

For our Environment

Umwelt 
Bundesamt

Virtual ESBB Conference 2021

Experiences from 30 years of Environmental Specimen Banking in Germany

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Part II – Research Institute perspective: Bernd Gökener, Fraunhofer IME

ENVIRONMENTAL SPECIMEN BANKS

Objectives

ESBs sample, analyse and archive samples from the environment over long time periods. The material is stored in such a way that the chemical and biological integrity is preserved over very long time periods.

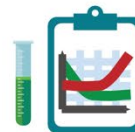
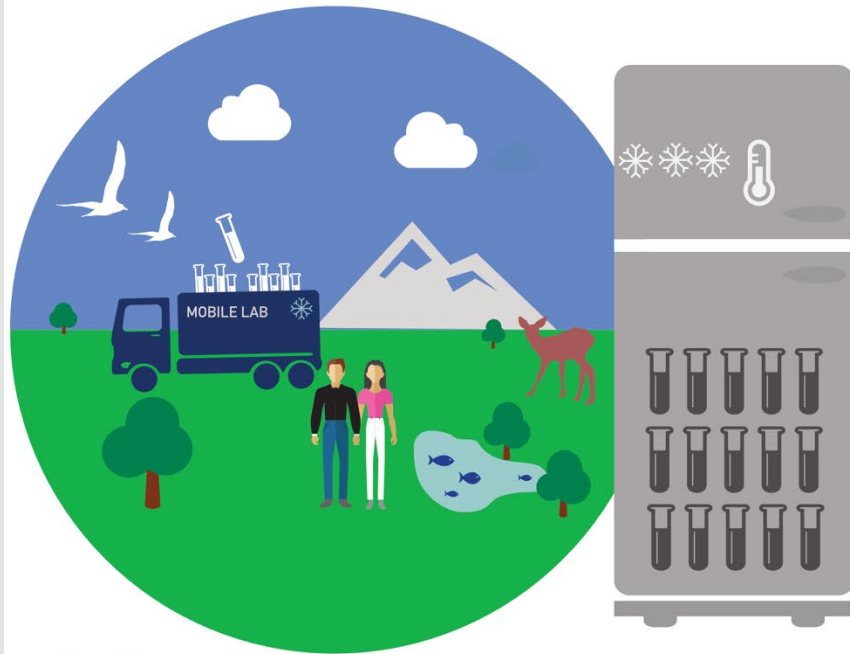
ESBs are traditionally linked to chemical monitoring, they

- provide long term trends for chemicals in the environment,
 - check the effectiveness of environmental and chemical regulation,
 - identify chemicals of emerging concern and support prioritisation,
- make historical samples available for new analytical techniques,
- preserve samples for yet unknown questions that may arise in future.

New technologies and techniques may provide for new applications outside the chemical world, e.g. eDNA metabarcoding and biodiversity, stable isotopes and food web changes.

ENVIRONMENTAL SPECIMEN BANKS

How does specimen banking work?



- Document long term changes in ecosystem
- Check effectiveness of chemical regulation
- Identify chemicals of emerging concern
- Be prepared for new environmental stressors

human

terrestrial

freshwater

marine



human food



air plants soil worm mammal bird



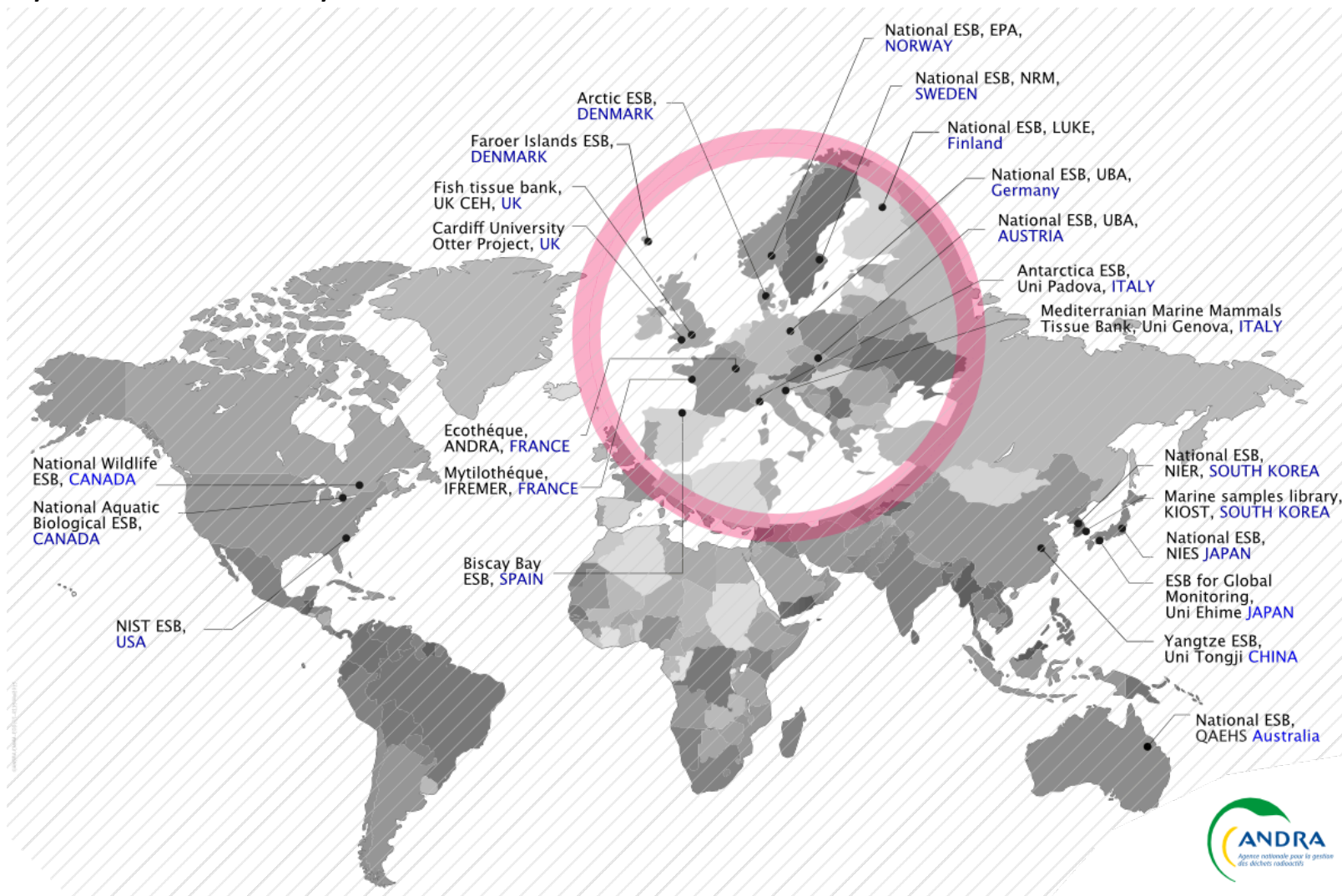
waste-water sewage sludge SPM mussel fish bird mammal



algae mussel fish bird mammal

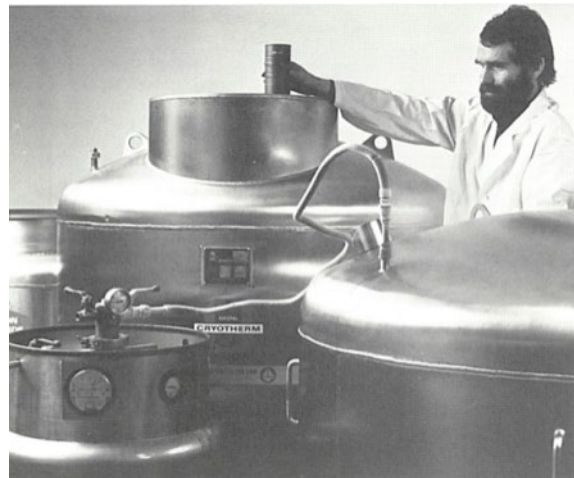
ENVIRONMENTAL SPECIMEN BANKS

Today's ESB community





HOW DOES THE GERMAN ENVIRONMENTAL SPECIMEN WORK? ORGANISATION



HOW DOES THE GERMAN ENVIRONMENTAL SPECIMEN BANK WORK?

What you can expect from ESB samples



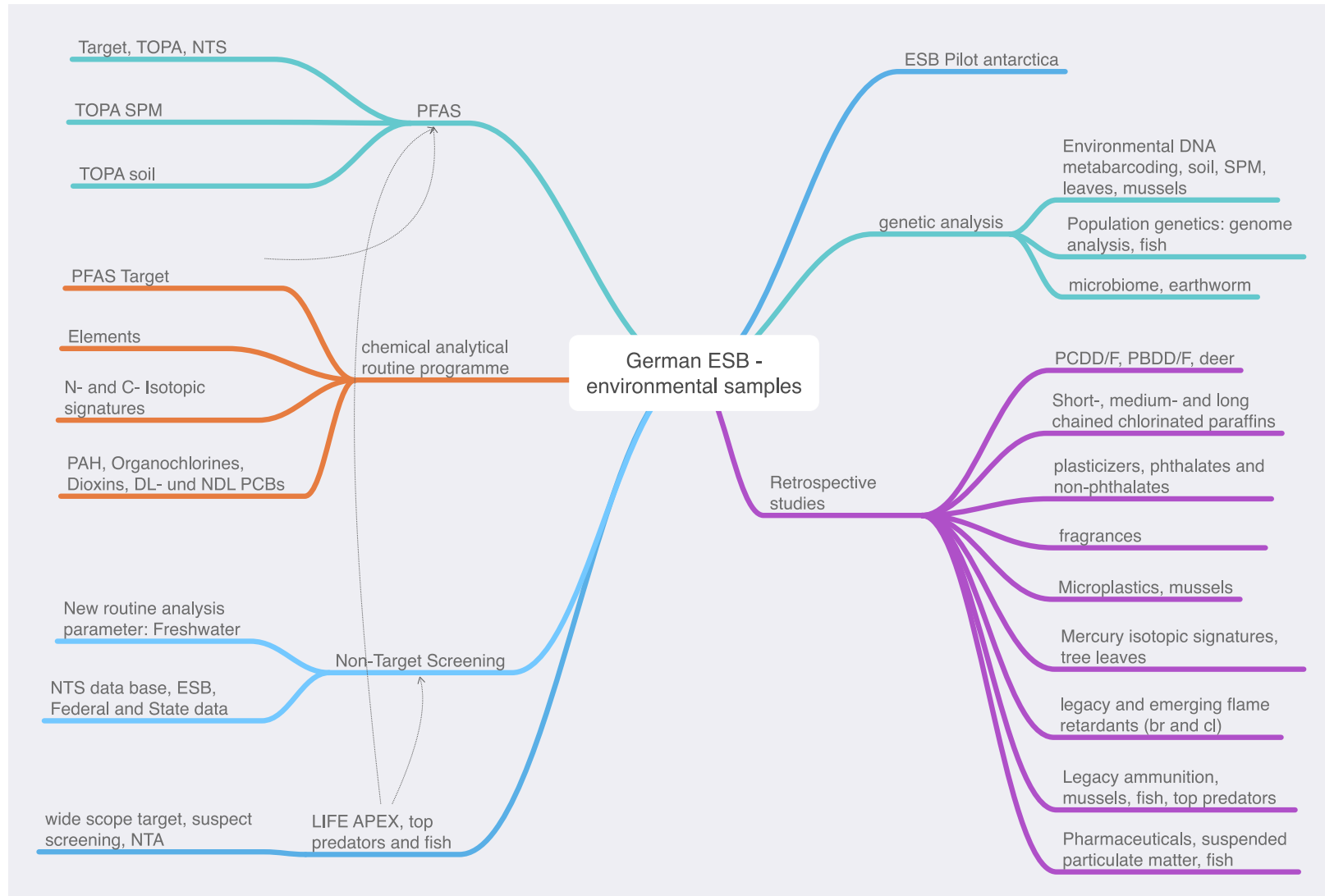
Photos: Fraunhofer IME (1,2), Eurofins GfA Lab Service (3)

one-stop shop for environmental samples

- High quality samples and expertise from long term partners, QA/QC measures, standardised protocols
- Continuous sample collections over decades: biota and non-biota samples from marine, freshwater and terrestrial compartment
- Consistent cold-chain from sampling via processing to archiving that preserves the chemical and biological integrity of samples
- Unique knowledge on samples and sampling sites and continuously growing amount of chemical and biometric data

HOW DOES THE GERMAN ENVIRONMENTAL SPECIMEN BANK WORK?

Analytical programme – environmental samples



ESB SUPPORT OF CHEMICAL MANAGEMENT

Substitution of a regulated compound by another from the same chemical group



Trends for plasticizers in German freshwater environments – Evidence for the substitution of DEHP with emerging phthalate and non-phthalate alternatives¹²

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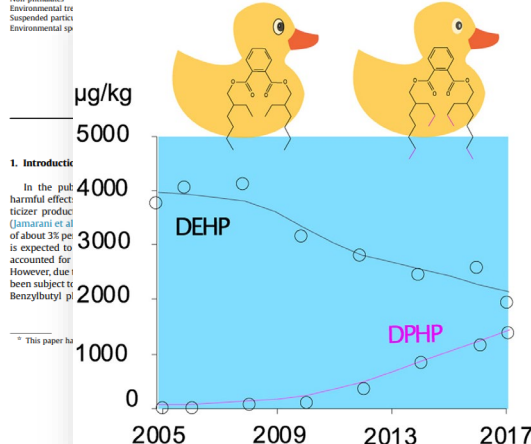
ARTICLE INFO

Article history:
Received 9 December 2019
Received in revised form
17 February 2020
Accepted 17 February 2020
Available online 20 February 2020

Keywords:
Plasticizers
Phthalates
Non-phthalates
Environmental risk
Suspended particles
Environmental risk

ABSTRACT

Plasticizers are marketed in high volumes and Di(2-ethylhexyl) phthalate (DEHP) is frequently detected in the environment and human populations. Industry had largely relied on DEHP until regulation started to restrict its marketing in 1999 due to environmental and human health concerns. The aim of this study was to obtain spatial-temporal trends for DEHP and its substitutes in German rivers. We have investigated suspended particulate matter (SPM) samples from the German Environmental Specimen Bank (ESB) for the presence of 23 plasticizers, i.e. 17 phthalates and 6 non-phthalates. The samples were collected in the last 10 years at 13 sites in large river basins in Germany such as the Rhine, Elbe and Danube. A decrease in DEHP concentrations was observed at all sampling sites between the mid-2000s and 2017. The maximum concentration for DEHP was determined in 2006 in samples from Rehlingen/Saar (16720 ng/g dry weight (dw)). By 2017, the DEHP concentration in Rehlingen had dropped to 1170 ng/g dw. In the SPM samples, the EACB, registration, (BpP) phthalate was the most frequent plasticizer in the mid-2000s (27%). However, in the 2010s, higher molecular phthalate (DHP) and non-phthalates (TOTM) were found as substances of emerging concern for the environment.



Nagorka et al., 2020

Data on the occurrence of substitutes of regulated compounds is important to avoid regrettable substitution


Risk assessment often lacks exposure data from the environment. Evidence of increasing trends can speed up the often time-consuming regulatory routine

Examples:

- High molecular plasticizers, e.g. DPHP, TOTM are replacing DEHP and other lower molecular phthalates
- Medium chained and long chained chlorinated paraffins are replacing short chained compounds
- Short chained PFAS, including per- and polyfluorinated ethers are replacing long chained PFAS

NETWORKING

International ESB website



IESB
International
Environmental
Specimen
Bank Group

International Environmental Specimen Bank Group

The International Environmental Specimen Bank Group (IESB) promotes the worldwide development of techniques and strategies of environmental specimen banking. IESB seeks international cooperation and collaboration among almost 30 specimen banks around the globe. The IESB online service provides links to established banks and background documents on the work routine.

[Read more](#)

What are the ESB samples used for?

The samples are authentic evidence for the biological and chemical state of the environment. The ultra-low storage temperatures provide for the integrity of the sample over very long time periods. With the help of the archived specimens, we can always go back in history and compare what was there before to what we see now. We can also apply new methods, e.g. of analytical chemistry to historical samples and understand environmental and human exposure to chemicals in a better way. Time trend analysis of archived samples can help to identify new contaminants of concern. Finally, we can check the efficacy of chemical regulation and see whether environmental concentrations are decreasing following management measures.



- www.inter-esb.com
- Overview of ESBs in the different regions
- Links to protocols for sampling, processing, archiving
- Photos illustrating field and lab work and videos introducing ESBs
- List of conferences, events and updates

**We would like to stay in
touch and support you, if
helpful**

