

COST Action Progress Report at 24 months (17/10/2017 to 17/10/2019)

CA16224: European Raptor Biomonitoring Facility

The Action was approved by the Committee of Senior Officials (CSO) on 23-6-2017 and has the MoU reference COST 035/17.

This report shows the data entered into e-COST to enable the Action Chair to verify the completeness and accuracy of the report with the MC prior to submitting the report via e-COST in fulfilment of the rules for COST Action Management, Monitoring and Final Assessment.

Action leadership and participants

Leadership positions

Position	Name	Contact details	Country*
Chair	Mr Guy Duke	guy.duke@skynet.be +3223729008	United Kingdom

Position	Name	Contact details	Country*
Vice Chair	Dr Al Vrezec	al.vrezec@nib.si +38641655633	Slovenia

Working groups

#	WG Title	# of participants	WG Leader	Country*
1	Research coordination and capacity building in the 'Analysis Arena' (Priority Substances)	15	Prof Richard Shore rfs@ceh.ac.uk	United Kingdom
2	Research coordination and capacity building in the 'Analysis Arena' (PPPs, Biocides, NSAIDs)	15	Prof Antonio Juan García-Fernández ajgf@um.es	Spain
3	Research coordination and capacity building in the 'Collections Arena'	15	Dr Paola Movalli paola.movalli@naturalis.nl	Netherlands
4	Research coordination and capacity building in the 'Field Arena'	15	Dr Chris Wernham chris.wernham@bto.org	United Kingdom

Other key leadership positions

Position	Name	Contact details	Country*
STSM Coordinator	Dr Oliver Krone	krone@izw-berlin.de	Germany
Science Communication Manager	Dr Madis Leivits	mleivits@gmail.com	Estonia
GH Scientific Representative	Prof Antonio Juan García-Fernández	ajgf@um.es	Spain

* The country displayed is:

- for the Action Chair, the country that nominated that person to the Management Committee before they were elected Action Chair;
- for the Vice Chair the country that nominated the person as a Management Committee Member,
- for all other leadership positions, if the person is a MC Member the country displayed is the country of nomination, otherwise it is the country of the person's primary work affiliation.

Participants

COST members having accepted the MoU

AT	12/09/2017	BE	15/09/2017	BA	17/08/2017	HR	15/07/2017	DK	03/08/2017
EE	29/08/2017	FI	21/09/2017	FR	11/07/2017	DE	31/07/2017	EL	13/07/2017
HU	14/07/2017	IS	04/10/2017	IL	03/08/2017	IT	14/09/2017	LU	16/10/2017
NL	19/07/2017	MK	20/09/2017	NO	23/08/2017	PL	11/09/2017	PT	22/08/2017
RO	01/08/2017	RS	06/10/2017	SI	11/07/2017	ES	22/08/2017	SE	06/03/2019
TR	01/12/2017	UK	14/07/2017						

Other participants

Institution Name	Country
------------------	---------

DRAFT

Summary

The main aim and objective of the Action is to

use raptors as sentinels of environmental contamination to answer three questions: (1) are European and relevant global and regional chemicals laws and conventions effective in reducing environmental exposure to contaminants; (2) what are the environmental risks of specific chemicals; (3) are there emerging contaminant problems needing remedial action?

During its first two years the Action progressed the achievement of this as described below

European Raptor Biomonitoring Facility is making strong progress in relation to the main aim of the Action. Progress is notably being made in developing frameworks for three key elements, namely: a European Raptor Biomonitoring Scheme (ERBioMS), which specifies priority species, matrices and compounds for pan-European monitoring; a distributed European Raptor Specimen Bank (ERSpeB), which processes and stores the raptor samples required by ERBioMS; and a European Raptor Sampling Programme (ERSamP), which gathers prioritised raptor samples and related contextual data from the field. Together, these will allow for delivery of an integrated framework for the Facility. This in turn will enable pan-European biomonitoring that can provide answers to the three questions posed by the main aim / objective and thereby enhance chemicals management in Europe, with ultimate benefits for human and wildlife health.

ERBFacility has awarded a total of 15 STSMs (8 in GP2, 7 to date in GP3) in the reporting period (24M to 17 October 2019), almost all to ECIs for whom there is substantial career benefit. A further 7-8 missions are anticipated in GP3. Mission output has underpinned discussions and progress at ERBFacility Working Group and General Meetings. Work has advanced in particular on: assessing current analytical capacities for pan-European raptor biomonitoring; prioritising species, matrices and compounds for the ERBioMS; review of existing raptor collections in Europe; scoping of key issues for the ERSpeB; addressing constraints to shipping of raptor samples among collections and to labs; technical specifications for the ERSamP; reviewing key constraints to field sampling; developing best practice guidance for field sampling; and developing a Proof of Concept study for roll-out over the remaining project period.

ERBFacility has made strong progress on networking and capacity building. The number of Parties has grown to 26 (12 ITC). ERBFacility has convened three Management Committee meetings (46 Members, 21 Substitutes), two General meetings (each 60-65 participants) and seven working group meetings (each 15-25 participants) to date. These have involved high ITC and ECI participation. ERBFacility is already engaging with EU and national chemicals management authorities. Presentations have been made at key external conferences/meetings related to the Analysis, Collections and Field arenas, raising awareness of the Action, expanding the network, fostering collaborations and spin-off activities and building capacities. ERBFacility has inspired/informed a considerable number of Masters and PhD theses.

ERBFacility notably helped shape development of the successful LIFE APEX proposal (budget >€3M of which EU funding >€2M) which is demonstrating the use of apex predators (including raptors) for contaminant monitoring in Europe. Several Action members are beneficiaries of LIFE APEX, promoting close interaction between the two initiatives. For example, ERBFacility collaborates with LIFE APEX on regulatory impact and on database development. ERBFacility has also initiated collaboration with DiSSCo - a major EU-funded research infrastructure for the digitisation of natural history collections.

The Action has published high profile Trend Editorials and other peer-reviewed publications with many more in preparation - in particular arising from STSMs.

ERBFacility successfully secured and made use of additional funding (€48000) in GP2.

The Action will implement the following measures in the coming two years to overcome any issues identified in this report as potentially endangering the

achievement of the objectives of the Action

Key risks identified in the MoU remain the key issues endangering achievement of the Action. Mitigation actions identified in the MoU remain pertinent.

We are managing potential risks related to Action management and administration through monthly Core Group (CG) meetings and recourse when necessary to COST Project and Administrative Officers.

We continue to mitigate potential risks related to the substantial burden of work through effective use of Working Groups and, where appropriate, additional Task Groups, spreading effort among the three Arenas and across many institutions. CG members' institutions are very supportive in allowing CG members to dedicate time and effort to the Action. We continue to manage constraints arising from differing capacities between participating countries through emphasis on sharing of knowledge and best practice.

We continue to mitigate the potential risk that the network fails to achieve required scale and impact by continuing to expand the network of participants, dissemination to relevant professional associations/networks and collaboration with related EU projects (e.g. DiSSCo, LIFE APEX).

We are working to mitigate the risk of limited impact with regulators by engaging with EU and national regulatory bodies (ECHA, EFSA, DG Environment, DG JRC) through the LIFE APEX Regulatory Advisory Board and ERBFacility meetings.

Action website

<https://erbfacility.eu/>

DRAFT

Achievement of MoU objectives, deliverables and additional outputs/ achievements

MoU objectives

Please self-assess and describe the level of achievement of each MoU objective. For any MoU objective that is 25% or less achieved, please add an explanation.

Mou objective	Assess current capacities for pan-European raptor biomonitoring and develop a framework for a European Raptor Biomonitoring Scheme (ERBioMS). The assessment will focus on current capabilities to detect temporal and spatial trends in contaminant exposure focussing on 4-6 selected contaminants, and on identifying key areas of weakness.
Type of objective	1.f Achievement of a specific tangible output that cannot be achieved without international coordination (e.g. due to practical issues such as database availability, language barriers, availability of infrastructure or know-how, etc.)
Level of progress	76 - 100%
Description of progress with achieving the MoU objective	<p>Overall very good progress has been made on this objective, including on MoU Task T1.1/2.1 Assess current capacities for pan-European biomonitoring for 4-6 prioritised contaminants (c.75% complete) and Task T1.2/2.2 Develop framework for European Raptor Biomonitoring Scheme (ERBioMS) using priority species and matrices (c.80% complete).</p> <p>Task T1.1/2.1 Assess current capacities (M1-24)</p> <p>Tasks T1.1/2.1 are c.75% complete</p> <p>Work has involved critical reviews implemented through four STSMs (3 completed, one pending). These missions evaluate state of knowledge and monitoring to detect temporal and spatial trends (exposure and effects) for: (1) veterinary pharmaceuticals (Herrero Villar, <i>ECl</i>, Jan-Apr 2019); (2) Pb (Monclús Anglada, <i>ECl</i>, Jan 2019); (3) emerging and legacy contaminants (González Rubio, <i>ECl</i>, Jan-Apr 2019); (4) legacy organochlorines (Bjedov, <i>ECl</i>, Nov-Dec 2019). Five peer-reviewed papers are submitted or in preparation:</p> <ul style="list-style-type: none"> • González-Rubio, S. et al. (submitted) A review on legacy flame retardants and emerging organic contaminants in raptors: the status quo in Europe. <i>Environment International</i> (IF 7.943). • González-Rubio, S. et al. (in prep) Determination of bisphenols and UV filters in raptor tissues from Greenland and France. • Herrero, M., Taggart, M. et al. (in prep.) Review of the potential risk of pharmaceuticals to avian scavengers. <i>Environmental Pollution</i> (IF 5.714) or <i>Environment International</i> (IF 7.943) • Monclus, L., Krone, O., Shore, R. et al. (in prep.) Lead contamination in raptors in Europe: A systematic review and meta-analysis. <i>Environment International</i> (IF 7.943) • Bjedov et al. (in prep) Title to be determined. <p>Links to publications once published will be posted on the ERBF website, accompanied by a synthesis document drawing together commonalities across compounds. Together, these publications satisfy deliverables D1.1/2.1. We will seek, where possible, to make peer-reviewed papers open-access.</p> <p>Herrero Villar also designed a recording template for post-mortem signs of visceral gout, a diagnostic (and typically fatal) symptom of intoxication of birds by Non-Steroidal Anti-Inflammatory Drugs (NSAIDs). The main impacts have been with vultures but there is growing concern that eagles (<i>Aquila</i>) and other species may also be susceptible. This template will be trialled for use across a number of European laboratories in GP3/4 and comprises a key tool for Task 1.4/2.4 and deliverable D.1.4/2.4.</p>

	<p>Tasks T1.2/2.2 Development of ERBioMS framework (M18-36)</p> <p>Tasks T1.2/2.2 are c.75% complete.</p> <p>Progress has been achieved through a workshop (Thessaloniki, Feb 2019), engaging c.30 European experts. This narrowed the focus to four contaminant groups, which consensus identified as of high priority: pharmaceuticals, agrochemicals, rodenticides, metals. Workshop participants also identified suitable matrices for measurements, and key species traits for selection of species suitable for monitoring prioritised contaminants (workshop report: https://erbfacility.eu/events/prioritisation-species-raptor-biomonitoring).</p> <p>Building on this, STSM Badry (Aug 2019) defined a framework, based primarily on species distribution and ecological traits, to identify individual species for <i>passive</i> monitoring of these contaminants. The preferred species varies by compound, reflecting the different trophic pathways through which these different contaminants travel. A peer-reviewed paper, outlining both the framework and the outcomes in terms of priority species for monitoring, is now in preparation (submission Spring 2020):</p> <ul style="list-style-type: none"> • Badry, A., Krone, O., et al. Towards harmonisation of chemical monitoring using avian apex predators: Identification of key species for pan-European biomonitoring. <i>Science of the Total Environment</i>.
Mou objective	Develop a framework for a distributed European Raptor Specimen Bank (ERSpeB) for contaminant monitoring. ERBFacility will develop an ERSpeB to link and expand existing collections and, where appropriate, propose new regional collections, to meet ERBioMS needs.
Type of objective	1.f Achievement of a specific tangible output that cannot be achieved without international coordination (e.g. due to practical issues such as database availability, language barriers, availability of infrastructure or know-how, etc.)
Level of progress	26 - 50%
Description of progress with achieving the MoU objective	<p>Overall very good progress has been made on this objective, including on MoU Tasks T3.1 (almost completed), T3.2 (c.33% completed) and T3.3 (work initiated).</p> <p>Task T3.1 Review of existing raptor collections in Europe (M1-24)</p> <p>One STSM (Ramello, <i>ECI</i>, Nov 2018) designed and issued a detailed questionnaire on raptor collections, securing replies from 116 collections across Europe. A resulting peer-reviewed paper is nearing submission:</p> <ul style="list-style-type: none"> • Ramello, G. Movalli, P., et al. (in prep.) Review of raptor collections in Europe and their potential to support pan-European contaminant monitoring. <p>A WG3 workshop (Brussels, Dec 2018) validated mission findings:</p> <ul style="list-style-type: none"> • Meeting report: https://erbfacility.eu/events/review-raptor-collections-scoping-erspeb-framework. <p>Together, these outputs satisfy deliverable D3.1 (due M24). The review provides a clear picture of state of play across Europe, notably on collection and storing of fresh raptor samples of potential value for contaminant monitoring. Key findings: many natural history museums (NHMs), environmental specimen banks (ESBs) and research collections collect and store raptor samples, with NHMs the main recipient of raptor carcasses for most countries; many thousands of carcasses arrive annually at collections, offering a substantial sample resource; most collections freeze-store carcasses; many process and freeze raptor tissues; freezer capacity is a key constraint to expanding collections; many are digitizing collections; few currently do contaminant research; work is needed to assure sample quality for contaminant monitoring.</p> <p>Task 3.2 Develop framework for a distributed ERSPeB (M12-36)</p>

	<p>The Brussels WG3 meeting considered key issues to be addressed. These include: examination of legal, resource and freezer capacity constraints to expansion of raptor collections for contaminant monitoring; development of standards and protocols for NHMs to gather, process and store raptor samples for contaminant monitoring; and review of collections' access policies, to ring-fence samples for contaminant monitoring.</p> <p>An STSM on legal constraints to shipping of raptor samples (Smpokos, <i>ITC</i>, April 2019) has identified the implications of relevant legal frameworks and compiled proformae to support shipping. A technical document collating mission output is in preparation (input to D3.2, due M36).</p> <p>A WG3 Call for GP3 STSMs (Aug 2019) addresses remaining key issues: (1) resource constraints; (2) standards and protocols; and (c) collections' access policies. Award of these missions is pending.</p> <p>A second WG3 meeting is planned for spring 2020 (Leiden) to discuss STSM output, make a first outline ERSpeB framework and plan remaining work to deliver the framework by M36.</p> <p>T3.3 Design and construct a meta-database (M18-45)</p> <p>The WG3 Brussels meeting kick-started this Task. The meeting: (a) recommended that the database focus on recent (e.g. 2000 to date), frozen tissues and on species and matrices prioritised by ERBioMS; (b) identified key issues including: interoperability of collections' databases and the ERSpeB database; maintaining real-time data on available samples; links to related databases (LIFE APEX knowledgebase, IPCheM).</p> <p>Under the WG3 Call for GP3 STSMs, one STSM on scoping the database has been awarded (Vlachopoulos, <i>ITC/ECI</i>, Nov-Dec 2019).</p> <p>The WG3 Chair meanwhile (Autumn 2019) initiated a key collaboration with DiSSCo (major EU research infrastructure initiative for digitisation of Europe's natural history collections) and LIFE APEX on digitisation of raptor collections. This collaboration will be advanced through the forthcoming STSM.</p>
--	--

Mou objective	Develop a framework, standards and protocols for a European Raptor Sampling Programme (ERSamP). This will provide for collection of the right raptor samples from the right locations at the right times. Standards and protocols will ensure harmonised sampling methods and harmonised recording of relevant field data.
Type of objective	1.f Achievement of a specific tangible output that cannot be achieved without international coordination (e.g. due to practical issues such as database availability, language barriers, availability of infrastructure or know-how, etc.)
Level of progress	51 - 75%
Description of progress with achieving the MoU objective	<p>Very good progress has been made on this objective through work on MoU Tasks T4.1, T4.2, T4.3 and T4.5.</p> <p>T4.1 Develop ERSamP framework [M1-36]</p> <p>The ERSamP concept was introduced to ERBFacility participants at GM1 (Ciudad Real, Mar 2018). A draft technical document on ERSamP has been written and the ERSamP structure was further refined at WG4 workshops in Thessaloniki (Feb 2019) and Florence (Mar 2019). A session at a WG4 workshop in Slovenia (Sep 2019) addressed logistics of ERSamP delivery and the role of 'ERBFacility Ambassadors' to promote the ERSamP and support delivery at national scale.</p> <p>Provision for '<i>collection of the right raptor samples from the right locations at the right times</i>' is dependent on WGs1&2 deciding on priority contaminants, focal species and sample matrices (to support T4.1a). This was initiated at a joint WGs1-4 workshop on prioritisation of species and matrices (Thessaloniki, Feb 2019) and advanced at a second joint WGs1-4 workshop (Stirling, Apr 2019), which determined priority species and matrices for proof of concept (PoC) work.</p>

	<p>Technical specifications for the ERSamP framework will be finalised during the first three months of 2020 (D4.1 on schedule).</p> <p>T4.2 Review key constraints [M6-24]</p> <p>Work is well advanced on consideration of key constraints that might limit ERSamP function, and potential solutions (T4.2). Detailed review of constraints and solutions was addressed at the WG4 workshop in Thessaloniki and updated to cover a wider cross-section of Action participants at the WG workshop in Florence. An STSM (Dulsat, ECI, Dec 2018-Feb 2019) carried out a broader assessment of constraints through a questionnaire distributed by ERBFacility participants; a manuscript reporting findings on constraints is at an advanced stage of preparation (submission c.Dec 2019).</p> <p>T4.3 Develop best practice guidance [M12-45]</p> <p>The breadth of best practice guidance and protocols required for successful delivery of ERSamP was considered with Action participants at GM1 (Ciudad Real, Mar 2018); the concept of 'contextual data' to enhance interpretation of contaminant data was outlined and refined.</p> <p>At the WG4 workshop in Thessaloniki (Feb 2019), four types of contextual data were considered in detail and collective decisions reached about the value of collection (T4.1d). Two strands of work were carried out to provide examples of the scope of guidance/protocols required for collection of contextual data: (i) an STSM (Michel, Jan-Apr 2019) which developed draft guidance for peregrine and other falcons (completed); and (ii) scoping of guidance for vultures through a Task and Finish Group, pending completion through a further STSM in GP3. In addition, existing protocols for contaminant sampling in the field were reviewed by ERBFacility participants at the WG4 workshop in Thessaloniki and have been enhanced.</p> <p>Best practice guidance for PoC focal species (Tawny Owl and Common Buzzard) will be delivered through a further STSM in GP3.</p> <p>T4.5 Deliver proof of concept [M24-42]</p> <p>Focal species (Tawny Owl, Common Buzzard) for PoC have been selected through WGs1-4 collaboration at workshops in Thessaloniki (Feb 2019) and Stirling (Apr 2019).</p>
--	--

Mou objective	Build capacity in the 'analysis arena' through networking and collaboration among ecotoxicologists, collaborating laboratories and regulators, including through: (a) collaborative work on objective R1; (b) piloting joint assessment and reporting between labs to deliver proof of concept; (c) developing guidance to integrate reports with regulatory assessments.
Type of objective	2.d Acting as a stakeholder platform or trans-national practice community, pertaining to a certain area of socio-economical or societal application, or to a certain market sector
Level of progress	26 - 50%
Description of progress with achieving the MoU objective	<p>Good progress has been made on this objective in association with work on Objective 1. The Thessaloniki and other Action workshops and the STSMs mentioned under Objective 1 above have all contributed to capacity building. The STSMs have built capacity across laboratories in Croatia, Denmark, Germany, Norway, Spain and the UK. Additional progress on this objective has been delivered through work on MoU Tasks T1.3/2.3 as outlined here.</p> <p>T1.3/2.3: Deliver a network of collaborating labs capable of delivering pan-European monitoring of key priority pollutants (M12-48)</p> <p>To date, two workshops have addressed this task:</p> <ul style="list-style-type: none"> • Joint WG1-4 workshop Stirling (16-19/4/19) – see: https://erbfacility.eu/events/cross-wg-meeting-developing-erbfacility-proof-

[concept-study-and-identification-funding](#)

- **WG1&2 workshop Madrid** (24-26/4/19) – see: <https://erbfacility.eu/events/wg2-workshop-risk-assessment-anticoagulant-rodenticides-european-raptors>.

Key outcomes are: an agreed design for a proof of concept (PoC) study for pan-European contaminant monitoring; and identification of Hg, Pb and second-generation anticoagulant rodenticides (SGARs) as compounds most tractable for the PoC.

Building on these workshops, **two STSMs** have been awarded for GP3 in order to: (i) review data that has been generated to date by the Action and that can be used for PoC; (ii) work closely with WG3 and WG4 to establish a network of sample providers; (iii) identify and establish a network of labs which can potentially analyse samples for the selected contaminants, and assess their ability to engage in the PoC; (iv) test sample shipment (company/conditions/ costs); (v) explore financial sources to cover shipment and analytical costs; and (vi) generate data that illustrate the current state of the network and help to identify, assess and address (where possible) any constraints. These STSMs are ongoing and will be key to delivering Objective 4.

A departure from Objective 4 work relates to the planned interaction between the Action and regulators from EFSA and ECHA. We have found engagement difficult because the Action is not offering data-rich products of immediate value to regulators. We have solved this by collaborating with the EU project LIFE APEX (<https://life-apex.eu>), which is undertaking significant analysis of contaminants (and data provision) in marine, freshwater and terrestrial apex predators. The terrestrial component relies on use of raptor samples but LIFE APEX does not have a pan-European collections network. By linking with LIFE APEX, we will demonstrate the value (and need for) the integrated analysis-collection-field network that the Action is establishing. The LIFE APEX project has established links with both EFSA and ECHA. The Action Chair attended the first LIFE APEX Regulatory Advisory Board meeting, involving both ECHA and EFSA representatives, in June 2019.

Mou objective	Build capacity in the 'collections arena' through networking and collaboration among ecotoxicologists and raptor collections, including through: (a) constructing a meta-database of raptor specimens and related contaminant data, and stimulating digitisation of collections, to enhance access and use for contaminant monitoring; (b) stimulating expansion of raptor collections.
Type of objective	2.d Acting as a stakeholder platform or trans-national practice community, pertaining to a certain area of socio-economical or societal application, or to a certain market sector
Level of progress	26 - 50%
Description of progress with achieving the MoU objective	<p>Very good progress has been made in this regard, involving networking and collaboration through meetings, STSMs and external events in relation to MoU Tasks T3.1, T3.2 and T3.3 (see Objective 2).</p> <p>In September 2017 (following Action approval), the WG3 Lead and other Action participants published a Trend Editorial on '<i>Bringing together raptor collections in Europe for contaminant research and monitoring in relation to chemicals regulations</i>' (see publications).</p> <p>WG3 plans for GP2 were discussed with c.60 Action participants at GM1 (Ciudad Real, Feb 2018) involving an overview of WG3 and a dedicated WG3 session to plan WG3 GP2 activities. These activities were agreed at MC2 (Feb 2018) and formally approved as part of the GP2 Work and Budget Plan (WBP).</p> <p>The first WG3 workshop (Brussels, Feb 2018) brought together 17 participants from 12 countries, from environmental specimen banks (ESBs), natural history museums (NHMs) and research collections, enhancing networking among these types of institution. The meeting determined that collections have good reason to engage in ERBFacility, including opportunities to demonstrate societal relevance of collections, for novel collaboration across NHMs, ESBs and research collections, to extend research interests to contaminant monitoring, and for samples exchange across Europe. Taking</p>

	<p>account of collections' limited resources, the meeting recommended building capacities organically, focusing first on one or two species and sample matrices for which analytical resources are available and for which there is clear regulatory interest. This has been picked up through cross-WG work on Proof of Concept (see Objectives 1 and 3).</p> <p>Following an invitation to the Brussels meeting, the Swedish Museum of Natural History joined the Action, with Sweden becoming the 26th Party to the Action.</p> <p>WG3 plans for GP3 were discussed at with c. 65 Action participants at GM2 (Florence, Mar 2019) and MC3 (Florence, Mar 2019). GM2 included a recap of WG3 progress and discussion of plans for WG3 GP2 activities. WG3 GP3 activities were then agreed at MC3 and then formally approved by MC as part of the GP3 Work and Budget Plan (WBP).</p> <p>A second WG3 meeting is planned for spring 2020 (date to be confirmed) at Naturalis (Leiden) to discuss outcomes from these missions and plan remaining work on Task 3.2 and Task 3.3.</p> <p>WG3 participants have been involved in networking and collaboration with WGs1&2 and WG4 through the two joint WG1-4 meetings (Thessaloniki, Feb 2019; Stirling, Apr 2019).</p> <p>WG3 STSMs have contributed substantially to networking and collaboration. The first WG3 STSM (Ramello) involved interaction with 116 collections across Europe. The second WG3 STSM (Smpokos) engaged with many NHMs across Europe to understand constraints to shipping of samples and identify solutions.</p> <p>In May 2019, the WG Lead published in collaboration with a large number of Action participants, a second Trend Editorial on '<i>Progress in bringing together raptor collections in Europe for contaminant research and monitoring in relation to chemicals regulations</i>' (see Publications).</p> <p>A presentations was made to the CETAF Governing Board and two posters presented to meetings of European Bird Curators (2017, 2019) about the distributed European Specimen Bank to engage with a wide number of collections.</p>
--	---

Mou objective	Build capacity in the 'field arena' through networking and collaboration among ornithologists, raptor collections and ecotoxicologists, including by: (a) stimulating and harmonising collection of raptor samples and field data relevant to interpretation of contaminant data; (b) testing the framework, standards and protocols to deliver proof of concept.
Type of objective	2.d Acting as a stakeholder platform or trans-national practice community, pertaining to a certain area of socio-economical or societal application, or to a certain market sector
Level of progress	51 - 75%
Description of progress with achieving the MoU objective	<p>Very good progress has been made on this objective through work on Tasks T4.1, T4.2, T4.3 and T4.5 (see Objective 3) and additionally through Task T4.4 as outlined here.</p> <p>T4.4 Expand stakeholder involvement in field sampling [M24-45]</p> <p>Maximising inclusivity of the ERBFacility network (making it as pan-European as possible) is central to building capacity in the field arena. WG4 has sought to involve as many participants as possible, from as many countries as possible. This has involved repeated welcoming messaging, promotion of workshop and STSM opportunities and running a range of activities and management structures that draw new people into active participation and encourage them to think about how to engage others.</p> <p>The WG4 Core Team meets regularly to coordinate and manage the work and has grown from 5 to 9 participants (from Greece, Hungary, Italy, Israel, Portugal, Slovenia, Spain, UK, Sweden). Regular WG4 workshops have provided an effective means of</p>

continued motivation of a widening cross-disciplinary network, increasing those leading and working on tasks (fostering ownership of Action aims, investment of time and expertise).

Network participants have been introduced to, and encouraged to think about, the different types of field participants that must be engaged, motivated and guided in order to successfully deliver Proof of Concept (PoC) and the future ERSamP, through consideration of the motivations and needs of each type (T4.4). This work started at **GM1** (Mar 2018) and was progressed in detail at the **WG4 Thessaloniki** (Feb 2019), **Florence** (Mar 2019) and **Slovenia** (Sep 2019) meetings.

WG4 has built on findings of previous reviews of raptor monitoring capacity across Europe, and used an **STSM** (Maiden, *ECI*, GP2) to review capacity of raptor ringers across Europe (a key group of participants for ERSamP delivery). At the **Slovenia workshop**, a template was filled by each country to review existing capacity to participate and how to enhance such capacity; this will be rolled out during the remainder of GP3 and findings collated and used to identify capacity gaps and how to fill them (T4.1b&c). The Slovenia workshop also started planning of training requirements and considered options for training delivery (in support of D4.4).

An overall structure for an ERBFacility web-based 'Advice Hub' to hold guidance on sampling, contextual data collection and capacity building was agreed at the Slovenia workshop and will be progressed before the end of GP3, either via an **STSM** or a small **task group** (T4.4, D4.3 & D4.4).

WG4 has taken the lead in the **PoC study** (T4.5, D4.5) by leading planning and delivery of the **first joint WG1-4 workshop** to set priority species, matrices and compounds (Thessaloniki, Feb 2019) and the **second joint WG1-4 workshop** (Stirling, Apr 2019) on the proof of concept study and funding. The latter delivered agreed objectives, an outline scientific proposal and implementation plan for the PoC study and a task group to manage the study.

WG4 has supported the Core Group in reviewing communication to, and active engagement of, the ERBFacility network and made recommendations on how to improve this (essential for capacity building and future ERSamP delivery).

Deliverables

This section covers only deliverables that were foreseen for the Action, not additional outputs that were generated during the Action (these additional outputs will be added in the following section). Please select and comment on the progress with achieving each deliverable.

For deliverables that are:

- Delivered, please provide proof to enable the Action Rapporteur to confirm the delivery
- Not delivered but delivery is foreseen within 2 years please explain how the delivery will be achieved
- Not foreseen to be delivered please explain why not

Deliverable	Final manuscript for publication on current capacities for pan-European raptor biomonitoring (assessment of exposure trends and, where feasible, effects) for 4-6 prioritised contaminants (WG1, WG2).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	24
Explanation	Three peer-reviewed papers on prioritised compound groups are in preparation (submission expected Spring/Summer 2020): (1) González-Rubio et al. Presence, concentrations and (bio)-analytical methods currently available for emerging and legacy organic contaminants in raptors: a review. Environmental Pollution; (2) Herrero, M. et al. Review of the potential risk of pharmaceuticals to avian scavengers. Environmental Pollution or Environment International; (3) • Monclus, L. et al. Lead contamination in raptors in Europe: A systematic review and meta-analysis. Environment International. A fourth paper (Bjedov et al) covering one further compound group is anticipated late 2020. A synthesis document will be prepared in 2020.		

Deliverable	Technical specifications for the ERBioMS framework and a final manuscript for publication on read-across techniques (WG1, WG2).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	36
Explanation	Work on this deliverable is about 75% done, see progress against Objective 1, Tasks 1.2/2.2.		

Deliverable	Report on network of collaborating labs for raptor biomonitoring capable of delivering pan-European surveillance and monitoring of key priority pollutants under: (1) REACH and Minamata Convention (WG1); (2) PPP and Biocides Directives (WG2).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	42
Explanation	Work is in progress - a GP3 STSM (Valverde) is currently compiling information on analytical laboratories (a questionnaire was issued in October 2019). See also progress report on Objective 1 for further information.		

Deliverable	Pilot reports, proof of concept and guidance for harmonisation of raptor monitoring data and its integration for regulatory purposes in the areas of risk assessment and risk mitigation (WG1, WG2).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	42
Explanation	Work has already started on Proof of Concept which was elaborated at the Stirling		

	workshop.
--	-----------

Deliverable	Report and final manuscript for publication on existing collections in Europe and constraints (WG3).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	24
Explanation	Report available as report from Brussels WG3 meeting (available on website). Final manuscript for publication - submission expected by end 2019.		

Deliverable	Technical specifications for, and a final manuscript for publication on, the ERSpeB framework (including collecting priorities, potential for collections to accept new specimens, storage needs; potential to establish new (regional) collections, enhanced research access to collections; measures to resolve constraints) (WG3).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	36
Explanation	Not yet due, but good progress made on scoping the framework at WG3 meeting Brussels (Dec 2018) and through two WG3 STSMs in GP2 (Ramello, Smpokos). Further progress expected through 3 planned STSMs and a second WG3 meeting in GP3. See also progress vs Objective 2 (Task 3.2).		

Deliverable	Meta-database, linked to IPChEM, of existing raptor specimens and of any related contaminant data (WG3).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	42
Explanation	The WG3 Brussels meeting (Dec 2018) kick-started work towards the Deliverable outlining the focus of the database and key issues to be addressed in developing it. A WG3 STSM in GP3 will scope the database. Collaboration on this has been initiated with related initiatives LIFE APEX Knowledgebase, DiSSCo digitalisation of European natural history collections). See progress reporting vs Objective 2, Task 3.3.		

Deliverable	Guidance on use of Natural History Museum and Environmental Specimen Bank collections for contaminant monitoring (WG3).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	45
Explanation	Work on this starts shortly with a WG3 STSM planned for GP3 addressing standards and protocols for contaminant monitoring by collections.		

Deliverable	Report on network of collaborating collections (Natural History Museums, Environmental Specimen Banks, etc.) (WG3).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	45
Explanation	Not yet due. The first WG3 STSM (Ramello) developed a directory of almost 200 raptor collections across Europe, carried out a successful review of these existing collections, and expanded networking with these collections through a detailed questionnaire - see progress report vs Objective 2, MoU Task 3.1. WG3 meetings and missions, WG3 sessions at GMs, and publications led by WG3 (e.g. the two Trend Editorials involving co-authors from numerous collections across Europe) are contributing to the		

development of this network. A report summarising the status of the network is expected by the deliverable due date.

Deliverable	Technical specifications for, and a final manuscript for publication on, the ERSamP framework (WG4).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	36
Explanation	Good progress made - a draft technical document on the framework has been written (M4.1 and M4.4 met) and overall ERSamP structure further refined during WG4 workshops in Thessaloniki (Feb 2019) and Florence (Mar 2019). Logistics of ERSamP delivery addressed at WG4 workshop in Slovenia (Sep 2019). Technical specification for the ERSamP framework to be finalised spring 2020. See also progress vs Objective 3 Task 4.1.		

Deliverable	Report on reducing constraints to raptor sampling and to capture of relevant contextual field data (WG4).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	27
Explanation	Work is well advanced - a detailed review of constraints and solutions was addressed through WG4 workshops in Thessaloniki (Feb 2019) and Florence (Mar 2019). WG4 GP2 STSM (Dulsat) carried out a broader assessment of constraints (M4.2 met). Manuscript reporting findings on constraints is at an advanced stage of preparation (submission by Dec 2019). See also progress vs Objective 3, Task 4.2.		

Deliverable	Best practice guidance, protocols for field raptor sampling and contextual field data capture (WG4).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	42
Explanation	Initial discussions on guidance held at GM1 (Mar 2018). WG4 workshop (Feb 2019) considered contextual data requirements. STSM (Michel, Jan-Apr 2019) developed guidance for peregrine and other falcons. Task & Finish Group scoped guidance (for vultures), to be completed through WG3 GP3 STSM. Protocols for field sampling reviewed/enhanced at WG4 workshop (Feb 2019). Best practice guidance for Proof of Concept focal species will be delivered through a GP3 STSM. A structure for an ERBFacility web-based 'Advice Hub' to hold guidance on sampling, contextual data collection and capacity building will be progressed in GP3. See also progress vs Objective 3, Task 4.3.		

Deliverable	Guidance on recruitment of volunteers and training of volunteers and/or volunteer trainers for raptor sampling and gathering of contextual field data (WG4).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	30
Explanation	This will be progressed via an STSM or small task and finish group before the end of GP3.		

Deliverable	Report on proof of concept (on application of the ERSamP framework, guidance and protocols to collect new raptor samples and contextual field data through existing and/or novel networks) (WG4).		
--------------------	---	--	--

Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	42
Explanation	Work has been initiated towards this deliverable. Focal species (Tawny Owl, Common Buzzard) for Proof of Concept have been selected through WGs1-4 collaboration at workshops in Thessaloniki (Feb 2019) and Stirling (Apr 2019). A proposal for a Proof of Concept study, which will inter alia test the functioning of the field sampling network, has been agreed by Action participants and the study has been initiated through STSMs		

Deliverable	Report on network of collaborating field organisations (NGOs, academia, etc.) for raptor sampling and gathering of contextual data (WG3).		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	45
Explanation	Substantial work done to date to develop this network. WG4 capacity building work to date has focussed on attracting appropriate representatives from key organisations to be part of the Action by involving them in relevant development work. Training initiatives to be planned for GP4 will enhance participants' ownership of the objectives of the Action. The ERSamP network will be reported on by the end of the Action.		

DRAFT

Additional outputs / achievements

Co-authored Action publications

Please enter below ONLY publications (including publications that are submitted but not yet accepted):

- that are on the topic of the Action, and
- that are co-authored by at least two Action participants from two countries participating in the Action, and
- for which the Action networking was necessary.

Please pay special attention to representatives of Inclusiveness Target Countries (ITCs) in each publication. If there are more than 20 publications you *may* choose to enter only the most 20 significant (in terms of Inclusiveness, Excellence and the MoU Objectives).

	Bibliographic data	Countries participating in the Action among authors	Open Access	COST cited?	COST funds?	Relevance to H2020 Societal challenge	Peer Reviewed?
1	<p>doi:10.1007/s11356-019-05340-6Title</p> <p>Authors</p>	<p>Progress on bringing together raptor collections in Europe for contaminant research and monitoring in relation to chemicals regulation</p> <p>Paola Movalli; Guy Duke; Gloria Ramello; René Dekker; Al Vrezec; Richard F. Shore; Antonio García-Fernández; Chris Wernham; Oliver Krone; Nikiforos Alygizakis; Alexander Badry; Fausto Barbagli; Koos Biesmeijer; Giovanni Boano; Alexander L. Bond; Yael Choresh; Jan Bolding Christensen; Alessandra Cincinelli; Sara Danielsson; Andreia Dias; Rune Dietz; Marcel</p>	Y	Y	N	Climate action, environment, resource efficiency and raw materials	Y

Eens; Silvia Espín; Igor
 Eulaers; Sylke Frahnert;
 Tibor I. Fuiz; Georgios
 Gkotsis; Natalia
 Glowacka; Pilar Gómez-
 Ramírez; Marco Grotti;
 Michel Guiraud; Peter
 Hosner; Ulf Johansson;
 Veerle L.B. Jaspers;
 Pepijn Kamminga; Jan
 Koschorreck; Burkhard
 Knopf; Eero Kubin;
 Sabrina LoBrutto; Rui
 Lourenco; Tania
 Martellini; Emma
 Martínez-López; Rafael
 Mateo; Maria-Christina
 Nika; Varvara
 Nikolopoulou; Dan
 Osborn; Olivier Pauwels;
 Marco Pavia; M. Glória
 Pereira; Heinz Rüdell;
 Pablo Sanchez-Virosta;
 Jaroslav Slobodnik;
 Christian Sonne;
 Nikolaos Thomaidis; Till
 Töpfer; Gabriele Treu;
 Risto Väinölä; Jari
 Valkama; Steven van der
 Mije; Didier Vangeluwe;
 Ben H. Warren;
 Friederike Woog
[doi:10.1007/s11356-019-05340-6](https://doi.org/10.1007/s11356-019-05340-6)
 Journal article
 Environmental Science
 and Pollution Research
 Springer Science and
 Business Media LLC
[0944-1344](https://doi.org/10.1007/s11356-019-05340-6); [1614-7499](https://doi.org/10.1007/s11356-019-05340-6)
 Pollution; Health,
 Toxicology and

DOI

Type
Published in

Published by

ISSNs
Subjects

	Links	Mutagenesis; Environmental Chemistry; General Medicine http://link.springer.com/content/pdf/10.1007/s11356-019-05340-6.pdf ; http://link.springer.com/article/10.1007/s11356-019-05340-6/fulltext.html						
2	doi:10.1007/s11356-017-0096-x Title Authors DOI Type Published in Published by ISSNs Links	Bringing together raptor collections in Europe for contaminant research and monitoring in relation to chemicals regulations Paola Movalli; René Dekker; Jan Koschorreck; Gabriele Treu doi:10.1007/s11356-017-0096-x Journal article Environmental Science and Pollution Research Springer Nature 0944-1344; 1614-7499 http://link.springer.com/article/10.1007/s11356-017-0096-x/fulltext.html ; http://link.springer.com/content/pdf/10.1007/s11356-017-0096-x.pdf	DE, NL	Y	N	N	Climate action, environment, resource efficiency and raw materials	Y
3	doi:10.1080/00063657.2018.1552919 Title Authors DOI Type Published in Published by	Editorial Guy Duke; Al Vrezec; Paola Movalli; Irena Bertoneclj; Chris Wernham doi:10.1080/00063657.2018.1552919 Journal article Bird Study Informa UK Limited	NL, SI, UK	Y	N	N	Climate action, environment, resource efficiency and raw materials	Y

		ISSNs Subjects	0006-3657 ; 1944-6705 Ecology, Evolution, Behavior and Systematics; Nature and Landscape Conservation						
		Link	https://www.tandfonline.com/doi/pdf/10.1080/0063657.2018.1552919						
4	doi:10.1080/00063657.2018.1447546 Title	Authors	A review of raptor and owl monitoring activity across Europe: its implications for capacity building towards pan-European monitoring Maja Derlink; Chris Wernham; Irena Bertonec; András Kovács; Pertti Saurola; Guy Duke; Paola Movalli; Al Vrezec	FI, HU, NL, SI, UK	Y	N	N	Climate action, environment, resource efficiency and raw materials	Y
		DOI	doi:10.1080/00063657.2018.1447546						
		Type	Journal article						
		Published in	Bird Study						
		Published by	Informa UK Limited						
		ISSNs	0006-3657 ; 1944-6705						
		Subjects	Ecology, Evolution, Behavior and Systematics; Nature and Landscape Conservation						
		Link	https://www.tandfonline.com/doi/pdf/10.1080/0063657.2018.1447546						
5	Paola Movalli, Guy Duke, Gloria Ramello, Jorgos Sbokos, René Dekker, Al Vrezec, Richard F. Shore, Antonio J. García-Fernández, Chris Wernham, Oliver Krone, Nikiforos Alygizakis, Arianna Aradis, Alexander Badry, Fausto Barbagli, Koos			BE, DK, FI, FR, DE, EL, HU, IL, IT, NL, NO, PT,	Y	Y	N	Climate action, environment, resource efficiency and raw	N

	Biesmeijer, Giovanni Boano, Alexander L. Bond, Yael Choresh, Jan Bolding Christensen, Alessandra Cincinelli, Sara Danielsson, Andreia Dias, Rune Dietz, Marcel Eens, Silvia Espín, Igor Eulaers, Sylke Frahnert, Tibor I. Fuisz, Georgios Gkotsis, Natalia Glowacka, Pilar Gómez-Ramírez, Marco Grotti, Michel Guiraud, Peter Hosner, Ulf Johansson, Veerle L.B. Jaspers, Pepijn Kamminga, Jan Koschorreck, Burkhard Knopf, Eero Kubin, Sabrina LoBrutto, Rui Lourenco, Tania Martellini, Emma Martínez-López, Rafael Mateo, Maria-Christina Nika, Varvara Nikolopoulou, Dan Osborn, Olivier Pauwels, Marco Pavia, M. Glória Pereira, Heinz Rüdell, Pablo Sánchez-Virosta, Jaroslav Slobodnik, Christian Sonne, Nikolaos Thomaidis, Till Töpfer, Gabriele Treu, Risto Väinölä, Jari Valkama, Steven Van der Mije, Didier Vangeluwe, Ben H. Warren, Friederike Woog. (2019). <i>Towards a European raptor specimen bank in support of contaminant research and monitoring for better chemicals management</i> . Poster. 11 th Biennial European Bird Curator Meeting, Tel Aviv, 24-26 September 2019.	ES, SE, UK				materials		
6	Vrezec, A. et al. (2019) <i>Review of raptor ringing in Europe: preliminary results and invitation for collaboration</i> . Conference presentation. Euring General Assembly. Zrenjanin, Serbia, 10 September 2019.	SI, UK	Y	Y	N	Climate action, environment, resource efficiency and raw materials	N	
7	Lourenco, R., Garcia-Fernandez, A.j., Movalli, P., Shore, R.F., Vrezec, A., Wernham, C., Duke, G. (2019) <i>European Raptor Biomonitoring Facility. Preventing and limiting negative impacts of chemicals on human health and the environment</i> . Poster presented at 21st Conference of the European Bird Census Council, Evora, Portugal, 8-13 April 2019.	NL, PT, SI, ES, UK	Y	Y	N	Climate action, environment, resource efficiency and raw materials	N	
8	Sun J., Covaci A., Bustnes J.O., Jaspers V.L.B., Helander B., Bårdsen B.J., Boertmann D., Dietz R., Labansen A.L., Lepoint G., Schulz R., Malarvannan G., Sonne C., Thorup K., Tøttrup A.P., Zubrod J.P., Eens M., Eulaers I., 2019. Temporal trends of legacy organochlorines in different white-tailed eagle (<i>Haliaeetus albicilla</i>) subpopulations. <i>Environment International</i>	BE, DK, DE, NO	N	Y	N	Climate action, environment, resource efficiency and raw materials	Y	
9	Mandalà G., Tedesco M., Bellia E., Consentino M. C., Ientile R., Lo Valvo F., Movalli P., Seminara S., Spadola F., Spinnato A., Toscano F., Vicari D., Woog F., Lo Brutto, S. (2019) <i>A first inventory of raptors in Sicilian collections</i> . Poster, 11th Meeting of European Bird Collection Curators, Tel Aviv, 24-26 September 2019.	DE, IT, NL	Y	Y	N	Climate action, environment, resource efficiency and raw materials	N	
10	doi:10.1016/j.scitotenv.2017.12.210 Title Authors	Blood concentrations of p,p'-DDE and PCBs in harriers breeding in Spain and Kazakhstan Silvia Espín ; Julien Terraube; Beatriz Arroyo; Pablo R.		Other	Y	Y		Y

		<p>Camarero; Rafael Mateo; Rubén Limiñana; Xabier Vázquez- Pumariño; Antonio Pinilla; Jesús T. García; François Mougeot</p> <p>DOI doi:10.1016/j.scitotenv.2017.12.210</p> <p>Type Published in Journal article Science of The Total Environment</p> <p>Published by ISSN Elsevier BV 0048-9697</p> <p>Subjects Environmental Engineering; Waste Management and Disposal; Pollution; Environmental Chemistry</p> <p>Links https://api.elsevier.com/content/article/PII:S0048969717336434?httpAccept=text/xml; https://api.elsevier.com/content/article/PII:S0048969717336434?httpAccept=text/plain</p>						
11	Soledad González-Rubio; Ana Ballesteros-Gómez; Alexandros G. Asimakopoulos, Veerle L.B. Jaspers. (submitted) A review on legacy flame retardants and emerging organic contaminants in raptors: The status quo in Europe. <i>Environment International</i> .		NO, ES	N	Y	Y	Climate action, environment, resource efficiency and raw materials	Y

Projects resulting from Action activities

Please enter below all the projects on the topic of the Action resulting from Action activities, involving at least one Action participant, and for which the Action networking was necessary.

The Action reported 5 project(s) and 0 proposal(s) resulting from the Action networking.

Key details of the projects are shown below.

#	Title	Countries participating in the Action among proposers	Main proposer name	Funder	Amount	Call identifier	Relevance to H2020 Societal Challenge
1	New insights in the anticoagulant rodenticides risk assessment on non-target species	ES	Antonio J. García-Fernández	National	122377 €	Government aid to competitive groups of research to carry out projects for the development of scientific and technical research 2018: https://fseneca.es/web/convocatoria/541	Climate action, environment, resource efficiency and raw materials
2	Effects of metals on antioxidant status, calcium metabolism and biochemistry in wild birds inhabiting mining areas.	ES	Silvia Espin	National	16000 €	Saavedra Fajardo Programme (Seneca Foundation) - 2016 call.	Climate action, environment, resource efficiency and raw materials
3	Movement ecology of Icelandic white-tailed eagles	DE, IS	Kristinn H Skarphedinsson	National	21000 €	(1) Ministry of Environment; (2) EM Energy	Climate action, environment, resource efficiency and raw materials
4	LIFE APEX - Systematic use of contaminant data from apex predators and their prey in chemicals management	IT, NL, UK	Jaroslav Slobodnik	Other EU	2012047 €	2017 Call for Proposals for LIFE Action Grants	Climate action, environment, resource efficiency and raw materials
5	Increasing the capacity of wildlife health research	EE	Madis Laevits	National	38922 €	n/a	Climate action, environment, resource efficiency and raw materials

Other outputs / achievements

Please enter below any additional outputs/ achievements on the topic of the Action that contribute to the COST mission: “COST enables break-through scientific developments leading to new concepts and products and thereby contributes to strengthen Europe’s research and innovation capacities”, and for which the Action networking was necessary (e.g. a patent, standards, white paper).

Output / achievement description	Dependence of achievement on the Action networking
Enhanced collaboration between Aarhus University (Igor Eulaers, MC Member Denmark) and University of Turku (Toni Laaksonen, MC Member Finland) through the opportunity provided by ERBFAcility meetings to meet and discuss. A specific output of this collaboration has been the initiation of a PhD project (2019-2022) at University of Turku on <i>Legacy and emerging anthropogenic contaminants in Baltic coastal food webs</i> (PhD candidate Riikka Vainio - https://www.utu.fi/en/people/riikka-vainio), funded mainly by the EU BONUS-funded project Balthealth.	High
ERBFAcility has motivated an Administrative Decision at the University of Turku (MC Member Toni Laaksonen, Finland) to initiate the planning of a first national Environmental Specimen Bank bank in Finland. The first samples of the sample data bank will be from raptors (eggs, feathers, tissues) gathered through various research initiatives at the Finnish Museum of Natural History (MC Member Jari Valkama, Finland).	High
ERBFAcility helped initiate collaboration on genetics and adaptation of the white-tailed eagle in the polluted Baltic Sea environment. between a genetics group, University of Iceland (Snæbjörn Pálsson, MC Member Iceland) and ecology group, University of Turku (Toni Laaksonen, MC Member Finland), as a direct result of meeting at the ERBFAcility GM1 in Ciudad Real, Feb 2018.	High
PhD thesis informed by engagement in ERBFAcility: Yael Choresh (MC Member, Israel), <i>Exposure to environmental contaminants and possible effects on breeding success of the Eurasian Griffon vulture (Gyps fulvus) in north Israel</i> . University of Haifa, Israel	Medium
PhD thesis informed by ERBFAcility: Pablo Sánchez Virosta. 2019. <i>Effects of arsenic on growth and physiology of passerines and the protective role of calcium</i> . University of Turku, Finland. Supervised by Tapio Eeva and Antonio J. García-Fernández (MC Member, Spain).	Medium
Masters/Degree thesis inspired/informed by ERBFAcility: Laura Martínez Quiles (2019) <i>Análisis de residuos de antibióticos en plasma sanguíneo de buitre leonado (Gyps fulvus), buitrenegro (Aegypius monachus) y alimoche (Neophron percnopterus)</i> . University of Murcia.	Medium
Masters/Degree thesis inspired/informed by ERBFAcility. Livia Spadetto (2019) <i>Evaluación de la exposición a antibióticos en alimoche (Neophron percnopterus), buitre leonado (Gyps fulvus) y milano negro (Milvus migrans) del centro de España</i> . University of Murcia.	Medium
Masters/Degree thesis inspired/informed by ERBFAcility. Samuel Castán Alloza (2019) <i>El papel de los rodenticidas anticoagulantes como causa de muerte por envenenamiento enpredadores</i> . University of Murcia.	Medium

Master/Degree thesis inspired/informed by ERBFacility. Lara Herrera Torres (2019) <i>Variaciones espacio-temporales de los niveles de Hg en huevos no eclosionados de búho real (Bubo Bubo) del sureste de España (provincia de Alicante y Región de Murcia)</i> . University of Murcia.	Medium
Masters/Degree thesis inspired/informed by ERBFacility. Maria de las Mercedes Andrés Estesó (2018) <i>Análisis de antibióticos en rapaces con hábitos necrófagos facultativos</i> . University of Murcia.	Medium
Masters/Degree thesis inspired/informed by ERBFacility: Daniel Mendieta Giraldo (2019) <i>Exposición a mercurio en aves carroñeras de Sudamérica</i> . University of Murcia.	Medium
Masters/Degree thesis inspired/informed by ERBFacility (2019) Sara Rodríguez Portal. (in progress). <i>Exposición a mercurio en aves carroñeras de Sudamérica</i> . University of Murcia.	Medium
Masters/Degree thesis inspired/informed by ERBFacility: Elena Sánchez Vega (2018). <i>Monitorización de contaminantes ambientales en tejidos de aves rapaces procedentes de centros de recuperación</i> . University of Murcia.	High
PhD thesis inspired/informed by ERBFacility. Irene Valverde Domínguez (in progress) <i>Optimización de métodos analíticos en la lucha contra el veneno en el medio natural</i> . University of Murcia. Supervised by Antonio J. García Fernández and Silvia Espín Luján.	Medium
PhD thesis informed by ERBFacility: Sun, J. (2019). <i>Reconstructing spatiotemporal trends of major contaminants in northern white-tailed eagle (Haliaeetus albicilla) populations using long-term feather collections</i> . University of Antwerp, Wilrijk, Belgium.	Medium
ERBFacility has influenced design of the course: Sustainable Environmental Management (UCL course code GEOL0035). The 2019-20 course contains lectures on the sustainability of predatory and seabird populations with chemicals as the exemplar pressure on individuals and populations. University College London.	Medium
ERBFacility is informing the new Open Access journal UCL Open: Environment (Editor-in-Chief Dan Osborne, MC Substitute, UK). The journal is open to publications on emerging research and policy agendas such as those discussed at ERBFacility meetings but for which there are insufficient outlets at present. Although the journal is very new, one article of this kind has already been fully published.	Medium
Masters thesis inspired/informed by ERBFacility: Peetris, P. (2019) <i>Second generation anticoagulant rodenticides in birds of prey of Estonia</i> . Estonian University of Life Sciences, Estonia. Supervised by Leivits, M. (MC member, Estonia)	High
Masters/Degree thesis inspired/informed by ERBFacility: Cara Rull Marti (2018) <i>Degradación postmortem del Diclofenaco en aves silvestres</i> . University of Murcia.	Medium
Masters/Degree thesis inspired/informed by ERBFacility: Cara Rull Marti (2018) <i>Degradación postmortem del Diclofenaco en aves silvestres</i> . University of Murcia.	Medium

PhD thesis inspired/informed by ERBFacility: María Yanneth Chaparro Torres (in progress) <i>El gallinazo negro (Coragyps atratus) como modelo de Biomonitorización de contaminación ambiental: Compuestos Orgánicos Persistentes (COP) y antibióticos en Santander, Colombia</i> . Supervised by Antonio J. García-Fernández (MC Member, Spain) and Pilar Gómez-Ramírez (MC Substitute, Spain).	Medium
PhD thesis informed by ERBFacility: Alessandro di Marzio (in progress) <i>Evaluación de la exposición a contaminantes ambientales en aves carroñeras de la Patagonia Argentina mediante el uso de muestras de obtención no cruentas</i> . Supervised by Emma Martínez-López (MC Substitute, Spain) and Antonio J. García-Fernández (MC Member, Spain)	Medium
PhD thesis informed by ERBFacility: Laura Ramón Vaquero (in progress) <i>Biomonitorización de contaminantes ambientales persistentes y evaluación de efectos subletales en aves rapaces: uso de huevos no eclosionados para estimar efectos reproductivos</i> . Supervised by Emma Martínez-López (MC Substitute, Spain) and Antonio J. García-Fernández (MC Member, Spain)	Medium
New collaboration between Naturalis Biodiversity Centre and Museum of Zoology, University of Palermo on inventory of raptor collections in Sicily.	High
Masters thesis inspired/informed by ERBFacility: Bernat Oró i Nolla, (2019) <i>Determination and occurrence of bisphenols and benzophenone-type ultraviolet filters in white-tailed eagles (Haliaeetus albicilla) from Smøla, Norway</i> . University of Barcelona. Supervisors: Silvia Corte, Veerle Jaspers (MC Member, Norway). Also, a related manuscript in prep.: Occurrence of bisphenols and benzophenone-type ultraviolet filters in <i>Haliaeetus albicilla</i> from Smøla, Norway.	Medium
Output from STSM Soledad González Rubio on <i>Presence, concentrations and (bio)-analytical methods currently available for emerging and legacy organic contaminants in raptors</i> used by Veerle Jaspers (STSM host and MC Member, Norway) in two Masters courses: MSc course Environmental Toxicology and MSc course Advanced Ecotoxicology at NTNU, Norway.	High
Video: European Raptor Biomonitoring Facility for pan-European contaminant monitoring in raptors. Recorded at Slovenia Workshop (Sep 2019).	High

Impacts

Please describe the impacts (the short- to long-term scientific, technological, and / or socioeconomic changes produced by a COST Action, directly or indirectly, intended or unintended) that have resulted, or might result, from the Action in the following table (one impact per line).

Description of the impact, i.e. what will change, and for whom, as a result of what the Action achieved	Type of impact	Timing of impact
<p>Longer-term socio-economic impact.</p> <p>Good progress is being made in terms of integrated work across the analysis, collections and field arenas, and as reported under the 6 objectives, towards: (a) much improved ability to assess the effectiveness of chemicals regulation and assess risks of chemicals; (b) earlier identification of emerging contaminant problems, with potential to save many millions (or even billions) of Euros, in costs associated with contaminant-related impacts on human and wildlife health; and (c) greater awareness of potential exposure of raptors to chemicals and increased capacity to assess effects.</p>	<ul style="list-style-type: none"> • Economic • Societal 	<p>Foreseen within two years of the end of the Action</p>
<p>Shorter-term impact, Analysis Arena.</p> <p>Good progress is being made by WG21&2, as reported under Objectives 1 and 4, towards building a new pan-European capability to carry out pan-European assessments of trends in exposure (and, where feasible, effects) in raptors for selected contaminants, and creating a new European consensus on priority raptor species and sample matrices for such assessments (a European Raptor Biomonitoring Scheme – ERBioMS). Ongoing engagement with the LIFE APEX Regulatory Advisory Board is expected to provide clarity on how these assessments can be integrated in to regulatory risk assessments and/or how they might inform effectiveness evaluation of EU regulations.</p>	<ul style="list-style-type: none"> • Scientific / Technological • Economic • Societal 	<p>Foreseen by the end of the Action</p>
<p>Shorter-term impact, Collections Arena.</p> <p>Good progress is being made by WG3, as reported under Objectives 2 and 5, towards putting in place a framework for a distributed European Raptor Specimen Bank (ERSpeB) which might store the necessary samples to underpin prioritised pan-European assessments. Work has also started towards putting in place a database that will offer greatly enhanced knowledge of and access to these samples and to related contaminant data – recent discussions to link this to the LIFE APEX Knowledgebase and the large-scale digitalisation of natural history collections in Europe under DiSSCo should substantially enhance the impact of this database work. Work between now and end of project will also provide guidance to enhance understanding among collections on how to make best use of such samples for contaminant biomonitoring in support of chemicals regulation in Europe, thereby enhancing the societal relevance of collections in Europe.</p>	<ul style="list-style-type: none"> • Scientific / Technological • Economic • Societal 	<p>Foreseen by the end of the Action</p>
<p>Shorter-term impact, Field Arena.</p> <p>Good progress is being made by WG4, as reported under Objectives 3 and 6, towards putting in place a new strategic European approach to the collection of raptor samples for biomonitoring research (a European Raptor Sampling Programme – ERSamP). Good progress is also being made towards enhanced capabilities across Europe to collect samples and relevant contextual data, with work ongoing to put in place good practice and agreed protocols.</p>	<ul style="list-style-type: none"> • Scientific / Technological • Economic • Societal 	<p>Foreseen by the end of the Action</p>
<p>Shorter-term impact, cross-Arena</p>	<ul style="list-style-type: none"> • Scientific / 	<p>Foreseen by the end</p>

<p>Good progress is being made in terms of integrated work across the analysis, collections and field arenas, and as reported under the 6 objectives, towards: (a) providing a more in-depth view of the level of European capability across the 3 arenas for pan-European raptor biomonitoring; (b) showing, through proof of concept work, the extent to which this can provide re-assurance that regulations are working properly and deliver more reliable risk assessments; (c) showing how to improve this capability across the three arenas; and (d) showing where to transfer expertise across Europe so that more countries are up to speed.</p>	<ul style="list-style-type: none"> • Technological • Economic • Societal 	<p>of the Action</p>
<p>Longer-term scientific impact</p> <p>Good progress is being made in terms of integrated work across the analysis, collections and field arenas, and as reported under the 6 objectives, towards better prioritisation of, and facilities and materials for, ecotoxicological research on raptors across Europe, underpinning next generation biomonitoring and research, with more effective and efficient use of available time, resources and expertise. This is expected to lead to a substantial expansion of scientific knowledge on exposure to and effects of environmental contaminants in raptors, with benefits on similar research in other apex predators.</p>	<ul style="list-style-type: none"> • Scientific / Technological 	<p>Foreseen by the end of the Action</p>

Please describe how the Action is advancing the careers, skills and network of researchers, including ECIs (for example: joint supervision of graduate and PhD students, research exchanges not funded by the Action, collaborations, Training Schools with ECTS accreditation, joint projects and jobs prospects).

The Action is enhancing the careers, skills and networks of researchers as follows: (1) Action meetings (General Meetings, MC meetings, WG workshops) provide an opportunity for participants (many of which are ECIs) to share knowledge, learn from each other including across the three arenas (which typically do not otherwise much interact), develop joint initiatives, and expand their personal networks at pan-European scale, thereby also enhancing career opportunities; (2) STSMs provide grantees (mostly ECIs) opportunities to expand their international mobility, knowledge, research competences and personal networks and enhance their CVs, while also enriching the knowledge and personal networks of the hosts; (3) joint publications by Action participants enhance their publications track record and career opportunities; (4) leadership roles enhance the CVs and career opportunities of Core Group members and other leaders in the Action; (5) research collaborations/projects and doctoral and masters theses catalysed or inspired by the Action enhance the knowledge, skills and career opportunities of the participants.

The career benefits are mainly to researchers with the following amount of experience after their PhD: ≤ 8 years.

Which of the stakeholders described in the “Plan for involving the most relevant stakeholders” in the Action’s MoU have been engaged and how? What additional stakeholders have been, or will be, engaged and how?

Of the stakeholders described in the MoU, we have engaged: (1) EU agencies – both ECHA and EFSA, through their participation in GM1 and through ERBFacility participation in the LIFE APEX Regulatory Advisory Board (RAB); (2) national competent authorities (NCAs) responsible for monitoring of these same compounds, through ERBFacility participation in the LIFE APEX RAB; (3) academic ecotoxicologists, in particular those working on or interested in working on raptors, through WG1&2 work/meetings/STSMs; (4) curators of NHMs, ESBs and other collections holding, or interested in holding, raptor samples, through WG3 work/meetings/STSMs; (5) field ornithologists (in academia, NGOs, volunteers) engaged in research on and/or monitoring of raptors, through WG4 work/meetings/STSMs. We will towards the end of the action also engage: (6) EU and national level policy-makers responsible for evaluation, review and development of chemicals regulations, through enhanced interaction with the LIFE APEX Regulatory Advisory Board (RAB); (7) chemicals manufacturing companies responsible for conducting risk assessments under EU and national regulations, also through the RAB.

Dissemination and exploitation of Action results (other than co-authored Action publications listed previously)

Please describe the Action's dissemination and exploitation approach as well as all activities undertaken to ensure dissemination and exploitation of the Action results and the effectiveness of these activities.

Dissemination and exploitation approach of the Action

Our dissemination and exploitation strategy targets all those stakeholder groups identified in our MoU. Our main dissemination channels are at present the Management Committee and other Action participants themselves and their professional networks, the ERBFacility website, peer-reviewed journals and relevant conferences/meetings of organisations (Consortium of European Taxonomic Facilities – CETAF, European Bird Curators – EBC, European Bird Census Council – EBCC, Raptor Research Foundation – RRF, Society of Environmental Toxicology and Chemistry – SETAC) working on issues closely related to the 3 arenas (analysis, collections, field). Existing dissemination products include: an attractive, easy to navigate and up-to-date website (<https://erbfacility.eu>), with content accessible to an informed reader; meeting and mission reports posted to the website; peer-reviewed papers, posters and presentations arising from meetings, missions and collaborations among Action participants. Future dissemination products will include a number of technical documents including framework documents for the three elements of the Facility (ERBioMS, ERSpeB, ERSamP), guidance documents, standards and protocols. We aim to develop a greater presence on social media and to produce output accessible to end users such as policy-makers and industry towards the end of the Action period.

Dissemination

Dissemination meetings funded by the Action

Title of Dissemination meeting	Meeting date	Meeting country	Action participant	Event name and hyperlink to the website	Title of presentation	Description of added value to the Action
Raptor Research Foundation Conference 2018	12-11-2018 to 16-11-2018	South Africa	Dr Oliver Krone	Raptor Research Foundation Conference 2018 https://www.raptorresearchfoundation.org/conferences/past-conferences/	The European Raptor Biomonitoring Facility: a European network for pollutants in birds of prey.	Enhanced awareness among RRF participants worldwide of the work of the Action. RRF has c.1000 members, convenes annual conferences and publishes The Journal of Raptor Research, a quarterly peer-reviewed journal. It is an important target audience in particular in relation to WG4 (Field Arena).

Other dissemination activities

E.g. participation to non-Action meetings, e.g. EU Parliament, meetings with policy makers, experts in the field, regional authorities.

Item/activity	Target audience	Outcome	Hyperlink
Duke, G., Movalli, P., Dekker, R., Woog, F. & Krone, O. (2017) European Raptor Biomonitoring Facility. Poster, 10th Biennial European Bird Curators Meeting, 17-19 October, Paris.	Bird curators in Natural History Museums and other research collections in Europe. This is a key target audience in particular for WG3 (Collections Arena).	Enhanced awareness among bird curators of the work of the Action.	https://ebc2017.sciencesconf.org
Movalli, P. et al (2019) Towards a European Raptor Specimen Bank in support of contaminant research and monitoring for better chemicals management. Poster, 11th Biennial European Bird Curators Meeting, 24-26 September, Tel Aviv.	Bird curators in Natural History Museums and other research collections in Europe. This is a key target audience in particular for WG3 (Collections Arena).	Enhanced awareness among bird curators of the work of the Action.	https://ebc2019telaviv.weebly.com
European Raptor Biomonitoring Facility- preventing and limiting negative impacts of chemicals on human health and the environment. Poster, European Bird Census Council 21st Conference, 8-13 April, Evora, Portugal, 2019	EBCC participants – largely researchers and conservation practitioners working on bird census schemes. This is a key audience for WG4 (Field Arena).	Enhanced awareness among bird census practitioners of the work of the Action.	http://www.ebcc2019.uevora.pt
García-Fernández, A.J. (2019.) Wildlife Toxicology within the One Health context. Keynote presentation, SETAC Latin America 13th Biennial Meeting. 15-18 September 2019, Cartagena, Colombia	SETAC Latin America participants. This is a relevant target audience for WGs1&2 in terms of transfer of knowledge from Europe to developing countries in Latin America.	Enhanced awareness of SETAC Latin America participants of the work of the Action.	https://sla2019.setac.org
Engagement in LIFE APEX Regulatory Advisory Board (RAB) meeting, 11 June 2019.	European Commission (DG ENV DG JRC), EU chemicals agencies (ECHA, EFSA), national competent authorities (RIVM, NIVA, UBA) and chemicals industry (CEFIC)	Enhanced awareness among relevant European Commission officials, EU Agencies and industry of the Action	https://lifeapex.eu/rab-members/
Presentation of ERB Facility at the 44th Meeting of the Governing Board of the	CETAF members - a key target audience for WG3 (Collections Arena)	Enhanced awareness among CETAF members of the aims of ERB Facility,	https://cetaf.org/news/44th-cetaf-governing-board-meeting-bratislava

Consortium of European Taxonomic Facilities (CETAF), 14-15 November 2018, Bratislava.		preparing the ground for engaging CETAF members in WG3 activities.	
Presentation to Estonian policy-makers on raptor health monitoring including information on ERB Facility.	Representative officials from Estonian Ministry of Environment, Estonian Environmental Board, Estonian Environmental Agency, Estonian Environmental Inspectorate (approx 20)	Enhanced awareness among policy-makers and implementers of role of raptors in monitoring of environmental contaminants	https://www.emu.ee/en/

Exploitation activities

Please describe below any activities undertaken to ensure exploitation (use, in particular in a commercial context) of the Action's achievements.

Item/activity	Target audience	Outcome
N/A		

DRAFT

Other matters

This section is confidential to the Management Committee, the Action Rapporteur and the COST Association, and is not included in the version of the report that is published on the COST website.

Difficulties in implementing the Action

If any difficulties are experienced in the implementation of the Action (e.g. imbalances of participation across the Working Groups, inactive country representatives) please describe these below. Please also describe the efforts made by the MC to address these.

A difficulty faced in the implementation of the Action is the imbalance, between countries, in resources and capacities in relation to one or more of the three Arenas (Analysis, Collections, Field). For example, a relatively small number of European countries have good capacities in the Analysis arena, only a few countries have large, well-resourced collections, and field capacities vary significantly between countries. Management Committee and Core Group are working effectively to address these imbalances through promoting the sharing of knowledge and helping to build capacities, and through working to ensure that the frameworks, standards and protocols and guidance under development take account of and work with the reality of these imbalances.

Suggestions for improvements to COST framework/ procedures

The mandate of the Scientific Committee includes providing advice to the COST Committee of Senior Officials on possible improvements to the COST framework. Please describe below any improvements that you believe should be made to the COST framework.

One issue that has arisen is that STSM grantees are not eligible for reimbursement of accommodation and meal costs if attending Action meetings during the period of their STSM. COST deems that accommodation and meals costs in such cases are already covered by the STSM grant. However, the accommodation and meals costs associated with Action meetings are considerably higher than those that a STSM grantee typically incurs while at their host institution. This therefore presents a barrier to the participation of STSM grantees in Action meetings, in particular for ECIs who typically have limited resources. This reduces the benefit that ECIs can obtain from STSMs. It also hampers the implementation of the Action, as the work of STSM grantees is often a key input to Action meetings. We suggest that COST allows for the reimbursement of accommodation and meals costs to STSM Grantees attending Action meetings, whether or not the meeting occurs during the period of the STSM.

Sustaining the network beyond the Action

Are there any plans to sustain the network beyond the end of the Action?

YES

Please describe how the network will be sustained beyond the end of the Action.

We are currently developing Proof of Concept work which will demonstrate how ERBFacility will work in practice. Together with the planned frameworks for ERBioMS, ERSpeB and ERSamP, the large functioning network of participants across the three Arenas (Analysis, Collections, Field) and other planned outputs (standards and protocols, guidance, etc), and in association with the expected outputs and outcomes of the closely related LIFE APEX project, we anticipate that there will be considerable momentum and interest - including from regulators - to sustain the network and advance the resulting ERBFacility beyond the end of the Action. We will develop thinking on post-Action governance and resourcing of ERBFacility over the remainder of the Action period.

Emerging topics/ developments in the field of the Action

Please describe any emerging topics or potentially important future developments identified during the Action and that could potentially be addressed by future COST activities such as Actions S&T Conferences or Exploratory Workshops.

DRAFT

Annex 1: Types of objectives

1 - Coordination of scientific and technological activities at a European level

- 1.a - Development of a common understanding/definition of the subject matter
- 1.b - Coordination of information seeking, identification, collection and/or data curation
- 1.c - Coordination of experimentation or testing
- 1.d - Comparison and/or performance assessment of a theory, model, methodology, technology or technique
- 1.e - Development of knowledge needing international coordination, pertaining to a new or improved theory, model, methodology, technology or technique
- 1.f - Achievement of a specific tangible output that cannot be achieved without international coordination (e.g. due to practical issues such as database availability, language barriers, availability of infrastructure or know-how, etc.)
- 1.g - Input to stakeholders (e.g. standardization body, policy-makers, regulators, users), excluding commercial applications
- 1.h - Input for future market applications (including cooperation with private enterprises)
- 1.i - Dissemination of research results to the general public
- 1.j - Dissemination of research results to stakeholders (excluding specific input in view of knowledge application)

2 - Community building

- 2.a - Building a community around a topic of scientific and/or socio-economic relevance, allowing for knowledge exchange and the development of a joint research agenda
- 2.b - Building a community around a new or emerging field of research
- 2.c - Bridging separate fields of science/disciplines to achieve breakthroughs that require an interdisciplinary approach
- 2.d - Acting as a stakeholder platform or trans-national practice community, pertaining to a certain area of socio-economical or societal application, or to a certain market sector
- 2.e - Building capacity in the demographic inclusiveness of networks in science and technology, including representation of newly established research groups, Early-Career Investigators, the under-represented gender and teams from countries/regions with less capacity in the field of the Action

Annex 2: Dimensions of successes

1 - Breakthroughs

- 1.a - Scientific breakthrough
- 1.b - Technological breakthrough
- 1.c - Breakthrough in socio-economic or societal applications

2 - Policy contribution

- 2.a - Contribution to regulatory policy
- 2.b - Contribution to environmental, infrastructural or agricultural policy
- 2.c - Contribution to economic or socio-economic policy
- 2.d - Contribution to social, cultural or legal policy

3 - Capacity building

- 3.a - Building capacity in an existing field of science and technology
- 3.b - Building capacity in bridging separate fields of science and technology
- 3.c - Building capacity in a new or emerging field of science and technology
- 3.d - Building capacity in valorising and implementing advances and applications in science and technology
- 3.e - Building capacity in the demographic inclusiveness of networks in science and technology, including representation of newly established research groups, Early-Career Investigators, the under-represented gender and teams from countries/regions with less capacity in the field of the Action

DRAFT