



## ECONOMIC RESILIENCE CHALLENGE



### What are economic resilience challenges?

Economic resilience challenges occur when there is a loss of confidence in the economy. This can be seen as a reduction in investment, leading company closures, job losses, and a general reduction in consumer spending.

Severity is a product of impact and duration; extreme events will be deeper and longer than mild ones.

|            |     | Event Severity |                         |                         |
|------------|-----|----------------|-------------------------|-------------------------|
|            |     | Minor (1-3)    | Average (4-5)           | Extreme (6)             |
| Resilience | <1  | Under prepared | Severely under prepared | Severely under prepared |
|            | 1-2 | fitting        | Under prepared          | Severely under prepared |
|            | 3-4 | overkill       | fitting                 | Under prepared          |
|            | 5-6 |                | overkill                | fitting                 |
|            | >6  |                | overkill                |                         |

### Minor Resilience Challenge

A large local employer closes down. All of a sudden, many people are out of work and companies that rely on the closed company have a reduction in their turnover.

### Average Resilience Challenge

Bad weather impacts the summer holiday season. This results in many local businesses being impacted by a downturn in their trade. Some businesses will be able to 'weather the storm', but for smaller businesses that rely on the summer season, a washout will mean the end of their business.

### Extreme Resilience Challenge

A global credit crunch, economic decisions in a country far, far, away impact the town's economy by removing money from the economy. This results in some international companies closing their operations in the town, increased costs for goods and services and a reluctance by people to spend their limited cash.



## BIODIVERSITY RESILIENCE CHALLENGE



### What are biodiversity resilience challenges?

Biodiversity resilience challenges occur when the fauna and or flora of an environment is threatened by external sources. Typically, this may occur as a side effect of industrial pollution, or the introduction of non indigenous flora and fauna.

|            |     | Event Severity |                         |                         |
|------------|-----|----------------|-------------------------|-------------------------|
|            |     | Minor (1-3)    | Average (4-5)           | Extreme (6)             |
| Resilience | <1  | Under prepared | Severely under prepared | Severely under prepared |
|            | 1-2 | fitting        | Under prepared          | Severely under prepared |
|            | 3-4 | overkill       | fitting                 | Under prepared          |
|            | 5-6 |                | overkill                | fitting                 |
|            | >6  |                | overkill                |                         |

### Minor Resilience Challenge

A local dairy farm has a storage failure, releasing milk into the local river, killing all the fish. Whilst the leak is repaired quickly and the dead fish removed, it takes considerable time for the river to return to pristine condition.

### Average Resilience Challenge

An oil tanker runs aground up the coast, spilling a million barrels of oil, wiping out much of the bird life and destroying the local beach tourism industry for a couple of seasons.

Residents and businesses are starting to get nervous about the future.

### Extreme Resilience Challenge

A local farm uses a pesticide that destroys the local bee population. Without bees, local crops and plants are not pollinated, resulting in a commercial and environmental collapse.

Some residents and businesses are now looking to move away to areas that have a better quality of life.



## RESILIENCE CHALLENGE OUTCOMES



### Severely under-prepared

The decisions made by the municipality have made the town highly sensitive to economic events. As companies close and jobs are lost, there is nothing in place for the residents of the town, making a bad situation much worse. People feel that the municipality has 'really dropped the ball' with their economic resilience planning, and it's expected that the mayor will resign.

### Under-prepared

The town has been impacted by the economic event with some knock on business failures and many residents reporting financial hardship. People feel that things could have been worse, but they could have been a lot better. There's a sense that the municipality has 'fumbled it' with their economic resilience planning.

### Fitting

Whilst there are some impacts to the event, they tend to be small in nature and there are no major causalities, this is a huge relief for the local businesses and towns people. People feel that the municipality has 'got it right' with their economic resilience planning.

### Overkill

There appears to be little impact of the economic event in the town, which is a huge relief for the local businesses and towns people.

However, the impact is so small people wonder if the municipality has over prepared for such events and whether the town will be able to overcome over events with such ease.



This project has received funding from the European Union's Horizon H2020 innovation action programme under grant agreement 101037424.



## RESILIENCE CHALLENGE OUTCOMES



### Severely under-prepared

The decisions made by the municipality have made the town highly sensitive to environmental pollution, and there appears to be nothing in place for the residents of the town, making a bad situation much worse. People feel that the municipality has 'really dropped the ball' with their biodiversity resilience planning, and it's expected that the mayor will resign.

### Under-prepared

The town has been impacted by the event, with much work to do to recover the town's fauna and flora, and the people and businesses that are involved. People feel that things could have been worse, but they could have been a lot better. There's a sense that the municipality has 'fumbled it' with their biodiversity resilience.

### Fitting

Whilst there are some impacts to the event, they tend to be small in nature and there are no major causalities, this is a huge relief for the town's fauna and flora and the people and businesses that are involved. People feel that the municipality has 'got it right' with their biodiversity resilience.

### Overkill

There appears to be little impact of the event in the town, which is a huge relief for all. However, the impact is so small people wonder if the municipality has over prepared for such events and whether the town will be able to overcome over events with such ease.



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## FLOOD RESILIENCE CHALLENGE



### What are flood resilience challenges?

Flood resilience challenges occur when there is water in places where water shouldn't be, and can occur from excessive rainfall, storm surges, or man-made flooding. Flooding causes damage in two main ways, firstly from water damage and then secondly from the debris and waste left by receding water

|            |     | Event Severity |                         |                         |
|------------|-----|----------------|-------------------------|-------------------------|
| Resilience |     | Minor (1-3)    | Average (4-5)           | Extreme (6)             |
|            | <1  | Under prepared | Severely under prepared | Severely under prepared |
|            | 1-2 | fitting        | Under prepared          | Severely under prepared |
|            | 3-4 | overkill       | fitting                 | Under prepared          |
|            | 5-6 |                | overkill                | fitting                 |
|            | >6  | overkill       |                         |                         |

### Minor Resilience Challenge

It's been raining more than expected for the time of year and the ground has become sodden, resulting in localised flooding. This impacts local people and businesses and takes resources to clean up once the flood water recedes.

### Average Resilience Challenge

The town has been battered by multiple winter storms, with each storm causing flooding that the town is struggling to recover from before being hit by the next one. Residents and businesses are starting to get nervous about the future.

### Extreme Resilience Challenge

The region has been absolutely battered by a once in a lifetime storm that has dumped unprecedented amounts of rain in the region, causing huge amount of damage. Rebuilding will take time and effort. Some residents and businesses are now looking to move away to areas that have a better quality of life.



## DROUGHT RESILIENCE CHALLENGE



### What are drought resilience challenges?

Drought resilience challenges occur when provisions for water consumption are not met. Typically, droughts are caused by insufficient water resources availability due to reduced precipitation over a period of time, or long-term over-exploitation of surface water and groundwater.

|            |     | Event Severity |                         |                         |
|------------|-----|----------------|-------------------------|-------------------------|
| Resilience |     | Minor (1-3)    | Average (4-5)           | Extreme (6)             |
|            | <1  | Under prepared | Severely under prepared | Severely under prepared |
|            | 1-2 | fitting        | Under prepared          | Severely under prepared |
|            | 3-4 | overkill       | fitting                 | Under prepared          |
|            | 5-6 |                | overkill                | fitting                 |
|            | >6  | overkill       |                         |                         |

### Minor Resilience Challenge

The town has a drier winter than expected, resulting in the main supply reservoirs being low, and a dry spring. By summer, the water board is restricting water use to essential activities only.

### Average Resilience Challenge

For the last year or so the town has been experiencing lower rainfall than typical. It was hoped that last year's low rainfall was a blip, but it's being repeated this year.

Residents and businesses are starting to get nervous about the future.

### Extreme Resilience Challenge

The town appears to be affected by climate change that the rainfall has reduced significantly. Resulting in the town becoming drier and browner, and making water a scarce resource.

Residents and businesses are now looking to move away to areas that are less harsh and have a better quality of life.



## RESILIENCE CHALLENGE OUTCOMES



### Severely under-prepared

The decisions made by the municipality have made the town highly sensitive to flooding. As the town floods, there appears to be nothing in place for the residents of the town, making a bad situation much worse. People feel that the municipality has 'really dropped the ball' with their flood resilience planning, and it's expected that the mayor will resign.

### Under-prepared

The town has been impacted by the flood, with much work to do to recover the town's infrastructure with some knock on business failures and many residents reporting hardships. People feel that things could have been worse, but they could have been a lot better. There's a sense that the municipality has 'fumbled it' with their flood planning.

### Fitting

Whilst there are some impacts to the flood, they tend to be small in nature and there are no major casualties. This is a huge relief for the local businesses and towns people. People feel that the municipality has 'got it right' with their flood planning.

### Overkill

There appears to be little impact of the flood in the town, which is a huge relief for the local businesses and towns people.

However, the impact is so small people wonder if the municipality has over prepared for such events and whether the town will be able to overcome over events with such ease.



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## RESILIENCE CHALLENGE OUTCOMES



### Severely under-prepared

The decisions made by the municipality have made the town highly sensitive to fluctuations in its water supply. As the town's water reserves dwindle, there appears to be nothing in place for the residents of the town, making a bad situation much worse. People feel that the municipality has 'really dropped the ball' with their drought planning, and it's expected that the mayor will resign.

### Under-prepared

The town has been clearly impacted by the drought, with much work to do to recover the town's infrastructure with some knock on business failures and many residents reporting hardships. People feel that things could have been worse, but they could have been a lot better. There's a sense that the municipality has 'fumbled it' with their drought planning.

### Fitting

Whilst there are some impacts to the drought, they tend to be small in nature and there are no major casualties. This is a huge relief for the local businesses and towns people. People feel that the municipality has 'got it right' with their drought planning.

### Overkill

There appears to be little impact of the drought in the town, which is a huge relief for the local businesses and towns people.

However, the impact is so small people wonder if the municipality has over prepared for such events and whether the town will be able to overcome over events with such ease.



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## HEAT RESILIENCE CHALLENGE



### What are heat resilience challenges?

Heat resilience challenges occur when there is a prolonged period of local excess heat as a sequence of unusually hot days and nights. Heat waves amplify many risks, such as health related or economic risks, including increased human mortality, drought and water quality, wildfire and smoke, power shortages and agricultural losses.

|            |     | Event Severity |                         |                         |
|------------|-----|----------------|-------------------------|-------------------------|
| Resilience |     | Minor<br>(1-3) | Average<br>(4-5)        | Extreme<br>(6)          |
|            | <1  | Under prepared | Severely under prepared | Severely under prepared |
|            | 1-2 | fitting        | Under prepared          |                         |
|            | 3-4 | overkill       | fitting                 | Under prepared          |
|            | 5-6 |                | overkill                | fitting                 |
|            | >6  | overkill       |                         |                         |

### Minor Resilience Challenge

The town normally has great summers, but this summer was a lot hotter than normal, making it hard to enjoy the weather as it was just too hot.

### Average Resilience Challenge

The town's hot summer has now extended into a hot autumn and a hot winter. Whilst tourists are enjoying the winter sun, residents have had their fill.

Residents and businesses are starting to get nervous about the future.

### Extreme Resilience Challenge

The town appears to be in a climate change where it's just so hot all the time, resulting in the town becoming drier and browner.

Residents and businesses are now looking to move away to areas that are less harsh and have a better quality of life.





## RESILIENCE CHALLENGE OUTCOMES



### **Severely under-prepared**

The decisions made by the municipality have made the town highly sensitive to heat waves. As the town suffers in the heat, there appears to be nothing in place for the residents of the town, making a bad situation much worse. People feel that the municipality has 'really dropped the ball' with their heat wave planning, and it's expected that the mayor will resign.

### **Under-prepared**

The town has been impacted by the event, with much work to do to recover the town's infrastructure with some knock on business failures and many residents reporting hardships. People feel that things could have been worse, but they could have been a lot better. There's a sense that the municipality has 'fumbled it' with their actions.

### **Fitting**

Whilst there are some impacts to the heat wave, they tend to be small in nature and there are no major casualties. This is a huge relief for the local businesses and towns people. People feel that the municipality has 'got it right' with their actions.

### **Overkill**

There appears to be little impact of the event in the town, which is a huge relief for the local businesses and towns people. However, the impact is so small people wonder if the municipality has over prepared for such events and whether the town will be able to overcome over events with such ease.



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## APPROVE A FISH FARM



Municipality has been approached to approve an offshore fish-farm. The farm will use modern methods to optimise fish yields.

The farm will create local jobs in growing and processing the fish and will make good quality fish available in the region and nationally.

However, fish farms are often criticised for creating monocultures, both for the fish and other water users as the farms are somewhat secretive about their methods of fish husbandry.

| EP | BP | FP | DP | HP |
|----|----|----|----|----|
| 4  | -1 | 0  | 0  | 0  |



## APPROVE A MONOFARM



Municipality has been approached to approve a commercial super-farm on unused farmland. The farm will use modern methods to optimise crop production.

The farm will grow high yield, resistant crops and will create local jobs to support its operations. However, the high use of pesticides and high water consumption are likely to have negative impacts on biodiversity and water availability.

| EP | BP | FP | DP | HP |
|----|----|----|----|----|
| 4  | -1 | -1 | -1 | 0  |



## CITIZEN BIODIVERSITY



Municipality has been approached to approve citizen science project to engage with members of the public to observe and record local fauna and flora using a mobile app.

Recording the environment will help researchers to understand the current state of the environment and capture its changes over time, to determine positive and negative biodiversity changes.

| EP | BP | FP | DP | HP |
|----|----|----|----|----|
| 0  | 2  | 0  | 0  | 0  |



## PROTECT LOCAL BIODIVERSITY



Municipality has been approached to approve the development of a wildlife park that specialises in protecting and supporting local flora and fauna.

The park will develop a breeding programme for rare fauna and look to release animals back into the local community to maintain viable stocks.

| EP | BP | FP | DP | HP |
|----|----|----|----|----|
| 1  | 3  | 0  | 0  | 0  |



## MONOFARM OUTCOMES



### 1: Oh Dear!

The crop chosen have proved extremely invasive and has spread to other farms and to peoples' gardens, outcompeting native species and reducing local biodiversity.

**The citizens demand a new mayor!**

### 2-3: Not Good

The farm is producing bumper crop yields, but requires considerably more water than anticipated, resulting in the local water company suggesting that people only shower once a week to save water.

### 4-5: Not Bad

The farm is producing an expected return and has created local jobs. The farm operators are careful to consider local biodiversity issues.

### 6: Great

The farm is producing bumper crop yields and is managing to deliver them in harmony with the environment. To conserve water, the farm has developed a sophisticated irrigation system that has gained wide praise.



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## FISH FARM OUTCOMES



### 1: Oh Dear!

Water has been greatly contaminated by the operation of the farm. As a result, the natural marine life has been endangered by the release of pathogens and parasites

**The citizens demand a new mayor!**

### 2-3: Not Good

The fish farm attracts a marauding shark pod that attacks a local surfer.

### 4-5: Not Bad

The fish farms are operational and working well, creating jobs and adding fish to the local palette.

### 6: Great

The fish farming has been a great success! Many more people can afford to have locally supplied fresh fish, saving air miles. The income from the farming has been put back into the local community in educating local fishermen on sustainable fishing practice



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## PROTECT LOCAL BIODIVERSITY OUTCOMES



### 1: Oh Dear!

The project is a disaster! An initial breeding programme to strengthen the wolf community led to wolves growing out of control and decimated local pets.

**The citizens demand a new mayor!**

### 2-3: Not Good

Whilst the wildlife park has been able to breed endangered local animals, returning them to their environments always proved difficult, leading to accusations that the park staff were incompetent.

### 4-5: Not Bad

The project is a success, with the wildlife park receiving awards for its programmes. There's interest from the community, but it's felt that people would rather enjoy their days out.

### 6: Great

The project is a great success, with the success reintroduction of rare species. The park is popular with both locals and tourists, offering both the opportunity to see rare animals and to learn about conservation.



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## CITIZEN BIODIVERSITY OUTCOMES



### 1: Oh Dear!

The project is a disaster! The app is developed by a consultancy with little understanding or interest in the project and product a buggy mess that nobody wants.

**The citizens demand a new mayor!**

### 2-3: Not Good

There's a small, but hardcore set of citizen users recording everything they can. This provides researchers with useful insights, but the project really needs more scale.

### 4-5: Not Bad

The project is a success, with the app being popular for school projects and wildlife enthusiasts. The app is niche, but provides a lot of value.

### 6: Great

The project is a great success, with residents keen to monitor the wildlife they see around them. The app's data provides local biodiversity researchers with clear insights into the state of the environment allowing for meaningful interventions.



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