

LIFE REACHnano

Development of a web based REACH Toolkit to support the chemical safety assessment of nanomaterials

Guidance on the application of the REACHnano Toolkit

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Guidance on the application of the REACHnano Toolkit

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Purpose of the **REACHnano Toolkit** is to offer to companies throughout the supply chain an efficient, innovative and user-friends tool that will help them to comply with REACH Regulation when manufacturing and handling nanomaterials.

The aim of the present **Technical Guideline** "**Guidance on the application of the REACHnano Toolkit**" developed in the scope of the LIFE REACnano project is to support users on the implementation of the Tool.

With that objective, present Guideline is divided in different parts. Firstly, a brief background explanation introduce the REACHnano project and developed REACHnano Helpdesk in which is implemented the REACHnano Toolkit. Secondly, the objective of the REACHnano Toolkit is presented, followed by the detailed explanation of the REACHnano Toolkit functionalities. Finally, different **CASE STUDIES** are presented as practical operation of the REACHnano Toolkit's functionalities supporting users on the REACH



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1. Background

Within the context of REACH Regulation, the main issue pertaining to the use of chemicals in whatever size, shape or physical state is to ensure their safety to the human health and the environment. Therefore, since its entry into force on 1 June 2007, REACH plays a central role to ensure the protection of environment and health from risk posed by chemicals and to promote sustainable development. In this context, all available information on the substance has to be gathered and considered for the registration. However, in certain cases, a lack of reliable information exists or even standardized methods, which make difficult the direct application of REACH regulation. This is the case of nanomaterials, which properties are often exceedingly different to those demonstrated by the bulk forms.

In order to address these concerns and considering the priority areas of LIFE +, the main objective of the REACHnano project is to provide innovative instruments to improve the implementation of REACH when manufacturing or handling materials or substances at the nanometer scale, through the development of a web based Help Desk tool to support the risk assessment



and promote the safety use of nanomaterials along their life cycle, providing the industry and stakeholders with easy to use tools to support the implementation of REACH regulation.

The **REACHnano Toolkit** developed within REACHnano project, accessible via the REACHnano Helpdesk, takes into account the needs and specifications of end-users and stakeholders, including advanced functionalities that will support industry and authorities to fulfil their main task under REACH. Moreover, this interactive web application will provide an innovative tool to share and exchange information between the scientific community and politicians, enhancing science-policy integration in support of REACH legislation.

2. Objective of the REACHnano Toolkit

The main objective of the 'REACHnano' project is to provide the industry and stakeholders with innovative and easy-to-use tools to support the risk assessment of nanomaterials along their lifecycle. Its goal is thus to support the implementation of the REACH Regulation with regard to nanomaterials manufacturing and handling and ultimately improve the protection of the environment and human health from risk.

The project seeks to consolidate the knowledge base on nanomaterials properties, hazard and exposure and their risk assessment. For that it collects and evaluate the adequacy of the available information on the physicochemical, toxicological and ecotoxicological properties of nanomaterials and related exposure, use and risk management measures.

'REACHnano' develops a complete description of the current exposure scenarios across the nanomaterials lifecycle, covering the existing operating conditions, efficient risk management measures and estimated exposure levels.

With that aims, the final result of the project is a web based Toolkit to support the risk assessment and promote the safety use of nanomaterials along their life cycle. The complete set of innovative tools supporting the risk assessment process, information exchange and the information search process are freely available in the form of a web-based toolkit, being well disseminated widely to stakeholders, including SMEs and competent authorities. This interactive web



application also provides an innovative tool to share and exchange information between the scientific community and politicians, enhancing science-policy integration in support of REACH legislation.

3. REACHnano Tool Kit

From the REACHnano Help Desk users can access to the REACHnano Tool kit, as showed in Figure 1. The freely accesibe REACHnano Tool kit's main functionalities are explained below.

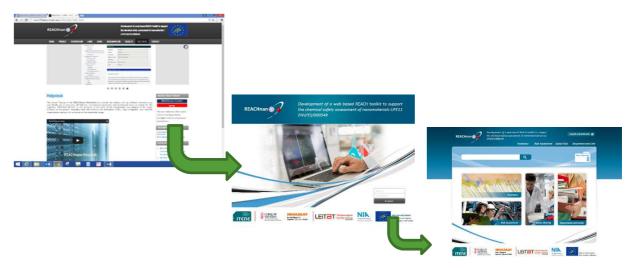


Figure 1. REACHnano Help Desk and linked REACHnano Tool kit Front End.

3.1. Login

Each user may register for free to start using the tool, from the "Sign in" option, as shown in Figure 2.



Figure 2. How to create a user account in the REACHnano Tool kit.

3.2. Main functionalities

Main links of the Reachnano Tool kit are the inventory, risk assessment and social Tool, showed in Figure 3.



Figure 3. Main functionalities of the Reachnano Tool.

3.2.1. "Inventory"

Access to the database with all the recompiled information on nanomateriales properties, uses, etc. (see Figure 4).

The database has been developed to allow users access to consult and exchange relevant information of most employed nanomaterials (to date, there are information for 30 NMs in the inventory). It is based on a metamodel whose main categories are:

- ✓ General information
- ✓ Classification and Labelling and PBT (persistent, bioaccumulative and toxic) assessment
- ✓ Manufacture, use and exposure
- ✓ Physical and chemical properties
- ✓ Environmental fate and pathways
- ✓ Ecotoxicological information
- ✓ Toxicological information

Each of these categories contains several sets of variables and sub-variables.



Figure 4. Inventory (base of data of nanomaterials).

3.2.2. "Risk Assessment"

This is the access to the environmental and human exposure risk assessment tools.

The environmental risk assessment is done through a model flow analysis probabilistic matter (PMFA). The tool includes all stages of cycle Life of nanomaterials from manufacturing to waste treatment and the model estimates the release of nanomaterials in the air, water and soil as a function of the initial amount.

Because of the paucity of information, the probabilistic models are most useful are the moment. In the probabilistic model, each flow is represented by a probability distribution rather than a fixed value.

In this environmental risk assessment tool, among other parameters, users introduce their tonnage and environmental risk management measures and the tool estimates amount of nanomaterials that is released into each environmental compartment, soil, water and air, as it is shown in Figure X.

Moreover, users can study different exposure scenarios and the tool represent the sum of the total amount released into each compartment (see Figure 5).



Figure 5. Environmental risk assessment tool.

The occupational risk assessment tool (see Figure 6) is based on a combination of control banding approach, exposure estimation tools and new templates of exposure scenarios developed specifically for the case of nanomaterials.

Users may estimate the exposure depending on the operative conditions and applied risk management measures. Once all the necessary data is introduced, the model estimates if one (or more) scenarios can be dangerous for the worker.



Figure 6. Occupational risk assessment tool.

Access to the tool for the introduction of user's comments and contributions regarding data of inventory, as one of the principals Help desk REACHnano objectives is to promote the exchange of information. In this regard, registered users may share documents with relevant information or data measured on different properties of nanomaterials in the inventory.

Once uploaded the information to the help desk for users, the management team validates the information and then makes available to the public. Information will be available in the database section and in the specific endpoint screen. The nickname of the person and the date will be indicated comment (see Figure 7).



Social Tool				
NAME OF YOUR SEARCH				
Subdance name:				
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anger.			REACHnan 🌚 🚽 the chemical s	glety assessment of nanomaterials (/FE1) 9
		Allere Consents		Inventory Risk Assessment Data Sharing Documen
Substance Neme	EC Number	Type Comment	Social Tool	
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Celcium Cerbenate	207-439-8 Mone caretilizer1 autoteou			APA
Carbon block	215-605-3 More constituent substance			
Cellulose	222-674-8	• •	Information Cologory	Sustance
Certurn avide	254-874-8 Mono constituent substance			
Cabult Capper avide	222-228-0 Minne canesituers substance 225-248-1 Minne canesituers substance		IF The General Information	Carbon black
Copper Source	225-386-2 Brand contributing address		Dunan	C MMAN
Fe203	225-275-4 01028		L. Corpolition	
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Figure 7. Data Sharing functionalities.

3.2.4. "Documents and links" link

Users can download help documents as manuals, guides, etc. and found links to websites of interest, as shown in figure 8.



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	Inventor	ry Risk Assessment Data Sh	ring Documents and Links
Documents o	nd Links		
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Figure 8. "Documents and links" link.

3.2.5. Search tool

The advanced search tool allows you to find information quickly within the Reachnano Tool kit (see figure 9 and 10).



Figure 9. "Search tool" link.

ACHnan 🔬 🖌		ed REACH toolkit to support eest of nanomaterials LIFE11	
1		wentery Risk Assessment Data Sharing	Documents and Link
silicon		Search	
	-		
Substances Substance Name	EC Number	Ine	Vine
Silcon Carbide	206-991-8	Mono constituent substance	Q.
Silcon dioxide	232-545-4	More constituent substance	٩
Silcon Nibride	234-796-8	Mono constituent substance	Q
	INVASSAT		



4. Practical Case Studies on the use of the REACHnano Toolkit

4.1. Case study on user's registration and password recovery

Registration to the REACHnano Toolkit is necessary in order to use. The request for access is attended immediately. The tool is freely accessible and information user introduce in it for risk evaluation is totally private. Only information willing to be shared by the user and thus introduced via the Data Share plugging will be published in the inventory after being corroborated and accepted by the tool developers.

Users registration process is presented in figure 11.





In the following registration process is explained step by step:

- 1. From the tool main page, up on the right of the page, access to the login area pressing the command
- 2. In the login area, you have a specific field to apply for registration. Click over "Sign in" text
- 3. A new screen appears, where you have to introduce your user email, nick¹ and password (twice).
- 4. One data introduced, you have to press "send" button, down on the right of the page
- 5. In a very short time you will receive an email with the confirmation of successful registry and then you are able to use the tool.





¹ This is the name that will appear when you share information via the Data Share plugging.

- 6. With your own account created, access again to the login area and introduce your email and password and click button for accessing to the main page of the tool.
- 7. Once logged, your own "nick" will appear up on the right of the page
- 8. When willing to log out, only press the cross icon
- 9. If you can't remember your password, you can recover it in any time, only clicking the "password recovery" text in the logging area

4.2. Case study on information searching in the inventory

The REACHnano Toolkit accounts with a searching plugging (see figure 12) permitting you to find any introduced words. The tool searches the word across inventory.

Introduced words. The tool searches the word across inventory.

Figure 12. Search plugging.

You only need to introduce the word/words willing to look for and related found out information will appear in the screen.

AIN

For example, if you need to find the term "graphene", introduce the word in the dedicated field and click "search" buttom.

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4.3. Case study for inventory use

The access to the inventory is shown in figure 13. In such inventory, reliable information, for of 30 nanomaterials, demanded by REACH regulation when registering chemicals can be found. When you access to this plugging, the list of introduced nanomaterials is presented.

It is possible to search for nanomaterial introducing different parameters: substance name, EC number, EC name, molecular formula, IUPAC name, type or origin and clicking button "Search".











As example, if you needed information regarding acute oral toxicity of the nanomaterial "silver", you could access to it by introducing in the field "Substance name" the word silver and clicking button "search". Then, you can select the substance from the list clicking on the icon.

Once on the substance information page you can select from the left list the study you are interested in. In this case, acute oral toxicity, you can find three studies (on the left). By clicking on each of them, the detailed information it is shown on the right (see Figure 14).

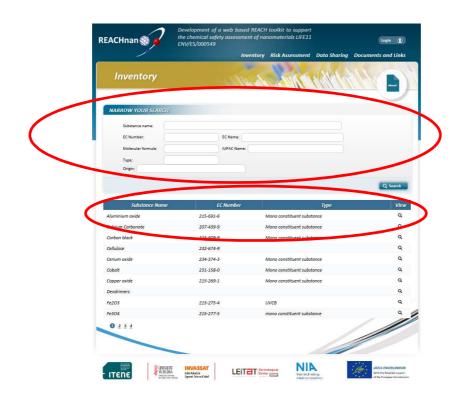


Figure 13. Inventory (base of data of nanomaterials).

	Sustance			
General Information	Silver			
	C Return			
Conduction		Trokicity to aquatic algae and cyanobacteria_001		
Charafeatile and Labelling econdag to GrS	Study	Toxicity to aquatic algae and cyanobacteria_002		
Citil Assessment	Acute oral toxicity_003	Terrestrial toxicity	Test Materials	
Chemitettan, sea and opposes Technological Process Committee Quantities		Toxicity to soil macroorganisms except arthropods Toxicity to soil macroorganisms except arthropods.	Test material identity	silver NPs
Distornation on mildures			Details on test	13 nm. Aldrich grade AgNO3
Life Cycle Description	Administrative data	Toxicity to terrestrial plants_001	material Test Animals: Species	mice
Masshere	Purpose flag no mortalities reported	😑 📟 Taxicological Information	Test Animals: Strain	balb/c
		🖂 📟 Acute toxicity		
		🕀 🚍 ord	Test Animals: Details on test organism	Seven-week-old male
		Acute coul toxicity_003	Administration exposure: Route of administration	oral gavage study
		Acute took/ky oral_002	Administration exposure: Details on exposure	fed 2.5 g of nano- or micro-sized silver particles directly to the stomach.
		Gradiente toxicity inhabition_001	Administration exposure: Duration of exposure	
		🕀 📟 dermal	Administration	2,5g
		C Acute toxicity dermal_001	exposure: Doses Administration exposure: Details on	Seven-week-old male balb/c mice were starved for 24 h before being fed :

Figure 14. Example of information available of the nanomaterial "silver" from the inventory.

4.4. Case study on Human Risk Assessment

The access for undertake a Human Risk Assessment is summarized in figure 15. When you access by first time to the Tool, no substances will appear in the summary screen as each user generate their own substances of interest and introduce parameters from their own process or activity (see Figure 16).



Figure 15. Occupational risk assessment tool.

Steps to be followed for Risk Assessment are:

- 1. Create your own substance
- 2. Access to the substance for Risk Assessment
- 3. Complete the questionnaire with required information and calculate
- 4. Check results from your calculations whenever you need in the main screen of listed substances as well as on main screen of Risk assessment tool.
- 5. Generate the printable template of the estudied exposure scenario.

1. Create your own substance for Risk Assessment

As a first step for Risk Evaluation, you have to create the substance. For that click the "New substance" buttom and a new screen will appear, as shown in Figure 17 with the example of "silver" substance. In that screen you have the option of introduce considered reference values that you can use for Risk Characterization ratio calculation.

Once information is introduced, press "Save button and directly you are taken back to the Summary screen of created substances (see figure 17).



				ENV/ES/000549 Invent	ory Risk Assessment D	ata Sharing D	ocuments an	d Links
			Risk Assessi	nent				1
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1	Inventory Risk Assessment	Data Sharing Documents and Links		Substance Name	Cnv	Ocup	Control	
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Risk Assessm	ant		Grafeno GP500		1	1	٩	
MISK ASSESSI	ient (Gruphene		2	4	Q	ß
			Prueba Marda		1	1	Q	
			Prueba una		1		Q	ß
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			prueba2			1	Q	ß
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			Site2				a	ß
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							1	

Figure 16. Summary screen for new substance creation (left) and control of the already introduced and studied substances (right).

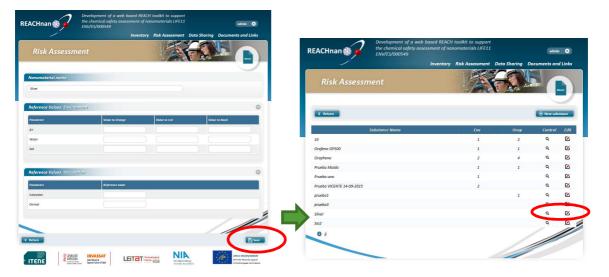


Figure 17. Creation of new substances (left) and selection from the list for Risk Evaluation by pressing "Edit" button (right).

2. Access to the substance for Risk Assessment

Once created the substance, pressing the icon "Edit" you access to the main page of the Risk Assessment, the Control Panel of the substance, with both Human and environmental Risk Assessment tools (see figure 17 on the right).

3. Complete the questionnaire with required information and calculate

In the Control Panel, by pressing the button "New study" on the Human Health Assessment you access directly to a questionnaire asking for different parameters needed for exposure estimation. Once introduced, you have to press "Save and calculate" button and predicted results will be shown (see figure 18).



Figure 18. Creation of new human assessment study (left) and questionnaire to be filled in for human exposure (inhalation and dermal route).

Mandatory fields for the estimation are marked. If no information is introduced on them, the tool notices a message of error. Needed information for exposure estimation is related with operational conditions affecting worker exposure, risk management measures to control worker exposure as well as contextual information on environmental exposure controls (information purpose only).

As an example, if formulating an ink based on graphene, your possible scenario and exposure estimation could be the one shown in figure 19.

If you change the scenario and use a formulation based on 25 % of graphene instead of preliminary 5%, you can observe as exposure estimation is higher, as shown in Figure 20.

41				
/	Inventory	Risk Assessment	Data Sharing	Documents and Lin
Risk Assessmen	nt			
Section 1. Exposure Scenario 1	Tille			
lanomaterial (Name / Size / EC number)	Graphene			
ctivity covered under the scenario	ink formulation			
Section 2. Operative condition 2.1. Operational conditions	is and risk management measures affecting workers exposure			
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2.1. Operational conditions	ajjesting workers exposure			
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Use of Local Exhaustive Ventilation *(Mandatory)	
Fixed Capturing hoods	Ŷ
Personal Protection (PPE) used *(Mandatory)	
Use of Half Mask (FPP2) and chemical-resistant gloves	~
Additional Personal Protection used	
Restrict area of openings to equipment	~
Tec. conditions and measures to control dispersion from source towards the worker	
Protective overalls and disposable coveralls (Class Type 1 to 6)	~
Organisational measures to prevent/limit releases, dispersion and exposure	
Dispose of empty containers and wastes safely.	~
Likelihood of exposure *(Mandatory)	
PoYESble	~

	environmental exporsures	
Technical onsite conditions and	I measures to reduce/limit discharges air emisions and release to soil	
Additive package assumed to t	be blended direct to lubricant with no process steps	Ý
Other		
Organizational measures to pre	vent/limit release from site	
Use of closed filling equipment		~
Other		
Conditions and measures relate	ed to municipal sewage treatment plan	
A leak prevention plan is need	ed to prevent low level continual releases	~
Conditions and measures relate	ed to external treatment of waste for disposal	
All waste product is assumed t	o be collected and returned for re-processing or use as a fuel.	~
Par waste produce is assumed t	nd te external recovery of warte	
Conditions and measures relate	a to external recovery of waste	

Exposure Route	Predicted Exposure	
inhalation	0,012	
Dermal	0,536	
< Return		Save and Calculate 🛛 🛅 Delete

Figure 19. Example of human exposure assessment.

	Development of a web based REACH he chemical safety assessment of na ENV/ES/000549			admin 😣
×	Inventory	Risk Assessment	Data Sharing	Documents and Link
Risk Assessme	nt			
Section 1. Exposure Scenario	Tille			
Nanomaterial (Name / Size / EC number)	Graphene			
Activity covered under the scenario	ink formulation			
(ns and risk management measures			
2.1. Operational condition Main Characteristics of the ENM / Na	ajjecting workers exposure			
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Use of Local Exhaustive Ventilation *(Mandatory)	
Fixed Capturing hoods	Ý
Personal Protection (PPE) used *(Mandatory)	
Use of Half Mask (FPP2) and chemical-resistant gloves	~
Additional Personal Protection used	
Restrict area of openings to equipment	×
Fec. conditions and measures to control dispersion from source towards the worker	
Protective overalls and disposable coveralls (Class Type 1 to 6)	×
Organisational measures to prevent/limit releases, dispersion and exposure	
Dispose of empty containers and wastes safely.	Ý
Likelihood of exposure *(Mandatory)	
PoYESble	~
Operational condition affecting environmental exporsures	
Operational condition affecting environmental exporsures	
Operational condition affecting environmental exporsures Technical onsite conditions and measures to reduce/limit discharges air emisions and release to soil	
Operational condition affecting environmental exporsures Technical onaite conditions and measures to reduce/limit discharges air emisions and release to soil Additive package assumed to be blended direct to lubricant with no process steps	~
Operational condition affecting environmental exporsures Technical onsite conditions and measures to reduce/limit discharges air emisions and release to soil	~
Operational condition affecting environmental exporsures Technical onaite conditions and measures to reduce/limit discharges air emisions and release to soil Additive package assumed to be blended direct to lubricant with no process steps Other	~
Deparational condition affecting environmental exporsures Technical onsite conditions and measures to reduce/limit discharges air emisions and release to soil Additive package assumed to be blended direct to lubricant with no process steps Other Other Organizational measures to prevent/limit release from site	~
2.3.Contextual information on Environmental Exposure Contraits (Informative purposes only) Operational condition affecting environmental exporsures Technical onaite conditions and measures to reduce/limit discharges air emisions and release to soil Additive package assumed to be blended direct to lubricant with no process steps Other Organizational measures to prevent/limit release from site Use of closed filling equipment Other	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Deparational condition affecting environmental exporsures fechnical onsite conditions and measures to reduce/limit discharges air emisions and release to soil Additive package assumed to be blended direct to lubricant with no process steps Other Organizational measures to prevent/limit release from site Use of closed filling equipment	~
Deparational condition affecting environmental exporsures Technical onaite conditions and measures to reduce/limit discharges air emisions and release to soil Additive package assumed to be blended direct to lubricant with no process steps Other Other Use of closed filling equipment Other	•
Deparational condition affecting environmental exporsures Technical onsite conditions and measures to reduce/limit discharges air emisions and release to soil Additive package assumed to be blended direct to lubricant with no process steps Other Other Use of closer sto prevent/limit release from site Use of closer stop gruppment Other Conditions and measures related to municipal sewage treatment plan A leak prevention plan is needed to prevent low level continual releases	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Deparational condition affecting environmental exponsures Technical onaite conditions and measures to reduce/limit discharges air emisions and release to soil Additive package assumed to be blended direct to lubricant with no process steps Other Other Other Other Other Conditions and measures related to municipal sewage treatment plan A has prevention plan is needed to prevent low level continual releases Conditions and measures related to external treatment of waste for disposal	~
Deparational condition affecting environmental exponsures Technical onsite conditions and measures to reduce/limit discharges air emisions and release to soil Additive package assumed to be blended direct to lubricant with no process steps Other Organizational measures to prevent/limit release from site Use of closed filing equipment Other Conditions and measures related to municipal sewage treatment plan	•

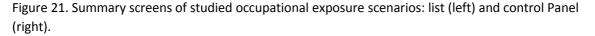
Exposure Route	Predicted Exposure
inholation	0,036
Dermal	1,607
< Return	Save and Calculate

Figure 20. Example of human exposure assessment.

6. Check results

When a result is calculated, by clicking the button "Return" in the page of the questionnaire, you are redirected to a screen where a list as summary of the different undertaken studies is shown (see figure 21, left). If you wish to modify a scenario, you press "Edit" icon and you are redirected to the questionnaire.





In this screen you can clearly check different estimation values for each studied exposure scenario (operation). If you click the "Return" button, the Control Panel is shown (see Figure 21, right). The number of studied scenarios is shown on the left (see Figure 22). Moreover, if introduced a reference value for the substance, in that screen it is shown if Risk is under control (green) or not (red color). If not, you are able to return to the scenario and by iteration estimate which are the most suitable risk management measures and operational conditions for exposure reduction until risk is under control.

4.5. Case study on Environmental Risk Assessment

The access for undertake a Human Risk Assessment is summarized in figure 22.

When you access by first time to the Tool, no substances will appear in the summary screen as each user generate their own substances of interest and introduce parameters from their own process or activity (see figure 16), as explained in 4.4.

Steps to be followed for Risk Assessment are, as explined in 4.4. for ocupational exposure:

- 1. Create your own substance
- 2. Access to the substance for Risk Assessment
- 3. Complete the questionnaire with required information and calculate
- 4. Check results from your calculations whenever you need in the main screen of listed substances as well as on main screen of Risk assessment tool.
- 5. Generate the printable template of the estudied exposure scenario.



Figure 22. Occupational risk assessment tool.

1. <u>Create your own substance</u>

See 4.4. and figure 22.

2. Access to the substance for Risk Assessment

See 4.4. and figure 22.

3. <u>Complete the questionnaire with required information and calculate</u>

In the Control Panel, by pressing the button "New study" on the Environmental Health Assessment you access directly to a questionnaire asking for different parameters needed for environmental exposure estimation.

Two columns are presented in the questionnaire in order to introduce the data (see figure 23 on the right). Column in the left is for the case of manipulating the nanomaterial itself (i.e. synthesis of the nanomaterial) meanwhile column of the right must be used when a nanobased product is studied (i.e. a cosmetic formulation based on nanoTiO₂).

Once the needed information regarding employed risk management measures and used amount, introduced, by clicking the "Save and calculate" button and predicted results will be shown. the tool estimates the release of the nanomaterial to each of the main environmental compartments /air, water, soil).

As an example, if formulating an ink based on graphene, 10g, using wet scrubber - for dusts, waste gas treatment – absorption, filtration and thermal treatment - Distillation/rectification, your scenario and exposure estimation would be the one shown in figure 24.

If you change the scenario and use 550g instead of preliminary 10g, you can observe as exposure estimation increases, as shown in Figure 25.

Finally, if you use directly 550g of graphene, your exposure varies as shown in Figure 26.

	REACHnan		st Data Sharing Document	amerika (
	Risk Assessment			P
				-
	Environmental release scenet(o)			
	Subdaras Name Disatasa			
	Science is Name: Openetity used in the science of the			
	Risk Management meditures (Ridicit) specied to work	alanday anangolebit be	to the size	
	Personalar	Ohlo production / spokes		# :
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	Wei scrabber - Jir gan seranal			
	Musicing and the observed approximate		D	
	Separater		6	
	Bast collection - de cyclone		D	
	Wante gan theatment - Mentral assistation	-		
	Wanie gan finationni - spiałytic addation			
	Waale gas menteren - administer	-		
	Ballopica/Instituter - depicable adutator		12	
b based REACH toolkit to support	Wante can treatment - conclementary			
	Solinvestation of valids Air Stranso Filmation		0	
	DN-sector separation		8	
	Dennial Instreet - We an addition			
-	Admontation		D	
243,194 33,761	Anneutrange		D	
345,154 55,753	Wernel meanert - Destitution/vert/Scales.		D	
	Balagha/Institute/ Assarblic	D	H	
	Ratiopha' transferent - Aerubic			
	Designal Abalagical analysis mader investigations			
Q View list	Beligkationiswi - Stage instruct e.g. dwenatidage reductor			
	Results Resident adaptivest	Prodicted rolenne (reg)		
Is a subquartery controlled Bisk is NOT controlled	*			
	Muter			
	Saf .			_
Q Vertite				
Q Vew Rat				14 See
Q Vicestor	KE Brite		1	
Q Vente				

Figure 23. Creation of new environmental assessment study (left) and questionnaire to be filled in for environmental exposure (air, water and soil compartments).

EACHnan 🔮	env/es/0	nical safety assessment of na 000549	nomaterials LIFE11		admin
/	e'	Inventory	Risk Assessment	Data Sharing	Documents and Li
Risk As	sessment				
Environmental	release scenario				
Substance Name:	Graphene				
Scenario Name:	Ink formulation		×		
Quantity used in the	icenario: 10000,000	mg			
Risk Managem	ent measures (RMM)	applied to avoid releasing n	anomaterials înto	the uir.	
Parameter		ENM	's production / synthesis	Production	on of nanoproducts
Wet scrubber - for d	ists				
Wet scrubber - for g	as removal				
Waste gas membrar		0			

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versenabber - jor gas remotar		
Waste gas membrane separation		
Separator		
Dust collection - air cyclanes		
Waste gas treatment - thermal axidation		
Waste gas treatment - catalytic oxidation		
Waste gas treatment - absorption	\checkmark	
Biological treatment - degradable substance		
Waste gas treatment - condensation		

Controls & Treatments	ENMs production / synthesis	Production of nanop	products
Sedimentation of solids			
Air flotation			
Filtration			
Dil-water separation			
Chemical treatment - Wet air oxidation			
Adsortption			
ion exchange			
Thermal treatment - Distillation/rectification			
Biological treatment - Anoerobic			
Biological treatment - Aerobic			
Central biological waste water treatament			
Biological treatment - Sludge treatment e.g. thermal sludge reduction			
tesults Environmental compartment	Predicted release (mg)		
Air	1180,174		
Water	744,725		
Sail	558,411		
K Return		E Save	Delete

Figure 24. Example of environmental exposure assessment.

ACHnan 🏽 🖌	Development of a w the chemical safety a ENV/ES/000549				admin 😣
~		Inventory	Risk Assessment	Data Sharing	Documents and Links
Risk Assessm	ent			a	
Environmental release sc	enario				
ubstance Name: Graphene					
icenario Name: ink formula	ation				
Quantity used in the scenario: 55	0000,000 mg				
Quantity used in the scenario: 55		ivojil releasing n	unomateriais into	the uir.	0
			นกอากมีรับร้านไร โกร้อ 's production / synthesis		on of nanoproducts
Risk Management measu					on of nanoproducts
Risk Management measu Parameter		ENM		Productio	on of nanoproducts
Risk Management measu Parameter Wet scrubber - for dusts		ENM		Productio	on of nanoproducts
Risk Management measu Parameter Wet scrubber - for dusts Wet scrubber - for gas removal				Productio	on of nanoproducts
Risk Management measu Parameter Wet scrubber - for dusts Wet scrubber - for gas removal Waste gas membrane separation				Productio	on of nanoproducts
Risk Management measu Parameter Wet scrubber - for dusts Wet scrubber - for gas removal Waste gas membrane separation Separator	res (tixib) applied to a			Production	on of nanoproducts
Risk Management measur Parametar Wet scrubber - for dusts Wet scrubber - for gas removal Waste gas membrane separation Separator Dust collection - air cyclanes	res (tiviki) applied to a tation				on of nanoproducts

Controls & Treatments	ENMs production / synthesis	Production of nanoproducts
Sedimentation of solids		
Airflotation		
Filtration		¥
Oil-water separation		
Chemical treatment - Wet air oxidation		
Adsortption		
Ion exchange		
Thermal treatment - Distillation/rectification		
Biological treatment - Anaerobic		
Biological treatment - Aerobic		
Central biological waste water treatament		
Biological treatment - Sludge treatment e.g. thermal sludge reduction		
Results Environmental compartment	Predicted release (mg)	
Air	64876,377	
Water	40870,140	
Sail	30571,034	
¢ Return		Save 🛗 Delete

Figure 25. Example of environmental exposure assessment.

Biological treatment - degradable substance

Waste gas treatment - condensation

ACHnan 🍕	ENV/I	ES/000549	anomaterials LIFE11		adn
/	A.	Inventory	/ Risk Assessment	Data Sharing	Documents a
Risk As	sessment				
Environmental	release scenario				
Substance Name:	Graphene				
icenario Name:	Ink formulation		×		
quantity used in the	scenario: 550000,000	mg			
Risk Managem	ient measures (NiVI	IVI) upplied to avoid releasing	nanomaterials into	the uir.	
Risk Managem Parometer	ient measures (RM)	1	กนกอกายเขาไปไร ไกเรื่อ Ms production / synthesis		on of nanoproducts
-		1	Ms production / synthesis		an of nanoproducts
Parameter	usts	EN	Ms production / synthesis	Productio	on of nanoproducts
Parameter Wet scrubber - for d	usts as removal	EN Z	Ms production / synthesis	Productie	an of nanoproducts
Parameter Wet scrubber - for d Wet scrubber - for g	usts as removal	en E	Ms production / synthesis	Productio	on of nanoproducts
Parameter Wet scrubber - for d Wet scrubber - for g Waste gos membrar	usts as removal ne seporation.	ен 2 С	Ms production / synthesis	Productio	on of nanoproducts
Parameter Wet scrubber - for d Wet scrubber - for g Waste gas membran Separator Dust collection - air	usts as removal ne seporation.	en 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Ms production / synthesis		on of nanoproducts
Parameter Wet scrubber - for d Wet scrubber - for g Waste gas membrai Separator Dust collection - air Waste gas treatmen	usts as removal ne separation cyclones		Ms production / synthesis		on of nanoproducts
Parameter Wet scrubber - for d Wet scrubber - for g Waste gas membrai Separator Dust collection - air Waste gas treatmen	usts as removal ne seporation cyclanes et - thermal axidation et - catalytic axidation		Ms production / synthesis	Production C C C C C C C C C C C C C	an of nanoproducts
Parameter Wet scrubber - for d Wet scrubber - for g Waste gas membran Separator Dust collection - air n Waste gas treatmen Waste gas treatmen Waste gas treatmen	usts as removal ne seporation cyclanes et - thermal axidation et - catalytic axidation		Ms production / synthesis	Production Control Control Co	on of nanoproduct

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Controls & Treatments	ENMs production / synthesis	Production of nanoproducts
Sedimentation of solids		
Airflotation		
Filtration		
Oil-water separation		
Chemical treatment - Wet air oxidation		
Adsortption		
lan exchange		
Thermal treatment - Distillation/rectification		
Biological treatment - Anoerobic		
Biological treatment - Aerobic		
Central biological waste water treatament		
Biological treatment - Sludge treatment e.g. thermal sludge reduction		
Results	Predicted release (mg)	
Air	85742,807	
Water	78408,052	
Soil	27615,460	
4 Return		E Save Delete

Figure 26. Example of environmental exposure assessment.

gas treatment - conden:

4.6. **Case study on Data Sharing operation**

Access to this module is shown in figure 27.

	Inventory Risk Assessment Data S	haring Documents and Links	Social Tool			
	Search		NAME OF YOUR SCAREE			9
			Substanta turtar			
			ti hunter	ethane		
			Malessian Remister	APAC Name		
			1			
and the second second second			triger.			
lover,			Selectorer Norme Alement pole	IChamber	Type: Mona caracturest substance	Constructed
I I II I I E EVILL			Californi Carbonate	207-429-8	More constituent substance	• 1
			Cardon Since	215-609-9	More constituent substance	· /
			Cellulose	232-674-8		
			Cerium axide	294-574-5	More constituent substance	-
		T P	Castern	222-258-0	Mana constituent autotence	~
			Capper axide	225-269-1	Mone constituent substance	
						~
			Dendrimers			
	nent Data Sharing	Documents and Links	Fe208	225-275-4	LVCB	
	nent Data Sharing	Documents and Links		225-275-4 225-277-5	UVCB mana constituent substance	

Figure 27. Data Sharing functionalities.

As a case study, if you are interested in introduce a study of measurement of granulometry of your synthetized nanomaterial ZnO, you have to proceed as explained below:

- 1. Once logged, access to the "Data Share" plugin. On the "Data share" screen appears a list with the 30 studied nanomaterials.
- 2. Look for ZnO directly from the list or use the "Narrow your Search" spaces for introduce the key words and press "search" button.
- 3. Once localized ZnO substance, press icon "Comments" on the right.
- 4. From information Category list, on the left, select the endpoint "granulometry" and insert your information. Press button "Save".
- 5. Once the introduced information is checked and approved by the tool development team, your information will appear published in the inventory of ZnO, in the granulometry endpoint, appearing your "nick" and the date the comment was sent.

		Inventory	
		Information Category	Sustance
Develop	ment of a web based REACH taolkit to support	8 🛶 Gammal referencies	Nanoclays
CHnan 🏶 🧉 the chen	nkal safety assessment of nonomaterials LIFE11 escape 📀	Distort Statutes	C Return
1	Inventory Risk Assessment Data Sharing Documents and Links	B Societation & Labeling and PRI Assessment Constitution and Labeling according to ON	Identification
		Direct Australiant	EC Number 215-328-5
Social Tool		🗵 🖨 Manufation, use and exposing	
		December	EC Name Nanoclays
		Defensation on initians	C/G Number Montmonilionite (1318-03-0)
		😸 🔤 Life Carls Description	Malessiar Formula NecCol0.31A1Ma1254030
ormation Category	Sustance	C Manufactures	UPAC Name
initian congory	- MARKING -	C formation	
	Zinc oxide	Date at wateroad lites	
annoral information	Line GAIDE	D that he professional analysis	Origin (Isorganic
Identification		Dimen	
analysis in a	K Return	S - Unit adviced second	
incurson & Laboriting and PHT Association		D Manufacture	
institution and Labeling according to G#5	Comment	The stand and character properties	30/03/2014 13:15:09 - odmin
enercation and Laboving according to Urs.		😑 🖨 Approx. an and physical statistication	
	Comment:	Data	correntario identificación
nufacture, use and expensive	To determine particle size distribution, 30 w% zinc oxide dispersions were prepared by adding zinc oxide to a	Dassa	
Technological Process	mixture of water and dispersing agent. The dispersion was composed of 2n0 (150 g), Tego Dispers 752W1 (50 g) and water (320 g). The dispersion was premixed in a dispolver and transferred to Dispermat 5U12	Si andreg Poters	Sed ut perspiciatis unde omnis late natus error sit voluptatem accusantium dolorerrique lauslantium, totam
Estimated Quantities	bead mill thereafter. The bead mill was operated using 0.5 mm 1TZ beads at a filling ratio of 05% and a rotor	Data	rem aperiam, exque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicab Nemo enim incam voluotatem quia voluotas sit assernatur aut odit aut hait, und quia consequentur maan
information an ministruc	speed of 4,500 rpm. >= 0.041 0.105 µm	In the providence of the state	dolores eos pui natione volucitatem secul naticunt.
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Manufacture		💷 🛶 Photostaandormation in air	Neque porto quisquam est, qui dolorem ipsum quia dalor sit amet, consectetar, adigisti velit, sed quia non
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Figure 28. Data sharing case study. On the left, introduction of information (i.e. granulometry of ZnO). On the right, published information (i.e. for nanoclays).



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Figure 26. Example of environmental exposure assessment.

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Figure 28. Data sharing case study. On the left, introduction of information (i.e. granulometry of ZnO). On the right, published information (i.e. for nanoclays).

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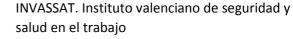


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