The HERA webinar series Science for EU Green Deal
Chemical Management for a Healthy Future.
30 June 2021

Ramon Guardans. Adviser on POPs Ministry of Ecological Transition and Demographic Challenge (MITECO), Madrid, Spain
Serves as ROG WEOG member in the SC Global Monitoring Plan

Cooperative learning under the SC bridging disciplines, sectors and geography (2001-2021)

1. brief introduction
2. learning under the SC
3. what was thought, what we know
4. oracles, forecasts and common sense

Opinions are mine and do not represent MITECO or GMP views
1. brief introduction to the history of environmental chemistry

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Chemical activity</th>
<th>Monitoring evidence</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000 - 2500 My</td>
<td>All metabolic pathways and molecules (DNA, RNA, ATP proteins etc)</td>
<td>Chemical traces and microfossils</td>
<td>Diagenesis, sediments</td>
</tr>
<tr>
<td>2500 - 570 My</td>
<td>Cell morphology and vast colonies of archaea, bacteria and virus</td>
<td>Stromatolites</td>
<td>Increase in O₂, multicellular colonies, oil, gas</td>
</tr>
<tr>
<td>570 - 50 My</td>
<td>Hard parts, gametes, zygotes and terrestrial ecosystems</td>
<td>20% O₂ in the atmosphere, pollen fossils</td>
<td>Cambrian metophyta and metazoa</td>
</tr>
<tr>
<td>50 - 0 My</td>
<td>Flowers, birds, mammals</td>
<td>Palaeobiology</td>
<td>Music, war, word</td>
</tr>
<tr>
<td>1890 - 1920</td>
<td>Ammonia, Dynamite, organohalogenс, radiation</td>
<td>Sediments, documents</td>
<td>Colonial plunder, chemical weapons, fertilizers</td>
</tr>
<tr>
<td>1921 - 1950</td>
<td>Nuclear physics, computing, transistors, radio, antibiotics, cars, planes, electricity</td>
<td>Increasing presence of organohalogenс and radionuclides in sediments, Hiroshima</td>
<td>SdN (UN after 1945), WHO, ILO, ICRP</td>
</tr>
<tr>
<td>1951 - 1980</td>
<td>&gt;2000 Nuclear tests, DNA structure, chemicals dispersed in vast amounts for industry and agriculture. Enhanced analytical tools ECD, HRMS, Jumbo 747, PC, Satellites</td>
<td>Accidents and large exposures to POPs in Osaka, Seveso, Vietnam and many other locations</td>
<td>Early warnings from monitoring, LRAT modelling: chemical weapons, radiation, acidification, POPs &gt; CC. LRTAP/EMEP, OSPAR, IAEA</td>
</tr>
<tr>
<td>1981 - 2021</td>
<td>AIDS, PCR, Omics, <a href="http://PAS">http://PAS</a> monitoring, NTA SARS-CoV-2 virus</td>
<td>From “discovery” to production 5 - 10 years Monitoring and health early warnings to regulatory action &gt;30 years Observable results from regulation &lt;5 years</td>
<td>AMAP, HELCOM, BRSM, FCCC, Montreal, CBD</td>
</tr>
</tbody>
</table>
1. brief introduction to the history of environmental chemistry

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Chemical activity</th>
<th>Monitoring evidence</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000 - 2500 My</td>
<td>All metabolic pathways and molecules (DNA, RNA, ATP proteins etc)</td>
<td>Chemical traces and microfossils</td>
<td>Diagenesis, sediments</td>
</tr>
<tr>
<td>2500 - 570 My</td>
<td>Cell morphology and vast colonies of archaea, bacteria and virus</td>
<td>Stromatolites</td>
<td>Increase in O₂, multicellular colonies, oil, gas</td>
</tr>
<tr>
<td>570 - 50 My</td>
<td>Hard parts, gametes, zygotes and terrestrial ecosystems</td>
<td>20% O₂ in the atmosphere, pollen fossils</td>
<td>Cambrian metaphyta and metazoa</td>
</tr>
<tr>
<td>50 - 0 My</td>
<td>Flowers, birds, mammals</td>
<td>Palaeobiology</td>
<td>Music, war, word</td>
</tr>
<tr>
<td>1890 - 1920</td>
<td>Ammonia, Dynamite, organohalogenes, radiation</td>
<td>Sediments, documents</td>
<td>Colonial plunder, chemical weapons, fertilizers</td>
</tr>
<tr>
<td>1921 - 1950</td>
<td>Nuclear physics, computing, transistors, radio, antibiotics, cars, planes, electricity</td>
<td>Increasing presence of organohalogenes and radionuclides in sediments, Hiroshima</td>
<td>SDoN (UN after 1945), WHO, ILO, ICRP</td>
</tr>
<tr>
<td>1951 - 1980</td>
<td>&gt;2000 Nuclear tests, DNA structure, chemicals dispersed in vast amounts for industry and agriculture. Enhanced analytical tools ECD, HRMS, Jumbo 747, PC, Satellites</td>
<td>Accidents and large exposures to POPs in Osaka, Seveso, Vietnam and many other locations</td>
<td>Early warnings from monitoring, LRAT modelling: chemical weapons &gt; radiation &gt; acidification &gt; POPs &gt; CC. LRTAP/EMEP, OSPAR, IAEA</td>
</tr>
<tr>
<td>1981 - 2021</td>
<td>AIDS, PCR, Omics, http:// PAS monitoring, NTA SARS-CoV-2 virus</td>
<td>From “discovery” to production 5 - 10 years</td>
<td>AMAP, HELCOM, BRSM, FCCC, Montreal, CBD</td>
</tr>
</tbody>
</table>

AMAP, HELCOM, BRSM, FCCC, Montreal, CBD
2. Learning under the SC

The work on POPs faced a number of challenges in the early stages (1980s)

- Presence in the Arctic indicated long range transboundary atmospheric transport (which was similar to radiation and acidification, not other chemical regulations at the time)

- The levels present were very low compared to $\text{SO}_2$, $\text{NO}_x$, $\text{PM}$, $\text{O}_3$ and required much more analytical work and authentic standards to be measured Low levels in abiotic media could lead to high exposure to humans and biota

- The substances of concern were not single chemicals but sets of isomers (eg PCBs, PCDD/Fs, HCHs) and groups of substances (eg PBDEs).

- Releases were not limited to a few sectors (as in acidification or radiation) but linked to industrial, agricultural and domestic activities in all sectors of society.

When in the early 1990s Canada, Sweden, AMAP and others considered ways to address the problem in an international framework UNECE/CLRTAP (1979) was the only MEA that dealt with long range transboundary transport of air pollution and worked on science based effects oriented strategies that could deal with the issue of POPs tackling the issues mentioned above.

CLRTAP adopted the Aarhus POPs Protocol in 1998, and subsequently UNEP initiated the work to develop a global agreement. The Stockholm Convention was adopted in 2001 and entered into force in 2004.
2. Learning under the SC

The SC integrating a number of precedent instruments related to POPs initiated a process of cooperative learning and knowledge sharing bridging disciplines, sectors and geography, in particular.

POPRC has developed for all 30 listed POPs extensive documents describing the risk profile of the substance, the risk management options and potential alternatives (or lack of them). This information is publicly and freely available to all parties and any interested person in the world.

For the substances listed in annex C (unintentional production) which includes HCB, HCBD, Pentachlorobenzene, PCBs, PCDD, PCDF and PCN, guidance documents have been developed detailing Best Available Techniques (BAT) and Best Environmental Practices (BEP).

These documents are freely available and constitute a unique and very valuable repository of possible measures and strategies to decrease POPs releases. A plurality of projects have been undertaken and funded to implement and refine the guidance across the world.
2. Learning under the SC

Article 7 in the SC establishes that parties shall develop a National Implementation Plan and revise it periodically. To develop the NIP each party shall “cooperate directly or through global, regional and subregional organizations, and consult their national stakeholders, including women’s groups and groups involved in the health of children, in order to facilitate the development, implementation and updating of their implementation plans.”

A detailed guidance document was developed to assist parties in organizing stakeholder consultations and drafting the NIP, financial support was made available to develop the NIP. The NIP provides the framework for National Reporting under Article 5.

Article 11 on Research development and monitoring and Article 16 on Effectiveness Evaluation have resulted in a significant development in the scientific understanding of POPs, their sources, LRT and effects.

The Global Monitoring Plan established under Article 16 in 2004 has delivered 5 regional Reports in 2009, 2015 and 2021 which show a significant increase in available data and understanding and provides a valuable compilation of baselines and changes over time for listed POPs on a global scale.

These processes, with its limitations have certainly contributed to the advancement towards the SC objectives and to develop cooperation and improve knowledge in the SC about the world and in the world about the SC.
3. What was thought what we know

What was thought in 2001 and does not apply in 2021

- Dealing with a limited number of substances can solve the POPs problem
- If regulations eliminate emissions over time concentrations will be 0
- POPs can be dealt with as a stand alone issue, and its relevance is obvious

What has been seen and is being considered by POPRC, GMP and CLRTAP

- The number of chemicals of concern, including transformation products from listed POPs is very large and increasing fast
- Secondary sources, transport and release in and from products can be the main source for POPs were the primary sources are extinguished
- All ecosystems, organisms and people are exposed to complex mixtures of contaminants, which can interfere with multiple toxicological endpoints, over decades and generations
- The importance of sediments, ice cores and sample banks to elucidate baselines and trends of emerging chemicals of concern. NTA and toxicogenomics in screening monitoring samples
- Need of curated, accessible data repositories and enhanced dataflow for a diversity of uses
4. oracles, forecasts and common sense, science is the easy part

A plurality of interfaces shape the cooperative learning and policy building process bridging

**scientific disciplines**: analytical chemistry, toxicology, ecology, microbiology, public health, data analysis, process modelling

**social sectors**: vulnerable groups, minorities, natives, labour, academia, industry, national and international policy-making

**geographical diversity and structural violence**
environmental justice, inverted commons

Urgent need to enhance stability, trust, transparency, inclusivity, dataflow, reporting within and between these entities to address growing chemical challenges in a turbulent world

A large part of the hard work is to get the existing infrastructures and processes to be more effective, coordinated and better funded.
BRSM<>CBD<>FCCC<>ODS

The SC is a productive dynamic process. Constructive critical cooperation works in the long term