of priority substances identified in the legally binding regional plans and SAP-MED provisions under the Barcelona Convention. They also address hazardous waste generation as stipulated in the Basel and Stockholm Conventions with special focus on the fate of generated wastes in terms of environmentally sound disposal; stockpiling; or transfer across international borders. Finally, the indicators highlight the number of priority measures adopted by national authorities and waste generators for pollution prevention, minimization and control. The updated set of indicators establish the necessary framework for informing on H2020 progress (and post 2020 horizon); and for highlighting the necessary interventions for pollution prevention and control aiming to reduce adverse impacts of industrial emissions on the Mediterranean marine environment.

Table 1: Updated set of H2020 industrial emissions indicators

No.	Title of indicator	Sub-indicators	Type

No.	Title of indicator	Sub-indicators	Type
IND 6.1	Release of nutrients from industrial sectors	6.1.1) Total BOD load discharged from industrial installations to the Mediterranean marine environment. 6.1.2) Total Nitrogen load discharged from industrial installations to the Mediterranean marine environment. 6.1.3) Total Phosphorus load discharged from industrial installations to the Mediterranean marine environment.	Pressure indicator
IND 6.2	Release of toxic substances from industrial sectors	6.2.1) Total heavy metals load discharged from industrial installations to the Mediterranean marine environment. 6.2.2) Furans and dioxins load discharged from industrial installations to the Mediterranean marine environment. 6.2.3) Polycyclic aromatic hydrocarbons (PAH) load discharged from industrial installations to the Mediterranean marine environment. 6.2.4) Volatile organic compounds (VOC) load discharged from industrial installations to the Mediterranean marine environment.	Pressure indicator
IND 6.3	Industrial hazardous waste disposed in environmentally sound manner	6.3.1) Total quantity of generated hazardous waste from industrial installations. 6.3.2) Quantity of industrial hazardous waste disposed in environmentally sound manner relative to total quantity of generated hazardous waste from industrial installations.	Pressure indicator

No.	Title of indicator	Sub-indicators	Type
IND 6.4	Compliance measures aiming at the reduction and/or elimination of pollutants generated by industrial sectors	6.4.1) Number of industrial installations reporting periodically loads of pollutants discharged to the marine and coastal environments relative to the total number of industrial installations. 6.4.2) Number of environmental inspections carried out by enforcement authorities in which industrial installations were found to be in breach of laws and regulations relative to the total number of executed inspections. 6.4.3) Number of eliminated hotspots identified in the updated NAPs relative to the 2001 and 2015 baselines	Response indicator

4. Major industrial sectors in the Mediterranean and their principal pollutants

The major industrial sectors in the Mediterranean are (RAC/CP, 2001) according to their importance in the Mediterranean region are:

1. Petroleum refineries	7. Textile dyeing
2. Food industries and food processing	8. Paper and pulp
3. Fertilizers and Inorganic Chemicals	9. Organic Chemicals
4. Metallurgy	10. Energy production
5. Leather processing	11. Gas production
6. Cement	12. Pharmaceuticals

Classification of these sectors and their related activities under the International Standard Industrial Classification of Economic Activities (ISIC, Revision 4) is presented in Table 2, along with discharged pollutants categorized under nutrients for indicator 6.1 and toxic substances for indicator 6.2.

Table 2: The common industrial sectors under the SAP and ISIC classifications and types of discharged pollutants

List of ISIC Sectors[5]			List of SAP Sectors			Nutrients (L: Liquid form)			Toxic substances (L: liquid form, G: gaseous form)			
Div. No.	**Group No.**	**Description of industrial activity**	**Major industrial sector**	**SAP code**	**Activity description**	**BOD**	**TP**	**TN**	**Heavy metals**	**PCDD PCDF**	**PAH**	**VOC**
35	351	Electric power generation, transmission and distribution	Production of energy	1.1	Combustion of lignite				**G, L**	**G**	**G**	
35	351			1.2	Combustion of heating oil				**G**	**G**	**L**	
20	201	Manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms	Manufacture of fertilizers	2.1	Nitrogenous fertilizers	**L**	**L**					**G**
20	201			2.2	Phosphate fertilizers and phosphoric acid		**L**	**L**	**L**			
21	210	Manufacture of pharmaceuticals, medicinal chemical and botanical products	Manufacture of pharmaceuticals	4.1	Pharmaceuticals					**G, L**		
19	192	Manufacture of refined petroleum products	Manufacture of refined petroleum products	5.1	Refined petroleum products	**L**			**L**		**G, L**	**G**
49	491, 492 493	Land transport and transport via pipelines		5.2	Transport & marketing of petroleum products						**G, L**	**G**
17	170	Manufacture of pulp, paper and paperboard	Manufacture of paper	6.1	Paper and pulp	**L**			**G**	**G**		
23	239	Manufacture of non-metallic mineral products	Manufacture of cement	7.1	Cement				**G**	**G**		
23	239			7.2	Lime and plaster					**G**		
15	151	Manufacture of tanning and dressing of leather, luggage handbags, saddlery and harness, dressing and dyeing of fur	Tanning and dressing of leather	8.1	Tanning and dressing of leather	**L**	**L**		**G, L**			
24	243	Casting of metals	Manufacture of metals	9.1	Casting of grey iron		**L**		**G**	**G, L**		**G**
24	242	Manufacture of basic precious and other non-ferrous metals		9.10	Second stage copper smelting				**G**	**G**	**G**	**G**
27	272	Manufacture of batteries and accumulators		9.13	Manufacture of accumulators				**G, L**			
24	242	Manufacture of basic precious and other non-ferrous metals		9.14	Manufacture of lead oxides and pigment production				**G**			

[5] International Standard Industrial Classification of all Economic Activities (ISIC), Rev4, Department of Economic and Social Affairs, Statistics Division, United Nations, New York, 2008.

List of ISIC Sectors[5]			List of SAP Sectors			Nutrients (L: Liquid form)			Toxic substances (L: liquid form, G: gaseous form)			
Div. No.	**Group No.**	**Description of industrial activity**	**Major industrial sector**	**SAP code**	**Activity description**	**BOD**	**TP**	**TN**	**Heavy metals**	**PCDD PCDF**	**PAH**	**VOC**
25	259	Manufacture of other fabricated metal products, metalworking service activities		9.15	Electroplating				**G, L**			
24	241	Manufacture of basic iron and steel		9.4	Manufacture of basic iron & steel				**G, L**	**G**	**G**	
24	242	Manufacture of basic precious and other non-ferrous metals		9.5	First stage aluminium smelting					**G**	**G, L**	**G**
24	242			9.6	Second stage aluminium smelting					**G**		**G**
24	242			9.7	First stage lead smelting				**G**	**G**		**G**
24	242			9.8	Second stage lead smelting				**G**	**G**	**G**	**G**
24	242			9.9	First stage copper smelting				**G**	**G**	**G**	**G**
13	131	Spinning, weaving and finishing of textiles	Manufacture of textiles	13.1	Manufacture of dyeing of textiles	**L**						**G**
20	202	Manufacture of other chemical products	Manufacture of other organic chemicals	16.1	Polyvinyl chloride					**G, L**		
20	202			16.3	Lead Alkyl				**G**			
20	202			16.4	Paints and varnishes							**G**
23	231	Manufacture of glass and glass products	Manufacture of other inorganic chemicals	17.4	Manufacture of glass and glass products	**L**			**G**	**G**		**G**
01	014	Animal production	Farming of animals	20.1	Farming of cattle, sheep, swine and poultry and slaughterhouses	**L**	**L**	**L**				
10	103	Processing and preserving of fruit and vegetables	Food packing	21.1	Preserving fruit and vegetables	**L**						**G**
10	107	Manufacture of other food products		21.2	Manufacture of sugar beet	**L**						**G**
10	104	Manufacture of vegetable and animal oils and fats		21.3	Manufacture of olive oil	**L**						
10	104			21.4	Manufacture of other vegetable oils	**L**						
11	1101	Distilling, rectifying and blending of spirits		21.5	Manufacture of wines and spirits	**L**						
11	1102	Manufacture of wines										
11	1103	Manufacture of malt liquors and malt		21.6	Manufacture of beer	**L**						
11	1104	Manufacture of soft drinks; production of		21.7	Manufacture of non-alcoholic	**L**						

This project is funded by the European Union

List of ISIC Sectors[5]			List of SAP Sectors			Nutrients (L: Liquid form)			Toxic substances (L: liquid form, G: gaseous form)			
Div. No.	**Group No.**	**Description of industrial activity**	**Major industrial sector**	**SAP code**	**Activity description**	**BOD**	**TP**	**TN**	**Heavy metals**	**PCDD PCDF**	**PAH**	**VOC**
		mineral waters and other bottled waters			beverages							
10	102	Processing and preserving of fish, crustaceans and molluscs	Aquaculture	22.2	Fish processing	**L**	**L**					
38	382	Waste treatment and disposal	Treatment and storage of hazardous wastes	23.1	Incineration of industrial waste	*Emitted pollutants depend on type of incinerated hazardous waste*						
38	382			23.2	Technical centre for landfill and storage	*Discharged contaminants depend on type of disposed hazardous waste*						
37	370	Sewerage	Treatment of urban wastewater	23.3	Industrial wastewater treatment plant	*Discharged pollutants depend on type of treated industrial wastewater*						
37	370			24.1	Wastewater treatment plants	*Discharged pollutants depend on type of treated municipal wastewater*						