



Australian Government
Department of Industry, Science,
Energy and Resources

Business
Cooperative Research
Centres Program

Risk Registry User Guide

The Blue Economy CRC is funded in part under the Australian Government's CRC Program, administered by the Department of Industry, Science, Energy and Resources.

The CRC Program supports industry-led collaborations between industry, researchers and the community.

Background to the Registry

Offshore marine economies have existed for decades, but new industries are emerging to join the traditional industries of oil and gas (exploration and extraction), commercial fishing, shipping, and telecommunications. Offshore renewable energy and aquaculture production are being proposed for offshore development in Australia, as they have been in Europe and North America (for example).

New development of any kind involves risk, which may be poorly understood when industries are expanding into environments where they have limited operating experience. An important first step in risk management is to acknowledge hazards that exist currently, or may emerge in the future. Once identified, these hazards can be prioritised; those with high priority can be progressed to full risk assessment and those of lower concern can be downgraded and potentially 'retired'. This kind of information is also important for Ecological Impact Assessments and other activities required in planning and permitting etc.

This registry summarises hazards identified across a very broad set of domains linked to Australia's emerging Blue Economy (Figure 1). Hazards were drawn from existing papers and reports on offshore hazards seen in Europe and elsewhere. This list was expanded based on experience and system understanding of Australian experts.

Experts from the different domains then ranked this list of potential hazards based on:

- The likelihood of the hazard having an impact;
- The consequence of that impact;
- How difficult is it to detect the impact; and
- How difficult it is to respond to the impact.

These scores were then combined in a Multi-Criteria Analysis (averaging the ranking scores). The end result of this process is the information captured in this interactive registry of hazards for the emerging offshore Blue Economy in Australia.

The eventual decommissioning of the new infrastructure associated with the expansion of these emerging domains will be important, but is not yet covered by the information in the registry. This is because there was not sufficient available information to go into detail on this topic. It will be important to collect information on this in future and add it to the registry.

User Guide

This document is a user guide to help people understand how to use the registry. It describes the user front end of the registry – found at <http://be.oceanpixel.org/>

It covers the two main areas of the registry – the data tables and the dynamic visualisation of the registry contents. Worked example are also provided.

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Data Tables (Raw Data)

The dataset is quite extensive, so practitioners have the flexibility to download the data, so they can analyse it as desired, or to filter the data considered for viewing on the site. This means selecting only the data that is required and customize the database(s) according to their respective needs.

Select data view

Visualizations Raw Data

Copy or save data in the table

Domain Hazards Data

Copy Excel PDF Columns Reset

Search:

Domain	Hazard	MCA (R)	Variability (R)	Consequence (R)	Likelihood (R)	Diff Det (R)	Diff Resp (R)
Aquaculture Production	Lack of preparedness (plans and infrastructure) for an emergency response	22	40	4	33	6	36
Aquaculture Production	High-energy environment: excessive stress on cultivated species	3	38	7	4	6	3
Aquaculture Production	Pollution from infrastructure: Light	40	38	40	40	30	39
Aquaculture Production	Unclear liability from environmental impacts (single-event and continuous)	16	36	29	25	4	26
Aquaculture Production	Pollution from operations: nitrogen/biological waste	28	36	32	19	27	21
Aquaculture Production	Rough weather/ocean conditions	2	35	2	1	35	2
Aquaculture Production	Lack of skilled labour	16	34	14	9	35	13
Aquaculture Production	Technological immaturity/limited deployment of emerging industries	16	32	28	10	13	23
Aquaculture Production	Uncertainty on applicable risk standards	36	32	35	31	16	36
Aquaculture Production	Climate change: changes in ocean properties (including marine heatwaves)	1	30	9	3	2	1

None

Showing 1 to 10 of 202 entries
Show entries

Previous 1 2 3 4 5 ... 21 Next

The user can navigate between the pages of data using the *Previous*, *Next* and numbered page links at the bottom of the data table page.

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Users can click on Columns to select the data columns to be viewed

Visualizations Raw Data

Domain Hazards Data

Copy Excel PDF Columns Reset

Search:

Domain	Hazard	Frequency (R)	Consequence (R)	Likelihood (R)	Diff Det (R)	Diff Resp (R)
Aquaculture Production	Lack of preparedness (plans and in for an emergency response)	4		33	6	36
Aquaculture Production	High-energy environment; stress on cult species	7		4	6	3
Aquaculture Production	Pollution from infrastructure	40		40	30	39
Aquaculture Production	Unclear liability environment	29		25	4	26

Columns dropdown menu:

- Domain
- Hazard
- MCA (R)
- Variability (R)
- Consequence (R)
- Likelihood (R)
- Diff Det (R)
- Diff Resp (R)
- MCA
- Variability

Users have the flexibility to sort the hazards according to any of the ranking criteria.

Sort direction (in this case descending)

↓

Domain	Hazard	MCA (R)	Variability (R)	Consequence (R)	Likelihood (R)	Diff Det (R)	Diff Resp (R)
Aquaculture Production	Pollution from infrastructure: Light	40	38	40	40	30	39
Aquaculture Production	Misinformation about new technology	39	25	38	36	16	29
Aquaculture Production	Commissioning: lack of framework to select suitable sites	37	28	25	35	16	40
Aquaculture Production	Hazards from maritime transport	37	5	20	37	40	32
Renewable Energy Production	High-tech industry: reliance on technology rather than manual labor	37	31	36	32	30	27
Aquaculture Production	Uncertainty on applicable risk standards	36	32	35	31	16	36
Renewable Energy Production	Lack of framework for decommissioning phase, including uncertainty of tenure of single sectors in multi-sector operations	36	24	34	24	23	37
Renewable Energy Production	Hazards to workers' health during operations	35	12	16	35	30	34
Aquaculture Production	Pollution from infrastructure or operations: Hazardous chemicals	34	30	24	37	27	25
Aquaculture Production	Lack of framework for decommissioning phase, including uncertainty of tenure of single sectors in multi-sector operations	34	14	36	30	16	35

None ▾ None ▾

Showing 1 to 10 of 202 entries
Show 10 ▾ entries

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Additionally, the user has the option to display only the domain required by them, removing excess information that might clutter the table.

Domain	Hazard	MCA (R)	Variability (R)	Consequence (R)	Likelihood (R)	Diff Det (R)	Diff Resp (R)
Environment	Pollution from infrastructure or operations: Hazardous chemicals	24	26	7	23	22	19
Environment	Altered ecosystem functioning due to offshore activities	2	22	8	11	1	2
Environment	Inadequate assessment of cumulative effects	3	22	2	5	3	3
Environment	Maintenance: effects of cleaning operations on surrounding environment	18	22	24	10	14	20
Environment	Sourcing: unavailability of (sustainable) inputs; illegal sourcing; supply-chain disruptions	24	22	13	25	15	22
Environment	Pollution from infrastructure: Marine debris	16	20	11	12	21	24
Environment	Pollution from infrastructure: Light	21	20	23	7	10	26
Environment	Seafloor disturbance	18	19	18	14	22	12
Environment	Pollution from infrastructure: Noise	7	18	25	4	4	14
Environment	Interactions with large pelagics and seabirds	5	15	18	3	19	6

Environment **Select domain of interest**

Showing 1 to 10 of 26 entries (filtered from 202 total entries)

Show entries

Previous **1** 2 3 Next

Similarly, the data can be filtered based on the hazard of interest.

Copy Excel PDF Columns Reset

Search:

Domain	Hazard	MCA (R)	Variability (R)	Consequence (R)	Likelihood (R)	Diff Det (R)
Aquaculture Production	Maintenance: effects of cleaning operations on surrounding environment	32	28	39	18	5
Environment	Maintenance: effects of cleaning operations on surrounding environment	18	22	24	10	14
Marine Engineering	Maintenance: effects of cleaning operations on surrounding environment	10	31	9	8	21
Renewable Energy Production	Maintenance: effects of cleaning operations on surrounding environment	26	36	35	36	3

None **Select hazard of interest**

Showing 1 to 4 of 4 entries (filtered from 202 total entries)

Show entries

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Lastly, a search feature lets users type in any keyword and the user will be guided towards the entry relevant to that keyword.

Search term

↓

Search:

Domain	Hazard	MCA (R)	Variability (R)	Consequence (R)	Likelihood (R)	Diff Det (R)	Diff Resp (R)
Aquaculture Production	Pollution from infrastructure: Light	40	38	40	40	30	39
Aquaculture Production	Pollution from operations: nitrogen/biological waste	28	36	32	19	27	21
Aquaculture Production	Pollution from infrastructure or operations: Hazardous chemicals	34	30	24	37	27	25
Environment	Pollution from infrastructure or operations: Hazardous chemicals	24	26	7	23	22	19
Environment	Pollution from infrastructure: Marine debris	16	20	11	12	21	24
Environment	Pollution from infrastructure: Light	21	20	23	7	10	26
Environment	Pollution from infrastructure: Noise	7	18	25	4	4	14
Environment	Pollution from operations: nitrogen/biological waste	7	13	10	2	22	9
Marine Engineering	Pollution from infrastructure: Marine debris	24	10	9	27	21	4
Renewable Energy Production	Pollution from infrastructure: Marine debris	26	19	21	27	30	11

None

Showing 1 to 10 of 16 entries (filtered from 202 total entries)

Show entries

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Visualizations

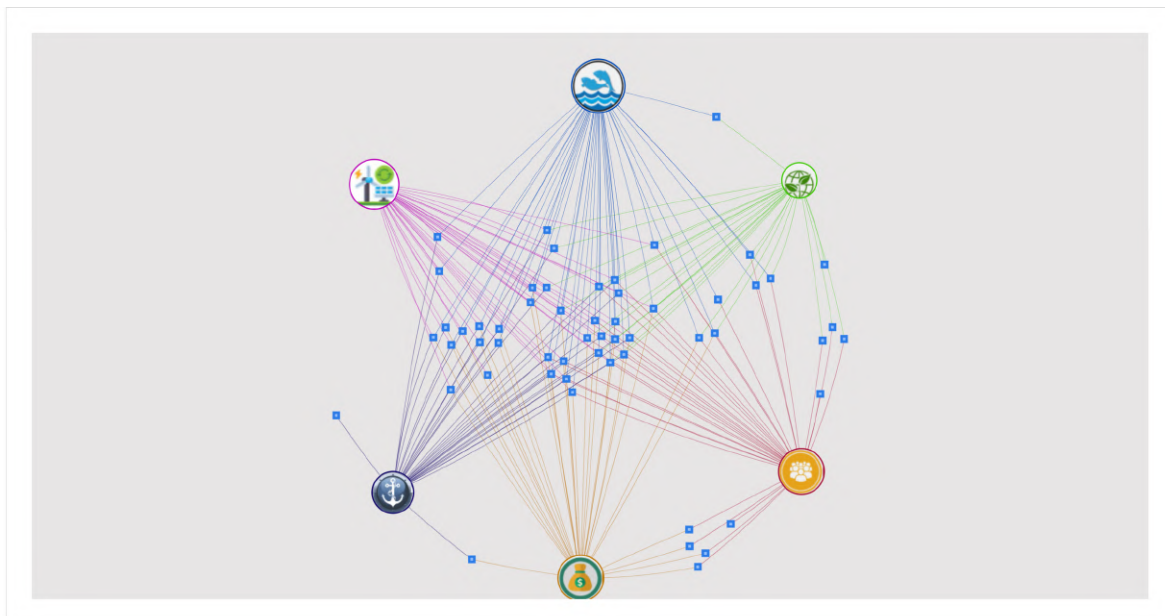
The registry responds to the user by serving up imagery based on specific hazard(s) selected by the registry user.

Click to enter visualisation view

Select colour filter (for colour blind assistance)

Alternative colour filters have been included to allow for maximum accessibility for colour blind users.

Understanding the connections between hazards was considered very important. To achieve this in the registry a 'Neural map' is used to visualize connections between all the common hazards and domains, giving an oversight of the database as well as how the components in the dataset are interlinked. Clicking on a node highlights its connections.

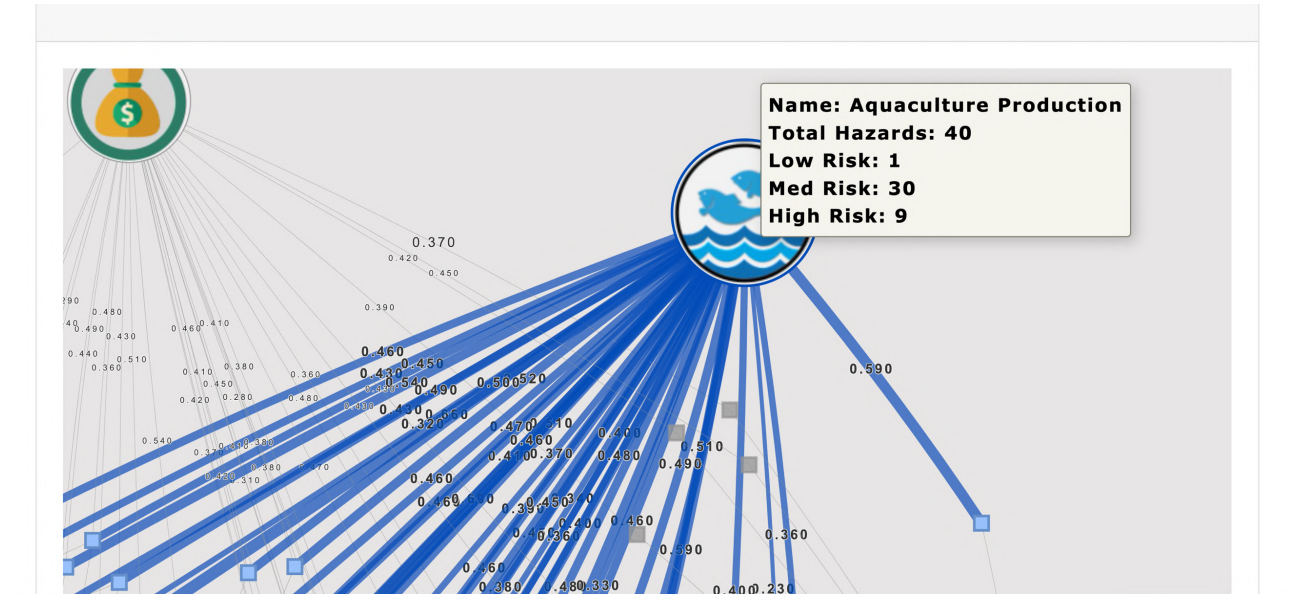


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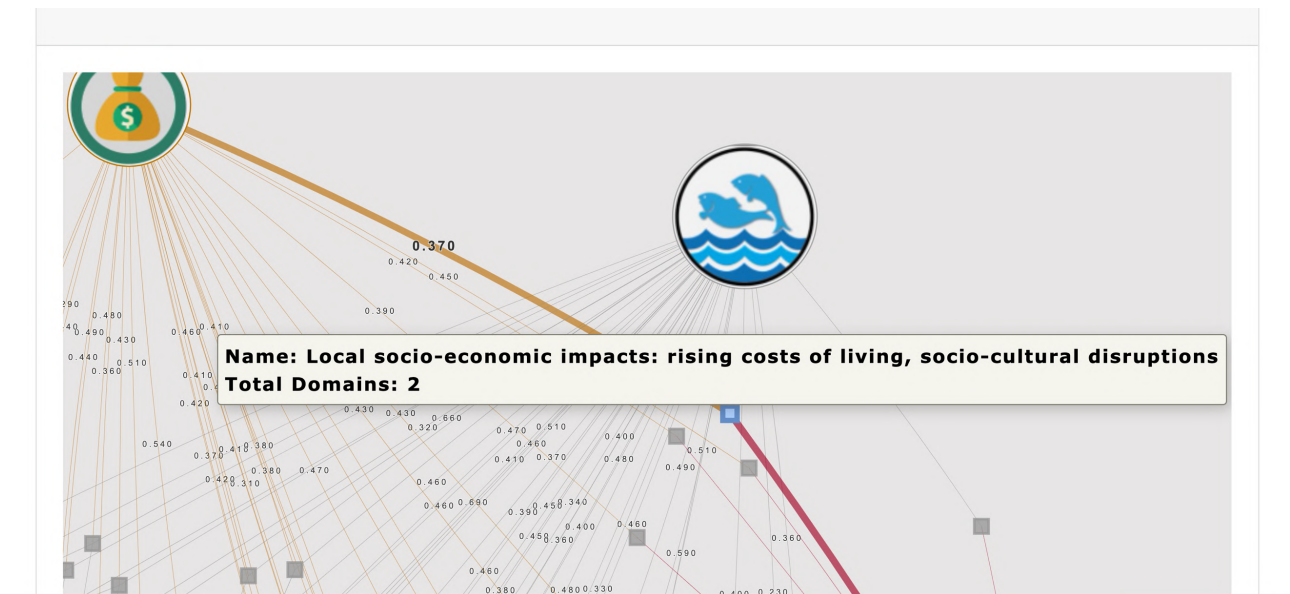
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Clicking on a domain highlights all of the relevant hazards for that domain.



Zooming in shows more detail regarding the hazards of interest.



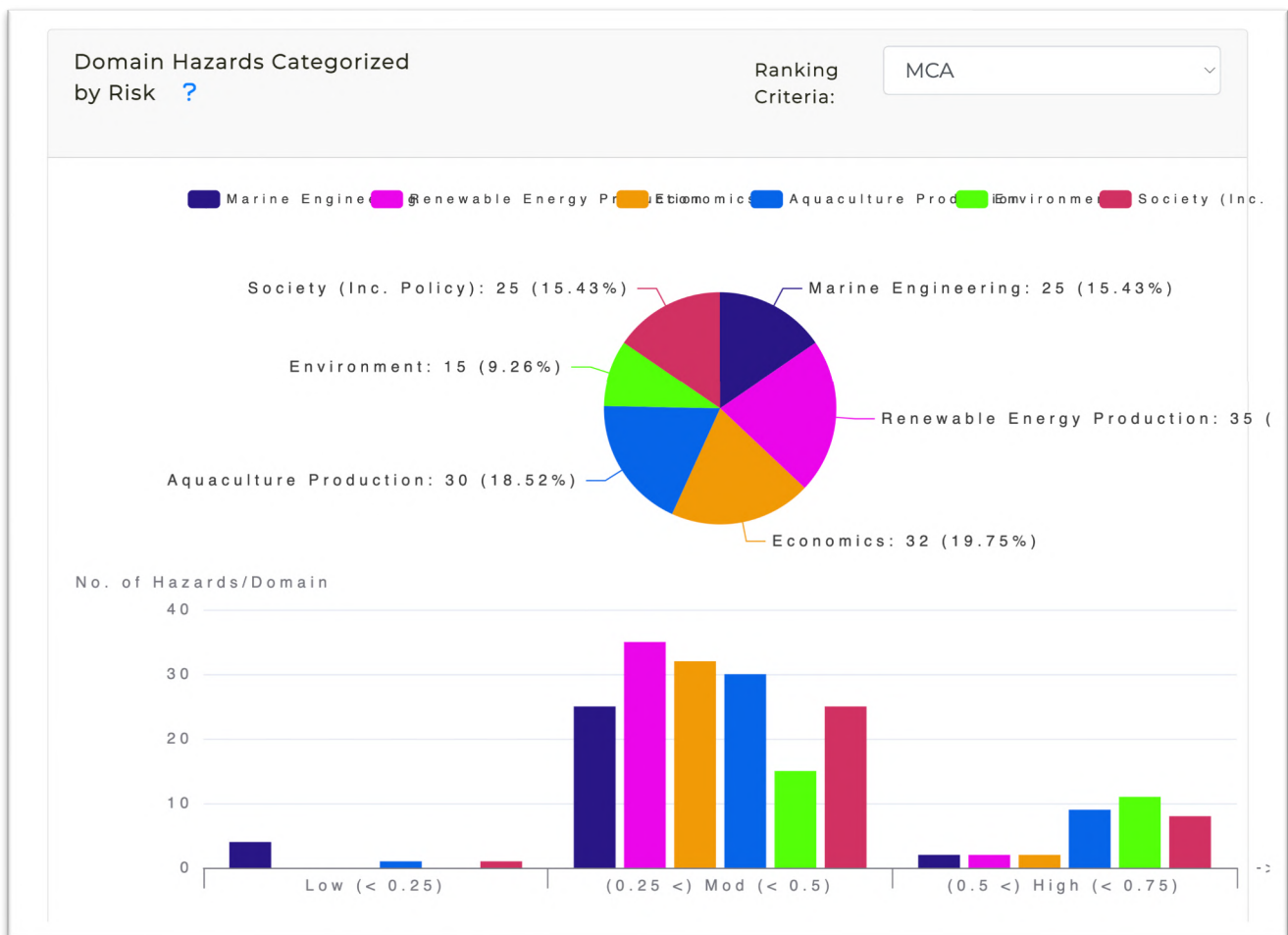
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The network can be filtered based on the different ranking criteria.

Bar and Pie charts are used as the other main visualization tool to give end-users different means of understanding how hazards are grouped in terms of ranks per domain and across different criteria. The user can select the criteria and hazard of interest and “mouse over” (hover over) or click the different plots and bars or pie slices to bring up more detail or highlight scores across domains.



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Drill down table

The drill-down table is another table lists the number of hazards for each domain lie in the four ranking categories, namely, Low, medium, High, and Extreme. Clicking on a domain expands the list so the score per hazard under that rank is listed. The user has the flexibility to select according to which ranking criteria would they want to categorize the hazards.

Domain Hazards Data By Risk		Ranking Criteria: Mca			
JSON Export					
Showing 1 to 6 of 6 entries					
Domain	Low Risk	Mod Risk	High Risk	Ext Risk	
Aquaculture Production	1	30	9	0	
Economics	0	32	2	0	
Environment	0	15	11	0	
Marine Engineering	4	25	2	0	
Renewable Energy Production	0	35	2	0	
Hazard					mca
Difficult transition from pilot to market-scale					0.430
Maintenance: effects of cleaning operations on surrounding environment					0.360
Maintenance: Prohibitive costs; reliance on advanced technology and support infrastructure					0.390
Uncertain development costs inhibiting investment					0.470
Economic viability: Prohibitive costs of grid connection (renewable energy)					0.440
Structural failure due to high-energy ocean conditions					0.420
High-tech industry: reliance on technology rather than manual labor					0.260
Technological immaturity/limited deployment of emerging industries					0.440
Uncertainty on applicable risk standards					0.370
Economic viability: Hindered market access (existing and emerging)					0.500
Rough weather/ocean conditions					0.480
Seafloor disturbance					0.330
Misinformation about new technology					0.490
Lack of framework for decommissioning phase, including uncertainty of tenure of single sectors in multi-sector operations					0.280
Social licence: Public opposition to development					0.500
Lack of skilled labour					0.390
Interactions with large pelagics and seabirds					0.400
Excessive biofouling					0.430
Pollution from infrastructure: Marine debris					0.360
Sourcing: unavailability of (sustainable) inputs; illegal sourcing; supply-chain disruptions					0.360
Hazards from maritime transport					0.340
Resource characterization: over-estimates of available resources					0.320
Economic viability: Unpredictable demand for product					0.480
Lack of clear environmental monitoring framework					0.440
Hazards to workers' health during operations					0.300
Conflict among sectors and with other ocean users					0.490
Maintenance: reduced temporal windows for operations					0.400
Lack of preparedness (plans and infrastructure) for an emergency response					0.370
Manufacturing defects of infrastructure					0.500
Criminal activity disrupting operations (including cybersecurity)					0.360
Commissioning: unclear/lack of planning process in single sectors					0.380
Commissioning: misalignment in planning process among sectors					0.380
Unclear liability from environmental impacts (single-event and continuous)					0.410
Disruption in power supply to offshore platforms					0.360
Commissioning: lack of framework to select suitable sites					0.330
Society (Inc. Policy)	1	25	8	0	

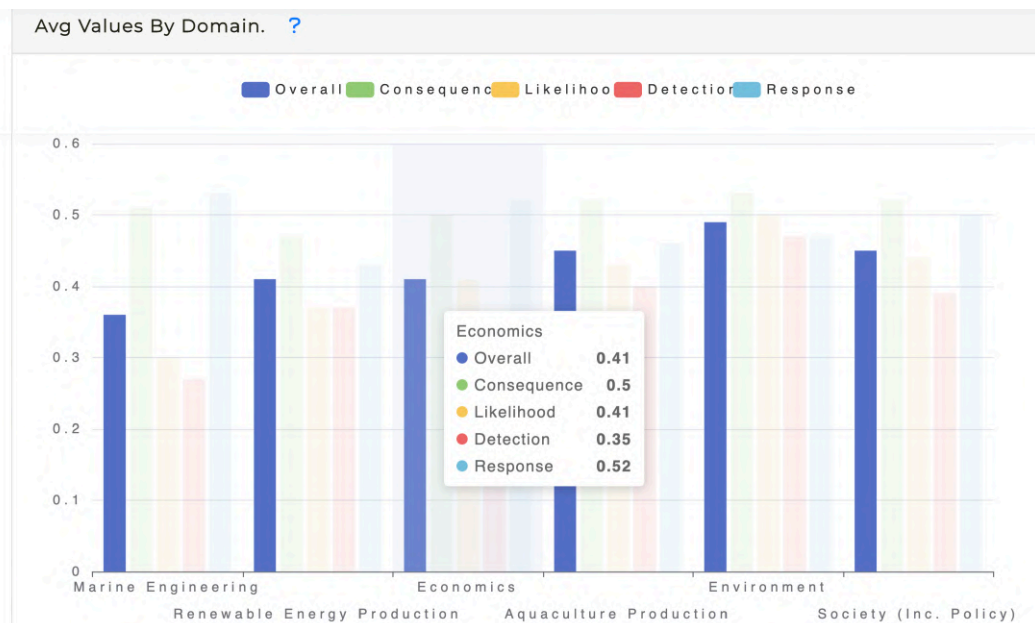
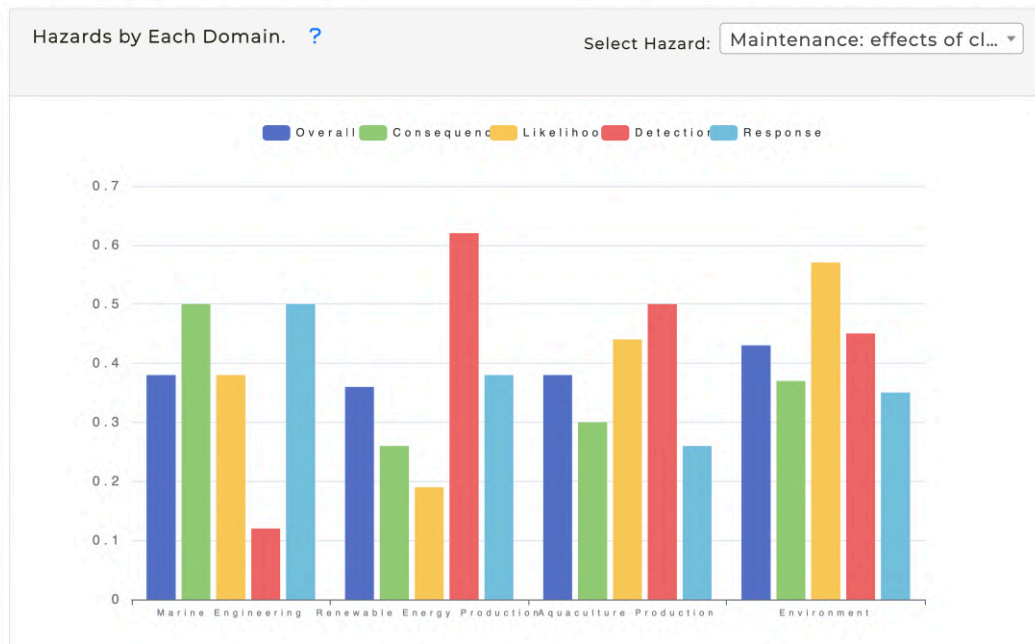
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Hazards by domain

The final set of bar plots show the average, maximum and minimum scores for the selected hazard for each domain.



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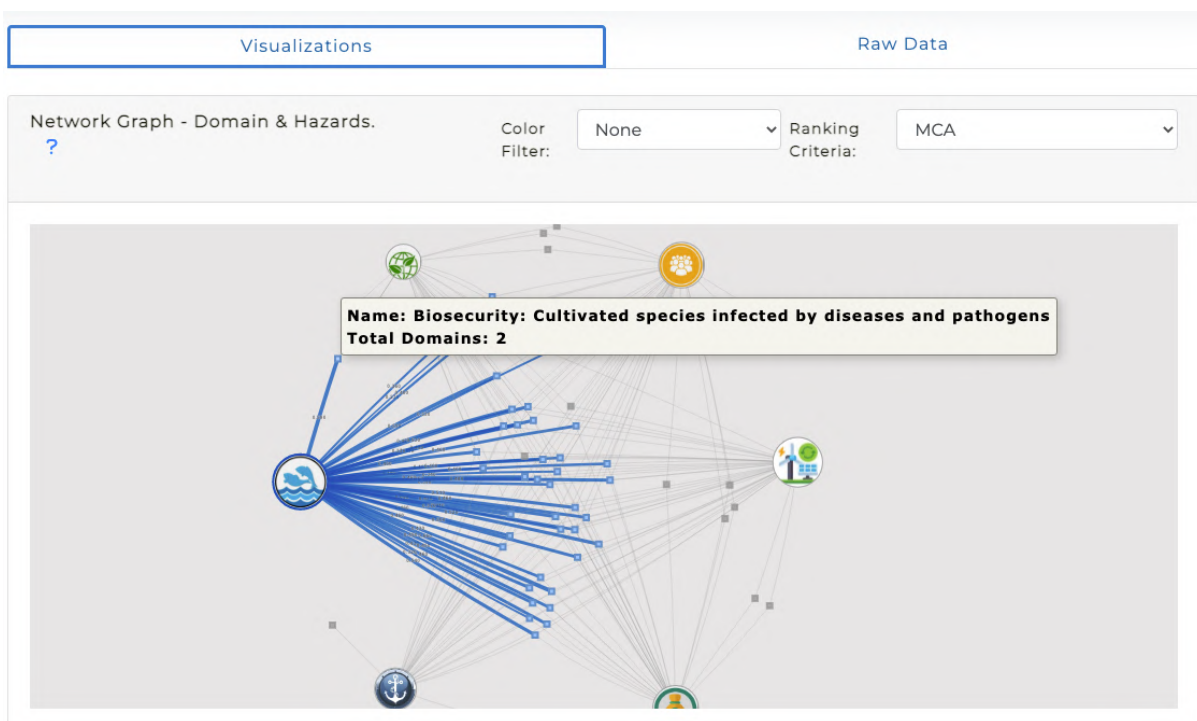
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Worked examples

Example 1: You are an environmental regulator tasked with ensuring a development proposal from the aquaculture industry. You want to ensure the proposal considers the most likely hazards to the environment in a detailed risk assessment so that appropriate mitigation measures can be implemented where applicable.

For a quick snapshot of hazards, click on the domain **Aquaculture Production** icon under the **Visualisations** tab. This will highlight all the hazards associated with Aquaculture Production and show where there are common hazards with other domains. Hover over the hazard to find out more and click the hazard to see which domains this hazard is connected to.

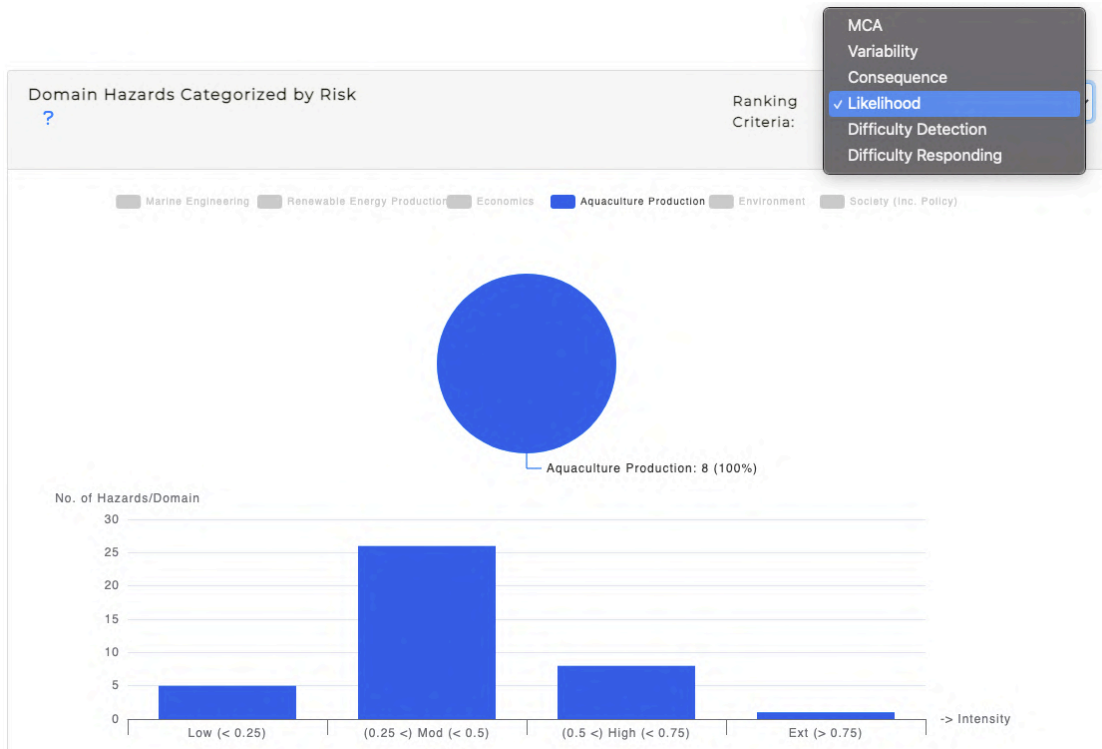


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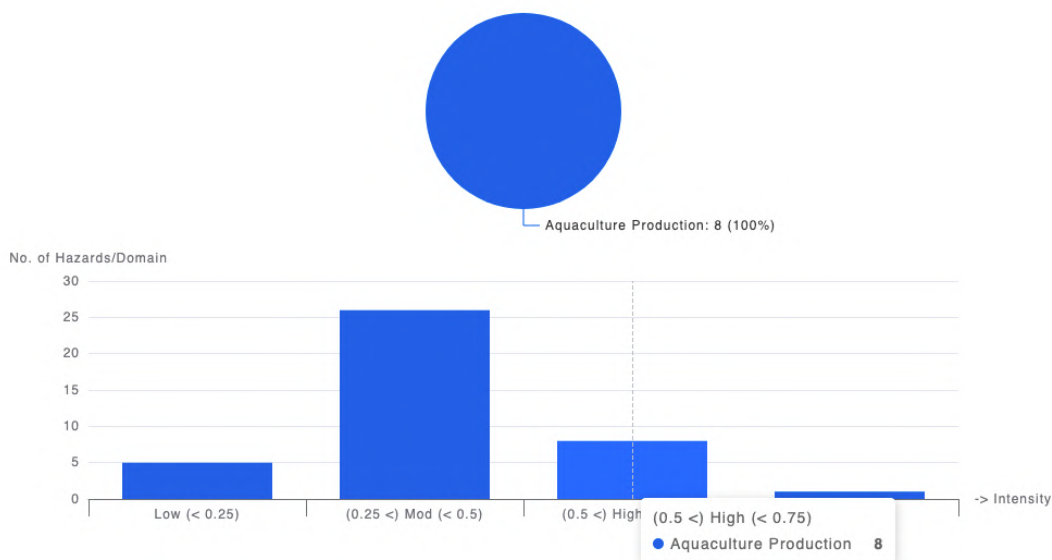
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Scroll down to the next visualisation and select **Likelihood** from the **Ranking Criteria** tab. Then only click the **Aquaculture Production** button to show relevant hazards.



Hover over one of the bars (e.g., high) and then click it see the hazards in that category

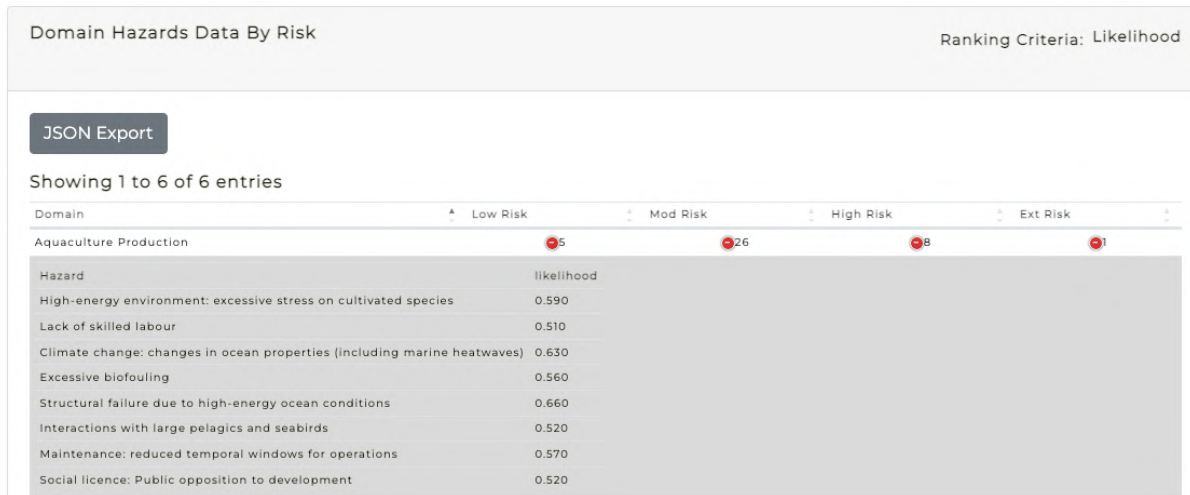


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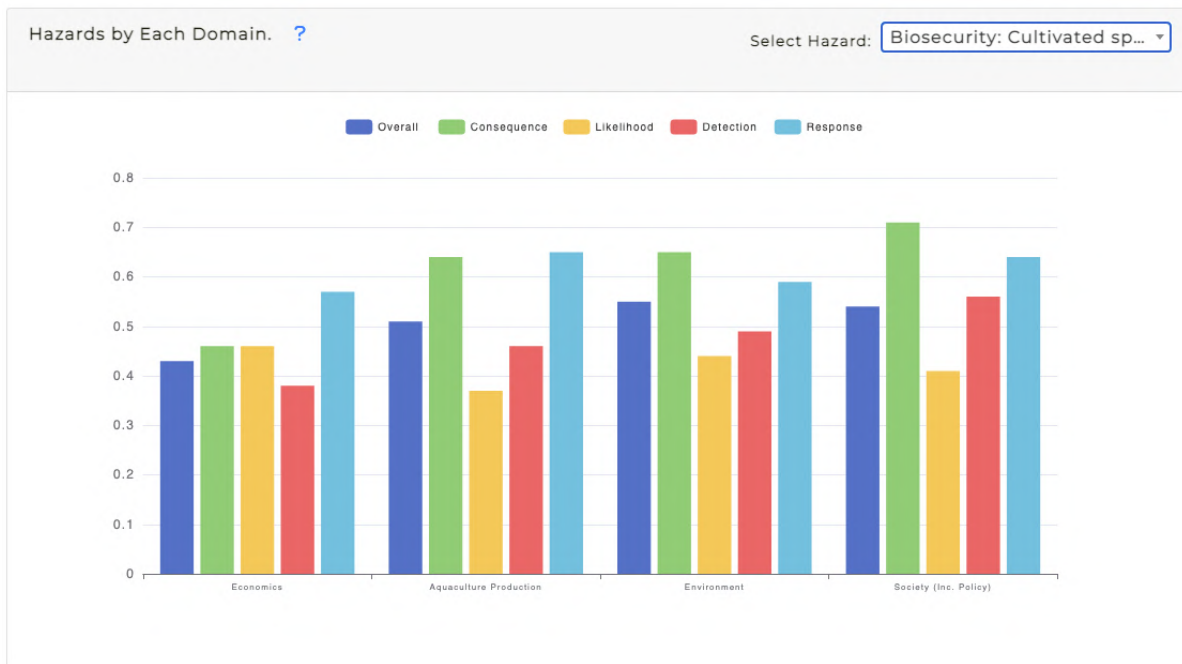
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You can now see the hazards considered highly likely.



You can search for a specific hazard to compare how other domains perceive this hazard.



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For a more detailed breakdown and to explore the rankings for the full hazard list, head to the top of the page and select the **Raw Data** tab. From here you can filter by domain and then rank all the hazards by each of the criteria.

Visualizations
Raw Data

Domain Hazards Data

Copy Excel PDF Columns Reset

Search:

Domain	Hazard	MCA (R)	Variability (R)	Consequence (R)	Likelihood (R)	Diff Det (R)	Diff Resp (R)
Aquaculture Production	Rough weather/ocean conditions	2	35	2	1	35	2
Aquaculture Production	Structural failure due to high-energy ocean conditions	5	10	2	2	33	18
Aquaculture Production	Climate change: changes in ocean properties (including marine heatwaves)	1	30	9	3	2	1
Aquaculture Production	High-energy environment: excessive stress on cultivated species	3	38	7	4	6	3
Aquaculture Production	Maintenance: reduced temporal windows for operations	16	4	25	5	37	13
Aquaculture Production	Excessive biofouling	16	25	20	6	38	18
Aquaculture Production	Interactions with large pelagics and seabirds	13	10	29	7	6	21
Aquaculture Production	Social licence: Public opposition to development	13	1	20	7	32	8
Aquaculture Production	Lack of skilled labour	16	34	14	9	35	13
Aquaculture Production	Technological immaturity/limited deployment of emerging industries	16	32	28	10	13	23

Showing 1 to 10 of 40 entries (filtered from 202 total entries)

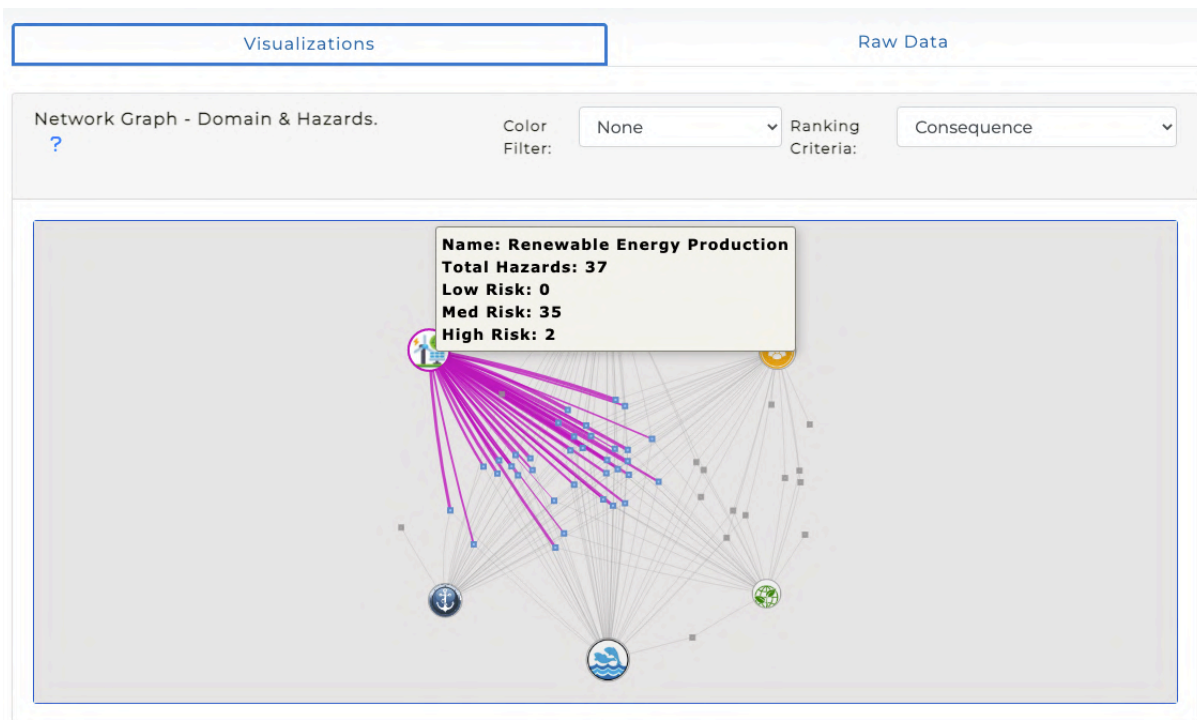
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Example 2: You are an interested community member and hear about a proposal for an offshore wind farm near your coastal town. You want to learn about some of the potential hazards associated with the establishment of a farm so that the community is informed.

For a quick snapshot of hazards, click on the domain **Renewable Energy Production** icon under the **Visualisations** tab. This will highlight all the hazards associated with **Renewable Energy Production** and show where there are common hazards with other domains.



You are only interested in hazards with the highest **Consequence** so you select that from the **Ranking Criteria** menu. You go down to the table and click to expand the high consequence hazards.

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Domain Hazards Data By Risk Ranking Criteria: Consequence

[JSON Export](#)

Showing 1 to 6 of 6 entries

Domain	Low Risk	Mod Risk	High Risk	Ext Risk
Aquaculture Production	01	017	021	01
Economics	00	020	014	00
Environment	01	09	015	01
Marine Engineering	04	019	07	01
Renewable Energy Production	02	022	013	00

Hazard	consequence
Economic viability: Prohibitive costs of grid connection (renewable energy)	0.600
Structural failure due to high-energy ocean conditions	0.580
Technological immaturity/limited deployment of emerging industries	0.570
Economic viability: Hindered market access (existing and emerging)	0.750
Rough weather/ocean conditions	0.600
Misinformation about new technology	0.550
Social licence: Public opposition to development	0.700
Excessive biofouling	0.570
Hazards from maritime transport	0.600
Economic viability: Unpredictable demand for product	0.620
Conflict among sectors and with other ocean users	0.570
Lack of preparedness (plans and infrastructure) for an emergency response	0.640
Manufacturing defects of infrastructure	0.720

Domain	Low Risk	Mod Risk	High Risk	Ext Risk
Society (Inc. Policy)	01	014	018	01

You notice that **Structural Failure** is listed as high consequence and want to mind out how likely structural failure is to occur. You search for that hazard to see the full breakdown of scoring and notice that even though it has a high consequence, it's less likely to occur, alleviating your initial concerns. You continue to explore other high consequence hazards to inform yourself and your community.



Max Values By Domain. [?](#)

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