TANIA

Interreg Europe

TANIA addresses the challenge of eco-compatible and eco-sustainable procedures for environmental treatments by supporting a wide and effective application of nanoremediation for contaminated soil and water.

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REGIONE TOSCANA

ASEV obiettivo sviluppo

An interregional cooperation project for improving resource-efficient economy policies.

TANIA ACTION PLAN FOR TUSCANY REGION

Project partner: ASEV, Regione Toscana

12th December 2019

Environment & resource efficiency

€ 1.09 M ERDF

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European Union
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Summary

Part I – General Information

Project	**TANIA - TreAting contamination through NanoremedIAtion**
Partner organisation(s)	Regional Government of Tuscany Agency for the development of the Empolese Valdelsa
Country	Italy
NUTS2 region	TUSCANY
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About the TANIA Project

Environmental remediation deals with the removal of pollution or contaminants from environmental media such as soil, groundwater, sediment or surface water. New technologies based on advanced materials have exciting potential for the protection of natural heritage, in terms of treatment of contaminated soils and water.

In this context **(nano)remediation aims to develop chemicals, natural and advanced materials** (at nano scale too) **that provide solutions to environmental problems**, such as: pollution prevention, soil remediation, disinfection, purification of water and wastewater treatment. Engineered nano-particles, nanostructured and natural based materials (e.g. nano-fibers, nano-cellulose, nano-sponge) can be used to achieve three main objectives: clean-up of past pollution, improvement of current treatments and prevention of future contamination.

(Nano)remediation is a highly innovative, low cost technology that can be used as an alternative to current in-situ methods (lengthy and costly). It has the potential to improve techniques and save time, with no additional risk to contaminating surrounding environments. (Nano)remediation uses secure and eco-compatible technologies, with minimal risks associated with their production and their use and facilitates replacement of existing products with new nano products that are more respectful of the environment throughout their life cycle.

However, **some challenges limit diffusion of (nano)remediation and full exploitation** of its benefits. The technology is currently not widely diffused despite an ever-increasing number of sites requiring swift treatment to combat contamination. Being so innovative, there is still resistance to their large-scale application and to policies to support it. There is a lack of information, rules and knowledge on their safety and potential, leading to much misinformation.

Particularly, since the project start-up phase of TANIA, **6 main challenges were identified** by TANIA partners and grouped in the following categories of requirements **for policy intervention and support**:

Challenge 1	Need for public **support for Research and Innovation** on identification and production of eco-compatible and eco-sustainable nanotechnology for treatment of contaminated soil and water (innovative solutions)
Challenge 2	Need for a **standardised methodology** to evaluate effectiveness, economic sustainability, environmental safety and impact of (nano)remediation, within the context of National and EU regulations (e.g. REACH on packaging and labelling of chemical substances) and strategies (e.g. EU Soil Thematic Strategy)
Challenge 3	Need for public support to activities for **pilot applications** of NM and NP (including those developed using safety-by-design concepts)
Challenge 4	Need for public support to encourage **patenting** of Nanomaterials and Nanoproducts (NM and NP) for remediation
Challenge 5	Need for public **incentives for in-situ use** of NM and NP to treat contaminated soil and water
Challenge 6	Need for public support to **raise awareness** on the process of (nano)remediation, its benefits and means of application, thus overcoming public fears and resistance

This is the context of **TANIA (*TreAting contamination through NanoremedIAtion*)** an European Territorial Cooperation project co-financed by the European Regional Development Fund (ERDF), through the INTERREG EUROPE Programme.

TANIA groups **8 partners from 5 regions** located in as well different countries, who are facing this regional development challenge together. Their overall objective is to improve regional policies for the protection and safety of the natural heritage: Particularly **TANIA focuses on policy actions able to combine innovation and the environment,** paving the road to the improvement of current treatments by the integration of innovative (safety, low cost) technologies based on advanced materials and using coordinated action from key players.

TANIA achieves this through **exchanging experiences and good practices** in a framework of interregional activities, communication and stakeholder engagement. In this context, partners develop Action Plans that result in improved policy instruments supporting (nano)remediation in each of the regions participating in the project.

About the Tuscan TANIA Action Plan

Each region participating in TANIA produces one Action Plan, providing details on how the lessons learnt from the interregional cooperation will be exploited in order to improve the policy instrument tackled within that region.

This document is the TANIA Action Plan for the Tuscany region. It was drafted by ASEV (Agenzia per lo Sviluppo Empolese Valdelsa) and the Regional Government of Tuscany, Directorate for Productive Activities and Innovation, with the contribution of several stakeholders coming from the regional Technology District for Advanced Materials.

The development of this Action Plan has been based on the principles of:

i. **interregional cooperation between TANIA partners**: cooperation was supported by a series of interregional learning events (TANIA Exchange Events, **TEE**), study visits, bilateral exchanges of experiences and sharing of good practices,

ii. **involvement of the key Tuscany stakeholders** dealing with innovation and the environment. Participation was supported mainly through setting up a regional TANIA Stakeholder Group (**TSG**), which met periodically in order to guide the project. TSG was composed by:

- *institutions* for environmental monitoring and protection,
- *entrepreneurs* working in the field of environmental remediation, but also large companies whose production processes cause pollution or SMEs proposing new technology solutions, in a context of green and remediation industry 4.0,
- *local public-private entities* (e.g. public utilities) dealing with the management and monitoring of water/land and related pollution problems,
- *research organizations*, dealing with environmental sciences (ecotoxicologists, chemists, geologists, agronomists), sciences of materials, but also engineers, biologists and other technicians who propose new solutions for environmental remediation.

This document is structured into four parts.

After this introductory section, the second part provides an overview of the territorial and policy context, including the instruments addressed by the Action Plan. The third part provides an overview of the actions envisaged by the Action Plan. The fourth part corresponds to the main part of the Action Plan, where each action is presented, specifying its background, planned activities, players involved, timeframe and costs.

Abbreviations

ARPAT	Regional Agency for the Environmental Protection of Tuscany
BE	Bilateral Exchange
GISFI	Groupement d'intérêt scientifique sur les friches industrielles (research centre located in Lorraine Region)
ISPRA	Higher National Ministry Institute for Environmental Protection and Research
KET	Key Enabling Technologies
LP	Lead Partner (ASEV agency as TANIA project coordinator)
NM, NP	Nanomaterials, Nanoparticles
PA	Public Administration
REACH	Registration, Evaluation, Authorisation and restriction of Chemicals (EC 1907/2006)

RIS3 2014-2020	Tuscany Regional Smart Specialisation Strategy 2014-2020
ROP ERDF 2014-2020	Tuscany Regional Operative Programme 2014-2020 (policy instrument) based on ERDF
RT	Tuscany Regional authority
RTD	Research and Technology Development
SISBON	Acronym of the regional (Tuscany) information system about the sites affected by remediation procedure
SOILIA	Centre for basic and applied research into soil, sediments, surface water and groundwater (located in Päijät Häme region)
TEE	TANIA Exchange Event, official project event (at least 1 for semester) part of the interregional learning process, which could also include study visits, seminars, focus groups, etc.
TD, TD Materials	Regional Technological District, Regional Technological District for Advanced Materials
TSG	TANIA Stakeholders Group, established at regional level in each participanting EU region
WBS	Work Breakdown Structure (diagram)

Disclaimer

This action plan only reflects the author's views. The programme authorities are not liable for any use that may be made of the information contained therein.

Part II – Territorial and policy context

Overview of the territorial context and main causes of water-soil contamination

Tuscany is the fifth largest region in Italy, with a surface of 22.897 Km2, about 3,74 million inhabitants (2018), with a greater number of residents in the metropolitan area of Florence and the major cities (Pisa, Livorno, Pistoia, Arezzo) located in the Arno valley, more than 1,6 million employees (6,8% of the whole Italy, + 3,7% in 2017), around 355.000 active enterprises and a GDP of 115 billion of euro that corresponds to 6.7% of the whole nation, but with a GDP quota per inhabitant (30,75K€) lower than that of other areas of the country (8th).

Tuscany has a relevant and diversified natural and environmental heritage.

The number of **sites affected by recovering or remediation processes** continuously increases, particularly the areas of industrial crisis in which the presence of land to be reclaimed is relevant.

In order to have a **registry of the contaminated areas** the regional Agency for the Environmental Protection (ARPAT) developed **SISBON** (http://sira.arpat.toscana.it/apex/f?p=SISBON:HOME) a web based information system where all sites affected by reclamation procedure (or needed to be treated) are catalogued and monitored according to their level of advancement of environmental recovery procedure. In SISBON all sites are registered (place, status, dimension, intended use) and classified according to own level (sites that do not require intervention, potentially contaminated sites, contaminated sites under recovering, reclaimed sites after recovering with environmental certification). To date there are more than **4042** contaminated sites registered on SISBON, of which 314 actively undergoing remediation treatment. **440** (~11%) of these are catalogued as sites of national interest (SIN).

Some **examples of the main contaminated areas** needing remediation are:

- **The coastal/flatland areas of Massa-Carrara**, also Sites of National Interest (SIN area), affected by residues of the work extraction of the marble quarries on the Apuan Alps. Several rivers and streams still carry today the **marble dust** (extremely thin) and other residues of the extraction which for many years have not been subjected to any control.
- **The flatlands of Pisa and its wide network of navigable channels**, mainly polluted by chemical residues of agricultural activities (e.g. **pesticides** and their derivate) and by **heavy metals** like nickel.
- **The harbour areas of Livorno and Piombino**, contaminated from industrial activities (**hydrocarbons** and **steel**), maritime traffic (fuel), but also **urban discharge** and metals arising from previous boat storage activities and painting of ships.
- **The flatlands of Scarlino**, polluted by the draining of the **chemical** industry strongly present in the area (e.g. **arsenic** in groundwater).
- **The area of the Colline Metallifere**, contaminated by mining activities: main pollutants are **ashes** from mining extraction and **heavy metals** like arsenic.

The following map/images report:

- An overview of the **main polluted areas in Tuscany** (Fig.1): red points highlight the contaminated sites under recovering, while yellow points represent the potentially contaminated sites to be

subjected to further investigation before proceeding to recovering

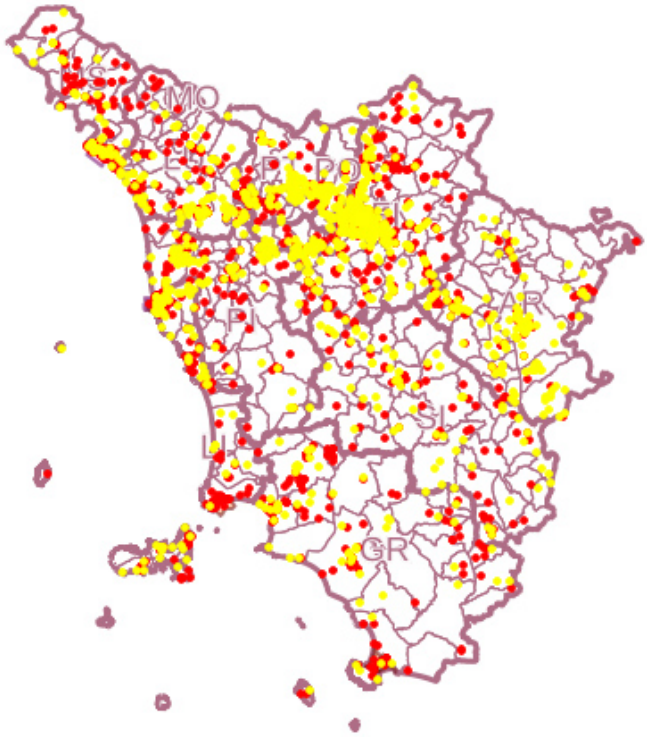


Figure 1 - Main polluted areas in Tuscany

- An overview of the **already reclaimed sites** after recovering with environmental certification (green points)(Fig.2)

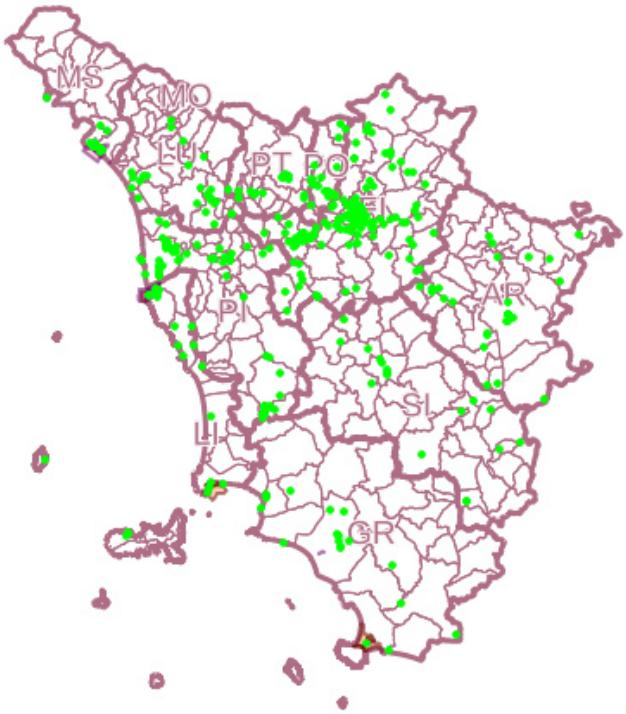


Figure 2 - Recently reclaimed areas in Tuscany

A more detailed analysis of the territorial context carried out on the SISBON system showed the following results:

Official (traditional) methodologies/procedures of environmental remediation:

– **Bio ventilation**	– Land farming
– **Draining trenches**	– Biopile
– **Biodegradation**	– Bioreactors
– Natural attenuation	– Thermal desorption
– Vertical barriers or diaphragms	– Inertia
– Resurrection	– Composition
– Soil flushing	– Extraction with solvents
– Soil vapour extraction (SVE)	– Chemical Reduction / Oxidation
– Thermal treatments (radiant heating, air, electric resistances, etc.)	– Washing the soil
– Inertia / Vitrification	– Inertia
– Capping	– Solidification / Stabilization
– Air sparging	– Incineration
– **Pump & Treat**	– Pyrolysis
– Barriers / diaphragms (static containment)	– Excavation and landfill
– Hydrographic barriers (dynamic containment)	– Bioreactors

Main pollutants and their diffusion in contaminated sites (analysis on a sample of 1.232 sites):

Pollutants	Number of sites (n°)	Percentage of sites (%)
Hydrocarbons	956	75.3%
Metals	350	27.6%
Chemicals	237	18.7%
Organic aromatics	133	10.5%
Polycyclic aromatics	128	10.1%
PBB	70	5.5%
Carcinogenic chlorinated aliphatic	59	4.6%
Other inorganics	53	4.2%
Asbestos	39	3.1%
Non carcinogenic chlorinated aliphatic	38	3%
Dioxins and furans	31	2.4%
Carcinogenic halogenated aliphatic	29	2.3%
Pesticides	24	1.9%
Non-chlorinated phenols	9	0,7%
Chlorinated phenols	7	0,6%

Chlorobenzenes	5	0,4%
Nitrobenzene	4	0,3%
Aromatic amines	3	0,2%

Main causes of contamination:

Causes	Number of sites (n°)	Percentage of sites (%)
Waste Management	606	15%
Mining	89	2%
Industrial	706	18%
Fuel Distribution	808	20%
Quarry	32	1%
Other (e.g. agriculture)	1.014	25%
Not yet defined	741	19%

Overview of the current legislation for the Environment

In Italy the remediation of the polluted areas was regulated for the first time with the **national law 441/1987** which required to all regions to develop a "*Regional Remediation Plan*" in order to gather knowledge and a comprehensive view of the areas and polluted sites.

At national level, the current most important law concerning the remediation of contaminated sites is the **DL 152/2006** which, integrated with several and periodic ministerial decrees, regulates:

- Concentration of contamination thresholds (levels of contamination of environmental matrices which require monitoring actions) and risk thresholds (where remediation measures are required)
- Reference procedures for sampling and analysis of samples.
- General criteria for the safety, decontamination and environmental remediation of polluted sites, as well as for drafting of related projects.

Other relevant acts are represented by the Decrees of the Ministry of the Environment and the Protection of the Territory and the Sea, such as DM 172/2016 (technical rules for dredging operations on sites of national interest), DM 31/2015 (criteria for the characterisation, safekeeping and reclamation of fuel stations), DM 03/02/2014 (procedures and products for reclamation of water contaminated by petroleum hydrocarbons).

In addition, national policies are also affected by several EU Regulations, as follows:

- COM (EU) 2016/293 on persistent organic pollutants;
- COM (EU) 2016/879 on hydrofluorocarbons;
- DIR (EU) 2016/802 on a reduction in the sulphur content of certain liquid fuels.

At regional level, Tuscany was among the first regions in Italy to have a law for remediation and drainage of polluted areas, and to draft out a map of sites that require environmental

remediation. Particularly the **Regional Waste Management Plan (LR 25/98)** regulates waste management as well as safety, reclamation and environmental remediation of polluted sites.

The Regional Government has all the administrative, planning, programming, management and control functions of waste management, sludge disposal in agriculture, reclamation and safe-keeping of polluted sites except for those attributed to the national level. Particularly it:

a. **Approves the Regional Plan** for the remediation of polluted areas (included in the Regional Waste Management Plan) and adopts procedural and technical guidelines, including monitoring and control
b. **Fixes the guidelines and criteria for remediation** of polluting sites;
c. **Provides funding for remediation** and drainage activities in polluted areas, including funds for local PAs for interventions in place of negligent or unenforceable subjects;
d. Participate in Programme Agreements with the Ministry of the Environment
e. Approves, together with the Ministry, remediation projects for sites of "national interest"

In this context, in 1996 Tuscany instituted **ARPAT**, the regional agency for environmental protection, with the tasks of:

- ensuring the implementation of regional guidelines (ARPAT acts as technical-operating sector of the regional authority),
- monitoring the state of the environment,
- investigating the sources of pollution and the impacts deriving from them,
- identifying and preventing the risk factors for the health of the environment and of man.

Policy instrument(s) addressed by the Action Plan

Tuscany participates in TANIA project in order to improve its own **ERDF Regional Operative Programme (ROP ERDF 2014-2020)** - particularly several measures of Axis I (Strengthening research, technological development and innovation), Axis III (SMEs competitiveness) and Axis V (Preserve and protect the environment and efficient use of resources). In this context, TANIA combines measures addressed to protect the environment with actions supporting development of new solutions and collaborations. The policy instrument encompasses these objectives in separate priorities:

- Objective 1B: Promote innovation and R&D synergies between enterprises, R&D centres targeted to development of products and technologies, TT, social and eco-innovation, networking and clusters. It particular refers to KETs.
- Objective 6C: Conserving, protecting, promoting and developing the natural/cultural heritage

Moreover, the Tuscany ROP:

- Is **strongly oriented to RTD** and Innovation with a relevant percentage of the whole budget addressed to Axis I (34.72%) and Axis III (Competitiveness of SME, 16.46%);

- States that RTD and innovation actions have to be **consistent with RIS3** and related technological priorities;
- **Awards** extra points in the evaluation stage to projects aimed at **environmental protection**, low carbon emissions and the sustainable use of resources ;
- reserves funding for the development of **new business and solutions based on green** technologies ;
- supports the regional **Technological District for Advanced Materials** - one of the 12 districts created by the Tuscan Regional Government, in order to reorganise and rationalise the local technology transfer system. The District includes (nano)remediation and related issues for the treatment of contaminated areas, waste recycling, recovery and efficient use of raw materials as 1 of its 4 strategic priorities.

Nevertheless, the **ROP ERDF 2014-2020** (with its action lines and funding measures) **is** a very "*operational*" tool **closely linked to other policy instruments more oriented to define strategic guidelines** and/or their management and implementation tools. For this reason the proposed ACTIONs aim to improve the ROP ERDF 2014-2020 by (or together with) the improvement of other policy instruments too: **the Tuscany regional Smart Specialisation Strategy (in the case of ACTION 1) and the regional Strategy for Industry 4.0 (for ACTION 2)**.

The Tuscany Regional Smart Specialisation Strategy (RIS3) 2014-2020, represents the main **technical annex** of the ROP ERDF 2014-2020 and sets the technological priorities on which to invest ERDF funds in research, development and innovation. All ROP measures must be developed **in accordance with** the priorities and **technological roadmaps** set out in **the RIS3,** which represents both ex-ante condition and technical annex of the ROP ERDF, as from the Resolution of the regional government n°1018 of 18th November 2014. **This means that each call, as well as measure or action, funded by ROP ERDF must be addressed to at least one RIS3 priority**. According to the EU COM(2010)553 "Regional Policy contributing to smart growth in Europe 2020", RIS3 is the agenda for the economic transformation of a given region, aimed at exploiting its development potential, leveraging technological excellence. As such, **RIS3 represents the regional strategy document for innovation and research** where the Regional Authority identifies investment priorities and technological domains (investment technological roadmaps) for regional policies and structural fund programming. Finally, Tuscany RIS3 differs from other European RIS3 because it **is structured on 3 trans-sectoral technological pillars** (*ICT and Photonics, Smart Manufacturing, Chemicals and Nanotechnologies,* **instead of** the usual Thematic Objectives, such as Research and innovation, SME competitiveness, Environment, etc.), which in turn are divided into several strategic paths of innovation or "*technological roadmaps*" on which to invest ERDF.

As well, the **Regional Strategy for Industry 4.0**, launched in 2016 when the programming period 2014-2020 was already started, born directly from the RIS3 and is a **policy instrument entirely addressed to "Industrial modernisation"**: particularly it aims to promote technological, organisational and socio-economic content related to industrial modernisation among enterprises and propose technical content for regional actions and interventions finalised towards the introduction of new technologies in enterprises, in line with regional specialisations.

In PART III of this document a **work breakdown structure** (WBS diagram) of the proposed ACTIONs is provided together with the relationships that link the policy instruments.

Part III - Overview of the Actions Envisaged

This section includes a brief overview of the actions included in the Action Plan starting from the policy weaknesses initially highlighted in the project application and following deepened during the TANIA learning process.

Policy needs

TANIA aims to "*improving regional policies for supporting the uptake and the awareness on innovative solution for environmental remediation based on nano and advanced materials*". In this context, Tuscany stakeholders particularly identified 4 main policy needs:

Policy NEED		Description	Preliminary notes and remarks for the improvement
N1	**Overcoming the regulatory vacuum (both at national and EU level)**	The **lack of clear rules and procedures** to follow at national and EU level on the use of (nano)materials **combined with the high bureaucratic difficulties** (and a frequent discharge of responsibility between different institutions) to introduce innovative solutions in the environmental field **leads to slowdowns in the development of new technologies** and barriers to investments. This happens in spite of the fact that running rules actually just would say "*….. new techniques that have not been subject to positive or documented experience, they should be preceded by experiments not only at lab scale, but also on a real scale, verified by the control bodies and followed by a significant period of monitoring ….*" without additional requirements for (nano)ones.	• The need is shared by all project partners: as such the problem cannot be solved only through an improvement of the ROP ERDF 2014-2020. • A dialogue with relevant national-regional environmental institutions has been opened at this purpose (see Action 2). • A dedicate survey on "Nanomaterials in the current regulatory framework" has been developed through the TSG in the first project year. • Need represents a key factor for TANIA Challenge 2 (slowdown of standardised methodologies), Challenge 5 (barrier to public incentives for in situ use of NMP) and Challenge 6 (no rules == bigger fear)

Policy NEED		Description	Preliminary notes and remarks for the improvement
N2	**Increase knowledge and awareness**	This need can be analysed by different points of view: **1.** The regulatory vacuum (see over) also inhibits the dissemination of knowledge → **lack of knowledge** generates unjustified fear in civil society → the **bad mood of civil society cools investors** **2.** The **readiness of (nano)remediation technologies** is differently perceived: • researchers consider them ready for in situ use, • institutions ask for caution, • industries are strongly interested, but find solutions ready for use abroad only (e.g. USA, China). **3.** Low **level of dissemination and knowledge** of the solutions of (nano)remediation and of the ongoing in situ experiments (several solutions are still around TRL 4-6)	• New projects for environmental remediation under ROP ERDF 2014-2020 should involve institutional monitoring bodies for the assessment/certification of the solutions adopted. Moreover, projects should schedule also dissemination and information actions for different types of users (research, companies, institutions, investors). Finally a specific allocation of budget reserved to novel depollution techniques (e.g. (nano)remediation) could be considered. • Tuscany has communication tools and networks of relevant institutions that could be used also in this case: for example, the regional Enterprise Platform 4.0 network, addressed to new technology solution 4.0 for industrial modernisation, could also be used for sharing and increasing knowledge about (nano)remediation solutions. • Need is fully compliant with TANIA Challenge 6 (raise awareness) and partially with Challenge 1 (support to R&I), Challenge 2 (standardised methodologies), Challenge 3-5 (pilot and in-situ applications).
N3	**Better investments in Innovation and Green Businesses 4.0**	Need to identify **new business models** in order to relaunch the competitiveness of the regional enterprise system, pursuing: - the integration in the production processes of new technological solutions (**Industry 4.0**),	• The need specifically matches with ROP ERDF 2014-2020 Axis I (Support to R&I) and Axis III (SMEs competitiveness). • Moreover ROP is also affected by other regional strategies and addresses such as: - Industry 4.0, where advanced materials represent a cross-

Policy NEED		Description	Preliminary notes and remarks for the improvement
		- the tight link between the new business models with **societal challenges** (e.g. environmental challenges), - creating a new business through qualified services aimed at solving problems that are relevant to entire territorial areas or large companies, such as in the case of remediation or environmental treatments. All these concepts can be summarized in support of a **Remediation Industry 4.0 investment strategy**.	sectorial axes and a KET for manufacturing. By the I4.0 platform and TSG a new branch for a Remediation I4.0 could be considered, - The Regional Smart Specialisation strategy (RIS3) (see under). • Need is clearly linked to TANIA Challenge 1 (support to R&I) but also Challenge 3 and 4 in order to support development (pilots) and innovative solutions (patents).
N4	**Better visibility and more emphasis on (nano)remediation issues in the updated RIS3**	Only a rough idea of nanoremediation is included in the Tuscany RIS3 2014-2020 drafted in 2013: the concept is still addressed in a preliminary way: Deepening and integration should be pursued. A **RIS3 updating and improvement is needed** in the framework of the Tuscany ROP ERDF for developing such innovative solutions in environmental remediation	• RIS3 is the technical annex of the ROP ERDF 2014-2020 through which the Managing Authority fixes the strategic priorities on which to invest own ERDF. • In late 2017, the Regional Government of Tuscany launched a participative process to revise the RIS3 2014-2020. • LP, as managing entity of the regional Technological District for Advanced Materials (TD Materials), is in charge of a consultation process with stakeholders, to revise priorities for the remaining time period 2014-20 and after 2020. • TSG, including several experts in novel environmental remediation techniques, are involved in order to include in the reviewed RIS3 2018 a dedicated and detailed roadmap on "*Technologies and materials for environmental remediation*". • Need is compliant with all TANIA Challenges.

Actions summary and WBS (Work breakdown structure diagram)

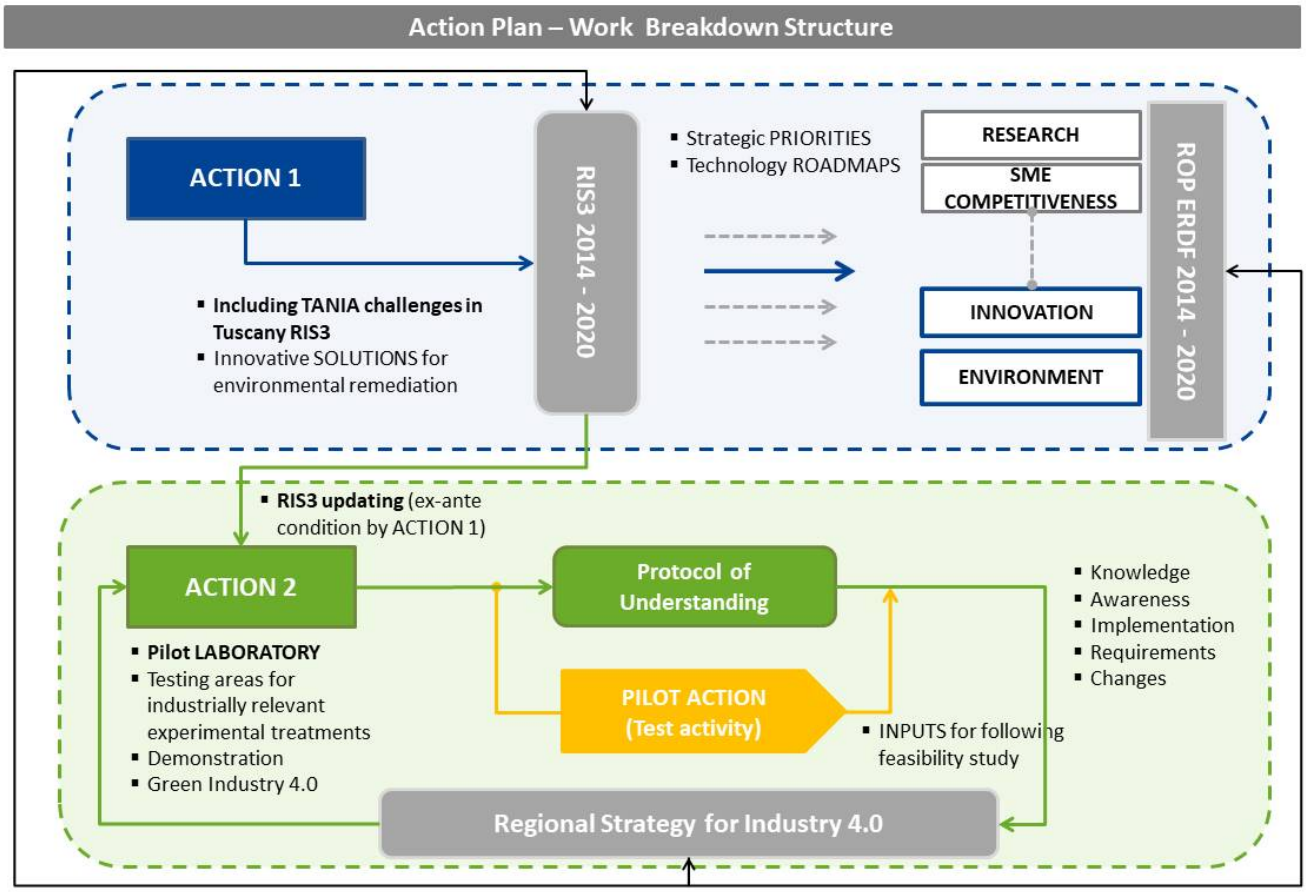
Envisaged actions were drafted according to a set of broad guiding principles:

- **Stakeholder inputs and policy needs** - The actions aim at tackling TANIA challenges and needs identified during the regional TSG meetings organised by LP/RT during the Phase 1.
- **Interregional learning process** - The actions aim at drawing on the lessons learnt from the several TANIA Exchange Events and activities carried out. Several TEE were also attended by stakeholders, such as research organization and environmental institutions.
- **Policy instrument improvement** - The actions focus on achieving improvements in the specific policy instrument(s) selected for Tuscany within TANIA.
- **Feasibility** - A limited number of actions (2) was defined and their scope was controlled, in order to increase the likelihood of their implementation in most activities, without compromising the purpose of the Action Plan and of the TANIA mission.

The TANIA Action Plan for Tuscany consists of **two complementary actions, both closely linked within the regional policy framework, within the context of the Regional Smart Specialisation strategy**:

ACTION 1 **Policy Instrument: ERDF ROP 2014-2020 with RIS3 2014-2020**	**Highlight the relevance of the TANIA challenges in the investment priorities of regional policies for research, innovation and the environment**, namely by capitalising on the stakeholder dynamics and interregional learning process brought by the TANIA project in a parallel review and updating process of the Tuscany RIS3 2014-2020 related to innovative remediation applications for the environment based on nano and advanced materials **In ACTION 1 the focus is specifically on technology solution development** and we aim to *a change in the strategic focus of the policy instrument* (Type 3) and *implementation of new projects* (Type 1) by improving the Tuscany RIS3 2014-2020. **Implementation started in Phase 1**
ACTION 2 **Policy Instrument: Regional Industry 4.0 Strategy**	**Remediation 4.0: Setting up of a regional "open" laboratory for the experimental treatment of contaminated soils and sediments through innovative environmental remediation techniques**, namely by involving and working in a joint agreement with the main monitoring institutions for the Environment and public-private entities. **In ACTION 2 the focus is on testing and demonstrating (nano)remediation solutions in a safe and "industrially relevant" environment** for supporting their following up-taking and funding, and we aim to *a change in the management of the policy instrument (soft measures)* (Type 2) and *implementation of new projects* (Type 1) by proofing effectiveness, safety and cost/benefit ratio. The Action includes an INTERREG EUROPE Pilot Action to support the setting up of a mini-laboratory in test conditions. **Implementation started in late Phase 1**

A **work breakdown structure** diagram (WBS) of the proposed plan and the relationship between the two Actions is provided below.



Part IV - Details of the Actions Envisaged

ACTION 1
ACTION 1 - Highlight the relevance of the TANIA challenges in the investment priorities of regional policies for research, innovation and the environment

Policy instrument addressed by Action 1

Name of the Policy Instrument(s) addressed:	
Tuscany Regional Operative Programme (ROP 2014-2020), with Tuscany Smart Specialisation Strategy (RIS3 2014-2020)	
The Action Plan aims to impact:	
Investment for Growth and Jobs programme	YES
European Territorial Cooperation programme	NO
Other regional development policy instrument	NO

Tuscany participates in TANIA project in order to improve its own **Regional Operative Programme (ROP 2014-2020)** - particularly several measures of **Axis I (Strengthening research, technological development and innovation), Axis III (SMEs competitiveness)** and **Axis V (Preserve and protect the environment and efficient use of resources)** - and its related **Regional Smart Specialisation Strategy (RIS3)**, which represents the main technical annex to the ROP and sets the technological priorities on which to invest ERDF funds in research, development and innovation.

Concerning ROP ERDF 2014-2020, TANIA combines measures addressed to protect the environment with actions supporting development of new solutions and collaborations. The policy instrument encompasses these objectives in separate priorities:

- Objective 1B: Promote innovation and R&D synergies between enterprises, R&D centres targeted to development of products and technologies, TT, social and eco-innovation, networking and clusters. It particular refers to KETs.
- Objective 6C: Conserving, protecting, promoting and developing the natural and cultural heritage

Moreover, the Tuscany ROP:

- is **strongly oriented to RTD** and Innovation with a relevant percentage of the whole budget addressed to Axis I (34.72%) and Axis III (Competitiveness of SME, 16.46%);
- states that RTD and innovation actions have to be **consistent with RIS3** and related technological priorities;
- **awards** extra points in the evaluation stage to projects aimed at **environmental protection**, low carbon emissions and the sustainable use of resources ;

- reserves funding for the development of **new business and solutions based on green** technologies ;
- supports the regional **Technological District for Advanced Materials** - one of the 12 districts created by the Tuscan Regional Government, in order to reorganise and rationalise the local technology transfer system. The District includes (nano)remediation and related issues for the treatment of contaminated areas, waste recycling, recovery and efficient use of raw materials as 1 of its 4 strategic priorities.

Nevertheless, all ROP measures must be developed **in accordance with** the priorities and technological roadmaps set out in **the regional** Smart Specialisation Strategy (RIS3) 2014-2020**,** which represents both ex-ante condition and technical annex of the ROP ERDF, as from the Resolution of the regional government n°1018 of 18th November 2014. This means that each call, as well as measure or action, funded by ROP ERDF must be addressed to at least one RIS3 priority.

According to the EU COM(2010)553 "Regional Policy contributing to smart growth in Europe 2020", RIS3 is the agenda for the economic transformation of a given region, aimed at exploiting its development potential, leveraging technological excellence. As such, **RIS3 represents the regional strategy document for innovation and research** where the Regional Authority identifies investment priorities and technological domains (investment technological roadmaps) for regional policies and structural fund programming.

Moreover, Tuscany RIS3 differs from other European RIS3 because it **is structured on 3 trans-sectoral technological pillars** (*ICT and Photonics, Smart Manufacturing, Chemicals and Nanotecnolologies,* **instead of** the usual Thematic Objectives, such as Research and innovation, SME competitiveness, Environment, etc…), which in turn are divided into several strategic paths of innovation or "*technological roadmaps*" on which to invest ERDF.

In this context, **in order to highlight the relevance of the TANIA challenges** and (specifically) in order to be able to use ROP funds for supporting innovation projects in the environmental remediation sector, LP - in according with RT - decided:

- To address the regional TSG efforts for including in the RIS3 a *technological roadmap* dedicated to the TANIA issues
- To take advantage at this purpose of the RIS3 mid-term review process scheduled in 2018 by the ROP 2014-2020 where the LP, as managing entity of the regional Technological District for Advanced Materials, was formally entitled by the MA to coordinate the review in relation to its area of competence.

Policy Needs faced by this Action

According to the 4 main policy needs highlighted by TSG during the TANIA learning process (see details in Part III), ACTION 1 specifically faces with:

- **N4 - Reviewing and updating the Regional Smart Specialisation Strategy (RIS3) with (nano)remediation issues**

However, the action also has positive effects for:

- N3 - Better investments in Innovation and Green Businesses 4.0, because it paves the ground for the use of ERDF for development of and investment in new solutions for environmental remediation
- N2 - Lack of knowledge and awareness, because it opens and facilitates exchange at regional level on (nano)remediation issues

Typology of Policy Improvement	Notes
☑ **New projects**	Tuscany ROP ERDF 2014-2020 funds only activities and projects addressed in accordance with the priorities and roadmaps set out in the regional Smart Specialisation Strategy (RIS3). This means that each call (as well as measure or action) funded by ERDF must be addressed to one or more of them (Regional Government Resolution n° 1018, 18 November 2014).
☑ **Change in the focus of the policy instrument**	RIS3 2014-2020 represents the regional strategy document for innovation and research and sets the technological priorities (focus) on which to invest ERDF funds and address ROP's measures

Coherency with TANIA challenges		
☑ **Support to R&I**	☑ **Pilot applications**	☐ Incentives for in-situ use
☐ Standards and rules	☑ **Patents**	☑ **Raise awareness**

Overall Topic and Description of the proposed Policy Improvement
Overall Topic
Highlight the relevance of TANIA challenges in the investment priorities of regional policies for research, innovation and the environment. **Re-addressing ROP ERDF 2014-2010 calls and measures** for a better supporting innovation and new business opportunities in the environmental remediation sector.
Specific Description
In Tuscany, the **ROP ERDF 2014-2020 funds can only be used in accordance with the priorities set out in the regional Smart Specialisation Strategy (RIS3)**. This means that **each call** (as well as measure or action) **funded by ERDF must be addressed to one or more RIS3 priorities** (Regional Government Resolution n° 1018, 18th November 2014). Therefore, in order to highlight the

relevance of the TANIA challenges and, specifically, to support ROP projects that aim to integrate innovative solutions within the environmental remediation sector, the first point to consider is to include in the RIS3 a priority roadmap dedicated to the TANIA challenges.

In this context, LP and RT in accordance with local TSG decided to take advantage of the opportunity offered by the scheduled **RIS3 mid-term review 2018.** They held working sessions and focus group meetings with regional entrepreneurs and researchers, in order to identify economic and territorial requalification priorities, as well as technological solutions and skills, to be included in the new and updated version of RIS3 2014-2020.

This **action began in spring 2017**, at the same time as the official launch of the process of revising and updating RIS3 2014-2020 and the holding of some TEEs and TSG meetings. Activities will continue throughout Phase 2 of TANIA, monitoring the results of the ERDF ROP calls influenced by the new RIS3 and indicators.

Ongoing activities already achieved the inclusion in the new RIS3 document of a strategic roadmap entitled "*Technologies and materials for environmental remediation*". The new RIS3 was published with the **Regional Government resolution n° 204 of 25th February 2019** and became immediately operational on all the measures of the ROP ERDF 2014-2020

Background

Regional / National input, including input from TANIA Stakeholder Groups

TANIA's main objective for Tuscany representatives is supporting the introduction of innovative technologies and solutions in the field of land reclamation and environmental remediation of a territory.

As well, Tuscany TSG aims to support the growth of a "*green remediation industry 4.0*" addressed to developing and applying more economic environmental remediation solutions than those currently in use (better cost/benefit ratio), sustainable (eco-compatibility, eco-sustainability) and tailored to different environmental matrices (marine and river waters, soils, sediments) and types of pollution occurring in the region (metals, chemicals, etc.).

All inputs coming from national/regional policies, as well as from the suggestions of the stakeholders surveyed, are consequently addressed to:

- **environmental goals**: protection of the territory, requalification of water and land, tailor-made solutions both in relation to the type of pollutant and the specific context and location;
- **economic goals**: cheaper and faster solutions respect to the existing ones, lower costs deriving from environmental damages (e.g. fines for environmental damage), creation of new business lines (e.g. new spin-offs/start-ups for a new green remediation industry 4.0);
- **knowledge and awareness goals**: technological dissemination and exchange with stakeholders and institutions in order to understand: why in spite of so big and relevant purposes national

and EU regulations are so (still) slow to take clear decisions?

The improvements of the selected policy instrument (ROP ERDF 2014-2020) must so be addressed both to supporting the implementation of "new and better projects" (Type 1) and to "changing of its strategic focus" (Type 3). To this end, actions on RIS3 2014-2020 must first be taken. RIS3, indeed, sets/fixes the priorities on which the Managing Authority can allocate the resources of the ROP ERDF 2014-2020: **in other words, all ROP ERDF calls can ONLY be focused on investment priorities listed in RIS3**.

According to the different steps of the TANIA interregional learning process, LP and RT held several TSG meetings composed by different regional stakeholders, such as:

- **entrepreneurs** working in the field of environmental remediation, but also large companies whose production processes cause pollution or SMEs proposing new technology solutions;
- territorial **public-private entities** (e.g. public utilities, such as for public water) dealing with the management and monitoring of water/land and related pollution problems;
- **researchers**, dealing with environmental sciences (ecotoxicologists, chemists, geologists, agronomists), but also engineers, biologists and material technicians who propose new solutions for environmental remediation;
- regional/national monitoring and **environmental institutions**.

Various meetings with stakeholders covered, the TANIA challenges/objectives, the common needs shared with the other participating EU regions and the technical, operational and policy solutions identified all along the TANIA exchange events (see under). This happen both during the official biannually TANIA stakeholders group meetings (e.g. Florence 6th April 2017 , Piombino 2nd March 2018) and all along the participation process for the RIS3 mid-term review and update organized by the LP through the Regional Technological District for Advanced Materials (TD Materials), where stakeholders, including TANIA ones, were divided into thematic groups.

Subsequently, a discussion was opened on individual solutions and their possibility of transfer and benefit for regional needs, as well as on how to improve the regional policy instrument

Transfer of TANIA Solutions

Good practices identified within TANIA were:

- firstly placed in the context of the Tuscan territory (areas subject to remediation, pollutants and causes of pollution, technologies adopted, possibility of using alternative methods, etc.)
- following drafted in a new priority roadmap document called "*Technologies and materials for environmental remediation*" and proposed by TSG to ROP ERDF 2014-2020 Managing Authority to be included in the new updated RIS32014-2020. This roadmap is one of the seven proposed by TD Material and included in the new updated RIS3.

The solutions/experiences used for the present action are:

- **Technical solutions** adopted in different environmental contexts:
  - **INNOVOC** (by University of Helsinki and Nordic Envicon Oy) novel in situ remediation

method for treating contaminated groundwater and saturated soils. The technique is suitable for removing volatile organic compounds (VOCs) like petroleum hydrocarbons.

- **NANOREM** project (by H2020 project and network including several regions invited in more TEEs) (nano-iron applications), for the (nano)remediation of TriChloroEthylene (TCE) contaminated groundwater area.
- **TUC studies** (by Region of Crete), studies on investigation, evaluation and remediation of uncontrolled contaminated sites/installations from industrial and toxic wastes in Greece.

– **Strategic and integrated approaches**

- **LORVER** strategy (by Grand'Est region), integrated approach for the reclamation, the sustainable management and reuse of brownfields and other degraded lands.
- **GISFI** (by University of Lorraine) and **SOILIA** (by University of Helsinki and LADEC), centres set-up and developed technologies. The new road map is designed to promote both the creation of new, strategic projects at regional level and on the development of new material and technologies.

The new roadmap widens potential fields of environmental application, to include forestry and agricultural areas, treatment of mud, sediments and biomass, plus application in relation to highly polluting economic sectors (Oil&Gas, Building & Spatial Planning, Chemical, pharmaceutical, manufacturing, Iron&Steel).

Moreover, solutions supported understanding that new RIS3 priorities had to be oriented to assuring both environmental sustainability and economic development. Exchange in TANIA clearly showed that most successful applications of novel remediation techniques were technically effective and economically beneficial for their territory. The roadmap reinforces this.

A number of key stakeholders, members of the scientific Committee of the TD for Advanced Materials, took directly part in the interregional activities of the project, before submission of the technological roadmaps. In this way, results of the learning process and exchange methodology could more easily feed into the regional participatory process for updating the RIS3.

Other input from TANIA project

TANIA Exchange Events (at interregional level) and Stakeholders Group meetings (at regional one) gave the opportunity to know, above all on a technical level, further innovative solutions coming from other EU regions.

Particularly several inputs (during the TEEs and TSG meetings held in 2017-2018) came from several researchers and technicians of the National Interuniversity Consortium for the Science and the Technology of Materials (INSTM) which is a relevant Italian network which links hundreds of laboratories and public researchers in the nanotechnology and materials sector. INSTM is also member of the TD Materials and it is actually supporting the RIS3 review process. Several INSTM members, coming from different Italian regions, participated to TANIA TEEs and TSG meetings proposing a wide range of technical solutions and in situ applications.

Moreover, Tuscany partners and several stakeholders (as well as other project partners) will benefit of the TANIA final Phase 1 exchange event (bridge event) organized in Lahti on 19th November 2019 as wide dissemination workshop also open to other EU regions and relevant stakeholders external to the TANIA partnership. Agenda will be structured in order to follow the TANIA challenges and will focus on: innovative ongoing (nano)remediation solutions (success stories), funding instruments which support innovation in the remediation sector, policy instruments and rules in the EU regions.

Work plan within TANIA Phase 1 – ELABORATION of the Action

Activities already undertaken at interregional and regional level in Phase 1

Introduction

As mentioned above, Lead Partner (LP) and Tuscany Region (RT) took the opportunity to combine the Action development phase with the Regional Smart Specialisation Strategy review process launched in late 2017 (RIS3 mid-term review). For this reason several activities of "Action IMPLEMENTATION" took also place in Phase 1 in the time period late 2017 – February 2019, but with a clear distinction from the project activities for the "Action ELABORATION".

Action ELABORATION activities - using INTERREG EUROPE funds and benefiting of the TANIA Exchange Events - started since the project kick-off and continued until the 6th semester of the project with the planned exchange sessions at regional and interregional level: interregional learning events, study visits, technical meetings and exchange sessions on identified practices or external experiences. Elaboration activities are been step by step described in the Phase 1 reporting period documents too.

Action IMPLEMENTATION activities - using ROP ERDF 2014-2020 funds or in-kind resources, but not INTERREG EUROPE funds - started in autumn 2017, initially with a partial overlap with the regional events foreseen by the TANIA learning process at regional level: for example, during the TSG meetings, by including a dedicated session on RIS3 and its relevance in affecting ROP ERDF or introducing a focus session about "*how to improve running RIS3*" after the presentation of the TANIA purposes, challenges and identified solutions.

Elaboration and implementation activities carried out for this ACTION in Phase 1 are following summarized.

Activity / Description	Regional/ Interregional	Timing
Official TANIA stakeholder group meetings They are been periodically planned in order to share project objective and challenges, identify regional solutions, transfer and exchange practices coming from other EU regions, focus on regional needs and policy improvements	Regional	One for semester (April 2017, October 2017, March 2018, September 2018, January 2019)

[*Elaboration activities*]		
<u>TANIA Exchange Events</u> For the purposes of this ACTION, the most relevant were the ones where technological solutions and their applications in different environmental contexts have been presented and deepened. This particularly happened in TEE2 (Pécs, with the NANOREM network), TEE3 (Metz, technical workshop on solutions developed in Lorraine and the study visit at the GISFI station), TEE4 (Lahti, with local practices by the SOILIA centre). In TEE5 (Heraklion), TEE7 (Nancy) and at the dissemination workshop in Lahti for the Final Phase 1 bridge event, several tips and solutions to be included in the new Tuscany RIS3 were also shared with stakeholders. [*Elaboration activities*]	Interregional	At least one for semester according to the project time plan
<u>Ex-ante analysis and assessment of the previous RIS3 2014-2020</u>, with the ROP ERDF 2014-2020 Managing Authority (sector Observatory RIS3), in order to evaluate: • strengths and weakness of the previously identified strategic priorities and technological roadmaps concerning environment and advanced materials • need and opportunities to proceed with their reviewing and updating [*Elaboration activity*]	Regional	June - September 2017
<u>Launch and management of a participation process</u>, in order to improve and deepen TANIA purposes within the new updated Tuscany RIS3 2014-2020. In the indicated period, several meetings and focus session with stakeholders (entrepreneurs, researchers, environmental institutions) were carried out in a complementary way (and sometime additional too) with the TANIA planned ones [*Elaboration activities*]	Regional	September 2017 – June 2018
<u>Data analysis and identification of the strategic roadmaps.</u> All results gathered during the focus groups, including	Regional	November 2017 – February 2018

questionnaires sent to stakeholders who could not physically participate in focus meetings, were composed in a first draft of recommendation document. [*Elaboration activities*]		
Fine tuning of a technological roadmap to be included in the new RIS3 2014-2020 titled "*Technologies and materials for environmental remediation*". [*Elaboration activity*]	Regional	February 2018 – September 2018
Benchmarking and assessment. Results from previous activities were to 3 different parallel analyses and evaluation procedures: - benchmarking analysis with the sectoral specializations indicated in the Horizon 2020 Program and relative positioning of strategic assets; - ability to attract investments on the territory; - benchmarking analysis with the thematic EU S3 platforms and / or interregional cooperation programmes; [*Implementation activity*]	Regional / Interregional	May 2018 – January 2019
Bilateral Exchanges with project partners on innovative solutions of (nano)remediation and policy tools [*Elaboration activities*]	Interregional	Several technical sessions in TEE5 (Heraklion) and TEE6 (Pècs), but also dedicated BE meetings in in Florence on 17th January and 7th March 2019 (see points over)
Institutional validation Validation and official publication, by a dedicate Regional Government Resolution, of the new Smart Specialization Strategy 2014-2020 document for Tuscany Region (Regional Government **Resolution No. 204/2019**, 25th February). [*Implementation activity*]	Regional	25th February 2019
Dissemination and exchange at the TANIA final Phase 1 and bridge event	Regional	19th November 2019

Participation and exchange, together with some TSG key stakeholder at the workshop on (nano)remediation innovative solutions hold in Lahti within the TANIA final Phase 1 and bridge event. [*Elaboration activity*]		

Work plan within TANIA Phase 2 – IMPLEMENTATION of the Action	
<u>Activities planned at interregional and regional level in Phase 2 (January 2020 – December 2021)</u>	
Introduction With the publication of Resolution No. 204/2019 on the Official Bulletin of the Region of Tuscany the new RIS3 2014-2020 has become operational also for the calls and measures of the ROP 2014-2020.	
Activity / Description	**Timing (month/year or specific date where possible)**
<u>Launch of the latest ROP ERDF 2014-2020 calls</u> (with the remaining programming funds) based on the new updated RIS3 and the Technological Roadmaps. This activity will follow the development of the latest calls based on the ROP 2014-2020 for funding research, development and innovation projects, aiming to support proposal dealing with TANIA challenges. LP will support this process using the regional Technological District for Advanced Materials (from which TANIA challenges have arisen, see under for stakeholders) and stakeholders involved in the Protocol of Understanding for the open Laboratory (see Action 2).	Whole Phase 2 time period (January 2020 – December 2021)
<u>Monitoring of results and assessment</u> This item includes all the activities of monitoring and impact assessment of the new RIS3 on the measures / axes of the ERDF ROP 2014-2020 (see indicators too). Due to the close link between RIS3 (technical annex) and the ROP ERDF 2014-2020, the Managing Authority officially adopts the **same tools and indicators** for the monitoring action. In this activity LP and Stakeholders Group will support the Tuscany Region for the impact assessment of the TANIA roadmap. At this purpose, **periodic checks and technical meetings** will be carried out (indicatively every six months) in order to:	Whole Phase 2 time period (January 2020 – December 2021)

- evaluate the results of the calls launched during the period (number of projects, relation with the topics, number of companies/SMEs/research bodies participating) - verify the consistency of project issues with the updated RIS3 roadmaps - examine funding opportunities for the next period (six months later) Currently there are no specific procedures for monitoring the project themes financed. The Managing Authority actually monitor only the coherence with one of the 3 RIS3 priority pillars, which consist in: 1. ICT and photonics 2. Smart Factoring 3. Chemistry and nanotechnology TANIA challenges mainly reside under pillar 3. Nevertheless, in order to carry out a more targeted monitoring action, LP will use the network of contacts created with the Technological District for Advanced Materials and stakeholders involved in Action 2 (see under). All new data collected will then be linked to the official indicators of the ROP ERDF 2014-2020.	

Stakeholders involved	
Name of Organisation / person (where possible)	**Role in Action Plan**
Tuscany Region – ERDF ROP 2014-2020 Managing Authority	Managing Authority. RIS3 2014-2020 represents the main technical annex of the ERDF ROP 2014-2020, because identifies the strategic and technological domains on which Tuscany addresses ERDF funds.
Tuscany Region - Observatory S3	Observatory S3 is the main responsible body for the RIS3 Mid-Term Review (MTR) 2018 and coordinate the whole process. They also have the task of involving external auditors to verify the quality, effectiveness and consistency of the proposed roadmaps for the new RIS3.
Regional Technological District for Advanced Materials (TD Materials), which includes: - Members of the Steering Committee (10 people) - Members of the Technical-Scientific	TD Materials one of the 12 districts created by the Tuscan Regional Government, in order to reorganise and rationalise the local technology transfer system TD gathers several key actors such as **entrepreneurs, researchers,**

Committee (12 people) - Industries, SMES and research organizations belonging to the District (around 170)	**technicians**, dealing with or wishing to invest in Advanced Materials in order to get innovation in own production process and products. LP is the managing entity of the TD Materials. Role: identify, discuss and propose technical roadmaps for RIS3.
INSTM Consortium (several members coming from all regional and some national academia)	The National Interuniversity Consortium for the Science and the Technology of Materials is a relevant Italian network which links hundreds of laboratories and public researchers in the NMP Sector. INSTM is also member of the TD Materials and support it in the RIS3 review process concerning NMP sector (including TANIA challenges). Several INSTM members participated to TANIA TEEs and TSG meetings. Role: identify, discuss and propose technical roadmaps for RIS3.
RIS3 external auditors	Several public and private entities have been asked to evaluate the new RIS3 and the priority roadmaps from different points of view, such as: effectiveness of the proposed solutions, consistency with existing skills, the industrial fabric and regional productive vocations, ability to attract investment, etc. Have covered the role of external auditor: Frost & Sullivan, IRPET (Regional Institute for Tuscany Economic Planning), ISMERI Europa, University of Trento and Modena-Reggio-Emilia. Role: evaluation and assessment of the proposals for the new RIS3.
Industries, SMEs, research organizations, entrepreneurship associations	They participate to the RIS3 review process, in order to identify the technological roadmaps (not only for TANIA purposes)

Risk and Contingency Plans		
Description of Risk	**Level of probability (High, Medium, Low)**	**Description of Contingency Plan**

Low number of calls in the remaining period of the ROP 2014-2020 for testing the effectiveness of the new strategy	Medium	• Even if not yet published, the last Call 2017 for strategic R&I projects (with a relevant budget) was highly influenced by the participation process for the new RIS3 and several topics - then become roadmaps - were developed in project proposals. • RIS3 doesn't not concern only calls, but the whole regional strategy and decisions taken on ERDF (e.g. it affects also Action 2). • New RIS3 roadmaps is supposed to impact on next programming period too.
Lack of specific indicators for the TANIA challenges	Low	• The new RIS3 will maintain the previous structure based on 3 main technological pillars. One of the pillars concerns "Chemical and nanotechnologies". ROP ERDF 2014-2020, based on RIS3, foresees indicators split for each pillar. Specific indicators are also planned for green technologies. Some activities of adaptation and reconciliation of the indicators will be necessary. • LP, by TD Materials, will also monitor projects and other initiatives launched by own industries/SMEs/research organizations.

Costs and funding sources	
Costs	**Funding Sources**
<u>Costs for the RIS3 review and update process</u> The whole cost for the RIS3 reviewing and updating process is estimated over 200 K€ (including the in-kind activity of the internal staff of the management authority) of which around 120K€ addressed to the wide participation process through the Technological Districts. Needed funds come from ROP ERDF 2014-	• Tuscany ROP ERDF 2014-2020 • In-kind resources (use of internal staff by the MA and all the stakeholders involved)

2020. Concerning TANIA and TD Materials, the regional authority allocated around 15K€ to be used for the implementation activities. To this must be added the contribution in kind (use of internal staff) by the various stakeholders	
ROP ERDF affected by the improvement The new RIS3 will affect the use of the remaining ERDF, mainly concerning research, development and innovation. The remaining funds for this purpose currently amount to around **€30 million** split into several measures. Nevertheless, there are the residual funds (unallocated or unspent) also coming from other Axes that should be reallocated under Axis 1. Moreover, in June 2019, the Tuscany ROP ERDF 2014-2020 has been awarded by the European Commission with 47.5 million euros of Performance Reserve for the results obtained as at 31th December 2018. A policy decision at this purpose is expected within late 2019: the same happened at the end of previous programming periods (2000-2006 and 2007-2013). This amount is still to be assessed (indicatively around €20-40 million) but would significantly increase the previous value. Finally, as already mentioned above, although the new RIS3 was not yet officially operational, the last call 2017 for regional strategic research and development projects (about **€70 million**) strongly influenced the process of revision of RIS3 and vice versa, as the two processes of participation took place at the very same time. Obviously, concerning TANIA purposes, we must consider a very smaller percentage of the whole amount (indicatively < 2% of the previous amount)	• Tuscany ROP ERDF 2014-2020

Monitoring
Self-defined Performance Indicator

Indicator	Target	Means of Verification
N° of pilot/project initiatives using NMP for green purposes and benefits for environment	3	Evidence of initiatives in the territory

Output Indicators		
Indicator	**Target**	**Means of Verification**
N° of stakeholders involved in the participation process	>100	Level of interest and sharing of the identified technological roadmap
Number of meetings (including dissemination and focus group) organized	10	Level of interest and sharing of the identified technological roadmap
Approval of the TANIA roadmap and formal publication of the new Tuscany RIS3 2014-2020	Yes/No	Official Act

Territorial Impact

The new RIS3, as for the ROP ERDF 2014-2020, applies for the whole Tuscany territory.

LP and RT took the opportunity to couple the RIS3 review process with the TANIA learning process with mutual exchange and benefits.

The main beneficiaries will be:

- **entrepreneurs** working in the field of environmental remediation, but also large companies whose production processes cause pollution or SMEs proposing new technology solutions. Applications could also involve several complementary sectors, such as agro-forestry, Oil and Gas, Mining, Pharma-Chemical, Manufacturing, in a context of green and remediation industry 4.0
- **local public-private entities** (e.g. public utilities) dealing with the management and monitoring of water and land and related pollution problems;
- **researchers**, dealing with environmental sciences (ecotoxicologists, chemists, geologists, agronomists), but also engineers, biologists and material technicians who propose new solutions for environmental remediation;
- regional monitoring and regulatory **institutions for the environment**;
- consequently, the Tuscany **Environment** itself.

More than 500 people participated to the whole RIS3 review process leaded by ASEV, of which around **40 TANIA stakeholders** for the environmental issues: the process was structured in more physical meetings/exchange sessions (see https://bit.ly/2JPlQW0) or giving the possibility to provide own feedbacks by a dedicated online form. Finally n°7 new priority roadmaps, including the TANIA one on "*Technologies and materials for environmental remediation*", were identified together with their potential application contexts in Tuscany and a benchmarking analysis.

The new RIS3 will now influence all the remaining ROP ERDF 2014-2020 calls, but also other strategic initiatives of the Regional Authority: for example the TANIA Protocol of Understanding itself (see ACTION 2) refers to the Tuscany RIS3.

ACTION 2
ACTION 2 – Remediation 4.0 - Setting up of a regional "open" laboratory for the experimental treatment of contaminated soils and sediments through innovative environmental remediation techniques

Policy instrument addressed by Action 2

Name of the Policy Instrument(s) addressed:	
Regional Strategy for Industry 4.0 – Guidelines for implementation of the Industry 4.0 Strategy (2016, and subsequent updates and related acts)	
The Action Plan aims to impact:	
Investment for Growth and Jobs programme	NO
European Territorial Cooperation programme	NO
Other regional development policy instrument	YES

Since 2016, and based on European and National level policy initiatives, the Regional Government of Tuscany has identified industrial modernisation as a priority for all sectors of its economy. The Regional Government has made a concerted effort to coordinate all regional development initiatives and funding in order to ensure that Tuscany moves towards digital transformation and modernisation.

The related Policy Instrument to be improved within TANIA is the Regional Strategy for Industry 4.0 – Guidelines for implementation of the Industry 4.0 Strategy. This is the official starting legislation for the Industry 4.0 strategy in Tuscany (April 2016)[1] and all subsequent measures are authorised by this and make reference to this. This was swiftly followed up by the legislation to create a 4.0 Platform in Tuscany (November 2016)[2].

The Regional Strategy for Industry 4.0 is an operative strategy, born directly from the Regional Smart Specialisations Strategy (see also Action 1).

The Regional Direction for Production coordinates the Regional Platform for Industry 4.0, which has among its objectives:

1. to promote technological, organisational and socio-economic content related to industrial modernisation among enterprises;
2. to propose technical content for regional actions and interventions finalised towards the introduction of new technologies in enterprises, in line with regional specialisations.

[1] Regional Government decision n. 20 (11.4.2016), "Indirizzi per l'attuazione della Strategia Industria 4.0";
[2] Regional Government decision n. 1092 (8.11.2016), "Strategia Industria 4.0. Piattaforma regionale di sostegno alle imprese: composizione e compiti"

The European position (also detailed in the Interreg Europe policy brief on industrial modernisation) stresses that the concept of industrial modernisation relates to areas such as high-performing manufacturing, Key Enabling Technologies, digital transformation, advanced materials, as well as service innovation concepts. The Regional Strategy for Industry 4.0 reflects this. The Regional Government calls on a number of regional technological districts to support industrial modernisation and, as such, application of the regional strategy. This includes the regional district for Advanced Materials[3], which sustains the applications of these KETs in a number of sectors including that of environmental remediation (see also Action 1 above, where this has been strengthened within the updated RIS3).

The Regional DG for productive activities and economic development, TANIA partner, is thus committed to ensuring that research and innovation in all regional fields goes towards supporting this policy objective and comprehensive regional strategy. A policy improvement is thus understood as a **concrete initiative** of direct relevance to (and directly referencing) the Regional Strategy for Industry 4.0, and taking forward its objectives for regional development.

Policy Needs faced by this Action	
According to the 4 main policy needs highlighted by TSG during the TANIA learning process (see details in Part III), ACTION 2 specifically faces with: • **N1 - Regulatory vacuum (both at national and EU level)** • **N2 - Lack of knowledge and awareness** • **N3 - Better investments in Innovation and Green Businesses 4.0**	
Typology of Policy Improvement	**Notes**
☑ **New projects**	The action paves the way for a monitored and safe experimentation of new solutions, stimulating companies and researchers to propose innovation projects. These can be new project funded by regional / ERDF resources or privately funded projects. This is linked with Action 1: Action 1 paves the way for new projects with the updated strategic focus, while Action 2 aims to create the place where projects can undertake innovative testing.
☑ **Change in the management of the policy instrument**	The Protocol of Understanding between the Regional Authority and the Environmental Protection Institutions (described below) represents a new management tool within the regional Industry 4.0 strategy.

[3] See decision n.1092 above and Regional Government decision_n.1362 _(10-12-2018) NUOVO SCHEMA Piattaforma I4.0

Coherency with TANIA challenges		
☑ **Support to R&I**	☑ **Pilot applications**	☐ **Incentives for in-situ use**
☑ **Standards and rules**	☑ **Patents**	☑ **Raise awareness**

Overall Topic and Description of the proposed Policy Improvement

Overall Topic

Setting-up a regional Laboratory (open and distributed in the territory) **inspired by** the experiences of the Lorraine Region (France) and the Päijät-Häme Region (Finland), in order to launch a **process of analysis (technical, regulatory, opportunity) of innovative solutions in the field of environmental remediation**.

Specific Description

In Tuscany, the TANIA Action Plan brings together innovation policy with environment policy, with a view to develop a new business sector oriented towards site-specific environmental remediation of contaminated water and soil (Green Businesses 4.0).

Nevertheless, to achieve this objective and support policy improvement, it is necessary to deal with several needs highlighted during the TANIA interregional learning process. One is the regulatory vacuum concerning authorisation for wide use of new environmental techniques and technologies in remediation. The other is the lack of knowledge and awareness about the new solutions proposed for environmental regulation and about the opportunities and of cost/benefit ratio that they represent.

In this context, ACTION 2 in the Tuscan Action Plan is designed to set up a regional laboratory for the experimental treatment of contaminated soils and sediments through innovative environmental remediation techniques.

In addition to the interregional exchange forming the basis of this action and described below, the following is necessary to set up the regional lab.

- A Protocol of Understanding between main stakeholders, committing to the concept of creating a regional lab and to taking forward necessary activities to assess its feasibility and, as such, to plan and implement all necessary actions.
- A testing activity (including a Pilot Action for the setting up of a mini-laboratory in test conditions where to put into practice the lesson learnt) to determine the exact location(s), structure and format of the lab. The Pilot will define:

- the specific Tuscan regional context, the objectives, the priorities of environmental remediation and the rules (at regional, national and EU level) within which the open Laboratory would arise. With respect to the context analysis activities carried out in phase 1, this preliminary phase of the study focuses on the open laboratory and its impact in the Tuscan context,
- the needed infrastructures and the proper geographical location,
- the functional and operational requirements, including necessary spaces and equipment,
- the management and working operational structure: partners, roles, tasks, professional figures, including links with the public research system, environmental protection and monitoring institutions, the private land management system and the hydrogeological system (e.g. reclamation consortia, utilities, etc.),
- innovative technologies and solutions to be tested, including links and networking activities at EU level,
- the financial management of the open Laboratory, including resources needed for the start-up, possible instruments and funding schemes for financing experimental activities, business plan of the first 3 years of activity (full capacity after start-up).

- Creation of the lab, on the basis of the results of the above. This includes the allocation of resources from the funding sources identified, including any regional funding (see potential funding sources below) and procedures to activate them;
- Insertion of the lab as an integral part of the Industry 4.0 Platform of the Regione Toscana (set up within the Regional 4.0 strategy), with all necessary regional procedures;
- Activation of the lab facilities. These would be used to test the effectiveness of new remediation techniques. These testing projects may be proposed by private users, by public users and / or by consortia with project funding (regional or European funding). Testing would promote the wide scale application and eventual market launch of these techniques.

Background

Regional / National input, including input from TANIA Stakeholder Groups (c.1500-2000 characters)

The regional territorial/policy context and needs have already been detailed in Part II and III of this document. However, for ACTION 2, the following instruments relating to the governance of innovation policies should also be highlighted:

- the **Regional Law n. 20 /2009** containing provisions on the actions of the Regional Government of Tuscany in the field of scientific and technological research and support for innovation, which:

- promotes the dissemination of knowledge and research in conjunction with regional development,
- supports industrial research and development for the benefit of the competitiveness of the business system and the growth of employment,
- supports cooperation between institutions, research and entrepreneurship for sustainable growth.

- The decrees of the regional government (DGR 20 and 1092/2016) which, starting from the National Plan Industry 4.0, drawing the regional guidelines for the implementation of the **4.0 strategy** and setting up the **regional Platform Industry 4.0** as integrated structure for coordinating the public system of competences to support businesses by technology transfer
- the **Tuscany RIS3 2014-2020** (DGR 1018/2014), which includes the priority 'Chemistry and nanotechnology';

During all TSG meetings clearly arose the need to deepen the regulatory issues for environmental remediation sector and start a debate at all levels as a **binding precondition** for any type of action:

- for understanding the **relationship between innovation and environment**, starting from an overview of the current regulations and of the new technological solutions in this field and making a first examination of the real opportunities they offer for experimentation and subsequent integration in the reclamation and recovery of water and soil;
- for **identifying values and benefits** that an investment policy in this field could produce with a view to industrial and territorial requalification of "brownfield areas";
- for formulating **proposals** to be developed in the context of the RIS3, particularly focusing on the circular economy and Industry 4.0 issues;
- for the **transferring in Tuscany of some relevant solutions** (practices) identified in the EU TANIA partner regions (see under). Particularly at 3rd TSG workshop (March 2018) the "French case" was publically presented just in Piombino where, as happened in Lorraine in the 90s, industrial and environmental requalification needs exist from the currently declining of the steel production activity.

In this context, **the idea of signing a Protocol of Understanding** between both the Tuscany TANIA partners and the main local public environmental institutions **was born** (see under).

Transfer of TANIA Solutions

ACTION 2 takes cue directly **from two successful cases** (good practices) identified during the TANIA interregional learning process **in France and in Finland** where with different times, objectives and methods **two open air public-private laboratories have been created** where testing and validating in industrially relevant conditions (TRL 5-6) innovative solutions and methodologies for the environmental remediation on polluted soils and sediments: **the GISFI Station in the Grand' Est Region and the SOILIA Centre in the Region of Päijät-Häme.**

Both practices resulted to be of considerable interest to the regional authorities and stakeholders **with a view to setting up a laboratory in Tuscany inspired by them, but tailored to the specific regional needs**. Indeed:

- Practices already offer **two similar situations, but with substantial differences in application**: in France the **GISFI Station** was built right on the ground where the problem of pollution was present, testing in situ various types of solutions, instead in Finland the **SOILIA Centre** was created in a non-polluted area, transferring to site conspicuous quantities of polluted soil/ sediments from other territories.
- **Both in France and Finland** national **regulations are not** more **flexible** then in Tuscany:
    - **In France**, the environmental protection authority has tried to be very prudent and rigorous in terms of innovative solutions applied to environmental remediation: the French partners have managed to enter the space between the regulation and therefore operate at the best with respect to the problems resulting from the industrial redevelopment paths that they had to face as a result of the steel industry crisis.
    - **In Finland**, without the burden of the crisis, a solution was adopted, that was the most appropriate in relation to local needs.
- Moreover, in Grand' Est region was developed an **integrated approach** for the reclamation, the sustainable management and reuse of brownfields and other degraded lands (called **LORVER strategy**). The solution is based on the administrative, technologic and scientific expertise acquired in the Lorraine area (now Grand' Est Region) over the years for the management of brownfields thanks to the close cooperation between the governments of France and of the Region, administrative institutions, companies, and academic institutions gathered within the **GISFI Station**.

In addition to the TEEs held in France on November 2017 and Finland on May 2018, a dedicated **Bilateral Exchange** event with the representatives of both centres was held in **Florence on 17th January 2019** in order to deepen "how they did it" and open the discussion and exchange with a selected number of regional stakeholders and TSG members.

Particularly, participants had the opportunity for a brief analysis and exchange with GISFI-SOILIA representatives about:

- the reasons that led to the creation of the two centres (*why they did it*),
- how they overcome the whole of technical and regulatory constrains that can inhibit the start-up (*how they did it*),
- how today the two laboratories are managed, work and produce results (*how the centres work*)

The final objective was fostering the start-up of a process of analysis on the possible ways and opportunities to realize in Tuscany an initiative inspired by these experiences.

This **BE represented a key step for the further development** of the Action 2, but also paved the way for additional cooperation activities among the TANIA regions, which could be exploited under the TANIA project, other funding programs or by specific regional cooperation agreements.

Other input from TANIA project

Since its beginning in 2017, the activities of the TANIA Project and in particular the interregional

and regional meetings have highlighted the need to challenge and raise awareness among European bodies, first of all the EU Commission, so that a solution can be found to the current regulatory vacuum in the field of environmental remediation.

The limits of the REACH Regulation, repeatedly underlined by several partners, and the absence of a clear regulatory framework entail a lack of basic security within the industrial world, which therefore does not feel encouraged to invest in innovative remediation techniques.

The regulatory vacuum is often filled:

- by the public-private initiative, which arises sometimes extemporaneously;

- by the political will that allows to open spaces in order to overcome the gaps of the current legislation, just as it happened in Lorraine and Finland with the two good practices identified.

Work plan within TANIA Phase 1 – ELABORATION of the Action

Activities already undertaken at interregional and regional level in Phase 1

Introduction

ACTION 2 was entirely born during the TANIA interregional learning process and the resulting regional debate with stakeholders. However, as in ACTION 1, some IMPLEMENTATION activities happened in project Phase 1 following the ELABORATION phase (see both definitions in ACTION 1), particularly after the formal publication of the new RIS3 2014-2020 (February 2018) which now include also the key elements for TANIA challenges.

In this contest there is a close correlation between ACTION 1 and ACTION 2 to be underlined: the new RIS3, indeed, will now influence not only the remaining ROP ERDF 2014-2020 calls, but also the strategic initiatives of the Regional Administration such as the TANIA Protocol of Understanding, milestone and result of the ACTION 2.

As done over for ACTION 1, elaboration and implementation activities carried out for this ACTION in Phase 1 are following summarized.

Activity / Description	Regional/ Interregional	Timing
Official TANIA Stakeholders Group meetings. They are been periodically planned in order to share project objective and challenges, identify regional solutions, transfer and exchange practices coming from other EU regions, focus on regional needs and policy improvements. Particularly, in March 2018 was presented the "French case" with the GISFI Station practice and the LORVER strategy just in Piombino, where industrial and environmental requalification needs exist from the currently declining of the steel production activity, as	Regional	One for semester (April 2017, October 2017, March 2018, September 2018, January 2019)

happened in Lorraine in the 90s. [*Elaboration activities*]		
<u>TANIA Exchange Events.</u> For the purposes of this ACTION, the more relevant were TEE3 (Metz, study visit at the GISFI station), TEE4 (Lahti, study visit at the SOILIA centre), TEE5 (Heraklion, with the focus sessions for deepening practices and proposed solutions), TEE7 (Nancy, including a short policy meeting between the general directors of Tuscany and Grand' Est) and the final TEE8 again in Lahti with the interregional workshop on new solutions for environmental remediation and related policy issues. [*Elaboration activities*]	Interregional	One-two for semester according to the project time plan
Separate (from TSG meetings) and preliminary **technical meetings with the main the key regional institution** for the Environment (**ARPAT** - Regional Agency for the Environmental Protection of Tuscany and **ISPRA** - Higher Ministry Institute for Environmental Protection and Research), in order to pave the ground for a following collaboration and agreement. [*Elaboration activities*]	Regional	3 technical meetings from July to December 2018
<u>Bilateral Exchange Event on GISFI station and SOILIA centre</u> The BE was coupled with the 5th TSG meeting. LP and Tuscany Regional Authority formally invited French and Finland partners and stakeholders in order to provide a deep presentation of their practices and be available for a question and answer session from the Tuscan stakeholders. Particularly partners deepened "how they did it (GISFI/SOILIA centres)" and RT invited the participants (a selected number of regional stakeholders and TSG members) to an open discussion in order to jointly assess whether such practices/solutions could be transferred and replicated also in Tuscany. [*Elaboration activities*]	Interregional	Florence, 17th January 2019
<u>Official publication of the updated Tuscany RIS3 2014-</u>	Regional	25th February 2019

2020 Validation and official publication, by a dedicate Regional Government Resolution, of the new Smart Specialization Strategy 2014-2020 document for Tuscany Region (Regional Government **Resolution No. 204/2019**, 25th February). [ACTION 1 *Implementation activity*] The reviewed RIS3, represents also ex-ante condition on which to base the following Protocol (see also WBS in Part III)		
Protocol of Understanding (drafting) As a logical consequence of the previous activities, the drafting of a Protocol of Understanding between the Region of Tuscany, LP, ARPAT and ISPRA was started, with the support of public research represented by INSTM, in order to take the preliminary steps (technology assessment, regulation, feasibility, actors, etc.) for the setting up of a regional "open" laboratory for the experimental treatment of contaminated soils and sediments through innovative environmental remediation techniques. [*Elaboration activities*]	Regional	November 2018 – March 2019
Protocol of Understanding (approval) Formal approval of the "Protocol of Understanding" by the Tuscany Regional Government. The Protocol of Understanding, as stated in the premises of the resolution, **is created to support** and **is in line with** the priorities of **the Regional Operational Programme ERDF 2014-2020.** [*Implementation activity*]	Regional	Regional Government Resolution n°382 of 25th March 2019
Protocol of Understanding (signing) Formal signature of the document by the representatives of the institutions by electronic signature. [*Implementation activity*]	Regional	July 2019
Dissemination and exchange at the TANIA final Phase 1 and bridge event	Regional	19th November 2019

Participation and exchange, together with some TSG key stakeholder at the workshop on (nano)remediation innovative solutions hold in Lahti within the TANIA final Phase 1 and bridge event. [*Elaboration activity*]		

Work plan within TANIA Phase 2 – IMPLEMENTATION of the Action	
Activities planned at interregional and regional level in Phase 2 (January 2020 – December 2021)	
Activity / Description	**Timing (month/year or specific date where possible)**
Protocol of Understanding (activity implementation) Implementation of several activities under the common roof of the Protocol of Understanding in order to pave the ground to the setup of the open laboratory. These mainly will focus on: - Identify the **value and benefits** that a regional investment policy addressed to the TANIA challenges could produce with a view to the industrial and territorial regeneration of brownfield areas. - Identification and sharing of **specific objectives (projects, intervention areas, policy strategies**) related to environmental remediation to be developed in the context of Smart Specialisation Strategy (RIS3), Industry 4.0 and circular economy policies and activities increasingly related to the Blue and Green Economy. - **Dissemination and knowledge awareness activities** about regional environmental needs and opportunities offered by new technologies and (nano)remediation to businesses and public administrations. This activity will be done all along the Phase 2 together with TSG and benefiting of the organization of the TD Materials. - Elaboration of an **operational proposal** for the Open Laboratory research activities to be submitted to the attention of the public and private regional research system. - Identification of a suitable place for the **start-up** of the Laboratory. - Identify the best **technologies** for environmental remediation to be applied in the regional context. - Involvement of public-private **stakeholders** and **potential**	From September 2019 to the end of the Phase 2 period

investors. The activities will be carried out by the signatories of the Protocol with the involvement of different public-private actors belonging to the TSG.	
<u>Pilot Action</u> **Mini (nano)remediation Laboratory In Tuscany (GISFI-SOILIA practice transfer)** ACTION 2 is very ambitious with implications which goes beyond the improvement of the ROP ERDF. The potential creation of the laboratory requires consensus and input from many regional stakeholders. The Protocol of Understanding is on this track, but the **practices** identified in France and Finland – and particularly the workflows models and the existing organization system between the public and private systems around the GISFI station and the SOILIA centre - **need to be tested** also in Tuscany before being rolled out. Consequently, the Tuscany Action Plan (and specifically the Action 2) was presented together with a request for **an INTERREG EUROPE Pilot Action** in order to support the effective transfer of the GISFI-SOILIA practices in Tuscany by the **setting up of a mini-laboratory in test conditions where to put into practice the lesson learnt**. The mini-laboratory want be placed in one of the ISPRA (Livorno) or ARPAT premises in Tuscany, which already has sufficient infrastructure, equipment and space to recreate the concept proposed by the experiences of GISFI-SOILIA. The testing activities is targeted at reproducing the different workflows to scale, together with the technical and bureaucratic problems they imply, in order to find the appropriate solutions. The Pilot includes also a new quick working tour in order to deepen the case studies. In particular, two visits will be held at the GISFI Platform in Grand Est and the SOILIA Centre in Päijät-Häme, during which a selected group of Tuscany representative composed by LP, RT and experts will have the opportunity for an exchange both with the laboratory owners and users. Study visit, including focus sessions with local stakeholders. The pilot action was approved in March 2020. (For better details please refer to the pilot action document, Annex 1 to the present document)	March 2020 – February 2021

Setting up of the Lab, on the basis of the results above The activities will begin with the preparation of a detailed feasibility study of the open laboratory. From October 2021 on evaluation and roll out of piloted laboratory. The objective is to close phase 2 (end 2021) by at least setting the laboratory on the right tracks.	Startup within end Phase 2

Stakeholders involved	
Name of Organisation / person (where possible)	**Role in Action Plan (c.200 characters)**
ARPAT Regional Agency for the Environmental Protection of Tuscany	ARPAT collaborates in the identified path, in the legislative deepening about the innovative applications in the field of environmental remediation and in the drafting of the mentioned Protocol of Understanding.
ISPRA Higher Ministry Institute for Environmental Protection and Research	ISPRA collaborates in the identified path, in the legislative deepening about the innovative applications in the field of environmental remediation and in the drafting of the mentioned Protocol of Understanding.
Regional Technological District for Advanced Materials (TD Materials), which includes: - Members of the Steering Committee (10 people) - Members of the Technical-Scientific Committee (12 people) Industries, SMES and research organizations belonging to the District (around 170)	TD Materials one of the 12 districts created by the Tuscan Regional Government, in order to reorganise and rationalise the local technology transfer system TD gathers several key actors such as **entrepreneurs, researchers, technicians**, dealing with or wishing to invest in Advanced Materials in order to get innovation in own production process and products. LP is the managing entity of the TD Materials. Role: participate and propose technical solutions/projects to be developed within the open Laboratory.
INSTM Consortium (several members coming from all regional and some national academia)	The National Interuniversity Consortium for the Science and the Technology of Materials is a relevant Italian network which links hundreds of laboratories and public researchers in the NMP Sector. INSTM is also member of the TD Materials and support it in evaluating

	GISFI/SOILIA solutions. Several INSTM members participated to TANIA TEEs and TSG meetings.

Risk and Contingency Plans		
Description of Risk	**Level of probability (High, Medium, Low)**	**Description of Contingency Plan**
The regulatory vacuum, along with the bureaucratic aspects, can entail a risk in the development and progress of the identified Action.	Medium	The Protocol with the main environmental institutions was created with the aim of finding the best solutions in response to the current regulatory gaps. If necessary, the agreement can be reviewed and updated accordingly.

Costs and funding sources	
Costs	**Funding Sources**
<u>Cost for the implementation of the Action</u> Costs here concern the start-up process of the open laboratory. In this context, needed resources will arise: - From the in-kind resources provided by the signatories of the agreement (internal staff resources and skills) - From resources of the Technological District for Advanced Materials, led by LP and coming from Tuscany ROP ERDF 2014-2020 - From specific measures of the ROP ERDF 2014-2020 (e.g. equipment) - From other resource available identified by the Regional Authority. This is the case, for example, where given the end of the ROP ERDF 2014-2020 funds and/or the slowness of the procedures to have them available, it would be preferable to use other resources in the availability of the Tuscany Region.	• In-kind resources: use of internal staff by all the stakeholders involved • Tuscany ROP ERDF 2014-2020 • Other resources available identified by the Regional Authority

- From the INTERREG EUROPE Programme limited to Pilot Action activities	

Monitoring		
Self-defined Performance Indicators		
Indicator	**Target**	**Means of Verification**
N° of pilot/project initiatives using NMP for green purposes and benefits for environment	3	Indicator is proper, BUT it is unlikely that there will be time to verify it in the light of this specific action. Probably the most suitable indicators are those proposed below
Output Indicators		
Indicator	**Target**	**Means of Verification**
Approval by regional decree and signing of the Protocol of Understanding	YES/NO	Official Act
N° of stakeholders involved (institutions, research organization, entrepreneurs)	>10	Level of interest and sharing of the identified action
Setting up of the Open laboratory	YES/NO	Final achievement
Territorial Impact		

The creation of a regional Open Laboratory entirely dedicated to the experimentation, verification and demonstration of innovative technological solutions for the environmental remediation of water, sediment and land - especially if under the control of institutions responsible for environmental protection - would **represent an effective *bridgehead* for the development of a new business sector** with a huge economic potential and benefits for the territory.

Through the open Laboratory, in fact, it would be possible to **break through the rubber wall** that today consists of regulatory gaps and bureaucratic procedures that slow down research, hinder in-situ experimentation and, as a result, inhibit companies and entrepreneurs from investing in innovation for the environment.

This would be of particular significance in Tuscany where it is present (see also Part II):

- a diversified natural environment and a heterogeneous geography (sea, rivers, mountains, flatlands and hills) distributed over a relatively limited area
- a distribution of contaminated areas (mainly caused by pressure and human activity) already identified and mapped
- a growing responsiveness to the Environment and its preservation

- a strong inclination towards research and innovation stimulated by the presence of numerous public universities and private research laboratories

The possible factors of territorial impact to be considered are therefore many and varied and also in this regard it is necessary to develop a feasibility study.

However, the main beneficiaries of full implementation of ACTION 2 would certainly be:

- **researchers**, dealing with environmental sciences (ecotoxicologists, chemists, geologists, agronomists), but also engineers, biologists and material technicians, who would find in the open Laboratory the ideal habitat and equipment through which to develop their ideas
- **entrepreneurs,** also perceived from very different points of view such as:
    - **young entrepreneurs**, for example young researchers, and start-ups able to develop their technical-scientific knowledge in an entrepreneurial way or to take advantage of the opportunities offered by the policies supporting the new entrepreneurship to invest in an advanced sector of remediation industry 4.0,
    - running **SMEs**, already working in the field of environmental remediation, eager to update their skills and invest in the future of their company, for example through the development of tailored or adaptable environmental remediation solutions,
    - **large/medium industries**, dealing with very different sectors, but whose production processes cause pollution for land and waters (e.g. agri-food, dairy, chemical, oil and gas, manufacturing) to be remedied
    - **public-private companies** (e.g public utilities) **or consortia** for land reclamation and protection dealing with the management and monitoring of water and land and related pollution problems

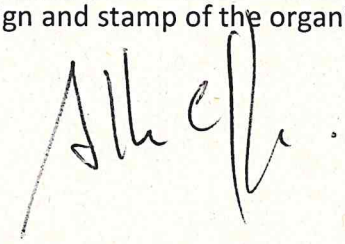
  Each of the above categories of *entrepreneur* would find in the laboratory the necessary skills and equipment not only to develop, but also to test, demonstrate and validate in an "industrially relevant environment" (TRL 5/7) - and under the control of the monitoring institution for the Environment - own suitable technological solutions local public-private entities
- the same regional **monitoring and regulatory institutions for the environment**, which would find in the open Laboratory the perfect environment where to develop and test standards and procedures for monitoring and control of remediation solutions.

Official Signatures

ASEV – Agenzia per lo Sviluppo Empolese Valdelsa (Lead Partner)

Date:	20th March 2020
Organization (Italian)	ASEV – Agenzia per lo Sviluppo Empolese Valdelsa
Organization (English)	ASEV – Agency for the Development of the Empolese Valdelsa
Name	TIZIANO CINI
Signature	Sign and stamp of the organization (if available) 

Regional Government of Tuscany

Date:	20th March 2020
Organization (Italian)	Regione Toscana - Direzione Attività Produttive
Organization (English)	Regional Government of Tuscany - Production Activities Directorate
Name	ALBINO CAPORALE
Signature	Sign and stamp of the organization (if available)  

Annex I – Pilot Action

Request for pilot action

IMPORTANT: Before completing the template, the lead partner should first check the idea of a pilot action with their Policy Officer in the Joint Secretariat.

Pilot actions are implementation-related activities dedicated to testing a new approach. This usually refers to the transfer of existing practices between partner regions. But it can also relate to a new initiative jointly designed by the partner regions during phase 1 and jointly implemented in phase 2. As reflected in the present form, pilot actions are possible under Interreg Europe under strict conditions only, and the description provided in the form should be as detailed and as clear as possible.

A request for a pilot action must be submitted to the programme as soon as it is ready and by the end of phase 1 at the latest. It will then be assessed by the Joint Secretariat which may require further clarifications. In case the pilot action meets the programme's requirements, the Joint Secretariat will recommend it for approval to the Monitoring Committee. If approved, the application form will be updated through a 'request for change' procedure. Further information can be found in section "4.2.2 Phase 2 – monitoring of the action plan implementation" in the programme manual.

Project Acronym:	**TANIA**
Project Index (PGI):	**PGI02125**
Title of the pilot action	**Mini (nano)remediation Laboratory In Tuscany (GISFI-SOILIA practice transfer)**
Policy instrument(s) addressed:	**Regional Strategy for Industry 4.0 – Guidelines for implementation of the Industry 4.0 Strategy (2016, and subsequent updates and related acts)**
Partner(s) concerned:	**PP-01 ASEV, PP-08 Region of Tuscany** Minor participation of PP-03 Univ. Helsinki and PP-05 Univ. Lorraine
Country (countries):	**Italy**
Date of request:	

Pilot action summary (information to be published in case of approval):

Please summarise in one sentence the pilot action requested.

The pilot action tests creation in Tuscany of a laboratory for experimental treatment of contaminated soils and sediments, through innovative environmental remediation techniques, by setting up a mini-laboratory in test conditions.

A. Relevance of the request

A.1 Nature of the pilot action

Please describe what will be tested in the region? What is the precise nature of the activities envisaged?

In Tuscany, the TANIA Action Plan brings together innovation policy with environment policy, with a view to **develop a new business sector oriented towards site-specific environmental remediation** of contaminated water and soil (Green Businesses 4.0).

To achieve this objective and support policy improvement, it is necessary to **deal with several needs** highlighted during the TANIA interregional learning process. One is the **regulatory vacuum concerning authorisation for wide use of new environmental techniques and technologies. The other is the lack of knowledge and awareness** about the new solutions proposed for environmental regulation and about the opportunities in terms of cost/benefit ratio that they represent.

In this context, **ACTION 2** in the Tuscan Action Plan (Remediation 4.0) is designed to set up an open **regional laboratory for the experimental treatment of contaminated soils and sediments** through innovative environmental remediation techniques.

Phase 1 of the TANIA project has already set in place a number of important activities to this end. The idea emerges fully from interregional exchange, as detailed in section A.2.3. Therefore, Tuscan partners have dedicated much time to working with French and Finnish partners to learn about the good practices at the basis of this action (GISFI in France and SOILIA in Finland).

Moreover, the potential creation of the laboratory requires consensus and input from many regional stakeholders. To this end, the Tuscan partners have worked hard to engage with stakeholders and to define and sign an agreement (Protocol of Understanding) between the two TANIA partners and two environmental and regulatory bodies (Regional Environmental Agency and Institute for Environmental Protection).

With this agreement, regional parties committed to taking work forward in order to test the feasibility of the open regional laboratory and to define the most suitable location, structure and procedures. The Pilot Action fits into this agreement. While the partners now have a clear idea of the original good practices in the French and Finnish context, the transfer into Tuscany requires a test phase.

Therefore, the Pilot Action proposes the set-up of a mini-laboratory. This mini-laboratory would use premises and equipment that are already available in one of the regional party's premises (thus no need for investment in equipment). It would link up with ongoing remediation projects and initiatives in the region, setting agreements with them to use the mini-laboratory for their activities. It would apply elements of the service model used in the original GISFI and SOILIA experiences, thus testing the conditions for a transfer of these laboratories into Tuscany.

In this way, the mini-laboratory would test a number of aspects that need to be consolidated in order to invest in the permanent version of the open laboratory:

- the needed **infrastructures** and proper geographical location;
- the **functional and operational requirements**, including necessary spaces and **equipment;**

- the **management and working operational structure**: partners, roles, tasks, professional figures, including links with the public research system, environmental protection and monitoring institutions, the private land management system and the hydrogeological system (e.g. reclamation consortia, utilities, etc.);
- innovative **technologies and solutions to be tested**.

On the basis of this test, the regional parties will be in a position to take the necessary decisions for the full-scale creation of the open regional laboratory.

The test will help the regional involved actors to verify operatively the characteristics of the laboratory, both to evaluate what organisational and technical features could be reproduced from the French and Finnish experiences and to observe which aspects would need to be adjusted and/or redefined.

Who will be the main beneficiaries of the pilot action?

The main beneficiary of the pilot action is the Tuscany Region as a whole. The region is represented in the TANIA project by LP (**ASEV, PP-01**) and the Tuscany Regional Government (**RT, PP-08**). However, the beneficiaries of the Pilot Action will also be:

- the two environmental and regulatory bodies (ARPAT - Regional Environmental Agency and ISPRA - Higher Ministry Institute for Environmental Protection and Research), already signatories to the regional Agreement;
- regional bodies (private and public) involved in remediation activities and invited to use the mini-laboratory to test new techniques;

On the long term, the open regional laboratory seeks to reduce pollution in soil and water sources across the region, thanks to the use of innovative techniques, and to create the conditions for the growth of a 4.0 remediation business sector.. This will have important socio-economic and environmental impacts on the region, with the beneficiaries being land-owners and users. The mini-laboratory is the first step towards this.

A.2 Compliance with the programme requirements

Please explain further how the pilot action complies with the programme's requirements in terms of:

A.2.1 Policy relevance

How will the pilot action contribute to improving the policy instrument addressed in the action plan? (Pilot action must be part of the action plan of the concerned region)

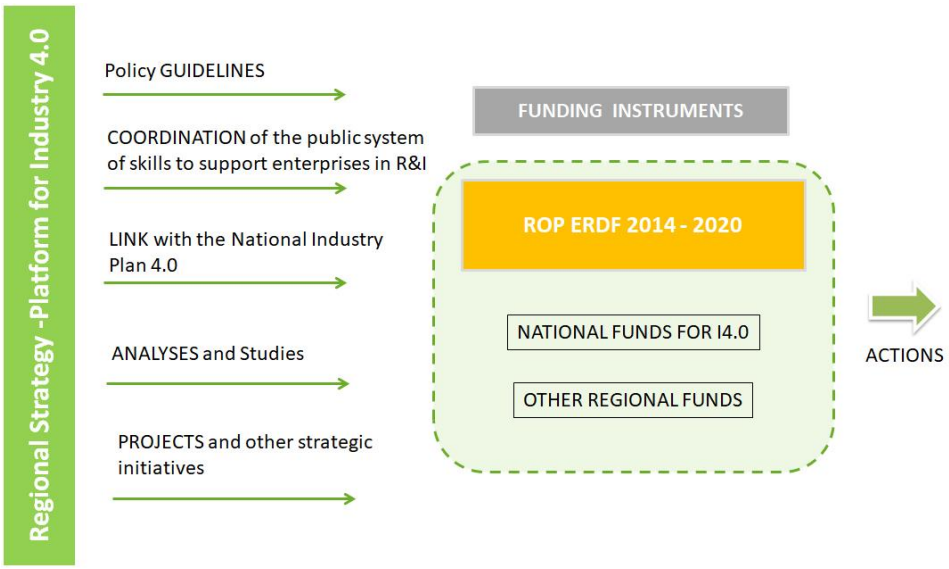
The Pilot Action addresses the policy instrument Regional Strategy for Industry 4.0 – Guidelines for implementation of the Industry 4.0 Strategy (2016, and subsequent updates and related acts).

Since 2016, and based on European and National level policy initiatives, the Regional Government of Tuscany has identified industrial modernisation as a priority for all sectors of its economy. The Regional Government has made a concerted effort to coordinate all regional development initiatives and funding in order to ensure that Tuscany moves towards digital transformation and modernisation.

The Policy Instrument to be improved within TANIA is the Regional Strategy for Industry 4.0 – Guidelines for implementation of the Industry 4.0 Strategy. This is the official starting legislation for the Industry 4.0 strategy

in Tuscany (April 2016)[1] and all subsequent measures are authorised by this and make reference to this. This was swiftly followed up by the legislation to create a 4.0 Platform in Tuscany (November 2016)[2].

The Regional Strategy for Industry 4.0 is an operative strategy, born directly from the Regional Smart Specialisation Strategy[3]. As RIS3, the strategy does not have its own resources, but it can use the ERDF funds - or others that may be available to the Regional Authority - for its own purposes. The following diagram shows the relationship between the two instruments:



The Regional Direction for Production coordinates the Regional Platform for Industry 4.0, which has among its objectives:

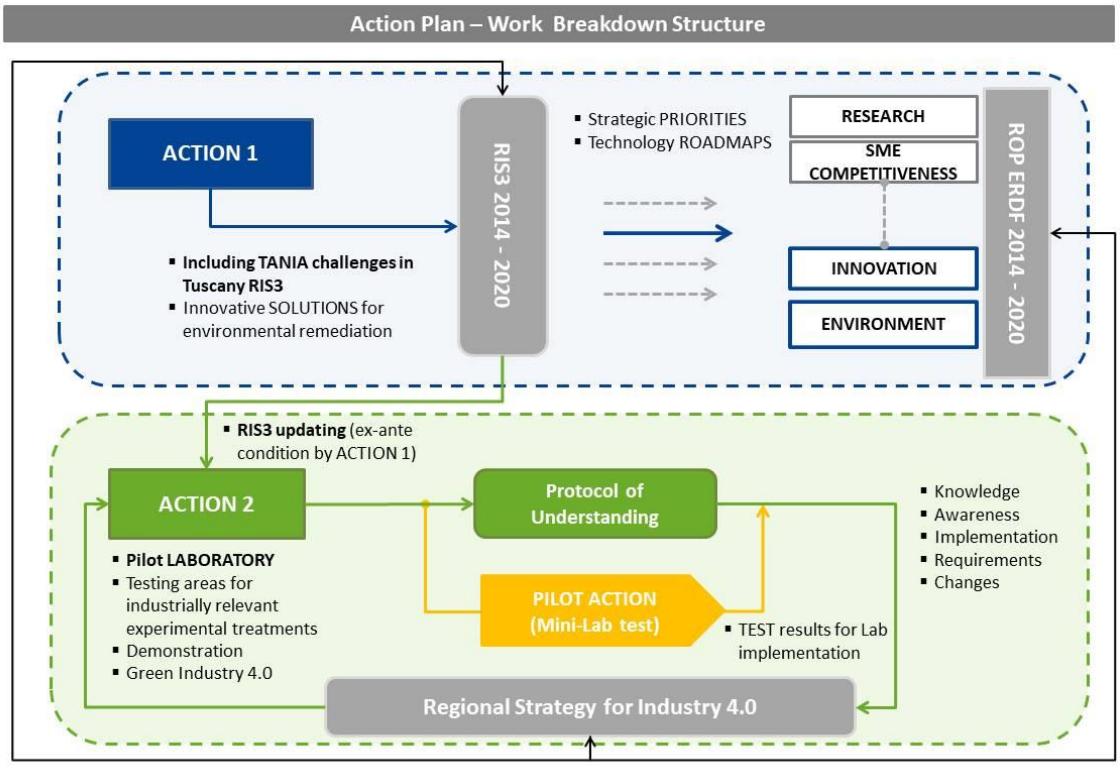
1. to promote technological, organisational and socio-economic content related to industrial modernisation among enterprises;
2. to propose technical content for regional actions and interventions finalised towards the introduction of new technologies in enterprises, in line with regional specialisations.

The European position (also detailed in the Interreg Europe policy brief on industrial modernisation) stresses that the concept of industrial modernisation relates to areas such as high-performing manufacturing, Key Enabling Technologies, digital transformation, advanced materials, new processes, as well as service innovation concepts. The Regional Strategy for Industry 4.0 reflects this. The Regional Government calls on a number of regional technological districts to support industrial modernisation and, as such, application of the regional strategy. This includes the regional district for Advanced Materials[4], which sustains the applications of these KETs in a number of sectors including that of environmental remediation (see also Action 1 above, where this has been strengthened within the updated RIS3).

The Regional Direction for Production, TANIA partner, is thus committed to ensuring that research and innovation in all regional fields goes towards supporting this policy objective and comprehensive regional

[1] Regional Government decision n. 20 (11.4.2016), “Indirizzi per l’attuazione della Strategia Industria 4.0”;
[2] Regional Government decision n. 1092 (8.11.2016), “Strategia Industria 4.0. Piattaforma regionale di sostegno alle imprese: composizione e compiti”
[3] The Regional Smart Specialisation Strategy and the ERDF ROP are improved within Action 1 of the TANIA Action Plan for Tuscany, thus forming a solid basis for Action 2.
[4] See decision n.1092 above and Regional Government decision_n.1362 _(10-12-2018) NUOVO SCHEMA Piattaforma I4.0

strategy. A policy improvement is thus understood as a **concrete initiative** of direct relevance to (and directly referencing) the Regional Strategy for Industry 4.0, and taking forward its objectives for regional development.



The image over demonstrates how this Pilot Action fits into the overall Action Plan and Policy Framework in Tuscany.

A.2.2 Durability

How will the results of the pilot action be evaluated? What are the measures envisaged to ensure its durability and / or generalisation in case of success? These actions should also be reflected in the work plan (section B).

The Pilot Action will generate an immediate, concrete result, represented by the set up and short term running of the mini-laboratory. Results will be documented in a full report. .

Moreover, the pilot is **fully embedded into ACTION 2** of the Tuscan Action Plan (developed in full collaboration with the Regional Government of Tuscany). Action 2 proposes the creation of the laboratory, using the results that will emerge from the Pilot Action. Specifically, following the Pilot Action, the following activities will be carried out:

- Creation of the full-scale lab. This includes the allocation of resources from the funding sources identified, including any regional funding and procedures to activate them;
- Insertion of the full scale lab as an integral part of the Industry 4.0 Platform of the Regione Toscana (set up within the Regional 4.0 strategy), with all necessary regional procedures;
- Activation of the full scale lab facilities. These would be used to test the effectiveness of new remediation techniques. These testing projects may be proposed by private users, by public users and / or by consortia with project funding (regional or European funding). Testing would promote the wide scale application and eventual market launch of these techniques.

In addition, the pilot action will be managed **within the framework of a Protocol of Understanding.** This agreement is addressed to "*setting up of a regional open pilot laboratory for the experimental treatment of contaminated soils and sediments through innovative environmental remediation techniques*". It was approved

with the Regional Government Resolution n°382 of 25th March 2019 and by TANIA partners ASEV and the Regional Government of Tuscany and two relevant environmental institutions: Regional Agency for the Environmental Protection of Tuscany (ARPAT) and the Higher Ministry Institute for Environmental Protection and Research (ISPRA). With this agreement, the signatories of the protocol commit to ensuring the long term durability of results. They will be the first guarantors and monitors of the Pilot Action, on the basis of the roles defined within the agreement.

Concerning resources, the laboratory will benefit as well of the signed agreement. As reported in the Action Plan, while the start-up process will rest mainly on the shoulders of the signatories (in-kind resources, using internal staff and existing equipment) in order to support the long-term establishment of the laboratory several approaches will be pursued.
In first instance, due to the public nature of the signatories, reference will be made to ERDF or national funds (Ministry for Environment). Concerning ERDF, taking into account the running ROP ERDF 2014-2020 structure, the most appropriate measures to consider concerns the Axis I "*Strengthen research, technological development and innovation*" and particularly the objectves:

- **OT1a** - **Strengthen the infrastructure for research and innovation** and the capacity to develop R&I excellence and promote centres of competence
- **OT1b** - **Promoting business investment in innovation and research** and developing links and synergies between businesses, research centres and higher education institutions

In this context, the follow up of the pilot action could consider the remaining funds under Axis I for research, development and innovation, which from mid 2020 will include also the 47.5 M€ of the OP Performance Reserve unlocked by EC in summer 2019 for the positive results obtained as at 31th December 2018: a policy decision is expected in early 2020 about whether to allocate this sum as a percentage to the different measures of the PO or to allocate funds to specific strategic projects for a faster implementation.

As well, benefiting of the national role of ISPRA (Higher Ministry Institute for Environmental Protection and Research) the possibility of drawing on ministerial funds for environmental research will also be followed up.

When fully operational, however, the common idea is to open the laboratory to public research (universities, INSTM consortium) and businesses too. This will be done both in terms of establishing a public-private partnership for the management of the laboratory and to encourage its use for specific investigations and testing of technological solutions of industrial relevance (>TRL5). In the first case the partnership will be pursued, for example, with large public-private companies managing water, land or environment (e.g. public utilities, reclamation consortia).
In the second case, the laboratory (skills, competence, facilities, equipment) will be rented for the management of investigation campaigns or testing of solutions on specific pollution contexts (e.g. to companies in the chemical, food, mechanical, mining, etc.), Several TANIA stakeholders already declared their interest at this purpose.

Finally, the idea of using the next Green Deal EU funds just announced by the new Commission is also on the table these days.

A.2.3 Interregionality

How is the pilot action linked to the interregional exchange of experience process? How does it relate to knowledge / practices learnt from other project partners?

The Pilot Action and ACTION 2 arise from two successful cases (good practices) identified during TANIA Phase 1.

Partners from France and Finland have both created open air public-private laboratories, where innovative solutions and methodologies for the environmental remediation on polluted soils and sediments can be tested and validated in industrially relevant conditions. These are the **GISFI Station** in the Grand' Est Region and the **SOILIA Centre** in the Region of Päijät-Häme.

Both practices resulted to be of considerable interest to the regional authorities and stakeholders with a view to setting up a laboratory in Tuscany inspired by them, but tailored to the specific local needs. Indeed:

- Practices offer two similar situations, but with substantial differences in application. In France, the **GISFI Station** was built right on the ground where the problem of pollution was present, testing in situ various types of solutions. In Finland, the **SOILIA Centre** was created in a non-polluted area, transferring to site conspicuous quantities of polluted soil/ sediments from other territories.
- Both in France and Finland national regulations are not more flexible than in Tuscany:
    - in France, the environmental protection authority is prudent and rigorous in terms of innovative solutions applied to environmental remediation. The French partners have managed to work within this regulation, but still addressing remediation issues in the context of industrial redevelopment paths that they had to face as a result of the steel industry crisis.
    - In Finland, without the burden of the crisis, the solution adopted was the most appropriate in relation to local needs, namely to tighten collaboration between universities and business and to do preliminary tests that can support decision making procedures of the authorities.
- Moreover, in Grand' Est region an integrated approach for the reclamation, the sustainable management and reuse of brownfields and other degraded lands was developed (LORVER strategy). The solution is based on the administrative, technologic and scientific expertise acquired in the Lorraine area (now Région Grand' Est) over the years for the management of brownfields thanks to the close cooperation between the governments of France and of the Region, administrative institutions, companies, and academic institutions gathered within the **GISFI Station**.

TANIA Exchange Events held in France on November 2017 and Finland on May 2018 contained presentations of the good practices and on-site visits. Moreover, a dedicated Bilateral Exchange event with the representatives of both the centres was held in Florence on 17th January 2019 in order to deepen "*how they did it*" and open the discussion and exchange with a selected number of regional stakeholders and TSG members. Finally, at a second TANIA Exchange Event held in France (May 2019), the Director for Production for the Regional Government of Tuscany participated in order to learn more about the GISFI station and its policy background.

Within the Pilot Action, interregional exchange would continue to some extent as the parties involved in the set-up and running of the mini-laboratory would visit once SOILIA and GISFI. The TANIA partners have visited these sites in Phase 1 of the project, but the other Tuscan regional stakeholders have not. These visits would allow them to see the examples on the field and would facilitate the setup of the mini-laboratory, Currently in fact, a partial knowledge gap still remains, with the exchange carried out within TANIA being more specifically related to the project activities than to the actual implementation of the open laboratory. The visits would take place early on in the pilot (Month 1 or 2). The French and Finnish partners would then be provided with updates on the Pilot Action process and the possibility to comment on the work, on the basis of their experience.

A.2.4 Additionality

Why can the pilot action not be financed by the policy instrument addressed or by other local / regional / national funds?

The Pilot Action is designed as a tool to permit activation of different funding sources to later establish the full-scale laboratory. At this early stage, the regional government requires the concrete results that will emerge from the test phase in the form of the mini-laboratory, in order to activate funding for later stages. For example:

1. The selection of the location is important. The mini-laboratory will be tested in a set location and results will show if this is the best site or if other sites would be more appropriate. ;
2. The definition of required equipment and infrastructures is necessary to provide a complete financial prospective, which will not only clarify amounts required but also typology of investment. As above, there are some funding options for equipment / infrastructure, but solid evidence is required to activate them and the Pilot Action will show what is needed in addition to equipment that is already available in the region (specifically in the mini-laboratory site);
3. The selection of structures / management procedures, thus defining who will be involved and how. Again, with this carefully analysed information, tested in the mini-format during the Pilot Action, it will be possible to define how stakeholders should participate, with which role and competencies and with what possible financial input;
4. Participation of regional entities engaging in remediation activities. They will be involved in the mini-laboratory, with the chance to test the service. Their feedback on their willingness to use such a laboratory and under what conditions, will be important to define aspects such as financial structure and services to be offered.

Further options about possible funding sources for the full scale open regional Laboratory, following Pilot Action results, can be summarized as follows:

- ERDF funds: Remaining funds for research, development and innovation, including the 47.5 M€ of the Performance Reserve recently (June 2019) unlocked by EC for the positive results obtained as at 31th December 2018, split into several measures or pending a policy decision (early 2020);
- Private-public partnerships with stakeholders and private payment for the use of laboratories once the facilities are active (modalities to be proposed, using feedback from the stakeholders and beneficiaries involved in the mini-laboratory);
- Other regional resources, related to local economic development, environmental protection and the Industry 4.0 Strategy.

B. Planned activities

Please describe precisely the different activities to be implemented for the pilot action during each semester of phase 2.

NOTE: The pilot action takes place over a period of about 10, maximum 12 months starting from March 2020. In this context activity will run from the middle of semester 1 until the beginning of semester 3 of phase 2.

PHASE 2
Semester 1
Activity will start in March 2020 (around mid-semester, see GANTT diagram under). The first step (**Concepts for the mini-laboratory**) will be dedicated to paving the ground for the activity. In the first instance, the work carried out during TANIA Phase 1 will be reviewed and analysed together with key members of the TANIA stakeholder Group and the environmental institutions joined in the formal Protocol of Understanding. In particular, they will examine: - the learning process carried out with TANIA, the practices identified in France and Finland, the **general objectives** underlying the implementation of the Pilot Laboratory; - the **reference scenario** - with a particular emphasis on the areas of Livorno and Piombino (planned site to test the mini-laboratory at the facilities of ISPRA) and specifically: o Environmental criticalities: identification of the main environmental criticalities (causes, matrices, contaminants, effects, diffusion, etc.) of the Livorno and Piombino sites (or others previously identified) and ongoing mitigation measures, reporting the knowledge already acquired; o Economic analysis: analysis of the main sectors and/or production areas of the Tuscan territory that are affected by environmental problems (current and/or past) such as to prevent or slow down economic development, starting from the SIN (Sites of National Interest) areas of Livorno and Piombino. - The **regulatory context** (general regulations, treatment of polluted soil/water for recovery or reuse, transport, permanent safety, etc.) in which the mini-laboratory is assessed and analysis of "*what can and cannot be done*" and possible solutions; - **Environmental remediation technologies and solutions** - Analysis of the traditional and innovative technologies that could be developed, with specific reference to the environmental pollution contexts of the Livorno and Piombino. Technical data sheets and comparison of known pro and cons; - **Mini-lab equipment**: analysis and evaluation of: current availability of facilities and equipment, hypothesis of social and economic repercussions in terms of development of research activities, including private research in the field of land reclamation, new skills (synergies with the system of higher education and university), redevelopment of disused areas, employment growth, etc. Meanwhile, as a second step, a working tour will be organised with PP03 (Univ. Helsinki) and PP05 (Univ. Lorraine) (**In-depth working tour**) in order to deepen understanding both the case studies identified in France and Finland. Two visits will be held, 1 at the GISFI Platform in Grand'Est and 1 at the SOILIA Centre in Päijät-Häme, during which a group of Tuscany representative composed of LP, PP08 RT and experts will have the opportunity to exchange with laboratory owners and users. Study visit, including focus session with local stakeholders, will be addressed to clarify the following points: a. Why did they do it? [e.g. starting need and objectives] b. How did they do it? [e.g. initial financing, partners, start-up period, necessary areas /infrastructure and their dimensioning, equipment]

c. How do they manage it? [e.g. organization chart, management, financial and administrative issues,]

d. How does it daily work? [e.g. operative working flows, roles and professionals, regulatory constraints]

e. How does it deal with regulatory constraints? [e.g. coherency with EU/national regulations for testing and experimentation activities, transport of contaminated water-soil-sediments, waste disposal, certifications]

f. Which technologies (and against which pollutants) are there tested and how? [e.g. innovative-traditional solutions, TRL level, Comparison tests on different soils and/or contaminants]

g. What are the links with local and other stakeholders? [e.g. working/business relationships with local industries and SMEs, networking activities and EU collaborations, terms of access to facilities, etc.]

In order to save travel time and costs, the tour will be arranged consecutively with one day meeting in each location. The tour will be done indicatively in month 3-4 of the pilot action (May-June 2020).

LP ASEV will be in charge of coordinating all activities in this semester. At regional level, LP AEV will work with ISPRA-ARPAT, which will act in the pilot action as a signatory of the Protocol of Understanding, and will involve key members of the TANIA Tuscany Stakeholder Group (TSG) formed in Phase 1. This includes researchers (chemists, engineers, ecotoxicologists, nanotechnologists) coming from the INSTM (National Interuniversity Consortium for the Science and the Technology of Materials) or statisticians / economists from IRPET (Regional Institute for Tuscany Economic Planning). LP ASEV will coordinate organisation of the working tours in France and Finland.

PP08 RT, with their own role and authority, will provide input to the adaptation phase and support **LP** in involving local and regional public authorities in operational meetings. They will participate in the working tour with 1 representative.

PP03 and **PP05** will support **LP** in arranging the visits in own facilities and involving local stakeholders.

Main outputs

- Technical meetings at regional (Tuscany) level with TANIA regional stakeholders and key institutions
- 2 working tours at GISFI platform (1) and SOILIA centre (1), including focus session with EU partner and stakeholders in Grand'Est and Pajaat-Hame

Semester 2

The third and key step (**Prototyping of the mini-laboratory and testing activities**) will consist in **setting up a mini-laboratory** in test conditions **where to put into practice and test the lesson learnt**.

The mini-laboratory will be placed within the new ISPRA facilities in Livorno, which already has sufficient infrastructure, equipment and space to recreate or scale model the concept proposed by the experiences of GISFI-SOILIA. The testing activities will be targeted at **reproducing the different workflows to scale, together with the technical and bureaucratic problems they imply**, in order to find the appropriate solutions. **Activities will include**:

A. Adaptation, contextualisation and **modelling of laboratory operating procedures**, **relationships** with external parties and main **workflows**:

   1. **Research activities**: activities within the laboratory, but also shared in a network with universities and other research centres:

      - *Problem*: *How can the (mini)laboratory be the driving force behind the study and development of environmental remediation solutions? How can research activities be shared in a collaborative way with regional competences and research structures (e.g. universities), in a collaborative research perspective?*

- *Target*: Modelling of activity flows following the example of the Universities of Helsinki and Lorraine]
    - *Activities*: analysing and modelling, case by case, the work flows of laboratory activity. Results summarised in technical report. Technical meetings with universities and academic spin-offs.

2. **Relationships with public and territorial bodies**, such as public administrations, environmental monitoring institutions and reclamation consortia that manage areas under environmental monitoring and remediation:
    - *Problem*: *How can the (mini)laboratory be shared (e.g. participated) and work in synergy with the different territorial institutions?*
    - *Target*: Assess the possibility of recreating the model of the consortium created for the GISFI station]
    - *Activities*: technical-policy meetings and agreements with public-territorial bodies (e.g. possible extension of the Protocol of Understanding to new entities)
3. **Co-working and relationship with private entities:** activity, exchange and sharing with private entities, such as industries, SMEs university spin-offs: modelling and testing of both solutions (very different) adopted in France and Finland, assessment and identification of a suitable model for Tuscany.
    - *Problem*: *How can the (mini)laboratory be used by private entities?*
    - *Target*: Comparison and applicability of the model for sharing the facilities of the SOILIA centre with private parties].
    - *Activities*; analysing and modelling, case by case, the work flows of laboratory activity. Results summarised in technical report. Technical meetings with industries/SMEs
4. **Transport of polluted matrices to the mini-laboratory** (see also hereunder point B.3) in order to have industrially significant quantities (high TRL) of polluted material (water/soil) available for testing:
    - *Problem*: *How could it be possible to transport a quintal of polluted soil from the industrial area of Piombino (pollution due to steelworks) or a hectolitre of water from the port of Livorno (hydrocarbons)?*
    - *Target*: Understand how to handle the rules of transport of polluted materials
    - *Activities*: regulatory analysis on use-cases

B. **Modelling of laboratory activity scenarios vs regulatory compliance** – including evaluation of the possible administrative simplifications generated by the laboratory - in relation to the Italian legislative context, particularly focusing on national Legislative Decree 152/2006 part IV "*Regulations on waste management and remediation of polluted sites*". Three possible scenarios are envisaged, on which the exchange of experiences with GISFI/SOILIA has already begun, focusing on:

1. Tests of remediation techniques to be applied directly on the environmental matrices on site [*notes*: concerning interventions proposed by a party not responsible for the contamination, the normative reference is given by art. 245].
2. Test for evaluation of reuse/recovery of production waste and residuals in the site [*note*: being research and experimentation activities on waste management, the normative reference is given by art. 211].
3. Tests of remediation techniques on matrices taken from polluted sites [*note*: although these tests are related to reclamation techniques, the matrices assume the character of waste and again the first reference is always art.211].

The activity includes, where necessary, the assessment of logistical and regulatory issues related to the need to transport to the laboratory suitable quantities for testing of polluted matrices.

Activities will concern analysis of the three scenarios and workflow modelling technical reporting.

C. In accordance with the previous point, preliminary **modelling and operational testing of a set of traditional and innovative environmental remediation technologies**, including for example:

- Adaptation and scale application testing of solutions adopted at GISFI for the remediation of soils contaminated by steel production processes [*target:* crisis area of Piombino]. These solutions, which were briefly discussed on a technical level during project phase 1, will be definitively selected and chosen following the working tour in semester 1.
- Adaptation and scale application testing of SOILIA solutions for the remediation of sediments (soils, sludge) contaminated by oils, hydrocarbons and heavy metals, including new solutions being studied and applied through the NANORAUTA project. These solutions, which were briefly discussed on a technical level during project phase 1, will be definitively selected and chosen following the working tour in semester 1.
- Experimental nanoremediation treatments to be applied to sediments coming from different harbour, marine-coastal, brackish and river areas, with different contamination levels, aiming at finding really viable solutions for the recovery and reuse of dredged materials developed in the regional project NANOBOND (TANIA good practice) [*target*: canals and rivers area of Pisa and port area of Livorno].
- Testing of other innovative treatments such as remediation technologies based on Nanosilica (effective in trapping heavy metals such as pollutants of inorganic origin present in the areas of Livorno and Piombino) and solutions based on electrochemistry (innovative technology extremely promising for the isolation and recovery of metals)

Activities will concern laboratory tests by using the mini-laboratory.

D. Integration of the mini-laboratory with the pilot plant for mechanical separation of sediments already operating at ISPRA in Livorno for the conduct of experimental tests for the treatment of contaminated marine and river sediments. The main function of the process is to separate the sediment as it is in the different granulometric fractions, then intervene on the separate matrices with chemical-physical and/or biological treatments and assess the environmental quality of the different fractions separated / treated. The plant will represent a relevant facility for the mini-laboratory test activities too.

Periodic reviews will be carried out on all activities. A working team composed by **LP ASEV, PP08 RT and key stakeholders** (ISPRA, ARPAT, INSTM) will address and implement the testing activities.

Main outputs

- Technical and institutional meetings at regional (Tuscany) level with the different stakeholders mentioned in order to participate in the construction and validate the laboratory model
- 1 mini-laboratory prototype for testing activities

Semester 3

In semester 3 activities described for semester 2 will be concluded together with the drafting of a document (report) summarising the activities carried out and guidelines for the full scale laboratory.

The results will be presented in a final workshop where all TANIA stakeholders will be invited. The workshop will be addressed in particular to those public and private entities potentially interested in investing in the laboratory or using it for remediation tests of their own interest. The workshop will also represent:

- ❑ an additional opportunity to communicate and promote the implementation activities of the TANIA Action Plan where the realization of the laboratory represents the most ambitious goal,
- ❑ a regional preview of the final international conference planned by the project in Florence at the end of Phase 2.

The time remaining after the workshop will be dedicated to the roll out of the workshop: in this context the pilot action activities will progressively merge with ACTION 2 of the Action Plan.

Activities will end by March 2021.

Following is the GANTT diagram of the pilot action.

TANIA - Pilot Action: Mini (nano)remediation Laboratory In Tuscany (GISFI-SOILIA practice transfer)																		
Time	Semester 1						Semester 2						Semester 3					
Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Concept of the mini-laboratory																		
In-depth working tours																		
Prototyping of the mini-laboratory and testing activities																		

Main outputs

- 1 Final report with recommendations/guidelines for the full scale laboratory
- 1 Final workshop

Semester 4

No content related activities should take place in this semester. The last months of the project should be entirely dedicated to the project closure.

C. State Aid

Funds used to implement pilot actions have to comply with state aid rules, in line with article 107 of the TFEU. Therefore, the JS has to assess if the pilot activities proposed by the project can be considered as state aid relevant. The activity carried out within the pilot could be state aid relevant if it has a commercial nature, is market related, it grants an economic benefit to the beneficiary that the beneficiary would not have received without the pilot and is thus able to distort the competition within the EU. If the proposed pilot action falls under state aid rules, the aid will be granted under the de minimis regulation[5]. According to this regulation, an organisation cannot receive more than EUR 200,000 of de minimis aid in the last 3 fiscal years. This means that, if the pilot action is state aid relevant and the project partner will receive de minimis aid, there will be specific procedures to follow. If the pilot benefits directly the project partner, a self-declaration will have to be provided by the project partner. In cases where third parties receive benefits from the pilot, they will be considered as the recipient of state aid/de

[5] 'Commission Regulation (EC) No 1407/2013 of 18 December 2013 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid'

minimis and projects partners bear the responsibility to ensure that state aid /de minimis rules are respected by the third parties, by collecting such self-declarations from them. Further information on state aid can also be found in section “2.7.5 State aid” in the programme manual.

In order to allow the JS to assess whether the proposed pilot is state aid relevant, we kindly ask you to reply to the questions below.

- Can any of the pilot activities be considered as an economic activity, i.e. market relevant, profit oriented or likely to improve the financial situation of the partner? Please justify as much as possible your answer, and if applicable, please explain how the pilot action could improve the financial situation of the project partner.

The partners involved are all public authorities or bodies governed by public law. The activities, closely connected to the Action Plan, are addressed to the creation of a public laboratory to testinnovative solutions for environmental remediation. This originates from a protocol of understanding signed thanks to the TANIA project at the end of Phase 1 between public and environmental institutions that do not carry out economic activities.

- Will there be a specific third party organisation or a selected group of third party organisations (other than the external experts sub-contracted in compliance with public procurement rules) involved in the pilot that could benefit from market related, or profit oriented activities, likely to improve their financial situation? If yes, please define the activities they will participate in and explain why you consider that they are market related and how they could bring an economic benefit to the third party.

No additional parties will benefit from the pilot. In addition to the indicated TANIA partners and external experts (subcontractors), the pilot action will involve ARPAT (Regional Agency for the Environmental Protection of Tuscany) and ISPRA (Higher Ministry Institute for Environmental Protection and Research) both signatories of the Protocol of Understanding (see also ACTION 2).

D. Partnership

Which partner(s) of the project will be in charge of the implementation of the pilot action?

Partner name:	Country:	Role in the pilot:
PP-01 ASEV	Italy (Tuscany)	Coordinator. As project LP, ASEV will also coordinate this pilot action
PP-08 Tuscany Region	Italy (Tuscany)	Owner of the policy instrument
PP-03 Univ. Helsinki	France (Grand'Est)	Support for the transferring of the SOILIA centre experience and practice
PP-05 Univ. Lorraine	Finland (Päijät-Häme)	Support for the transferring of the GISFI platform experience and practice

Does the pilot action require the introduction of new partners in the partnership?

No.

If yes, please specify (*)

Partner name:	Country:	Role in the pilot:
N/A		
N/A		

(*) *In order to confirm the eligibility of the new partner(s) please fill in Annex 1 – Part B Partnership for each of the new partners joining the existing partnership.*

Will other stakeholders be involved in the implementation of the pilot action?

Other stakeholders in the pilot will be:

- Representatives (experts) of the 2 public institutions for environmental monitoring (**ARPAT** - Regional Agency for the Environmental Protection of Tuscany and **ISPRA** - Higher Ministry Institute for Environmental Protection and Research) that signed the above described agreement (Protocol of Understanding) with RT and LP to set up the regional laboratory. ISPRA will host the mini-laboratory;
- Representatives (experts) of **INSTM** (National Interuniversity Consortium for the Science and the Technology of Materials) a national consortium on nanotechnologies and materials which links hundreds of public laboratories and researchers within the same university departments;
- Other entities (private and public), involved in the TANIA stakeholder group in Phase 1 and key players in regional environmental remediation. This includes, for example, companies involved in industrial waste management.

E. Budget (*)

Partner	Staff costs	Office and administration	Travel and accommodation	External expertise and services	Equipment	Total partner budget
PP-01 ASEV	10.000,00 €	1.500,00 €	1.000,00 €	13.000,00 €	0,00 €	**25.500,00 €**
PP-03 Univ. Helsinki	500,00 €	75,00 €	0,00 €	0,00 €	0,00 €	**575,00 €**
PP-05 Univ. Lorraine	500,00 €	75,00 €	0,00 €	0,00 €	0,00 €	**575,00 €**
PP-08 Region of Tuscany	1.000,00 €	150,00 €	1.000,00 €	0,00 €	0,00 €	**2.150,00 €**
Total	12.000,00 €	1.800,00 €	1.600,00 €	12.000,00 €	0,00 €	**28.800,00 €**

(*) *In addition to section E, please fill in the Excel file "Pilot Actions request template – section E budget"*

F. Questions for the Joint Secretariat

Part to be completed by the Interreg Europe Joint Secretariat

1. JS clarifications

2. JS final recommendations

State aid relevance	Yes	No
1/ Does the pilot action represent a service which allows to make profit and for which a market exists (i.e. is it considered as an economic		X

activity in the meaning of the Commission notice on the notion of State Aid (n° 2016/C 262/01)?		
2/ Could the financial situation of the concerned partner(s) improve as a result of the pilot (i.e. could the pilot action potentially distort the competition)?		X
3/ Will there be any economic benefit to third parties? (indirect state aid relevance)		X
Conclusion	**The pilot action is not state aid relevant**	

Fulfilment of criteria?	**Yes**	**No**
1/ Relevance	X	
2/ Additionality	X	
3/ Interregionality	X	
4/ Feasibility (including finance)	X	
Final recommendation	**Recommended for Approval**	

Annex 1: PART B – Partnership

B.1 Partner's details			
Name of organisation in original language			
Name of organisation in English			
Department/unit/division (if applicable)			
Legal status	☐ *Public body or body governed by public law* ☐ *Body governed by private law (only non-profit!)*		
Type of partner	☐ *local public authority* ☐ *regional public authority* ☐ *national public authority* ☐ *EGTC* ☐ *Business support organisation* ☐ *Education and research institution* ☐ *Agency (different from business support organisation)* ☐ *Infrastructure and public service provider* ☐ *Interest group* ☐ *Other*		
Address			
Town		Postal code	
Country			
NUTS 1 level			
NUTS 2 level			
NUTS 3 level			
Legal representative			
Contact person 1			
Phone (office)		Mobile	
E-mail		Website	
Contact person 2 (optional)			
Phone		*E-mail*	
Partner financed through regional operational programmes	☐ *Yes* ☐ *No* Please tick yes only if the participation of the partner is financed directly by their regional operational programme and not through Interreg Europe (see programme manual for further information)		