



HERA-MP

Holistic **E**nvironmental **R**isk
Assessment for **M**icro**P**lastic
in the terrestrial environment

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»Holistic Environmental Risk Assessment for MicroPlastics in the terrestrial environment«



Food and Agriculture
Organization of the
United Nations

ASSESSMENT OF AGRICULTURAL PLASTICS AND THEIR SUSTAINABILITY A CALL FOR ACTION

Integrated Environmental Assessment and Management — Volume 18, Number 4—pp. 851–852

851

Editorial

Plastic pollution: Where are we regarding research and risk assessment in support of management and regulation?

2) 150431



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Evidence of microplastic accumulation in agricultural soils from sewage sludge disposal

Fabio Corradini ^{a,b,*} Pablo Meza ^a Raúl Equiluz ^a Francisco Casado ^a

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Article

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Cite This: *Environ. Sci. Technol.* 2018, 52, 9656–9665

ENVIRONMENTAL Science & Technology

Impacts of Microplastics on the Soil Biophysical Environment

Anderson Abel de Souza Machado,^{*,†,‡,§} Chung Wai Lau,^{†,‡,||} Jennifer Till,[†] Werner Kloas,^{‡,⊥}
Anika Lehmann,^{†,§} Roland Becker,[#] and Matthias C. Rillig^{†,§}

Review

Microplastics pollution in the terrestrial environments: Poorly known diffuse sources and implications for plants

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»Holistic Environmental Risk Assessment for MicroPlastics in the terrestrial environment«

Objectives

1

A critical review of the literature to select a number of MPs to evaluate potential toxicological modes of action in relation to potential properties (e.g. size, shape and polymeric composition).

2

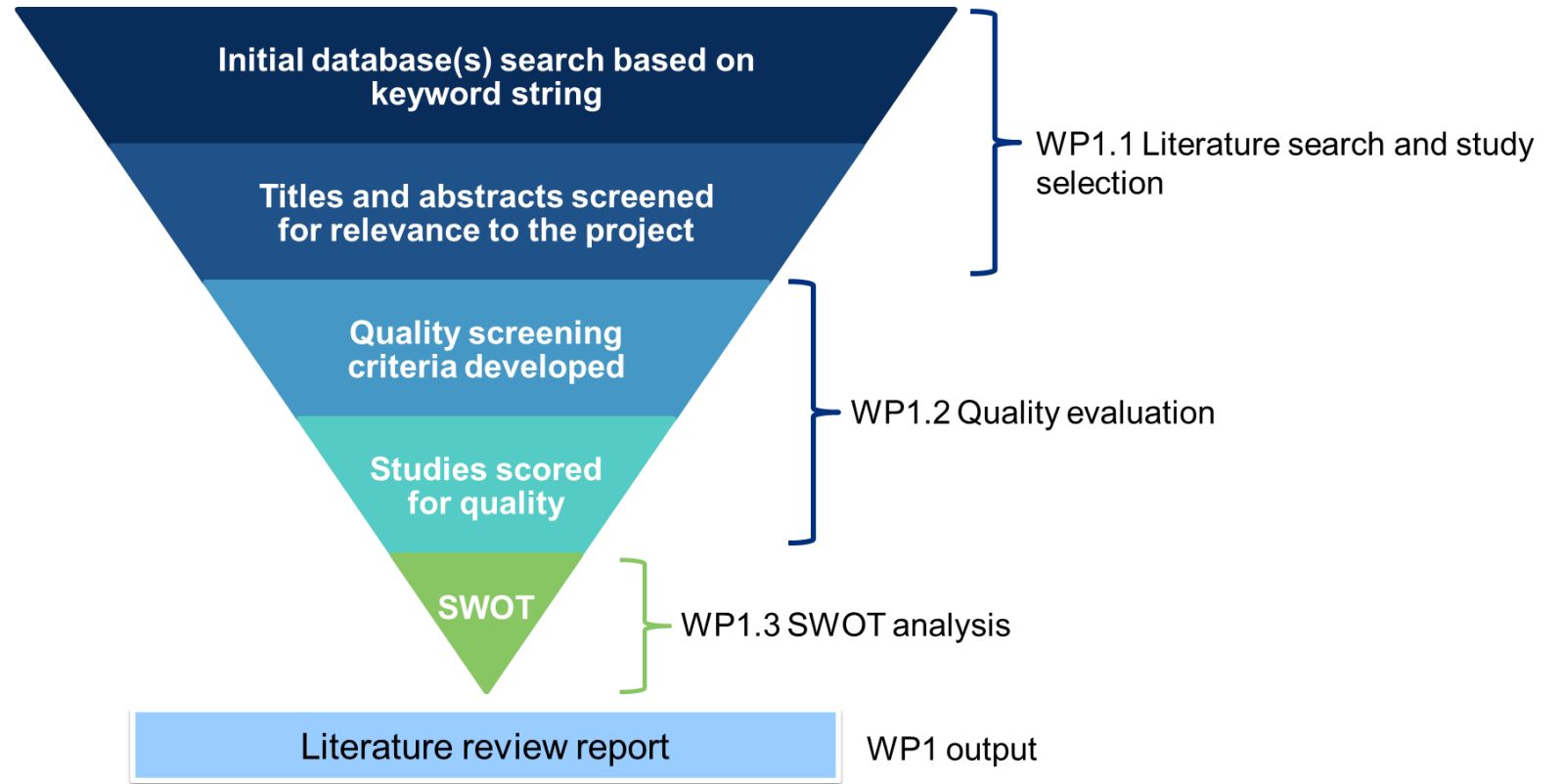
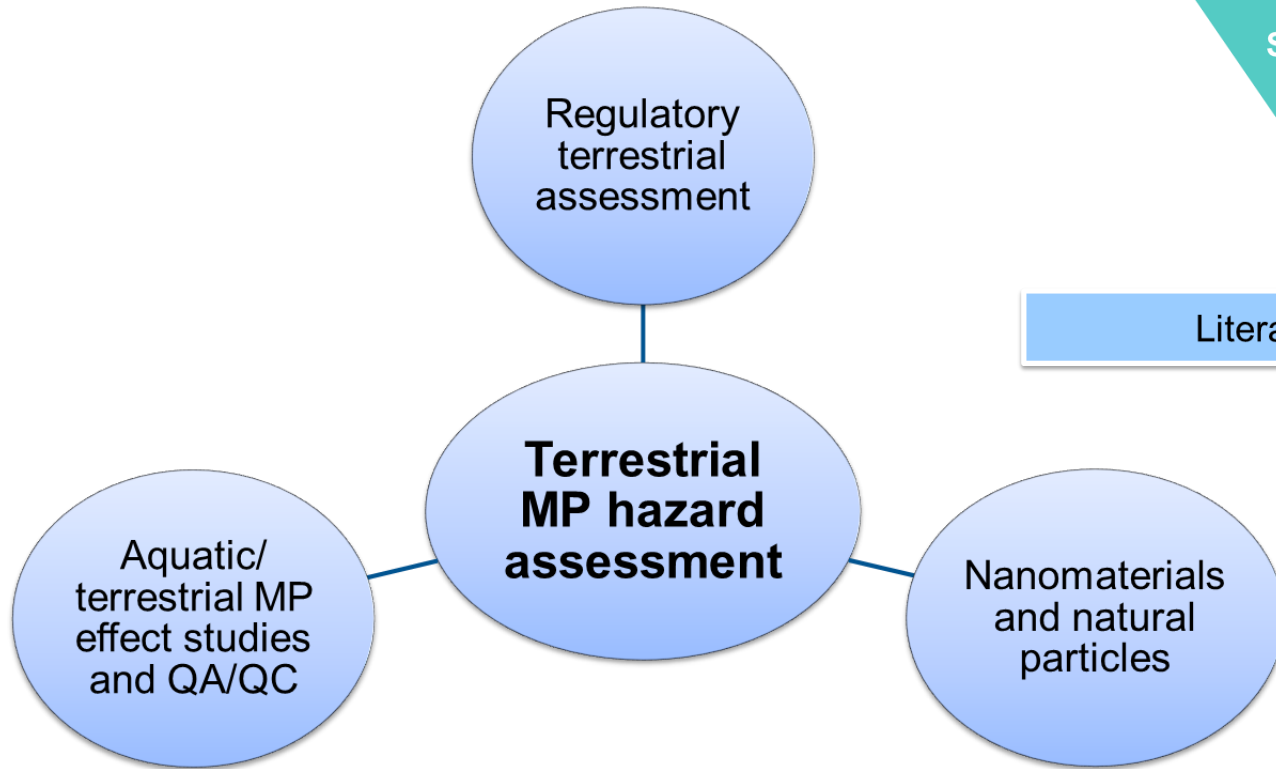
Apply a number of **OECD/ISO standardized effect test systems for the terrestrial environment** on different types of MPs.

3

To **develop a holistic risk assessment framework for MPs** in the terrestrial environment using the gathered information from the literature review and the ecotoxicological data.

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Work Package 1 – Literature Review



Ecotoxicological Tiered Approach

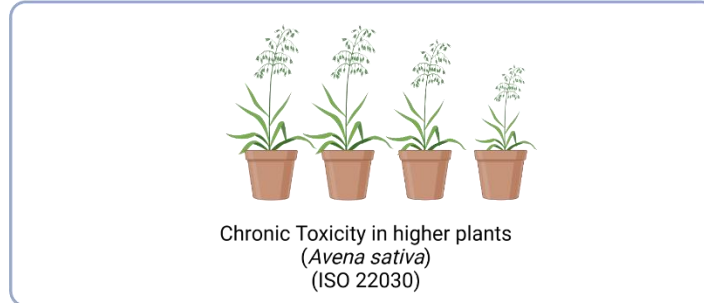
Tier 1

Standard Terrestrial Ecotoxicological Tests MP relevant adjustments

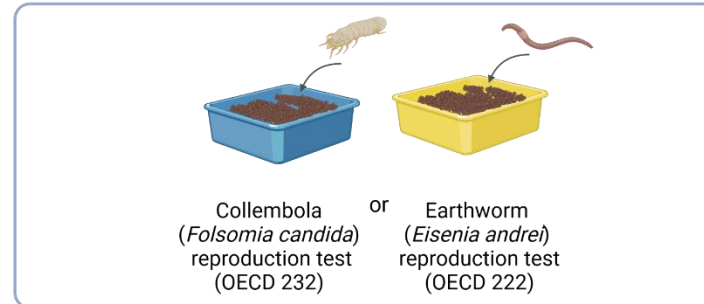


Nitrogen transformation
(OECD 216)

Automated Ribosomal
Intergenic Spacer
Analysis (ARISA)



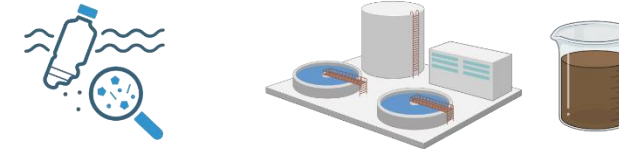
Chronic Toxicity in higher plants
(*Avena sativa*)
(ISO 22030)



Collembola
(*Folsomia candida*)
reproduction test
(OECD 232) or
Earthworm
(*Eisenia andrei*)
reproduction test
(OECD 222)

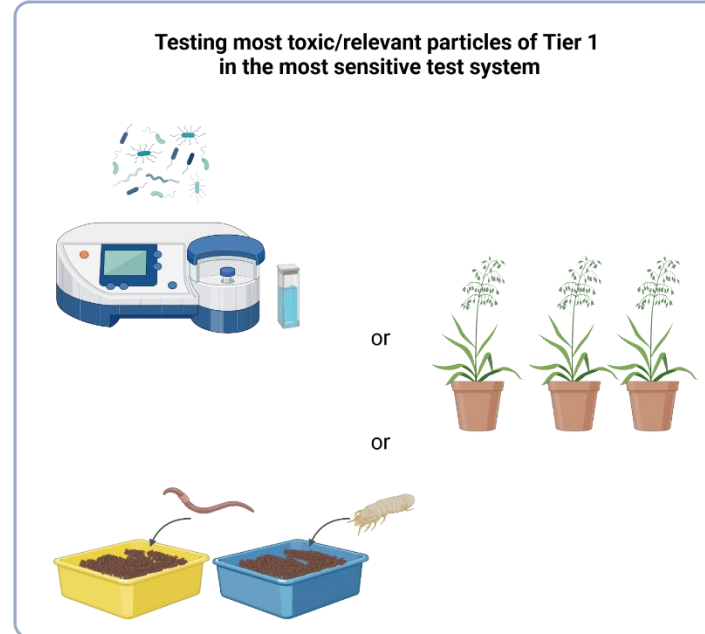
Tier 2

Terrestrial Ecotoxicological Tests with aged test materials



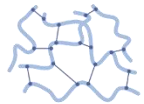
Increasing environmental relevance

Aging, weathering, biofouling
(protocols to be established)



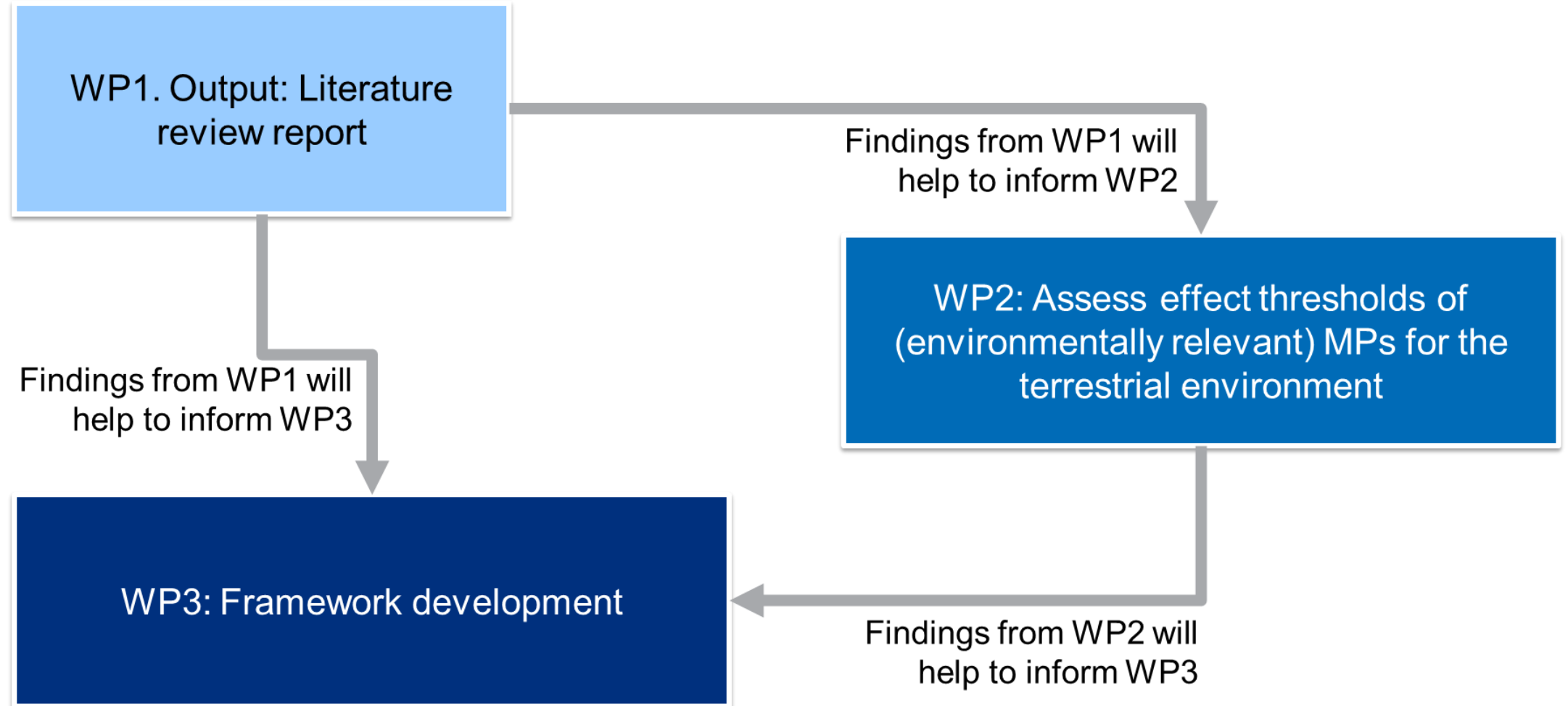
Microplastics

- Relevant for agriculture
- Feasible to determine MoA



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Work Package 3 – Framework development



Thank you for your attention



De Ruijter et al. (2020) ¹	ECO61 screening criteria	Additional aspects from other approaches
<i>MP particle characterisation</i>		
Particle size		
Particle shape		
Polymer type		
Source of MP		
Data reporting		
<i>Experimental design and set-up</i>		
Chemical purity		
Laboratory preparation		
Verification of background contamination		Soil appropriate methods for assessing MP contamination of the exposure systems.
Verification of exposure		Analytically challenging in soil matrices. Test system dependant.
Homogeneity of exposure		Difficult to validate. Discussion of homogenisation procedure adequate.
Exposure assessment		
Replication		
	Acclimatisation	Adequate handling, observing and sampling of organisms ³ .
	Test medium and conditions	Details of test medium and test conditions ^{2,3} .
	Test organism details	Test organism details e.g. species, sex, strain, life stage/age, body weight ^{2,3} .
	Inclusion of controls	Positive and negative controls ^{2,3} .
<i>Applicability to risk assessment</i>		
Endpoints		
Presence of natural (food) particles		Test conditions should be appropriate and stable for the organism with details of the feeding scheme (if any) included ^{3,4} .
Reporting of effects thresholds		
Quality of dose-response relationship		
<i>Ecological relevance</i>		
Concentration range tested		
Aging and biofouling		MPs will be subject to aging in the soil environment. Biofilm formation is likely to occur in soils ⁵ . Pre-aging or in-situ aging.
Diversity of MP tested		
Exposure time		Frequency and duration of exposure ² .
	Exposure conditions	Relevance of test conditions for respective environment and organism ² .
	Test standardisation	Ideally a test would follow a standardised method, although non-guideline methods may be equally reliable where sufficient details are given ³ .
<i>Data reporting</i>		
	Data reporting quality: Methods	Information relating to the method and administration of the study should be reported ^{2,3} .
	Data reporting quality: Results	Data must be reported accurately and completely to provide assurance of quality data ⁴ .
	Statistical analysis	Suitable statistical analysis ^{2,3} .

¹ de Ruijter et al. (2020), ² Fernandez-Cruz et al. (2018); ³ Lahr et al. (2023); ⁴ Redondo-Hasselerham et al. (2023); Liu et al., (2022).