TRANSAT

Research and Innovation Action (RIA)

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Dissemination and exploitation plan

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Summary

TRANSAT (TRANSversal Actions for Tritium) is a 4-year multidisciplinary project built to contribute to Research and Innovation on "cross-cutting activities" needed to "improve knowledge on tritium management in fission and fusion facilities". 18 Partners are participating in TRANSAT from all the European countries involved in tritium activities. The purpose of this document is to describe dissemination activities to support project outputs based on knowledge sharing among targeted stakeholders.

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Executive Summary

TRANSAT (TRANSversal Actions for Tritium) is a 4-year multidisciplinary project built to contribute to Research and Innovation on "cross-cutting activities" needed to "improve knowledge on tritium management in fission and fusion facilities". It proposes actions answering the following main challenges addressed by the call: i) tritium release mitigation strategies, ii) waste management improvement, iii) refinement of the knowledge in the field of radiotoxicity, radiobiology, and dosimetry. To evaluate the scientific tasks to be covered by TRANSAT, all the open issues of the tritium cycle that have not been yet tackled by European research activities or by former studies have been determined. This general picture has been constrained to crosscutting fusion and fission activities. 18 Partners are participating in TRANSAT from all the European countries involved in tritium activities. The purpose of this document is to describe dissemination activities to support the deployment schemes of the project outputs based on knowledge sharing among targeted stakeholders at EC level.

Abbreviations

BWR	Boiling Water Reactor
CA	Consortium Agreement
CANDU	CANada Deuterium Uranium reactor
CEA	
EC	European Commission
EDF	Électricité de France
CEN/CENELEC	European Committee for Standardization/European Committee for Electrotechnical Standardization
CONCERT	European Joint Programme for the Integration of Radiation Protection Research
DEMO	DEMOnstration power plant
DEP	Dissemination and Exploitation Plan
DMP	Data Management Plan
ECCP	Electronic Collaborative Content Platform
EPR	Evolutionary Power Reactor
ENEA	Italian National Agency For New Technologies, Energy And Sustainable Economic Development
ENEN	European Nuclear Education Network
EPR	Evolutionary Power Reactor
EPRI	Electric Power Research Institute
EUROfusion	European Consortium for the Development of Fusion Energy
EU	Europe
GA	Grant Agreement
GEN IV	GENeration IV
GFR	Gas Fast Reactor
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
ICSI	National R&D Institute for Cryogenic and Isotopic Technologies - ICSI Rm.

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IRSN	Institut de Radioprotection et Sûreté Nucléaire
ITER	International Thermonuclear Experimental Reactor
IGD-TP	Implementing Geological Disposal of radioactive waste Technology Platform.
JET	Joint European Torus
JHR	Jules Horowitz Reactor
JSI	Joseph Stefan Institute
KIT	Karlsruhe Institute of Technology
MELODI	Multidisciplinary European Low Dose Initiative
NUGENIA	Nuclear GENeration II & III Association
KPI	Key performance indicator
OECD/ NEA	Organisation for Economic Co-operation and Development/Nuclear Energy Agency
PWR	Pressurized Water Reactor
R&D	Research&Development
R&I	Research & Innovation
SAC	Scientific Advisory Committee
SCK-CEN	StudieCentrum voor Kernenergie
SFR	Sodium Fast Reactor
SG	Stakeholders Group
UKAEA	UK Atomic Energy Authority
UNGG	Uranium Naturel Graphite Gaz
VHTR	Very High Temperature Reactor
VNS	Variable Neutron Shields
V4G4	Visegrad 4 for Generation 4 reactors
WP	Work package
WPL	Work package leader

1 Introduction

The main goal of the Dissemination and Exploitation Plan is to raise the awareness of the project activities in order to make TRANSAT a successful project with a huge charisma. Therefore, a dedicated Work Package has been implemented in order to ensure the handling of public and confidential results. This will be carried out by using different communication channels and materials and in addition by organizing summer schools, and workshops with stakeholders or by visiting conferences.

1.1 Purpose of the Dissemination and Communication Plan

This document describes the Dissemination and Exploitation Plan of TRANSAT – a R&I project funded under Horizon2020. Horizon2020 is the EU Research and Innovation programme with nearly €80 billion of funding available over 7 years (2014 to 2020).

The purpose of this document is to determine all planned communication and dissemination actions during the project lifetime, to ensure an access for all interested stakeholders to public reports and to announce potential events where the project will be represented. Furthermore, KPIs are defined in order to measure the effectiveness of the dissemination tools.

1.2 Document Maintenance

This document will be reviewed and updated as needed, as the project proceeds. This document contains a revision history log. When changes occur, the document's revision history log will reflect an updated version number, the date of the latest version, the author making the change, and a summary of the changes.

2 Communication and Dissemination Strategy

2.1 Communication and Dissemination objectives set up by the TRANSAT project

The knowledge gathered in TRANSAT will be disseminated, both inside the consortium and to the relevant stakeholders in the nuclear sector. Furthermore, the consortium as a whole has a wide network of advisors and experts worldwide (e.g. USA, Canada, Japan) who will be regularly informed and who will contribute to the dissemination and exploitation of the project's results.

The project will engage with academic, industrial peers and regulators through traditional conference presentations and manuscripts in open access journals once the experimental results have been generated. This includes also educational activities in form of summer schools, organisation of meeting with selected stakeholders, publishing of the scientific results achieved and presenting those within appropriate fora. Communication activities will also be carefully planned and monitored.

Key objectives of the dissemination of knowledge produced in TRANSAT are:

- Spreading information on the project's activities and results widely among stakeholders
- Exploitation of the project results after the project lifetime to furnish recommendations for future developments
- Ensuring the right coordination with the Scientific Advisory Committee through an integrated, targeted and participatory dissemination approach (consultations, peer-reviews, etc.)
- Ensuring continuation and sustainability of the TRANSAT results beyond the project, thus paving the way for the continuous uptake of the results across the relevant European and international communities
- Establishing synergies and boosting new collaboration with external parties, such as public authorities and international organisations, to utilise a multiplier effect, thus

contributing to knowledge building and best practices diffusion in Europe and beyond, avoiding overlap of different projects
- Linking to the EC's coordination activities on radioprotection, waste disposal management and other fission & fusion R&D initiatives

2.2 Strategy to maximize communication and dissemination activities

To maximize communication and dissemination activities, several actions will be organised to structure interactions with relevant stakeholders around the project:

- Identification of actors to establish dialogues with external entities considered as potential users of the project outcomes: established stakeholder networks (EUROFusion, ITER, IAEA, JHR Consortium, NUGENIA, MELODI, EPRI…); industrial actors (ORANO …); Technical Safety Organisations; and other stakeholders (ENEN, IGD-TP, OECD/NEA, CEN/CENELEC)
- Animation of cross exchanges with the two European Joint Programs (EUROfusion and CONCERT) and other major consortia in the field
- Creation and interaction with the Stakeholders Group (SG): covers regular invitation of pre-selected experts to the project meetings and structured discussion & their feedback on the project progress and outcomes
- Synthesis and final report on recommendations.
- Organisation of a final meeting at the end of the project to disseminate the knowledge acquired during the project. All relevant stakeholders will be invited to attend.

All identified actions are monitored in a dedicated WP (WP5: Dissemination, Communication & Stakeholders Engagement) lead by JSI.

2.3 Communication and Dissemination target audience

2.3.1 Targeted stakeholders

The TRANSAT project value chain brings together activities to be performed in order to provide the project stakeholders with representative results. The value chain presented in the table below shows the tritium production actors with challenges tackled by this project and stakeholders that shall profit from the project outcomes.

Table 1: TRANSAT project value chain

Primary tritium source	Challenge in relevant time frame	Industrial and R&D potential
GEN II & III Fission tritium production and management: **UNGG, CANDU, PWR, EPR, BWR**	Release mitigation challenge, safe dismantling plan, waste management (short term issues), improvement of knowledge on radiotoxicity, radiobiology, dosimetry (mainly due to next future dismantling activities)	*R&D institutes (CEA, ICSI, ENEA, SCK-CEN), Companies working in the field of dismantling (ORANO and its subsidiaries, NUKEM, ENEL, MAGNOX, SELLAFIELD), nuclear reactor operator (EDF, ESSENT, DELTA, Nuclearelectrica, GEN Energija, Horizon Nuclear power), OECD, IAEA, UKAEA, National Nuclear Safety Authorities, Commissions on Radiological protections Institutions promoting Radiological protection (ICRP, IRSN, Société Francaise de Radioprotection, Euratom Article 31 expert group)*

GEN IV Fission tritium production & management: **SFR, GFR, VHTR**	Conception choice for tritium source limitation and tritium release mitigation, waste management (long term issues), improvement of knowledge on radiotoxicity, radiobiology, dosimetry (mainly due to next future dismantling activities)	*ORANO, IAEA, OECD, National Nuclear Safety Authorities, Research institutes involved in GENIV activities (CEA, SCK-CEN, V4G4 Centre of Excellence, ENEA), Ansaldo Nucleare Institul de Cercetari Nucleare), Institutions promoting Radiological protection (ICRP, IRSN, Société Francaise de Radioprotection, EURATOM Article 31 expert group)*
Fusion experimental tritium production & management: JET, ITER, STELLARATOR, DEMO	Conception choice for tritium source limitation and tritium release mitigation, dismantling plan, waste management (mid-term issues: 15 years, improvement of knowledge on radiotoxicity, radiobiology, dosimetry (in particular for future dismantling activities)	*R&D institutes (CEA, KIT, ICSI, ENEA), UKAEA, ITER, Max-Planck-Institut für Plasmaphysik, IAEA, Institutions promoting Radiological protection (ICRP, IRSN, Société Francaise de Radioprotection, EURATOM Article 31 expert group)*

2.3.2 *Targeted audiences within the project's partners*

Furthermore, the TRANSAT project will contribute to increase the innovation capacity of the project partners. The following paragraphs sum up how **the consortium partners expect to profit and increase their innovation capacity from the project activities during and after its end**. For each topic in which expected impacts are foreseen, **the objectives are recalled with reference to the list presented below**.

- O1 - Refine the knowledge on outgassing and release mechanism
- O2 - Minimise the permeation source and develop tritium permeation control
- O3 - Work to develop engineering solutions for detritiation techniques
- O4 - Refine the knowledge on radiotoxicity, radioecology, radiobiology, dosimetry
- O5 - Capture and store tritium
- O6 - Refinement of the knowledge on metrology of tritium

Partner n. 1: CEA (O1, O2, O4, O6)

- Results on mechanisms of tritium release from **massive and dust materials,** in particular cement and steel which has never been studied in that perspective
- Outcomes of studies on **permeation barriers of coating issues, ageing effect and mechanical resistance** linked to optimisation processes of **innovative coating** i.e. such as PLD (Pulsed Laser Deposition) and ALD (Atomic Layer Deposition)
- Validation of **autoradiography systems** for tritium analysis dedicated to fusion/fission metallic samples, as the existing techniques are currently dedicated only to biological researches
- Improved knowledge on alternative methods to animal testing through the use of **three-dimensional (3D) in vitro human airway epithelial tissue model** for studying the toxicity and behaviour of tritiated products from nuclear field. The results will be analysed in order to determine how they are **predictive of physiological responses in rodents following inhalation**

Partner n. 2: Aix Marseille University (O4):

- For the **IMBE** lab TRANSAT is considered as follow-up of the PASSIV-ITER project (launched in the frame of the AMIDEX French Initiative d'Excellence) focused on tritiated and untritiated tungsten particles. The team will address and get results on **epigenotoxic effects in conjunction with DNA and/or chromosome damaging properties**
- **CEREGE** lab will gain expertise within the field of the **environmental fate and effects (chemical and physical stability) of material** studied in the PARAVANT project e.g. **cement, steel and aluminium particles**

Partner n. 3: CIEMAT (O1, O2)

- The exercise of benchmarking with EcosimPro tritium transport code will open a new field of work and allow application of innovative research methods
- The test of the tool in a fission system and the comparison with other codes results will improve reliability of the code

Partner n. 4: CORIA (O6):

- **Validation of innovative way to perform LIBS experiments on samples implanted with light elements** for other applications. The measurements of light elements concentration in metallic samples is tricky to perform with usual laser-induced breakdown spectroscopy

Partner n. 5: DH PHE (O4)

- Performance of **in vivo inhalation studies using tritiated aerosols** in parallel to the determination of the tritium content of samples, the particle matrix will be assessed using mass spectrometry analysis. The authors are not aware of previous studies which have undertaken such parallel analyses, and therefore they will start the **development of new approaches and protocols for such studies**, which will be used in-house and to the wider research community
- Development of models of the biokinetics of tritiated materials and of the dosimetry for these materials

Partner n. 6: ENEA (O2, O3)

- Application of the results is expected in the participation to the **design activities of ITER also in support of the industry**. Results concerning key technologies such as **anti-permeation coatings and tritiated gas and water treatment** will be applied in the studies of the DEMO reactor (EUROfusion WP Breeding Blanket, anti-permeation and anti-corrosion coatings of LiPb blanket)

Partner n. 7: IFIN HH (O2)

- The results obtained in the project shall be exploited by developing a new concept for a tritium storage facility with **minimised permeation of all tritium chemical forms**

Partner n. 9: INFLPR (O6)

- **Preparation of deuterated samples that will be used for laser technique development**. The experiments to be performed will allow understanding the interdependence between laser and RF discharge. The conclusion of comparison between characteristics of deuterium doped and undoped thin films obtained by radiofrequency assisted pulsed laser deposition will be further used for other similar experiments

Partner n. 10: IRSN (O4)

- The project outcomes will facilitate better understanding of the elementary mechanisms governing **deposition of (tritiated) aerosols and their internalization in plant biomass**, thereby developing a fit-for-purpose modelling approach for these processes
- Data from the project will be used **to update animal and human biokinetic models, bioassay functions and dose coefficients for specific tritiated material**
- The aspect dealing with the interaction of particles with vegetation has been poorly studied so far and the project outcomes will **definitely improve the accuracy of internal dosimetry for tritium**

Partner n. 11: JSI (O6):

- Development of a new method for tritium detection by nuclear reaction analysis (NRA) that would enable to study depth and lateral distribution of small amounts of tritium in the samples whose radioactivity is below the threshold of maximum allowed radiation safety limit for tritium (10^9 Bq). **The existing competence in detection of deuterium in materials with accelerated ^{3}He ion beam and Nuclear Reaction Analysis (NRA) will be then extended to the detection of tritium**

Partner n. 12: KIT (O1, O2)

- The outcome of the experimental investigations of the effectiveness of the investigated coatings will **provide references for the enhancement of the physical and chemical characteristics of the coatings**
- The project work will also trigger the development of a novel and economically attractive process for **lithium isotope separation** that is urgently needed for future fission and fusion power plants

Partner n. 13: LGI

- The project will feed LGI's own knowledge management mechanisms, including internal knowledge exchange sessions, document database, and hands-on training of consultants. In turn this will foster the staff's capacity to efficiently contribute to future R&D and innovation projects. The network of partners established in the project will also facilitate future collaborations

Partner n. 14: RATEN (O1, O2, O3)

- Update of the scientific and technical information relating to the **sources of tritium production** in Romania considering specific issues of CANDU technology
- Basic research on fundamental aspects related to the **diffusion of hydrogen isotopes** in nuclear materials (adsorption, trapping and permeation), focusing on tritium mobility
- Update of scientific information concerning the effects of the **surface state on the diffusion of tritium in materials** in radiation field, including (in cooperation with specialists in surface coatings technology) developments related with barriers against tritium permeation and potential use in CANDU reactors; and concerning **diffusion profiles** of tritium in cementitious materials (with/without reinforcing elements) and possible implications on the kinetics phenomena of aging/degradation due to hydrogen isotopes

Partner n. 15: SCK CEN (O3, O6)

- The project recommendations shall result in a **dismantling and disposal plan for the tritium getters** that are present in the obsolete Variable Neutron Shields (VNS) at SCK•CEN. This plan will lead eventually to the safe dismantling and disposal of these tritium getters
- In addition the teams will improve skills in **characterizing, dismantling and disposing off installations with large quantities of elementary tritium** (in a 10 TBq range). Also handling of radioactively contaminated NaK will become a new competence

Partner n. 16: UKAEA (O2, O6):

- Development of innovative measures and recommendations on **how to package the waste arising on site or any other future tritiated waste prior to disposal** and the construction of interim and final disposal facilities
- The comparison of the effectiveness of different **tritium measurement techniques in soft waste** could alter the strategy for tritiated waste assaying at UKAEA and other relevant organisations, i.e. ITER

Partner n. 17: UNIPV (O4)

- Project foreseen activity is a **starting point for extension of the biological modelling to other cases of radionuclide contamination**
- **New competences on internal contamination will be acquired, complementary to those more oriented towards medical applications** by the ad-hoc upgrades of the tools in the hand of the Radiation Biophysics and Radiobiology group will be provided, e.g. implementation of specific distribution due to the chemical form of tritiated products in

cellular compartments in the biophysical model for electron track structure calculations and DNA damage

Partner n. 18: UOP (O4)

- Development of reliable, reproducible and sensitive methodologies to detect tissue specific bioaccumulation of the tritiated compounds in the systems in parallel to the **compilation of tools and techniques for assessing interaction of various tritiated compounds with biological and aquatic systems**
- The team will **benefit from overall assessment and mitigation impacts of potential discharges and the models developed to limit them at source or in the environment**

2.4 Strategy to optimize interactions with stakeholders

To reach the necessary mass of experts who can bring added value to the project and also benefit from the project's results after it ends, a Scientific Advisory Committee and Stakeholders group will be established based on preliminary personal contacts and formal expressions of support to the project. Project result reviews by the experts from the scientific advisory and stakeholder groups will ensure that the project's objectives are followed and the expected impacts achieved. Annual meetings are established to organise these reviews.

2.4.1 Scientific Advisory Committee (SAC)

To increase the scientific impacts, enhance international interactions and receive high-quality feedback on performed activities, TRANSAT will establish a Scientific Advisory Committee in WP6 dedicated to the Management with recognised experts in the field who will be invited. The initial list of invited experts is summed up in the table below.

Table 2: List of contacted experts that shall form part of the SAC

Scientific Advisory Committee		
Expert name	**Organisation, region**	**Participation**
Pr Yuji Hatano	University of Toyama, Japan	Yes
Pr Seung Yeon Cho	ITER Korea	Yes
Dr Arkadiy Yukhimchuk	Russian Research Institute of Experimental Physics, Russia	under discussion
Mr David Wickenden	Magnox LTD, UK	Yes
Dr Walter Shmayda	Rochester University, US	Yes
Dr James Klein	Savannah River National Lab., US	Yes
Dr Jerome Pamela	EUROfusion, EU	Yes
Dr Scott Willms	ITER Organization	Yes
Dr Sabatier Laure	CEA, France	Yes

2.4.2 Stakeholders group (SG)

The Stakeholders group will be established in WP5 with the aim to spread the appropriate level of information to the interested and engaged public and private stakeholders. The table below sums up the actors who were identified to join the TRANSAT Stakeholders group and expressed their interest.

Table 3: List of contacted experts who shall be part of the SG

Stakeholders Group	
Organisation, region	**Potential impact**
Fusion area	
ITER consortium, international	Input to future tritium management strategies
UKAEA (JET Operator), UK	
Fission area	
SNETP, EU	Feedback on challenges described in SNETP/NUGENIA/ESNII strategic/technical documents
Western European Nuclear Regulators' Association, EU	Input for future recommendations/rules
ORANO and its subsidiaries, France & Germany	Input to tritium management strategies in the field of dismantling, fuel reprocessing, conceptual and design studies
NUKEM, Germany	Input to tritium management strategies in the field of fuel reprocessing
MAGNOX and SELLAFIELD, UK	Input to tritium management strategies in the field of decommissioning
EDF, France	Input to tritium management strategies
ESSENT and DELTA, Netherlands	
Nuclearelectrica, Romania	
GEN Energija, Slovenia	
Horizon Nuclear Power, UK	
CEZ Group, Czech Republic	
V4G4 Centre of Excellence, Czech Republic, Hungary, Poland, Slovakia	
Ansaldo Nucleare, Italy	
Institutul de Cercetari Nucleare, Romania	
ENGIE Tractebel, Belgium	

EON Kernkraft, Germany	
ENBW Kernkraft, Germany	
TEPCO, Japan	Input to tritium management strategies, in particular for dismantling operation
Cross-cutting area	
Max-Planck-Institut für Plasmaphysik, Stellarator R&D center, Germany	Input to future tritium management strategies
ETSON – European Technical Safety Organisation Network	
IAEA, international	
EC JRC, EU	Input to future R&D roadmap on tritium
European Nuclear Safety Regulators Group, EU	Input for future safety and waste management recommendations/rules
EC DG RTD (Euratom), EU	Recommendations for energy policy, input to future R&D roadmap in the field of tritium
ICPR, International Commission on Radiological Protection	Recommendation for future tritium radioprotection rules
Société Française de Radioprotection, France	
ASN, France	Recommendation for future tritium radioprotection and safety rules

2.5 Responsibilities

JSI, as work package leader of WP5 dedicated to “Dissemination, Communication & Stakeholders engagement”, is and will be responsible for the project communication and dissemination. In addition to JSI, the following research units are also largely involved in WP5:

- CEA
- LGI

Moreover, all project partners will contribute to the implementation of all relative activities.

2.6 Data, knowledge and IPR management

The consortium agreement, signed by all the parties, specifies the terms and conditions pertaining to IPR, ownership, access rights, exploitation of background and results and dissemination of results, in compliance with the grant agreement n°754586.

As part of making research data findable, accessible, interoperable and re-usable the TRANSAT partners will specify the data management life cycle in a **Data Management Plan (DMP), which is foreseen to be released in May 2018 (Deliverable D5.3)**. The plan will describe in particular how research data will be handled during and after the end of the project, what kind of data will be collected, processed and/or generated, which methodology and standards will be applied, whether

data will be shared/made open access and how data will be curated and preserved. In principle, each partner uses its own **data management system**, which ensures that all data will be properly curated after the project. **All project deliverables are envisaged to be public** and acquired project data will be proposed after consultation of all partners for curation to selected data banks (as OECD/NEA Data bank, JRC Knowledge Management system, etc.)

3 Dissemination and exploitation activities

WP5 of TRANSAT Project will ensure:

- Coordination and monitoring of the participation of partners in conferences to disseminate knowledge and results. Possible conferences are e.g. International conference on Tritium Science & Technology, International conference on Radiation Research, Symposium on Fusion Technology, etc.
- Coordination and monitoring of scientific publications, including open access journals, free (online) journals, and online repositories. The online project website will also be used to archive and make accessible relevant publication
- Increase of the visibility of infrastructures available for Tritium R&D via the publication in AIR2 Bulletin and the incrementation of AIR2D2 database

Dissemination and use of knowledge produced in the project is governed by the terms of the Grant Agreement (GA) and the terms of the Consortium Agreement (CA). TRANSAT will also fully embrace the open access policy of Horizon 2020 by providing online access to scientific information that is free of charge to end-users and that is re-usable. In the context of this project, scientific information refers to peer-reviewed scientific research articles (published in journals).

3.1 Foreseen publications and targeted journals

The planned scientific publications are separated into 4 general groups and the author(s) organisation(s) indicated.

<u>Tritium in material (diffusion, permeation, surface effects, coatings development…)</u>

- Comparison of tritium release from massive and dust for different materials: cement and steel (CEA)
- Development of new coating to control tritium permeation (KIT)
- Assessment of term sources relevant for fusion and fission reactors (KIT)
- Assessment of different types of barrier against tritium permeation (KIT)
- Experimental validation of permeation barriers based on coatings (KIT)
- Review of gas treatment technologies in both fission and fusion (ENEA)
- Demonstration of transfer of technology under operating conditions of fusion/fission;
- Assessment of a viable route for the separation of lithium isotopes (KIT)

<u>Radiotoxicity of tritium</u>

- Particles production and characterisation for radiotoxicity studies (CEA, IRSN, CEREGE)
- A paper providing details and results from the project, including model equations and model-model and model-(existing) measurements comparison could be foreseen (IRSN)
- Environmental transformation of the released particle by-products using mesocosm scale studies
- Biokinetics of inhaled tritiated particles (DH PHE)
- Toxicity, genotoxicity and behaviour of tritiated particles in human lung models (AMU, CEA, DH PHE)
- UOP team will lead a series of publications dealing with the influence of physico-chemical factors (pH, salinity and humic content) on the release of tritium in the seawater from the

supplied dust particles. We will also lead the publications pertaining to tissue-specific bioaccumulation and potential biological effects on a representative marine organism.

- Modelling of radionuclide concentration/dose deposition at the cellular/tissue/organ level (UNIPV)
- Development of specific biokinetic models (IRSN)

Tritium measurements

- Measurement by laser techniques of low level concentration of deuterium in deuterated Al and steel under LIBS picosecond/femtosecond regime (CORIA)
- Measurement by laser techniques of low level concentration of tritium in tritiated Al and steel under LIBS picosecond/femtosecond regime (CORIA)
- Modelling of a LIBS double pulse of the experimental results obtained (CORIA)
- Tritium measurement by autoradiography (CEA)
- Deposition of deuterium doped Al thin films and deuterium doped stainless steel thin film for development of the measurements techniques (INFLPR)
- Deposition of deuterium doped stainless steel thin films layers characterization (INFLPR)
- Development of new ion beam technique for tritium detection for fusion and fission applications (JSI)
- Measurement of tritium inventory in fusion samples by nuclear reaction analysis method – comparison of retention to deuterium (JSI)
- Tritium systems behaviour under transient/non-steady states (UKAEA)
- Permeation model upgrade, validation and prediction capabilities (UKAEA)
- Surface interface exchange rates of tritium in wet media (UKAEA)

Waste management and dismantling studies

- Dismantling and disposal plan for the tritium getters (SCK CEN)
- Assessment of the permeability of disposal facility container relevant materials to tritium at lower temperatures (UKAEA)
- A review of different techniques for soft waste characterisation and experiments on the form of tritium in soft waste (UKAEA)

The articles mentioned above will be oriented towards the following pre-selected targeted journals, ensuring a broad expert audience.

Table 4: List of pre-selected targeted journals for TRANSAT scientific publications

Journal title	Impact factors	Target audience
Journal of Radiological Protection	1.58	Radiation protection professionals, Radiation dosimetrists
Health Physics	1.19	
Radiation Protection Dosimetry	0.89	
Particle and Fibre Toxicology	8.94	Toxicologists, Risk Assessors
Journal of Environmental Radioactivity	2.05	
Radiation research	3.02	
Fusion Engineering and Design	2014/2015 1.152	Researchers in the field of tritium applications for fusion and fission
Journal of Nuclear Materials	**2.152**	**Researchers in Fusion and**

		fission material research
International Journal of Hydrogen Energy	3.313 2014-2015	Fusion technology audience
Fusion Science and Technology	0.799	
Nuclear fusion, IOP science	4.04	
Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms, Elsevier	1.389	Ion beam community
Publication of the assessment results in the Elsevier journal Applied Radiation and Isotopes	1.136	Radiation protection professionals, Radiation dosimetrists, researchers in the field of tritium applications for fusion and fission
Environmental Science and Technology	5.330	Biologists, dosimetrists, radiation protection professionals
Romanian Reports in Physics	2014/2015 1.517	researchers in the field of tritium applications for fusion and fission
Spectrochimica Acta Part B	3.289	LIBS community
Plasma Source Science and Technology	2.808	Plasma physicists' community
Journal of Radioanalytical and Nuclear Chemistry	0.983	Nuclear measurements

The monitoring of scientific articles and conference abstracts under preparation, information on targeted journals, etc. will be followed up within the WP5 of TRANSAT project.

3.2 Foreseen patents & exploitable elements

Some project partners indicated the probability to deposit a patent resulting from the project activities. The below summary provides with more information that will be further considered by the project management during the project implementation.

At ENEA patents could be expected in the field of effective anti-permeation barriers (new materials and new deposition techniques), new detritiation processes and innovative membrane devices.

KIT envisaged the two major activities, namely the development/characterisation of the coatings technics and the development of the active barrier against tritium permeation, have great potential for filling at least one patent application. Also, the activities concerning the lithium isotopes separation might lead to a patent for a very efficient lithium isotope separation technique based on the combination of techniques assessed and/or developed during this work.

The expected developments as far the validation of the coatings techniques are concerned will be used for the manufacturing of the components that realize the interface between the tritiated fluids and the non-contaminated fluids. The validation of the barriers against tritium permeation **can be commercially exploited** by ENEA, KIT and RATEN by manufacturing specific components in the future, **in particular heat transfer systems, for the fusion and fission industry.**

4 Communication Activities

Communication is strategically important to this project and it aims at sharing techniques and data in order to collectively develop a critical mass acceptable to improve our understanding and to help the regulators. In line with the "*Communication of EU Funded Projects: Transition to H2020*" guidelines, communication activities included in the TRANSAT dissemination plan focus on the promotion of the project and its results.
TRANSAT seeks to engage the following four target audience groups: Industry, scientists, policy makers and the general public. For that, the TRANSAT dissemination plan includes several communication actions summarised in Table 5. For each action, Key Performance Indicators (KPIs) are given to control the effectiveness of the dissemination plan.

Table 5: Key Project Indicators for Communication actions

Activity	Key Project Indicator
1. TRANSAT public website	At least 10 000 hits at the end of the project [M48]
2. Communication toolkit	Availability of Logo/template [M6] General project presentation (poster/flyer) [M12] Updated project presentation [M24, M36]
3. E-newsletter	800 subscribers at mid project [M24]
4. Factsheets & case studies	at least 2 factsheets and 4 series of case studies at the end of the project [M48]
5. Education & training activities	At least 1 post-doctoral position and 8 young researchers
6. Summer schools	50 participants [M24, 42]
7. Promotion at external events	Representation at external events – at least 5 [M48]

The partner's public relation / press offices will release regular updates to the public for wider promotion; the project's coordinator will also keep the EU well informed of progress. In addition, Plymouth University has a significant outreach programme that includes the annual lecture series, '*Festival of Research*' to engage the general public, and additional regular engagements with schools. It is planned to participate in workshops to disseminate project results to enhance both scientific and public understanding of environmental radioactivity. The project's public results will be relayed also via the LGI`s dissemination channels, and embedded in a broader communication on sustainable innovation which is the core value of LGI. More specifically, as secretary of the European technology platform SNETP and its three pillars, LGI may act as facilitator to ensure that the knowledge produced in the project is transferred to a larger community.

4.1 Project website

The project website is the main communication tool for the project, where all the dissemination materials will be timely published. The TRANSAT public website was designed and developed to serve as a dynamic information and Communication tool, as well as a platform for the project team.

The website URL is: http://transat-h2020.eu/

It acts as the main channel for news and updates with the aim to address the key questions that external visitors are expected to have, these include:

- What is the project about?
- What will the project deliver and why?
- Who are the partners of the project?
- What are the main advancements of the TRANSAT project?

Google Analytics is used as the main tool to monitor the statistics of the website and make changes to the content architecture if necessary.

The TRANSAT website was officially launched in December 2017 and will be continuously updated as it is an interactive environment. It will evolve with the lifecycle of the project, according to the dissemination and communication policy of the project, and will remain at least 5 years after the end of the project. A detailed description of the project website is given in deliverables D5.7, which is available on the Electronic Content Collaboration Platform (ECCP TRANSAT https://app.lgi-consulting.org/ecm/transat)

4.2 Communication toolkit

Within TRANSAT project, communication toolkit to support the promotion of the project will be produced. It includes:

- Project branding, i.e. graphic identity & logo, including QR code
- Generic project presentation under the form of leaflet and poster/roll-up. These documents will give the basic features of TRANSAT project: objectives, expected results, partnership, organisations, etc.
- Various word templates for EU and local project communication gathering key messages and one-page project description for use by all
- Deliverables, meeting minutes and presentation templates to be used by project partners

All communication materials will be available on ECCP TRANSAT (https://app.lgi-consulting.org/ecm/transat) at the latest one year after the beginning of the project.

The TRANSAT logo has been already validated by the partners during the kick-off meeting of the project and is given below:

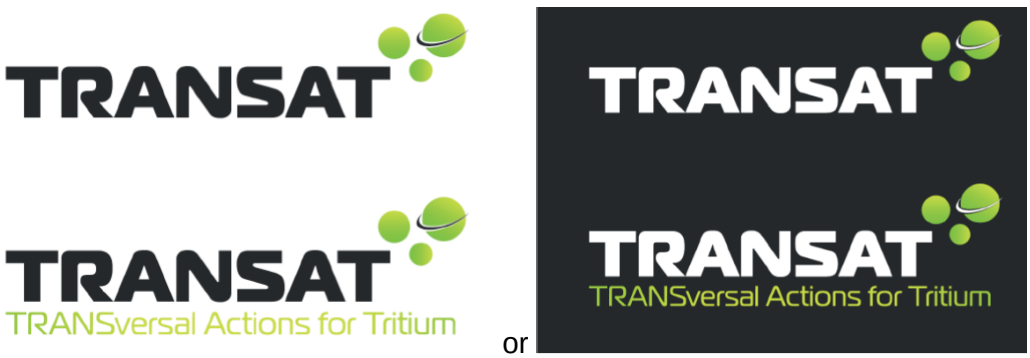

Figure 1: TRANSAT logos

Deliverables, meeting minutes and presentation templates including TRANSAT logos are already available on the ECCP TRANSAT.

The generic project presentation materials will also be available on the TRANSAT website: http://transat-h2020.eu/.

4.3 E-newsletter

At least 2 e-newsletters will be distributed to the subscribers of the TRANSAT network and promoted via the project's social networks, in order to draw attention to the project and related news. The newsletters will include for instance: a word from the coordinator, a general overview of the main results obtained, a video interview of one of the consortium partners, one highlight per work package, relevant news, relevant workshops and conferences attended within TRANSAT project.

4.4 Factsheets & case studies

At the end of the project, 2 factsheets and a series of case studies will be produced to support raising awareness of tritium.

4.5 Education and training activities

TRANSAT Project will propose education and training activities within the project with a particular focus on tritium fission and fusion cross-cutting issues. During the lifetime of the project, partners will organise students' exchanges by providing short term support for students and young post-doctoral positions within TRANSAT partners labs and relevant infrastructures.

A detailed list of postdoctoral position and students training will be tracked and monitored during the project . Furthermore, access to the summer school planned within the TRANSAT project will be opened to young researchers, PhD students and post-doctoral researchers.

4.6 TRANSAT summer schools

To gather and disseminate the knowledge on tritium, **two summer schools** (around M24 and M42) will be organised. The preliminary format of the school contains one day of lectures given by experts on general topics of tritium release management, detritiation and waste management, tritium metrology etc. The following day will cover presentations given by the work packages leaders and project partners focused on particular achievements and challenges. Posters and presentations by young researchers and PhDs will be encouraged during these schools. Both event proceedings will be public.

The first summer school is organised by JSI and will be held in Ljubljana (Slovenia) from the 25th to the 28th of March 2019. A flyer and a tentative agenda were proposed to the executive committee in February 2018 and are under approval.

4.7 Promotion at external events

Consortium partners will actively promote the project, its objectives and results at relevant external events through oral and poster presentations, distribution of project leaflets, exhibition stands.

The following list provides pre-selected events of high relevance to TRANSAT partners and beyond. The participation will be discussed case by case at project management level to ensure appropriate and efficient representation.

Table 6: Targeted conferences

Conference title/web	Approximate venue / date	Target audience
EMSLIBS conferences	Every 2 years,	LIBS community

	Pisa, June 2017	
LIBS conferences	Every 2 years, Last one in 2016, not yet announced in 2018	
IRPA: Congress of the International Radiation Protection Association	2018 - 2020	Dosimetry and particle toxicology community
HEIR: Health effects of incorporated radionuclides	2017	Dosimetry and radiotoxicology community
International nanotoxicoloy congress	2020	Particle toxicology community
International Conference on Environmental Effects of Nanoparticles and Nanomaterials	2018	
EUROTOX: Congress of the European Societies of Toxicology	2020	Toxicologists
IUTOX: International Congress of Toxicology	2020	
SOFT (Symposium on Fusion Technology)	Naxos, September 2018, every 2 years	Industry, university and research groups interested in fusion
ISFNT (International Symposium on Fusion Nuclear Technology)	Every 2 years, Kyoto 2017	Industry, university and research groups interested in fusion
TOFE (Topical Meeting on the Technology of Fusion Energy)	Orlando, 2018	Industry, university and research groups interested in fusion
SOFE (Symposium on Fusion Engineering)	Shanghai, 2017	Industry, university and research groups interested in fusion
National Conference with international participation "Progress in Cryogenics and Isotopes Separation", Romania	every 2 years, 22nd edition in October 2018	Industry, university and research groups interested in isotope separation
International Conference on Tritium Science & Technology	Every 3 years, Korea, 2019	Industry, university and research groups interested in tritium management
E-MRS (European Materials Research Society)	Twice a year, Warsaw, September 2016	Fusion and fission community
COLA (International Conference on Laser Ablation)	Every 2 years, Marseille, September 2017	LIBS community

International conference on plasma surface interactions in controlled fusion devices	Every two years, last 22nd in 2016	Fusion community
International Conference on Ion Beam Analysis	Every two years, 23rd conference, Shanghai 8-13 Oct. 2018	Ion beam community
International Conference on Radiation Research	2018	Dosimetry and radiotoxicology community
International Conference on Radioecology and Environmental Radioactivity	2019	Radioecologists
Annual International Conference on Sustainable Development through Nuclear Research and Education of RATEN ICN	Each year Rome, September 2017	Fusion and fission community
WM2018, The annual Waste Management (WM) Conference	Phoenix, March 2017	Waste management specialists
EUROMAT 2017	Thessaloniki, Greece, 2017	Fusion and fission community

5 Conclusion

TRANSAT is a transdisciplinary research and innovation project involving 18 partners in the framework of Horizon2020. In order to ensure a wide dissemination of TRANSAT results, a dedicated WP is included in TRANSAT.

Key objectives of the dissemination of knowledge produced in TRANSAT are:

- Spreading information on the project's activities and results widely among stakeholders.
- Exploitation of the project results after the project lifetime to furnish recommendations for future developments
- Ensuring the right coordination with the Scientific Advisory Committee through an integrated, targeted and participatory dissemination approach (consultations, peer-reviews, etc.).
- Ensuring continuation and sustainability of the TRANSAT results beyond the project, thus paving the way for the continuous uptake of the results across the relevant European and international communities.
- Establishing synergies and boosting new collaboration with external parties, such as public authorities and international organisations, to utilise a multiplier effect, thus contributing to knowledge building and best practices diffusion in Europe and beyond, avoiding overlap of different projects.
- Linking to the EC's coordination activities on radioprotection, waste disposal management and other fission & fusion R&D initiatives.

This Dissemination and Exploitation Plan gives an overview on the several actions that are handled to maximize the impact of communication and dissemination activities. They cover communications activities like project website/communication toolkit/summer school/education and training as well as dissemination activities like publications/patents/stakeholders meetings.