



Nexus Island - Facilitator Manual

(Version: 27 June 2024)

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Key information

Nexus Island is a game-based workshop focused on planetary health, and developed in the context of the TREC expedition (<https://www.embl.org/about/info/trec/>).

- Duration: 45/55 minutes
- Number of participants: Between 8 and 24, divided in 4 teams
- Minimum space: 5x5 metres of open space (no chairs, tables, etc.)
- Materials: walkable map (a carpet), deck of cards
- Overview: Everybody taking part in the workshop is a “citizen” living on Nexus Island. The island is portrayed on a walkable 4 x 4 metres map. The different parts of the workshop are linked together by a story that spans 3 days:
 - Day 1: the citizens discover the microorganisms living on the island.
 - Day 2: the island is suddenly affected by an extreme event, and the citizens have to understand what happened during this event, and assess the implications for the island’s organisms.
 - Day 3: the citizens recommend actions to the island’s government to remedy the situation.

Structure of the workshop

You can remember the structure of the workshop using one of your hands.

Like your hand, the workshop is divided into 5 parts:

- Introduction (Intro)
- First day of the story
- Second day of the story
- Third day of the story
- Conclusion



Here a summary of the 5 parts (detailed info after):

	Duration	What happens	Important things
Intro	5	Welcome participants, explore map, play association game	Participants sit on the map with you (preferably no shoes). Ask participants to describe the map. Association game (do a demonstration)
First day	10	Explore the island	Show the cards and explain their features. Participants discover the organisms using the cards. Ask questions about the organisms (most present organism, favourite organism, etc.)
Second day	10	Algae bloom	Show the image of the algae bloom. Ask if somebody can explain what an algae bloom is, and what it means for the environment. Ask which organisms might have caused the bloom. Focus on the connections among organisms (if this happens here, what will happen there?...)
Third day	10	Recommendations to the Council	Foster complexity in the discussion. Ask participants to think about the long term consequences of their ideas. Organise a vote at the end to select the best recommendations
Conclusion	10	Play association game, summarise the experience, thank the participants.	Ask if there are differences between the initial associations and the final ones. Ask people to elaborate on these differences. Explain that what they experienced through the game is what TREC researchers do.
Feedback	4	Online	(optional)

The workshop in details

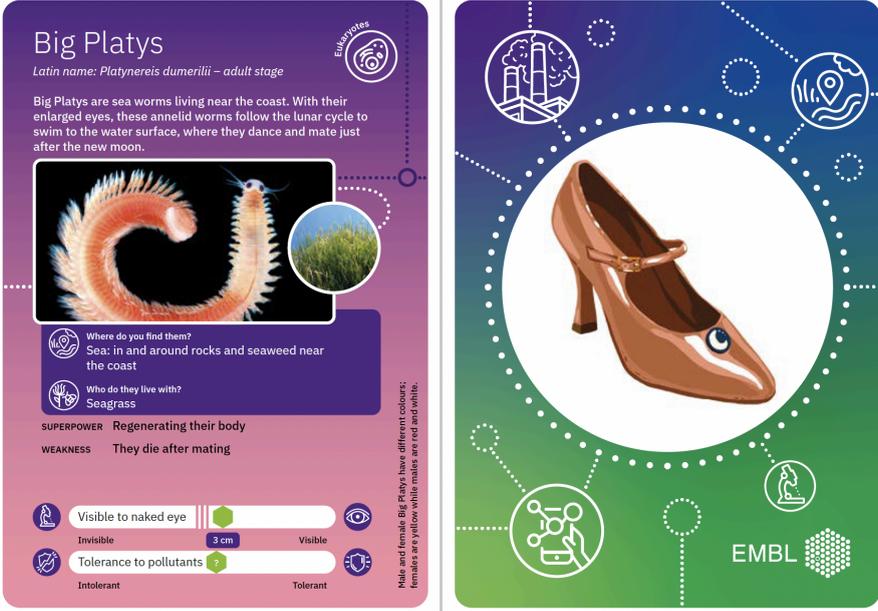
1- Intro

The workshop begins	<ul style="list-style-type: none"> • Sit in the middle of the carpet, with no shoes • Participants arrive • Welcome participants and invite them to join you on the carpet (without shoes) - <i>(Please check the note on welcoming participants later in this document)</i>
Ask participants questions to focus their attention on the carpet	<ul style="list-style-type: none"> • What are we seated on? (A map of an island) • What is the name of this island? (Nexus) • What does Nexus mean? (Connection) • In how many parts is the island divided? (Four) • What are the different parts of the island about? (Agriculture, city, industry, nature)
Association game	<p>Ask the participants to play an association game with you.</p> <ul style="list-style-type: none"> • Ask if anyone knows what an association game is. In an association game, one person says one word (for example: fire!), and participants immediately reply with the first word that comes to their minds (for example: hot! flames! forest!). • Demonstrate how an association game works: ask one participant to tell you a word, and immediately say what comes to your mind. • Check that everyone has understood how to play, then loudly say “scientists.” Listen to the participants’ associations. Then, tell them that you are going to say the second word, and loudly say “citizens.” Listen to the participants’ associations, and ask them to remember their associations, because they will need them at the end of the game. • Thank everyone for playing

2 - First day

Tell the story	<p>“This is a three-day story. It happens here, on Nexus Island. And the protagonists are us: the citizens of this island! On the first day, we wake up and find an email from our Mayor. The Mayor is telling us that the Gaia Atlas of Biodiversity (a big book that lists all the organisms living on the planet) has accepted our application: our beloved island will be included in its next edition. But we have to</p>
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	<p>hurry! We have to submit a list of the Island organisms by tonight. The Mayor needs our help: let's go out and find as many organisms as we can."</p>
<p>Divide the participants in 4 teams</p>	<p>Divide the participants in 4 teams, one for each part of the island <i>(Please note: letting people divide themselves in teams is probably the best strategy, but in specific contexts you might need to support the group in this. Be flexible, and for example don't hesitate to leave a group of friends together in a team that is twice the size of all the other teams if they clearly prefer to play together - this does NOT apply to school groups).</i></p>
<p>Introducing the cards</p>	<p>Tell the participants that to find the organisms, they are going to use cards, which are like pokemon cards, and that you are going to show the cards now.</p> <ul style="list-style-type: none"> ● <u>Give participants their cards</u>, according to their quadrant <i>(more info on how to organise the card later on)</i>. ● Ask each team to take a card from their deck, and flip it so everyone in the team can see it ● Take a card yourself, and explain the features of the cards: <ul style="list-style-type: none"> ○ All the cards have the same type of information ○ Each card has a drawing on its front, which matches a drawing on the carpet. ○ Each card has information on a specific organism on the back. ○ Show the card you have while explaining this, and point to the various sections of the card: nick name, latin name, description, image, where does it live, with whom, superpower, weakness. Draw particular attention on the 2 sliding scales at the bottom of the card (dimension and resistance to pollutants).

	<p>Here an example of a card:</p> 
<p>Participants find the organisms</p>	<p>Tell participants to explore their part of the carpet, checking the front of the card and the drawing on the carpet. Once they find a matching drawing, they put the card on the carpet, while turning the card and discovering which organism lives there.</p>
<p>Ask participants questions to help them in getting familiar with the organisms and the content of the cards</p>	<ul style="list-style-type: none"> • Ask each team if there is an organism that is the most present in their part of the island (while there are a few organisms that are present twice in each part of the island, there is only <i>one</i> organism that is present 3 times. This organism is different for each part of the island). • Ask each team if they think that it makes sense that <i>that</i> specific organism is the most present in their part of the island (more info on this later on). • Ask each team to pick an organism in their part of the island. This can be an organism that they really like, or an organism that they dislike. Once the organisms have been selected, ask each team to present their choice to the whole group. <p><i>Note: these questions are designed to push participants to check and read the cards. The information they collect in this phase is important for the following parts of the workshop.</i></p>
<p>Tell the story</p>	<p>“Well done, the Mayor is very happy with your work! This has been a long day, and we have discovered so many organisms that live on our island. It’s time to go home, and to go to bed!”</p>

3 - Second day

Tell the story	<p>“But we cannot sleep! There is a storm on the island. Thunders and rain - so much rain! The noise of the rain on the roofs is deafening. So we are restless in bed, for the whole night, unable to sleep. Until, around 6am in the morning, the rain eases off, and we are almost asleep when... the phone rings! Who do you think is calling us? <i>(Ask this question to the participants - the answer is... the Mayor!)</i> Yes, it’s the Mayor! She tells us that when she opened the window this morning, she found this...”</p>	
Show the image of the algae bloom	<p>Please see the image “Algae_Bloom_credit_Tom_Archer” in the digital package. The image should be presented on a A3.</p>	
Tell the story	<p>“There is a strange layer of green stuff on the sea just in front of the island. The Mayor has no idea what this is, and she is asking for our help. Given our knowledge of the organisms, can we go out and try to tell her what is going on?”</p>	
Ask participants if anyone knows what that is	<ul style="list-style-type: none"> • Does anyone know what this is? • Can you please explain to everyone? <p><i>(Note: always try to gather information from the participants, instead of simply providing information. This for two reasons: you want participants to... participate! Also, studies have shown that participants more easily accept and remember information that comes from their peers).</i></p>	
ESA variant	ESA variant (I)	<p>“Luckily, we have some help to solve this mystery. The European Space Agency has also noticed something with its satellites, and reached out to the Mayor sharing these images”</p>
	Give the ESA cards	<p>The ESA cards present satellite images. Each team receives 2 cards (2 different satellites, the same 2 cards for all teams).</p> <p>Here an example of the ESA cards:</p> 

	ESA variant (II)	<p>“These satellite images show the ocean around our island one week ago, and today. Do you notice anything? Are there differences between the two cards? On the cards, we can also find a few organisms that might be responsible for the algae bloom. Check in your part of the island, and see if you have any of these organisms. When you find one of these, carefully read the card and decide whether the organism can cause this event.”</p>
Participants find the organisms that are the most likely cause of the algae bloom	<p>Tell participants to use their knowledge of the organisms to figure out which organisms might be responsible for the algae bloom. While there are a few organisms that might cause a bloom, in the context of this game there are two organisms that are the best candidates: Super Bloom and Green Poison.</p> <p><i>(Other potential organisms either cause blooms that are red in colour, or bloom that are characterised by a strong smell. Refer to what the Mayor said and what the image of the bloom / ESA cards show to guide the decision process).</i></p>	
Ask participants questions to understand why the bloom happened and what are the consequences for the whole island	<ul style="list-style-type: none"> ● What caused these organisms to bloom? (Sudden availability of a lot of nutrients) ● Where do these nutrients come from? (From the agriculture part of the island: these are the fertilisers that last night rain carried into the ocean) ● What are the consequences of this blooming event for each part of the island? (some organisms thrive, some organisms die, humans cannot eat shellfish/fish or swim, etc.) <p><i>(Note: there is a list of organisms / how organisms are affected by the bloom at the end of this document).</i></p>	
Summarise what has been discovered	<p>“We started the day with the Mayor discovering the algae bloom and asking for help. We figured out that the two most likely organisms responsible for the bloom are Super Bloom and Green Poison, and that their explosive growth is caused by the fertilisers that the rain brought into the ocean. We explore what could be the consequences for the rest of the organisms. Well done! The Mayor is - once again - very happy with you. It is now time to go home - and finally rest. We go home, we switch off our phones and computers, and we sleep like a baby!”</p>	

4 - Third day

Tell the story	<p>“But at 7am - KNOCK KNOCK KNOCK! - somebody is pounding on our door! Who do you think is knocking? (<i>Ask this question to the participants - the answer is... the Mayor!</i>) Yes, it’s the Mayor! Again! After all our research and study on the Island organisms, she wants us to talk with the City Council to decide what to do next. On the first day, we became “experts” of the island organisms. On the second day, we explored the ecological connections among the organisms of the island. Could we now use what we know to help the Council to create some rules and regulations to prevent a blooming from happening again?”</p>
Moderate the group discussion	<p>Tell participants that now - as a single group - we are going to discuss possible ways to prevent the bloom from happening again. This is the most delicate part of the game. The discussion might struggle to start, in which case you can try to ask questions. For example:</p> <ul style="list-style-type: none"> ● What are the consequences of the algae bloom for the environment and for society? ● What could happen if there is a ban on chemicals in agriculture? ● What is our vision for this island in 100 years? <p>The discussion might also get quite animated and polarised. You can defuse these situations bringing back the attention to the data, and asking questions like:</p> <ul style="list-style-type: none"> ● What did we see? ● What are the connections that we have discovered? <p>If possible, try to create space for participants that are less vocal, while reining in participants that are talking a lot.</p> <p>For each proposal, try to explore its consequences. For example, if somebody suggests that we could ban fertilisers, ask the participants living on the agriculture side if they would agree with that (probably not: how are they going to farm without fertilisers? Can they switch to organic fertilisers? Are they going to reduce production? Who is going to feed the people living on the Island?...).</p> <p>Examples of ideas include: banning fertilisers, filtering the water before it reaches the ocean, using organisms to decompose fertilisers in the water.</p>
Summarise what has been discussed	<p>After the discussion has highlighted a few options, sum them up and ask participants to vote which options should be brought to the Council. Once a consensus has been reached, thank everyone</p>

	for their input and tell them that the Mayor is very happy with their suggestions, and she will bring these ideas to the Council. Thanks to our work , the Island will be a better place.
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5 - Conclusions

Association game	<p>“If I tell you now “scientists”, what comes to your mind? And if I tell you “citizens”?”</p> <p>Ask the participants if they remember the associations they did at the beginning of the workshop, and if there are differences with what they think now.</p> <p><i>(Note: we do the association game again to explore whether the workshop has had any impact on the participants’ perceptions of the figures and roles of scientists and citizens. Sometimes, there are no differences - mostly when participants are scientists. Sometimes, there are differences and it is quite thought-provoking to discuss them).</i></p>
Provide an overview of what participants have done, in the context of the TREC expedition	<p>“What we have done today is similar to what the scientists on the TREC expedition do. They arrive in a place, explore the organisms that live there, try to understand the ecological connections among the organisms and the environment, and - if asked - support the local stakeholders in thinking how it could be possible to improve the quality of the place.”</p>
Thank everyone	<ul style="list-style-type: none"> ● Thank everyone for their time, participation, and ideas. ● Wish them a great rest of their day ● Be ready to answer questions and shake hands

TREC and this workshop

TREC is a scientific expedition to study coastal ecosystems and their response to the environment, from molecules to communities. Here a short video that presents TREC, and the updated map of the expedition:

- <https://www.rnf.de/mediathek/video/ecosystems-know-no-national-borders-the-trec-science-project-gets-underway-and-embl-in-heidelberg-plays-a-leading-role/>
- <https://trec.embl.de/itinerary.cgi>

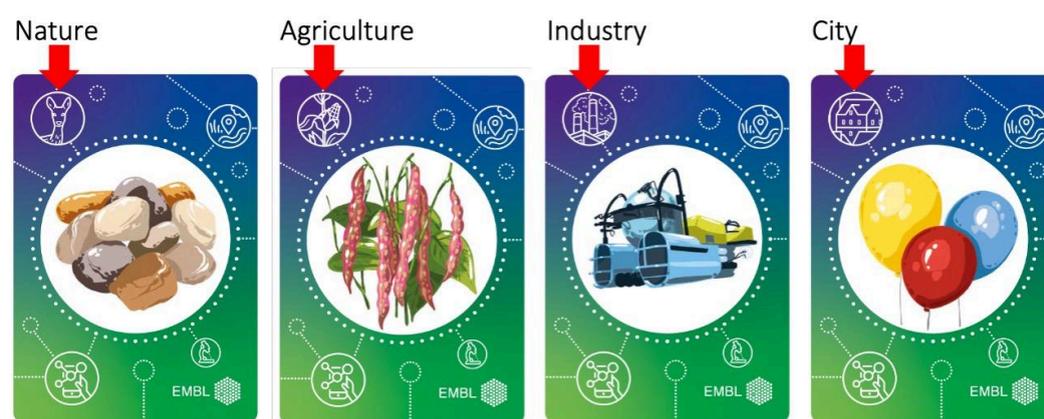
We have designed several initiatives to actively engage the public with this expedition. This activity (Nexus Island) has been designed starting from this question:

How can we make people **experience** (*not tell them*) how it feels to be a **researcher** and specifically a researcher on the **TREC** (*planetary health*) expedition?

Workshop set up

How does the location for the game look? Would you like to play in this particular location? Is it welcoming? Is there anything you can do to improve it?

- Imagine when the participants will come in: what is the first thing you want them to see? Do they need space to put their belongings? If they need to sit, are there chairs for everyone?
- Place the map on the floor, on an even surface, as early as possible to allow the map to flatten itself out - tape the edges of the map to the floor. Choose a place that leaves as much space as possible around the map.
- From the deck of cards, take out the title card “Nexus Island”, the “Definitions” card, and the 2 “Image credits” cards. After that, divide the cards according to the quadrants.
(The map is divided into 4 quadrants: Nature, Agriculture, Industry, City; each card has a symbol on the front that allows you to assign the card to the right quadrant - please see following images). Once you have divided the cards, keep the 4 piles separated.



- Remove these following 4 cards (1 from each quadrant pile - check the cards carefully: some have similar design).



- Place the signs for video/photo release on the door of the room where the participants will play the game, or in a prominent location if there is no door (sign provided via email).

Welcoming the participants

People that are showing up to play this game have already done a lot: they have decided that this event was fascinating, they signed up to reserve a spot, and they left their homes to join you. Like any public event, we could not do it without them (and you!). While waiting for the game to start, some of them might enjoy a quick chat with you, and some of them might prefer to quietly explore the map. Anything goes :-). Try to match their style, chatting with the chatty ones, while giving space to the more introverted participants.

At the exact time when the activity is supposed to start, decide if you start right away, or if you want to wait 2 more minutes. If you decide to wait, quickly (but loudly!) communicate that to all participants (“Hello everyone! Just waiting for a few more people, we’ll start in 2 minutes!” - or something like that). After 2 minutes, start.

Please note: each culture has a different idea of what it means to be “on time.” You are the expert of your own culture, so feel confident in deciding when is the “exact time when the activity is supposed to start.”

What do you think participants need to know before playing the game? You might want to try to think from their perspective, and write down a simple list.

Here are some ideas, but feel free to decide by yourself!

- Welcome and thank you for being here
- Your name
- How long the game is going to last
- Ask them how they are doing (so they know that you care about them)
- Where are the toilets
- Where are the emergency exits
- To be careful when stepping on the carpet (participants can keep or remove their shoes)
- Questions are always welcome, from anyone, at any time
- Anything else you consider important
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Playing the game

The game will be different every time it is played. Different participants, different facilitators, different locations, and so on. What matters is that the participants AND you have a very good time. What matters is that everyone has a positive experience. Why? Because we want to have a positive impact on the participants' perceptions of science & scientists. It is unlikely that participants will remember the scientific content of the game, even just after a couple of hours. But they will remember the feeling of playing the game, and possibly associate that feeling with science. So have fun, talk with them, and let the game take its own shape.

Information on some of the organisms on the map

FARMING QUADRANT	
Nitroso	The most prevalent organism in this quadrant. Nitroso are archaea that live in the soil with other plants. They are involved in nitrogen fixation like nitro fixers.
Nitro fixer	These are bacteria that live in soil with plants. They provide the plants with N based compounds that are required for their growth and development.
Super bloom	Together these organisms produce nearly half of the oxygen gas that organisms like us, humans, use to exist. They are normally in small numbers unless fertiliser run-off feeds them and triggers their bloom into massive numbers. As their numbers explosively increase during these blooms, they also produce neurotoxins harmful for organisms like marine mammals and birds. During such blooms, fishing and shellfish harvests are limited or stopped to prevent the toxins from flowing into our plates.
Green poison	

NATURAL QUADRANT	
Seagrass	The most prevalent organism in this quadrant. Flowering plants adapted to life in the sea. These organisms are producers and they contribute to sustaining the ecosystem by producing food from sunlight. Function as shelter and food source for organisms like the Platy, seabee and many species of fish. They are found by the coast and not in deeper and darker parts as they need sunlight to grow.
Salty or not	Needs a mixture of salt and freshwater to live. That's why estuaries are critical for their survival.
Polaris	Algae-handlers capture Polaris in their mineral shells and benefit from the nutrients they produce. We don't know if polaris benefit from this interaction as well.
Algae-handlers	

CITY QUADRANT	
Coli	The most prevalent organism in the city quadrant. Coli live in the guts of humans and can protect humans from other harmful bacteria simply by taking up space in the gut and not letting harmful bacteria settle in their spots. Because they live in our bowls, finding coli in a region can also mean that there's sewage or simply poop discharged to that area.
Green poison and Green sailors	Both of them are close to the farming border. Might be because of the border's proximity to the farming region where fertilisers are regularly used.
Dead eaters	An organism found in the coast of the city region. They feed on other dead organisms.

INDUSTRY AND ESTUARY QUADRANT	
Petroleum sweeper	Most prevalent organism in this quadrant. This organism can break down petroleum and other xenobiotic compounds and produce energy for itself in the process
Forams	They have different species with varying degrees of tolerance to pollution.
Coli	If there are no humans living in that particular space that you find them, Coli's presence may indicate that sewage is being discharged into this region.
Super cleaner	Industries built along riversides can pollute the river with the discharged chemicals. Around the site of the river and sea contact, there is 'super cleaner' which is an organism that has a high tolerance to pollution. So it is not surprising to see it there.

Information on how some organisms can be affected by fertilisers

FARMING QUADRANT	
Green sailors, super bloom and green poison	Green sailors, super bloom and green poison benefit from the fertilisers and grow too much. Green poison and super bloom produce toxins which can accumulate in organisms like fish and shellfish. When organisms like humans, seabirds and marine mammals like whales and dolphins consume these fish and shellfish, they can get poisoned and killed.
Ocean lords	We don't know how ocean lords are affected. They are far out in the ocean.
Pill-makers	Pill-makers are tolerant to pollutants. We see them living on agricultural sites which means they already have a certain level of tolerance to the fertilisers.
Gassy	Gassy can be tolerant considering it lives on the farming sites. We don't know however if the ones that live in the guts of animals are as tolerant to fertiliser pollutants as the ones living in soil are.
Nitroso and nitro-fixers	Nitroso and nitro-fixers are very tolerant to fertiliser pollution. They can even use the excess fertiliser to grow more.
Super cleaners	Considering the fact that these organisms can live on farming sites shows that they have tolerance to fertiliser pollution.
Speedies	Speedies can also be tolerant for the same reason. Living on the farming site hints at a level of tolerance against chemicals used on this site.

NATURAL QUADRANT	
Seagrass	Seagrass and other organisms with low tolerance to pollutants die because of the fertiliser. As they are a food source for many organisms like sea urchins and fish. These organisms are badly affected by their death.

Super bloom	Super bloom grows and produces toxins. As the presence of fertilisers boosts their reproduction by providing extra N-based compounds which can be a limiting factor for growth.
Teen Platy	Teen Platy is also affected because the seagrass it uses as a shelter and feeds on dies.
Seabee	Sea bees are sheltered by seagrass. So if the seagrass is negatively affected, so is the sea bee.
Polaris, Algae-handler, Pop-head, Milkies, Salty or Not	We don't know how and if they are affected by the fertilisers.

CITY QUADRANT	
Green poison	Green poison blooms and produces a toxin. The toxin is absorbed by the shellfish and fishes which are consumed by marine mammals and by humans (toxins reach and impact human health).
Forams	Some foraminifera may die because some of the species is intolerant to chemicals.
Green sailor	Green sailors will thrive with the fertilisers reaching the city coast and boosting their growth
Coli and bacillus	We don't know if e.coli are resistant to fertilisers. Maybe they are because they also live near the farming site. Same applies for Bacillus as it does for Coli.
Dead eaters	We don't know if dead eaters are tolerant to fertilisers. However, if the fertilisers reach the coast of the city and cause toxic algal bloom which kills marine mammals, dead eaters can benefit from more dead organisms and increase in numbers.
Vinfecto, Mint sauce, petroleum sweepers	We don't know how and if they are affected by the fertilisers.