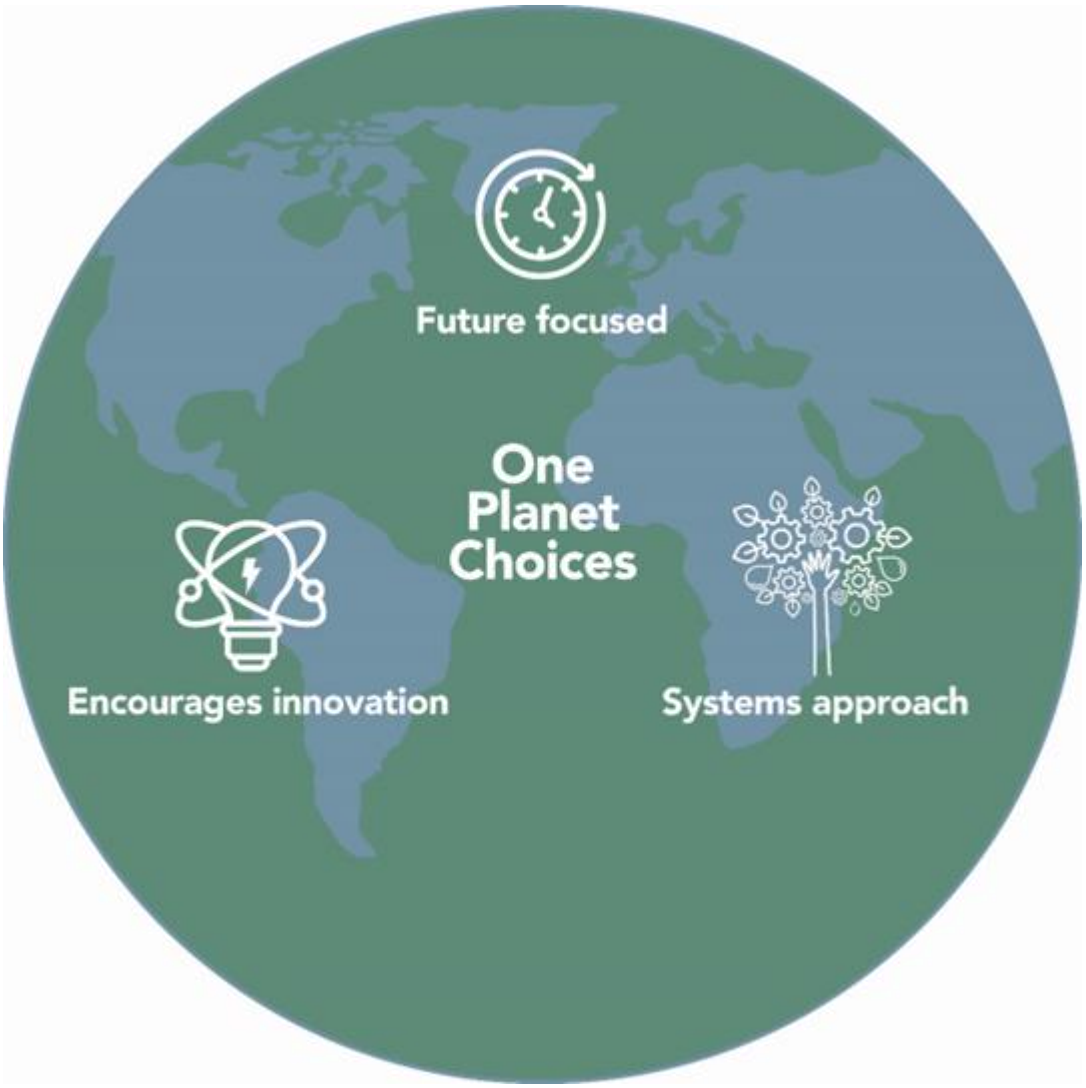
One Planet Choices



Making better decisions in an interconnected world

Method guidance

Authors and contributors:

Nicola Melville (SEPA); Sarah Gillman (Scottish Water); Jim Pritchard (SEPA); Katie Edwards (Scottish Water); Jennifer Leonard (SEPA); Mark Williams (Scottish Water); Kerry Davidson (Scottish Water) and M^2 under contract.

Contents

How to use this guide

This guide contains active links that enable you to navigate to the sections that contain more detail.

Use the ↑ to navigate back to the section you have left. There are also links to external documents and websites if you want more information from external guidance.

Overview of One Planet Choices method – *making better decisions in an interconnected world*

Why use One Planet Choices?

Effective and sustainable resource use is at the heart of investment planning decisions. Often resources are shared, and the decision by one user affects the others. Businesses and SEPA, as an environmental regulator, need to make investment decisions that deliver multiple outcomes in complex, shared systems (Figure 1). Many organisations have multiple goals to achieve in their corporate strategies and plans. This could include:

a. Provide high quality products and services.
b. Provide affordable services for customers.
c. Improve the quality of the environment.
d. Optimise use of materials, energy, chemicals, and water
e. Achieve a goal of net zero carbon emissions by 2045.
f. Enable sustainable and inclusive growth and development.

Figure 1: One Planet Choices enables decision makers to consider multiple outcomes and risks in complex shared systems

One Planet Choices informs them which interventions best deliver across the multiple outcomes they are seeking to achieve, and the implications of their decision for shared resources they rely on.

The approach enables those who share resources to collaborate in identifying solutions, which leads to more efficient and effective use of resources, whilst meeting their future business needs. The proposed solutions are compared in a colour-coded appraisal dashboard that presents all the information needed to make the choice in one place. This enables objective and intuitive decisions on the preferred way forward. Follow link for examples of the dashboard.

This document summarises the principles, framework, and main steps in the method for users.

What is One Planet Choices?

One Planet Choices provides principles, a framework and tools for joint decision making to achieve multiple outcomes that benefit society, the environment, and the economy. It can be used to inform the development of strategies, for sustainable catchment decisions, or decide between options for a specific place. It was designed to inform investment planning and regulatory decisions which require consideration of resource use and need to satisfy multiple stakeholder outcomes.

It applies three main principles:

- Takes a whole system approach;
- Future focused
- Encourages innovation

An outline of what these principles mean are in Figure 2. You can find more explanation by following the links in the bullet points.

One Planet Choices helps to bring clarity and structure to the conversations that need to happen to address the issues in the system. It enables transparency in the decision-making process by providing an audit trail to evidence the decision which provides confidence to stakeholders.

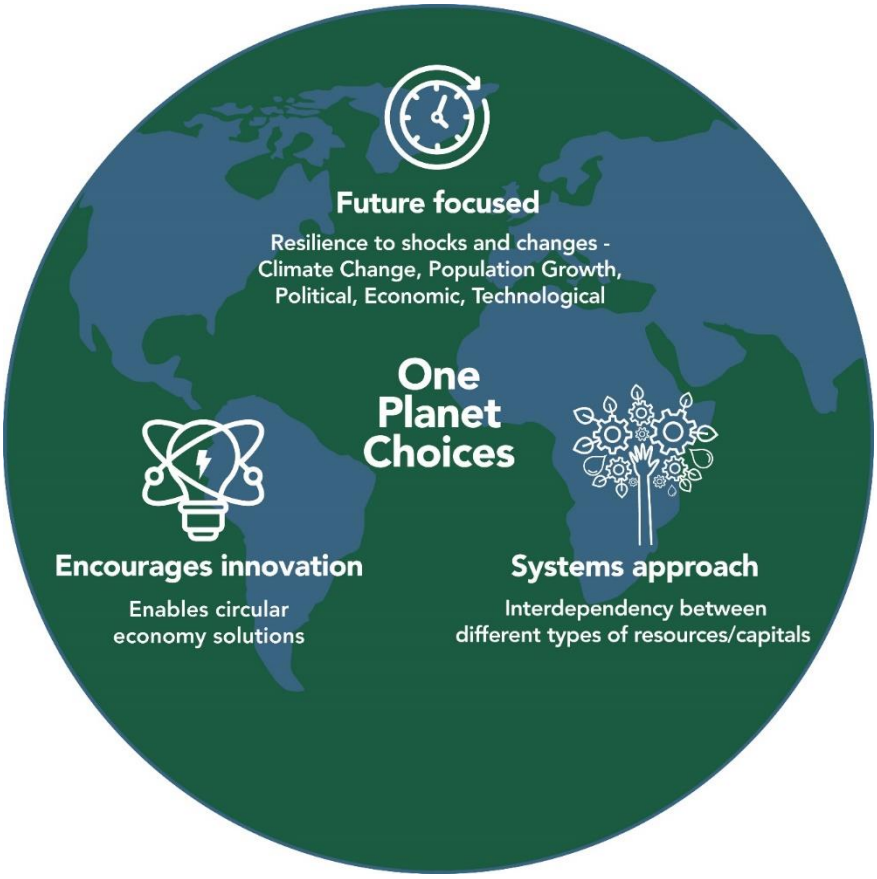


Figure 2: Outline of One Planet Choices main principles

One Planet Choices Framework

The framework has five main stages (Figure 3):

Figure 3: Overview of One Planet Choices five stage Framework

The framework can be applied at different stages in the investment planning process with different levels of detail. Stages 2-4 can be iterative with increasing levels of detail gathered as options are screened in early stages and more quantitatively appraised in later stages. A choice of a rapid or detailed appraisal can be taken, according to the appropriate levels of information required for early idea development through to detailed design. The main steps in the framework are described in the summary of stages.

Compliance with Government policy on option appraisal and global business good practice

The appraisal approach used in One Planet Choices is compliant with Treasury Green Book on Option Appraisal Guidance for spending by public authorities. It quantifies criteria, as far as possible with effort proportionate to the business case decision being made. The criteria are monetised where this is appropriate and depending on the measure of success defined for each SMART objective. The dashboard is also compliant with The Green Book (2022) - GOV.UK (www.gov.uk), which requires that identification of the preferred option is based on the detailed analysis at the shortlist appraisal stage. It involves determining which option provides the best balance of costs, benefits, risks and unmonetisable factors thus optimising value for money.

It also reflects the principles in the internationally adopted and extensively tested integrated reporting framework. This uses a systems approach based on six capitals: financial, natural, social, human, manufactured and intellectual. These capitals form a useful basis for investment and planning decisions as they represent the full stock of resources businesses and organisations require for creation of value through their products and services.

The approach and framework adopt the same stages as the Capitals Approach – Capitals Coalition and the UN Sustainable development Goal SDG Compass – A Guide for Business Action to Advance the Sustainable Development Goals. These frameworks are used by businesses globally, making it easy to build One Planet Choices into business decision making.

Triggers for using the approach and who is involved?

One Planet Choices could be triggered by SEPA, Scottish Water or other stakeholders for the reasons 1-4 in Figure 4

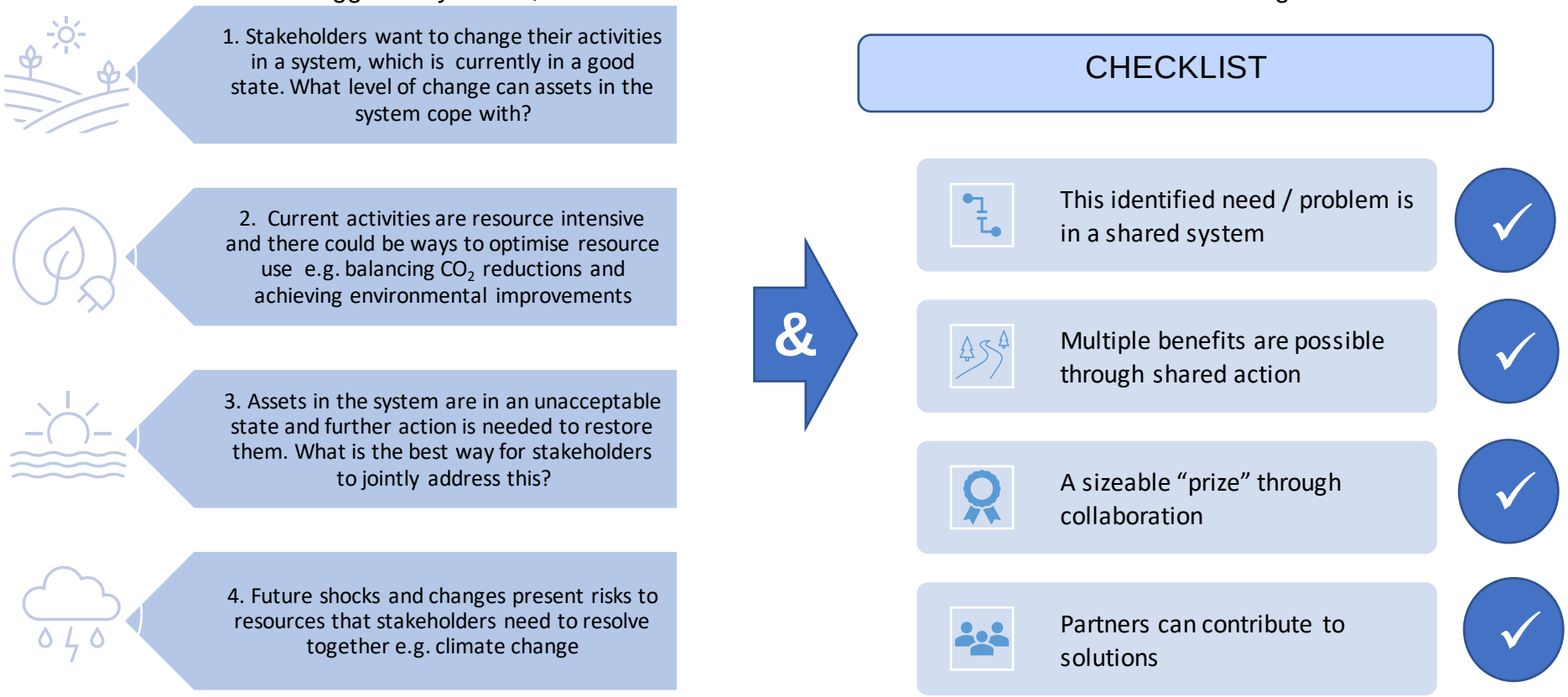


Figure 4: Define the reason for undertaking assessment.

To be effective, One Planet Choices requires the investment of time to engage and involve relevant stakeholders in the decision. Therefore, it cannot be applied to every decision made by an organisation. The checklist in Figure 4 helps to identify those decisions that are most likely to benefit from its application. The approach is flexible to enable a rapid screening-level, which could be applied more in-house or with the regulator to ascertain if a more detailed application with stakeholders is worthwhile undertaking. Follow the link to the decision tree to define the level of detail required.

Scottish Water is developing System Plans as part of its approach to Sustainable Investment Decision Making. System planning involves collaboration between Scottish Water and external partners to achieve the best solution, in areas such as flooding, growth and storm water management. Opportunities to utilise a One Planet Choices approach are most likely to be identified through these System Plans, subject to the checklist above.

Who is involved?

One Planet Choices helps with identifying the key stakeholders to involve in the approach and making the decision. Different levels within an organisation may be involved at different stages. Here is a guide:

Stage 1 helps determine the level of stakeholder engagement required. At this stage it is helpful to involve **senior level decision makers** from partner organisations in directing the focus for the decision and developing the SMART objectives.

At stage 2 the **stakeholders who manage assets and users** affected by the decision are identified in a dependency diagram. Involve the critical stakeholders on the critical pathways. They could be involved either directly or through a representative.

At stage 3 in addition to the critical stakeholders identified in stage 2, consider **positive disruptors** who might help stimulate new ideas and ways to address issues. The positive disruptors could come from a research background or a representative of the sector who is leading innovations that address similar issues or trialling new approaches.

At stage 4 involve **senior level decision makers**, who will make the final decision about resources in determining the appraisal criteria and making the decision.

At stage 5 involve **those who delivered the preferred option(s)** and the **critical stakeholders** to learn from experience how it worked in practice, adaptation actions (if required), and to feedback actual measures of benefits and disbenefits to improve future appraisals.

Summary of One Planet Choices Stages 1-5

Stage 1: Framing the focus for the decision

This stage is addressing the questions:

- Why do you want to undertake the assessment?
- What issues are you seeking to address through this decision?

The output of stage 1 is a defined focus for the decision with a reason behind making that choice. It should also be clear which system this method will be applied to and the timeframe. The goals and objectives are SMART, with relative priority assigned if required. The user has identified the level of detail and resources needed to inform the decision.

The main steps in stage 1 are:

1. Identify the problem and reason to apply the One Planet Choices approach
2. Define the system or catchment to which the decision applies (including boundaries of the system / catchment)
3. Check whether all relevant stakeholders have been identified and involved.
4. Define the framing question for the decision
5. Define the SMART objectives, including measures of success
6. Decide on the level of detail required.

Follow the links if you need more detail on steps at stage 1.

There may be some iteration of the SMART objectives as stakeholders become clearer about the decision.

↑ *Return to Overview*

Stage 2: Scope and assess current and future health of the system

At this stage key information is gathered to inform ideas for solutions in stage 3. The approach presents current state and trends of critical assets, alongside future risks and opportunities from future shocks and change affecting the system. The trials used a range of tools for this stage, as illustrated in the case studies.

The steps at stage 2 are:

1. Create a simplified diagram of the current system to illustrate key relationships between resources you depend on to address the issues you are seeking to address. This includes relationships between the system of man-made assets or infrastructure, and environmental relationships.
2. Determine critical interdependencies in the system that affect the decision
3. Identify current health of assets and resource, including asset state, trend and locational information on maps
4. Identify future drivers for change and shocks to system and determine future risks and opportunities for resources in the system using PESTEL framework.
5. Determine resilience of resources /assets in the system to change factors, including potential future state and trend
6. Use Catchment Resilience Tool if you want to understand complex interactions between factors of change
7. Summarise information in dashboard that identifies current health and resilience of assets to future change.

You can use modelling evidence on baseline conditions of the system to understand the issues better and agree with participants and collaborators where to target management options in stage 3.

The Eden, Pharmaceuticals and Philipshill case studies demonstrated the key role of participants and collaborator in verifying the information in the dashboard as representative of their understanding of the issues. In Philipshill, this has led to an iterative process, with further information being provided for those options selected for further investigation from the rapid appraisal.

↑ *Return to Overview*

Stage 3: Develop and test the effectiveness of management options

The purpose of this stage is to identify suitable solutions that address the current and future issues affecting the system and address the decision. Users of the method and stakeholders are encouraged to consider:

- Where in the system would action most effectively address the issues?
- How could resources be used more efficiently?
- Are there opportunities for circular uses of resources between stakeholders?

A long list of actions generated by the stakeholders is then assessed for technical effectiveness. The technically feasible actions are grouped into themed scenarios and agreed with participants in the process.

The output from this stage is between two to five management scenarios for screening or appraisal in stage 4

The steps at stage 3 are:

1. Use a workshop with materials from stage 2 to determine a long list of management options
2. From the long list, generate genuine scenarios which satisfy the ambition of the framing statement
3. Review and test effectiveness of interventions using models if needed.
4. Shortlist between two and five scenarios for screening or appraisal in stage 4

↑ *Return to Overview*

Stage 4: Option screening/appraisal and decision

The purpose of this stage is to compare the scenarios developed in stage 3 to determine which one is most preferred and present the outputs in a dashboard to inform the decision. The One Planet Choices Appraisal Tool is used at stage 4.

One Planet Choices provides a flexible and iterative approach to screening or appraising options depending on whether you are undertaking a rapid or full assessment.

The outputs from this stage are the One Planet Choices Appraisal Dashboard, recommendations and agreed next steps.

Stage 4 involves the following steps:

1. Refine and agree assessment criteria based on the SMART objectives and ensuring criteria are considered for each capital type.
2. Determine how each criterion will be measured – quantify, where possible, otherwise use qualitative values: e.g. very high to very low
3. Taking each criterion in turn, assign a relative or actual value to each scenario. Relative values can be assigned within a workshop setting using combined stakeholder views.
4. The One Planet Choices appraisal tool automatically generates overall scores for each of the scenarios based on comparing them to each other, and which best fulfils the criteria.
5. The tool presents results in the One Planet Choices Appraisal Dashboard.
6. Summarise the preferred scenario along with a narrative to explain the preference and the basis for the decision including benefits, beneficiaries and any issues or weaknesses to be considered. There are possible next steps for the decision provided as examples.

↑ *Return to Overview*

Stage 5: Learn

The purpose of this stage is to enable decision makers to improve future decisions by learning what worked well in practice.

Monitoring can be put in place to check which management options worked best and reduce uncertainty about their delivery. This type of review is only required once the decision has been taken to implement an agreed scenario.

Stage 5 also reviews the decision-making framework itself to ensure that the framework is improved using lessons learned from its application. This type of review can take place at any stage in the process. The trials undertook the review as part of the final workshop, with outputs presented in the case studies in the lesson learnt section.

The main output from this stage is a monitoring and review programme that tracks actual outcomes from implementing the decision. This could form part of an overall performance monitoring framework.

There are five main steps in stage 5:

1. Set up relevant monitoring to enable adaptive management.
2. Agree a review period with stakeholders.
3. Engage stakeholders in the review.
4. Review and revise management interventions if desired outcomes not achieved.
5. Review and refine One Planet Choices approach using the lessons learned.

↑ *Return to Overview*

Evolution of the One Planet Choices Methodology

The OPC methodology was created in response to the commitments made under the Sustainable Growth Agreement between Scottish Water and SEPA in 2018. The methodology itself was developed and refined in 2018-19. Over the period 2020 to 2022 the methodology was trialled on a range of systems and the method further refined.

Summary of trials

The following trials are available as case studies:

1. **Sustainable catchment decisions, Eden catchment, Fife – Full assessment**

One Planet Choices was used to enable the land managers and Scottish Water to work together to address nutrients and water resources issues. Stakeholders

developed and appraised joint solutions to enable more sustainable and resilient use of these resources in the future.

2. **Prioritising actions in a national strategy, Pharmaceuticals in the environment trial – Rapid assessment**

One Planet Choices was used to help the One Health Breakthrough Partnership develop a strategy and focus for their shared work programme to address the environmental impacts associated with pharmaceuticals in the environment.

3. **Taking a systems approach to developing options for a specific works, Philipshill Wastewater Treatment Works – Rapid assessment**

One Planet Choices was used to help Scottish Water and SEPA develop and agree actions that will lead to an overall environmental benefit, including net zero carbon emissions and, resource re-use whilst achieving River Basin Management Plan objectives for the receiving waterbodies.

Explanation of One Planet Choices Principles

Systems approach

One Planet Choices follows a six capitals approach by considering financial, manufactured, natural, human, intellectual and social capitals (Figure 3). It sets out the interdependencies and the interlinked system between these resources, including those that are used and managed by different stakeholders. This enables the user to work with the stakeholders to identify where in the system to focus actions, and to understand the implications of making those changes on other parts of the system.

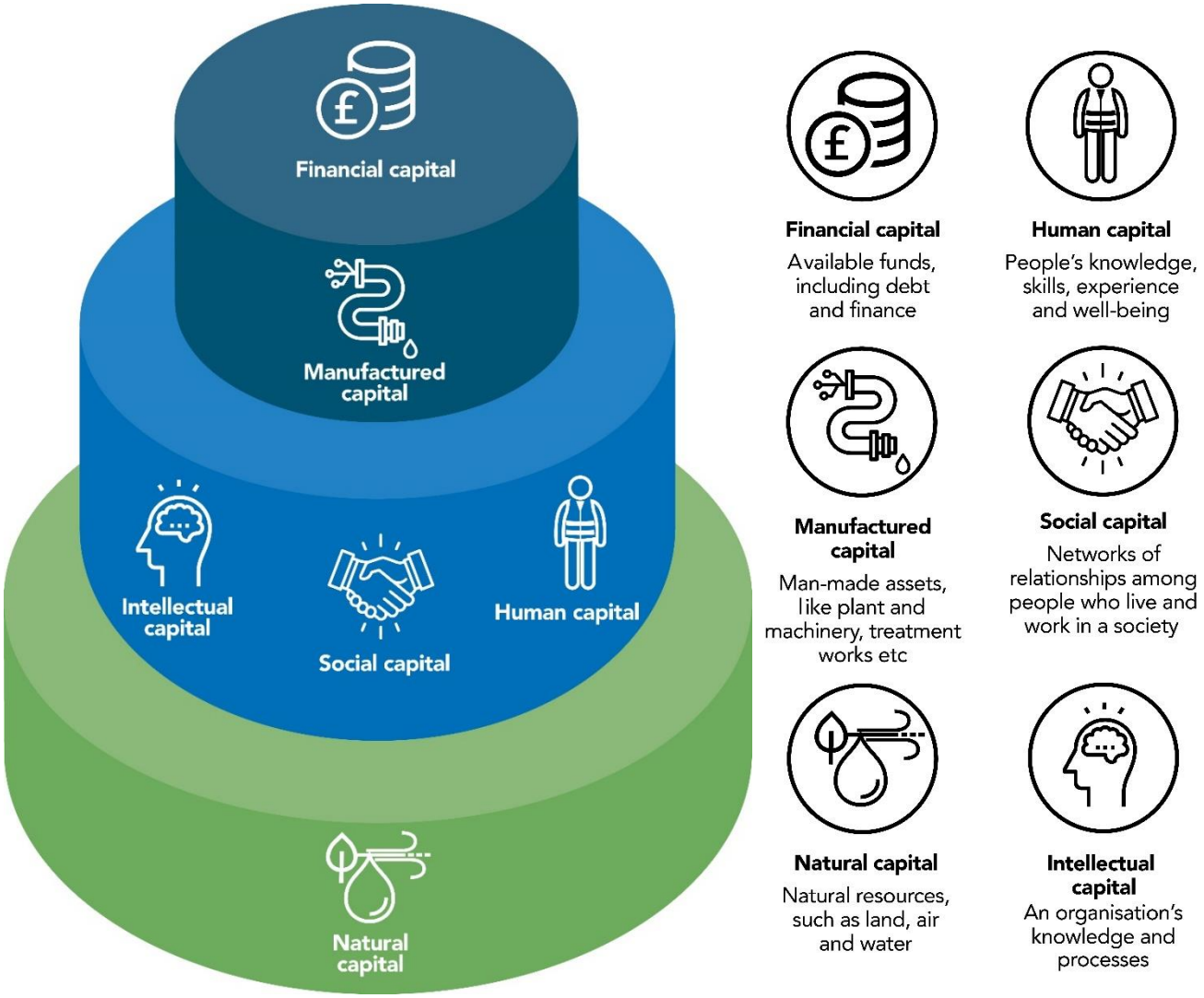


Figure 3: The interdependency between the six capitals

Investment decisions rely on availability of financial capital to deliver specific objectives. Conventional investment is often in engineered solutions which use manufactured capital (the dark blue tier in Figure 3). A least cost investment decision would only consider financial costs and the manufactured assets delivered to meet the objectives. However, this does not adequately consider the wider costs and benefits of the decision to people (middle blue tier in Figure 3) and the environment (green tier in Figure 3), which provides the resources and services that underpin human health and wellbeing.

One Planet Choices considers the interdependency between capitals and the impact of different options on these different asset types. There is a constant flow from one type of capital to another.

Figure 4 provides an example of a catchment system. It shows that drinking water quality depends on land management in the surrounding catchment for good raw water quality. It also shows that treated wastewater, released to the river as effluent, can then be extracted for use by farmers downstream to irrigate their crops, as well as maintaining river flows which supports the river ecosystem. Stakeholders who change their management practices in one part of the system affect the use and quality of resources used by others. Financial capital from selling produce and from customers, combined with the intellectual capital to develop new technologies and facilitate new partnerships enables change in management practices, technology and sustainable use of assets in the system.

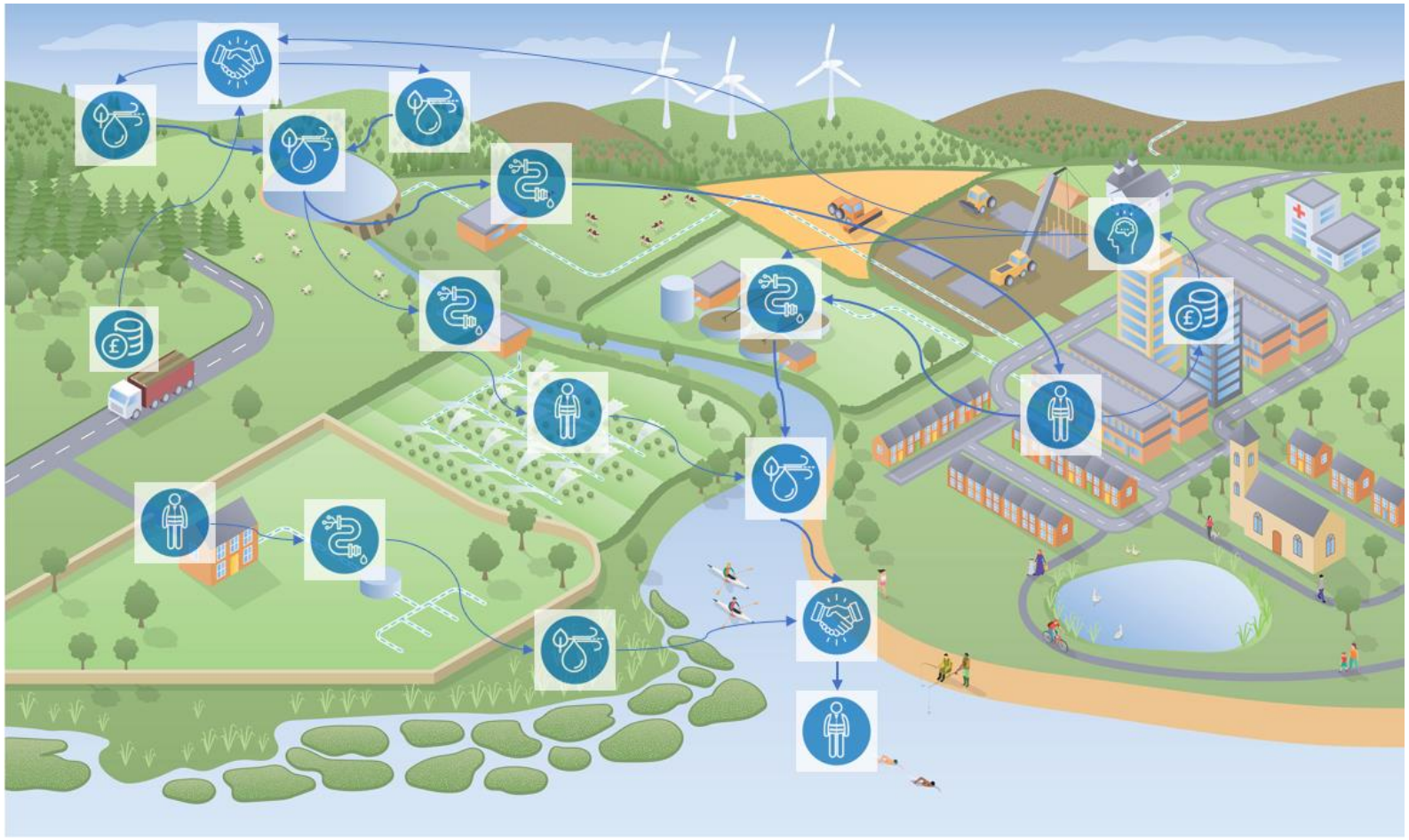


Figure 4 Example of multiple stakeholders using water in a catchment system

Identifying these interactions and interdependencies between different resource assets informs who might need to be involved in making the decision and where in the system is the most effective place to intervene. It also helps with spotting opportunities to make more effective and circular use of resources. One Planet Choices uses a dependency diagram to help understand the interdependencies between the resources the business depends on and impacts as it creates value through its products and services (Follow the link to see *an example of a system dependency diagram*)

↑ *Return to Overview*

Future focussed

One Planet Choices is a future-focussed approach which not only considers the current state of assets but also the impact on these assets that arise in the future due to factors such as climate and population growth. Investment in infrastructure is usually a long-term decision therefore it makes sense to consider the future situation to ensure that solutions are resilient to those future changes.

The framework includes systematic consideration of risks and opportunities using PESTEL: Political, Environmental, Social, Technological, Economic and Legal changes.

↑ *Return to Overview*

Encourages innovation

One Planet Choices encourages consideration of a wide range of interventions by engaging with a range of stakeholders in the system and at the earliest stages of investment planning. For example, identifying more circular use of materials such as nutrients; considering reduction at source solutions to reduce use of pharmaceuticals; or more effective use of water within a city. Innovative and sustainable solutions that create wider value can be identified through considering all resource types within the system.

The current and future health dashboard, catchment resilience tool and appraisal tool inform the identification of interventions and appraise them.

↑ *Return to Overview*

↑ *Return to Stage 2.4*

Detail for steps at stage 1

1.1 Define the system

Where? Is this a national, regional, catchment, sub-catchment, or city-wide issue?

At this stage define the place. You will define the boundary of the decision in more detail in stage 2.

For example, the Eden catchment, in Fife, was selected as an example of a catchment where there were both water quality and water resource issues with multiple stakeholders responsible for managing these resources. It was representative of a wider national issue of how best to resolve complex interrelated issues of water quality and quantity. Staff in Scottish Water and SEPA suggested several catchments and the Eden was found to be both representative and had good availability of data.

Who?

Who is this for?

Think broadly about the beneficiaries of the decision. You are unlikely to know all the stakeholders in detail at this stage. Is it for the public, or businesses? Is it to inform the decision made by a specific business, or a partnership? This will affect how you present the information and whose information you use.

1.2 Define the framing question

This is the decision summarised into a single sentence question. It helps create a clear focus for all the next stages. If a partnership is working together to make the decision and deliver goals, then it is worthwhile working together on the wording to make sure all parties are agreed on the decision you are taking together.

Example of a framing question for the decision in the Eden catchment:

"What combination of management actions across all sectors enables good status to be achieved whilst optimising resource efficiency, in the Eden catchment, now and in the future?"

See the case studies for more examples of framing statements

Note that **How?** is not a key question in stage 1. It is tempting to jump straight to the solutions which can limit our thinking to what we already do or know. The One Planet Choices approach considers how the framing statement could be achieved in stage 3.

1.3 Define the SMART Objectives

SMART objectives means that they are:

Specific
Measurable
Actionable
Relevant
Time bound

The reason for defining these in stage 1 is to enable the agreed goals for the decision that include quantifiable measures of success.

Example of SMART objectives for the decision in the Eden catchment:

We will achieve the ambitions of the framing question by deploying management actions that:

1. Achieve good status for the River Eden by 2027 by addressing catchment pressures.
2. Optimise use of energy, chemicals, and other materials, contributing to net zero by 2045.
3. Ensure resilience to future change scenarios to 2050 through collaboration in ways that maximise benefits to all stakeholders and the environment.
4. Ensure food production is optimised in accordance with other goals.

The case studies demonstrated that it was not always possible to identify quantifiable criteria at stage 1, as it is not clear what evidence is available. Stage 2 helps to understand the baseline evidence, and the SMART objectives can be revisited at this stage. SMART objectives should also be revisited once stakeholders have been engaged. For example, objective 4 in the Eden case study was added after engaging landowner representatives.

A key test for a SMART objective is whether the objective is measurable. Asking the question:

How will we measure if this objective has been successfully delivered?

provides the foundation for the criteria in the screening/ appraisal in stage 4.

1.4 Define the level of detail needed

There is a decision tree to help decide the level of detail required in Figure 7. This helps with defining the resource needs for the decision. For example, so that there is sufficient resource to enable facilitation of stakeholder workshops, if this is required. Use the framing stage to justify and define the business case for resources.

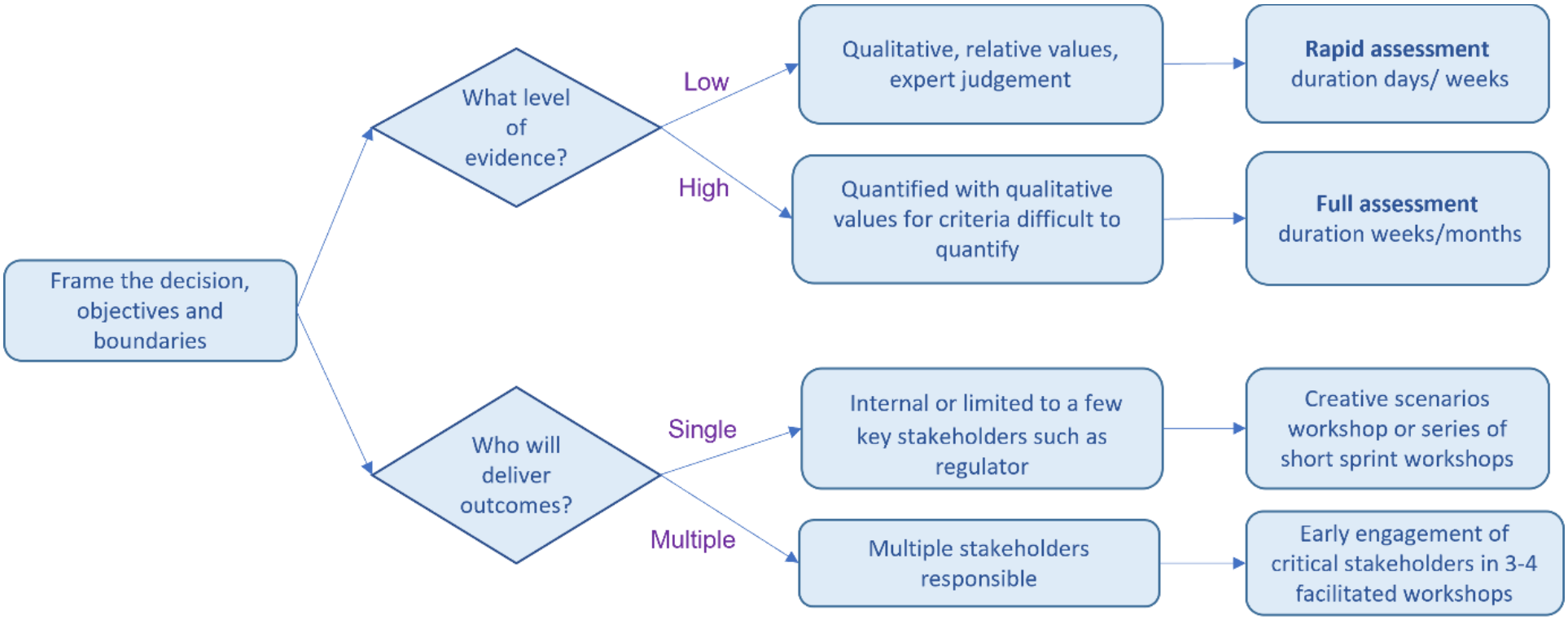


Figure 7: Decision tree for deciding the level of detail needed to inform the decision

↑ *Return to Stage 1 Summary*

↑ *Return to Overview*

↑ *Return to Stage 4 Detail*

2
Current health & future resilience of system

Detail for steps at stage 2

2.1 Create a simplified system dependency diagram

The dependency diagram sets out the interdependencies between the assets and resources that the organisation relies on for its products or services. The system is split into six different capitals as defined in Figure 8.

Figure 8: Definition of the six capitals used in One Planet Choices decisions.

The dependency diagram identifies which capitals are critical to the decision and focusses attention on which information to gather in stage 2 and where in the system it is best to intervene in stage 3. The diagram is appropriate to the scale of the decision and issue. Figure 9 provides an example.

Use the following steps as a guide for developing the system dependency diagram:

1. Identify components of manufactured capital in the business supply chain.
2. Identify the natural capital the business depends on.
3. Identify key stakeholders in the decision and their relationships as social capital These are people and organisations who:
    a. Manage the resources the business relies for its products and services.
    b. Share use of resources and therefore may be affected by any management decisions or make decisions that affect the business.
    c. Use the service or products provided by the business e.g., customers.
    d. Make decisions that affect others' use of the resources e.g., regulators, supply chain manufacturers, prescribers.
4. Identify the roles of staff and contractors of the organisation who manage assets and resources as human capital.

5. Identify other key capitals influencing the decision as required. For example:
    a. **Intellectual capital** represents the knowledge assets required, for example this could be a specific model used to inform the current decision or access to a key source of data.
    b. **Financial capital** is helpful to consider at this stage, if there are defined sources of capital which constrain the decision or, as in the pharmaceuticals trial, influence the choices by key decision makers in the system.
6. Use arrows to link up the resources to show how they depend on each other. The direction of the arrow shows the direction of flow of resources between the assets.
7. Represent a particular process or service using a rectangular box along the line. For example, storage and attenuation of water was a service provided by the natural capital assets in the Aberdeen City trial.

8. Information on the amount of resource within the system, or limits on the service or process can be included in the diagram for context to help determine critical dependencies.

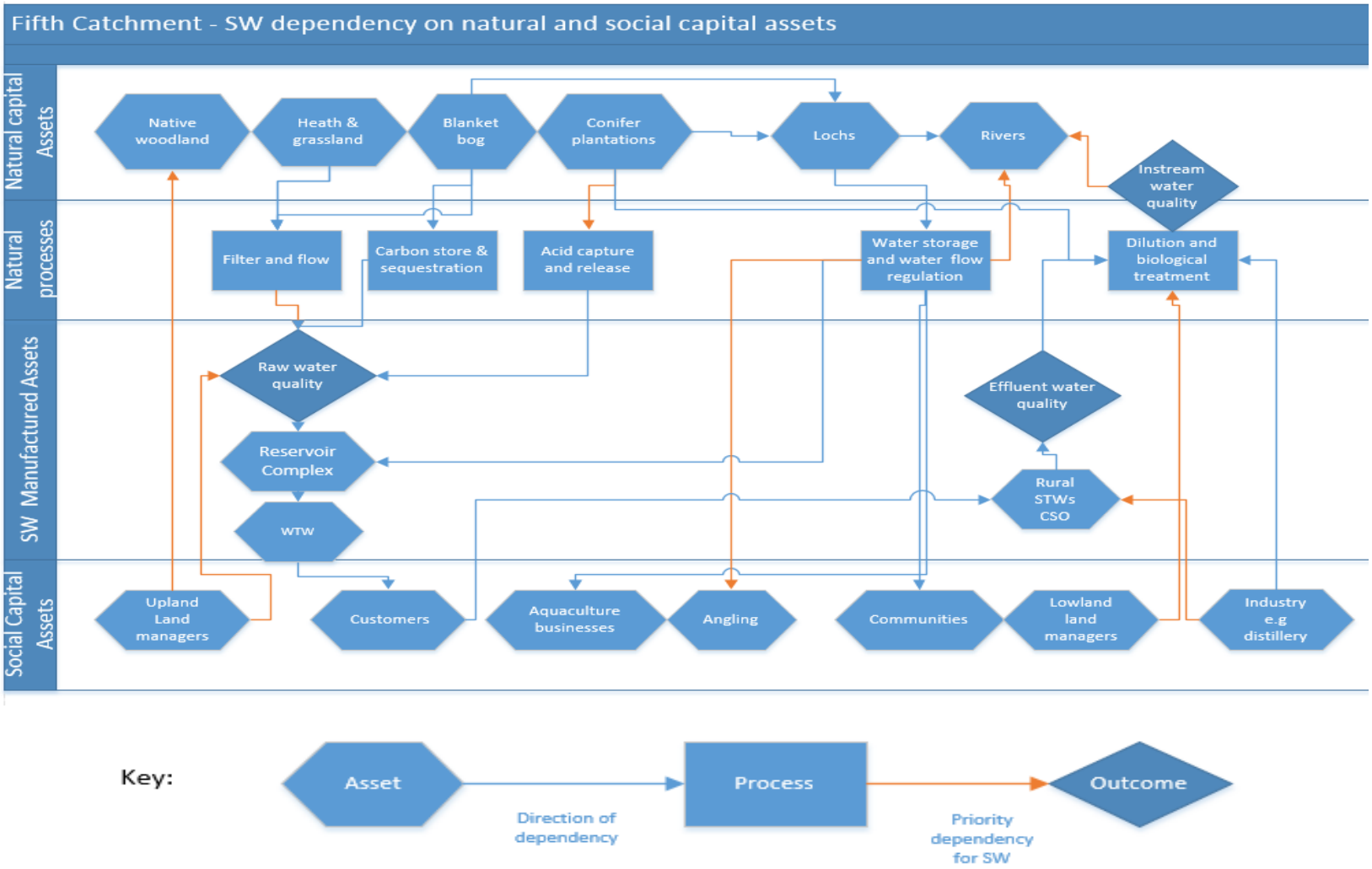


Figure 9: Example of a dependency diagram for a theoretical catchment which considers relationships between natural, manufactured and social capitals

↑ *Return to Systems Approach*

↑ Return to Details for stage 3

A variety of tools can be used to illustrate the system and the decision is up to the user based on familiarity. The following were used in the trials:

Visio - used to create systems diagrams, good for capturing the diagram, but not suitable in workshop settings.

GeNIe – software for Catchment Resilience Tool – good for capturing system details in workshops, especially for setting out the basic structure, which can be used in later stages of the method. However, it requires experience and training in the use of the software.

DEPENDENCY DIAGRAM TIPS:

1. Some stakeholders find it easier to get started if basic elements of the system are already identified that they can add to. The method user can create this in advance and use previous system diagrams as a starting point.
2. Start with the part of the system most familiar to stakeholders.
3. Work with small groups with similar interests initially to build up components of the system. We found in the trials that different stakeholders knew different parts of the system depending on their role and expertise.
4. Involve stakeholders in making links between the systems. As a result of working together on the dependency diagram all three stakeholder groups in the Eden trial better understood how resources are interconnected and shared.

↑ *Return to Summary of stage*

2.2 Determine critical dependencies

This step informs what factors are material to the decision and the pertinent aspects you will need to measure to inform it.

Check each of the identified dependencies and impacts against the purpose in the framing statement and SMART objectives to determine if it is critical to the decision. One way to decide this is to ask:

If this link were missing what would be the outcome?

If it makes no difference to delivering the framing statement and SMART objectives, then it is unlikely to be critical to the decision.

Record which resources are critical in a table and identify the metrics and sources of data that will be used to measure their state and trend. Stakeholders can contribute their evidence and knowledge for their part of the system.

Indicate the critical resources and dependencies on the diagram using a different colour or wider border. For example, in Figure 9 the critical dependencies to the decision are marked in red.

The analysis of social capital helps define the key stakeholders to involve in making decisions through One Planet Choices.

↑ *Return to Summary of stage*

2.3 Identify state and key pressures on resources

This step develops a current health dashboard that informs the decision maker about the current state and trends for all the material capital assets. In addition to state, the dashboard quantifies resource use such as energy and chemical use for manufactured capital in the current system. This information is used to inform management options in stage 3.

↑ *Return to Summary of stage*

2.4 Scope and analyse resilience to drivers of future change and shocks to the system

Many management interventions require significant investment and may take several years to design, implement and then deliver the required outcome. In this time the system is affected by changes such as to land use, climate change and population growth. There may also be major shocks the system needs to cope with such as drought or major storms, or major political changes such as Brexit.

This step identifies the future drivers of change and shocks that could impact on the resilience of resources within the system, to understand where in the system to focus adaptive or transformative actions and whether identified interventions will still deliver the desired outcome under various future scenarios.

The PESTLE framework provides a systematic and effective way to consider different factors of change: **Political, Economic, Social, Technological, Legal and Environmental.** This framework enables a broad analysis of factors that could impact the system in the future positively and negatively. For example, 'Environmental' factors could include issues such as flooding, drought, water scarcity, storm damage, and wildfires. Climate change predictions for the area can be used to quantify the scale of potential changes. The use of PESTLE is supported by the Treasury Green Book, and there is supplementary guidance in the Green Book on accounting for the effects of climate change .

The future changes create both risks and opportunities. Sometimes the change is transformational and results in complete change in the system to a different state. These transformational shifts are called **tipping points**. The shifts in state may be desirable or undesirable to stakeholders, and this will affect what action is taken. Record the views of stakeholders including any differences in stakeholder opinion. This will inform the preferences to minimise or maximise criteria in the appraisal at stage 4.

Different approaches can be taken to engage stakeholders in identifying change factors and the resources in the system. Involving stakeholders in this step helps to develop a common understanding of risks and opportunities, which enables a future focussed approach.

↑ *Return to Summary of stage*

2.5 Determine the impact on the system and the consequences using models

Modelling can be used to inform impacts on the system and consequences of multiple factors of change on the 6 Capitals.

For example, in the Eden catchment case study a catchment resilience tool was developed based on a Bayesian Belief Network (BBN) model. The BBN model was constructed using GeNIe software to represent the impact on the resource types in the catchment. The outline structure showing the elements of the model are in Figure 10.

The model calculates probabilities for each of the capitals being in a resilient, low risk, moderate risk, and high-risk state under different combinations of change narratives. It also enables the root causes of the future state to be identified.

This type of probabilistic model is helpful for resilience planning as it is responsive to stakeholders' understanding of the system. It can use expert views about the probability of an impact alongside quantified data, where these are available. It is also easy to adapt if a stakeholder later identifies consequences to the system. It therefore provides a rapid and effective way to understand the consequences of multiple factors of change happening concurrently.

Figure 11 is an example output from the catchment resilience tool developed for the Eden catchment trial. It summarizes the current health and future resilience risks for the Eden catchment, showing which specific resource types are at risk, the level of risk and target interventions to address those risks. The tool indicates which of the assets are most at risk and implications for dependent assets in the system.

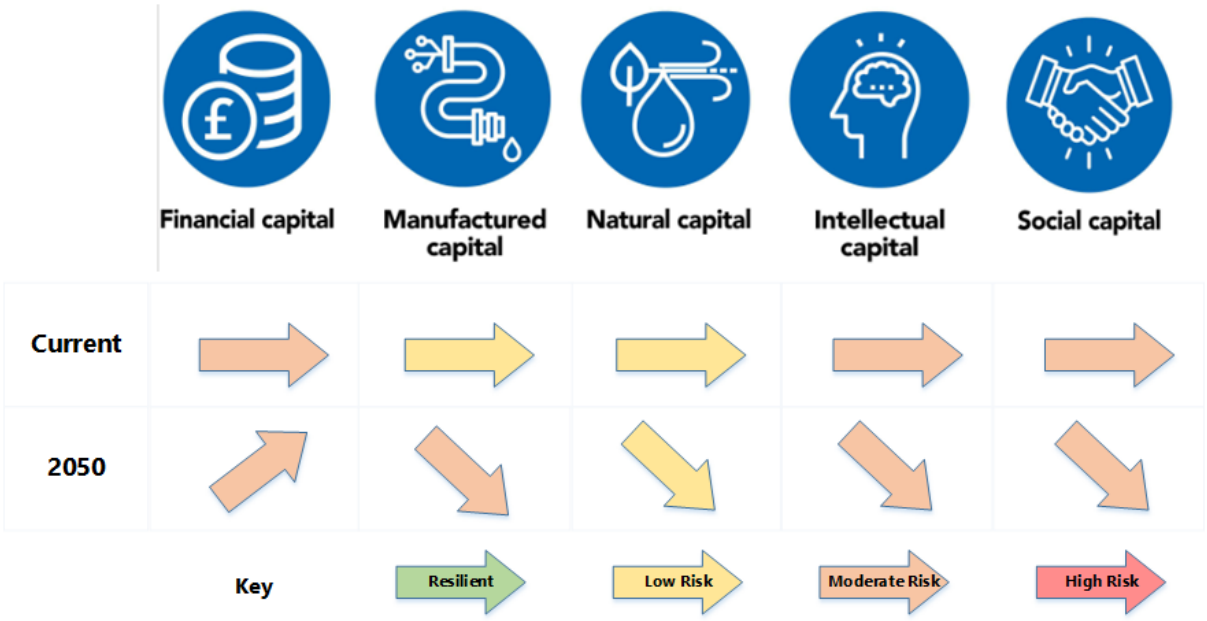


Figure 11: Example summary of the current state and future risk for capitals in the Eden

↑ *Return to Summary of stage*

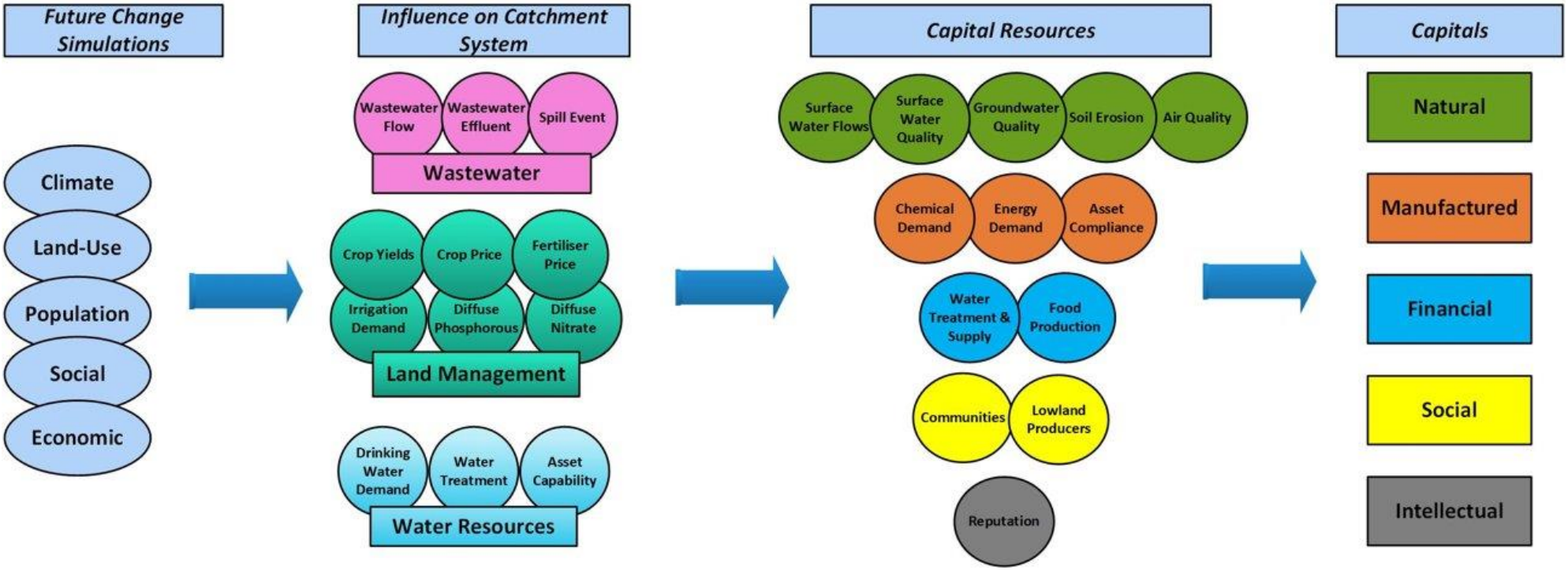


Figure 10: Outline structure for Bayesian Belief Network Model used in the Eden catchment trial

Current health and future risks for resources in the Eden catchment Fife

Capital	Resource type	Measure	Current	Description of current health	Future Risk 2050	Future residual risk	Description of risk and resilience factors
Natural	Groundwater	Quantity – WFD status		4/6 WBs poor due to low flows in rivers caused by abstraction	VH	M	Decline in summer mean flows increases demand for groundwater. Adaptation in water use from SW, industrial and other water users required
		Quality – WFD status		2/6 WBs poor due to nitrate (agriculture) and manganese (mining)	H?	M?	Larger farms which are more efficient at applying fertilizers combined with switch to less intensive crops reduce nitrate impacts
	Surface Water	Quantity – WFD status		8/10 WBs moderate due to primarily abstractions from land managers -98%	VH	M	Decline in summer mean flows, combined with increasing agricultural demand. Adaptation from land managers through drought resistant varieties & more efficient irrigation technology.
		Quality – WFD status		7/10 moderate due to phosphate from land managers, septic tanks, WwTW	VH	VH	Increased frequency of storms triggers more CSO spills. Increased population, whilst sufficient capacity available in works phosphate will increase
	Land	Soil risks – WFD status		High risk due to 30% of cultivated soils at risk of erosion and leaching	H?	M?	Increase in high intensity storm events increases likelihood of soil erosion leading to increase in phosphate pollution. Mitigate with cover crops.
	Air	Greenhouse gas emissions (operational)	⇧	Moderate and trend improving due to action to decrease in greenhouse gas emissions;	M?	L?	Trend of improving due to action to decrease in emissions continues
Manufactured	Operational efficiency	Energy use		WTW contribute highest annual energy use 2000MWh/yr Sludge treatment 1000MWh/yr WwTW and pumping both approx. 600MWh/yr	H	L	Ageing assets and increased loads due to population growth lead to increased energy use at WwTWs and WTWs. Mitigated by increasing switch to renewable energy sources and electric vehicles.
		Chemical use	⇧	WwTW varies between 10150kg/yr (2017) and 9100kg/yr (2015 & 2016). No data WTW.	?	?	
	Water treatment works	Life expectancy (or reliability)	?		H	M	Ageing assets lead to WTW failure. Mitigated by maintenance spend on assets
	Treated water distribution	Life expectancy	?		?	?	
	Waste water treatment works	Life expectancy	?		VH	H	Ageing assets result in WwTW performance failure leading to increased pollution risk Combined with more concentrated sewage loadings and increased loads from population growth. Partly mitigated by maintenance spend.
	Sewage pumping and transfer	Life expectancy	?		?	?	
	Sludge treatment centre	Life expectancy	?		VH	L	Population estimates Eden population will grow from 17.8K in 2016 to 18.5K by 2050 leading to increase in sludge treatment required. Mitigated by sufficient capacity at works and electric vehicle use
Social	Lowland land managers	State of relationship		SW no relationship; SEPA good relationship with 70/100% through 1:1 partnership >5 years	M?	M?	Increasing pressure on relationships due to competition over water resources
	Septic tank users	State of relationship		SW poor relationship >5years; SEPA good relationship with 70-100% through 1:1 regulation >5years	H	M	More decentralised waste water systems and septic tanks not properly maintained leads to increase pollution risk. Mitigated by campaign by SW to explain issues and impacts

Figure 12 Extract from rapid appraisal current health and future risks for resources in the Eden catchment Fife with uncertainty or missing information indicated by question marks. This helps understand where more information is needed in full assessment

2.6 Summarise information on current and future resilience in a dashboard and/ or presentation for use by stakeholders in the next stage

One Planet Choices is a future focussed approach. Stakeholders and decision makers need to be able to easily understand the future issues to be addressed when they develop and appraise management options.

The way the future is presented will depend on the audience to some extent. For example, some stakeholders may appreciate quantified impacts from modelling. Whereas others may prefer a high/medium/low assessment of state and direction of trends, sufficient for their needs to understand where to focus management effort.

The amount of evidence presented will also vary depending on the level of evidence available. Where there is less certainty about a prediction this can also be represented by symbols or varying the shading.

The case studies demonstrated a range of methods:

Examples include:

- Flag assets at risk and opportunities on the system using symbols on the dependency diagram. By visualising the system in its entirety, it helps to identify where in the system is best to intervene (stage 3).
- Maps to inform targeting of interventions, such as location of issues and state of assets.
- Future narratives for shocks and changes and their impact on the system
- Modelling outputs of consequences of future narratives such as climate change, populations growth and changing economic situations
- Summary dashboard with current health and future risks to assets including a short description (Figure 12).
- Presentation with future risk and/ or resilience of assets.

↑ *Return to Summary of stage*

Detail for steps at stage 3

One Planet Choices recommends a workshop format for generating a long list of management interventions. The workshop should involve the key stakeholders responsible for making the decision alongside positive disruptors to bring in new ideas.

Professional facilitators can help design, format and facilitate the workshops to enable all stakeholders to contribute effectively.

3.1 Materials for developing the long list

The following materials are used by participants in the workshop to identify what type of action is needed and where in the system it could be most effective:

- The system diagram.
- Current and future health dashboard
- Maps which help with targeting of measures
- Management option recording sheet to capture long list actions.

In the trials these materials were presented in different ways depending on if it was online or in person. Presentations provided a useful overview of the materials to all participants. Copies of the targeting maps, dashboard and system diagram were helpful for the group(s) to refer to as they discussed options.

↑ *Return to Summary of stage*

3.2 Develop genuine scenarios

The purpose of this step is to generate genuine scenarios which satisfy the ambition of the framing statement. This is achieved through the following steps:

1. **Grouping** - Actions in the long list are grouped into similar actions.
2. **Sorting –** Actions on the long list can also be cross-checked against the SMART objectives to identify any gaps and ensure there are actions targeting all of the objectives.
3. **Consider scope –** Some actions may be removed from the long list if they are outside the boundary and scope set at stage 1.

The short list of options is now in a state where there are grouped actions that all meet the requirements of the framing statement, and it is clear whether they deliver for a single or multiple objectives.

GENUINE SCENARIOS TIPS:

1. **Group similar actions together** e.g., all relating to land management grouped under Rural Sustainable Drainage Systems unless purpose of the appraisal is to choose between land management options.
2. **Be clear about what you want to compare** e.g., are you comparing all underground options with all overground solutions or are you grouping based on ease of implementation?
3. **Actions considered out of scope due to boundaries set at the framing stage, may still require follow up** action at a national level e.g., a policy or legislative change is required. Record these constraints and bring them back for consideration in stage 4 when you consider constraints and make recommendations about implementation of the preferred scenario(s).

↑ *Return to Summary of stage*

3.3 Review and test effectiveness of options

The purpose of this step is to test effectiveness of options and discount those that are not effective i.e., options that do not satisfy the ambition of the framing statement.

Evidence on effectiveness of the actions can be gathered through review of scientific or grey literature e.g. from an organisation's R&D programme.

It is useful to focus on systemic reviews as these summarise evidence across multiple studies, and the quantified evidence of effectiveness will have been tested across a range of situations.

Single studies can also indicate if proposed measures are effective, however the local context and experimental design needs to be considered in applying it. Modelled evidence of effectiveness can also be used but the reviewer needs to consider the assumptions and whether they are relevant to this decision.

A system such as a catchment has different factors acting together that are interdependent. Models are useful to test the implications of changing how complex systems are managed. These models can measure effectiveness for the primary objective or across multiple objectives.

For example, models used in the trials included SAGIS and the One Planet Choices Catchment Resilience Tool. SAGIS was able to consider implications for water quality objectives, whereas the Catchment Resilience Tool was able to consider

multiple consequences across all six capitals. In the city scale trial, a 2DI model was used to test for hydraulic effectiveness and implications for flood risk.

The results of the effectiveness testing should be clearly presented to stakeholders, including any management options that have been discounted as they are not effective.

The Future Business as Usual Scenario is always taken forward to appraisal as a "counterfactual" scenario.

Figure 13 provides an example of presenting the results of the effectiveness testing from the Eden trial. The standard scenario was still taken forward to the appraisal stage even though it was not effective in achieving the framing statement's primary objective. This was to enable comparison with the "business as usual" actions that would have been taken without One Planet Choices identifying more innovative ways forward.

What combination of management actions across all sectors enables good status to be achieved whilst optimising resource efficiency, in the Eden catchment, now and in the future?

	Future BAU (A)	Standard Scenario (B)	Nature Based Scenario (C)	Best Available Technology Scenario (D)	Resource Centre Scenario (E)
Good Status Achieved (Current)	✘	✘	✓	✓	✓
Good Status Achieved (2050)	✘	✘	✓	✓	✓

Figure 13: Example of summary of outputs from the effectiveness testing phase presented to participants in the appraisal workshop.

↑ *Return to Summary of stage*

3.4 Shortlist between two and five scenarios for screening /appraisal

The One Planet Choices appraisal tool in stage 4 allows comparison of up to five scenarios. One of the scenarios must be the future business as usual (counterfactual) scenario.

The names of the scenarios should be sufficiently distinct for easy comparison at the appraisal/screening in stage 4. This is essential if qualitative approaches are used where the stakeholder participants are comparing the relative value of the scenarios.

An overview slide is created to summarize the management options in each scenario and used in the screening workshop in stage 4.

An example of the summary table used in the Eden trial is shown in Figure 14. This summarizes which interventions are included in each scenario to achieve the goals of the framing statement.

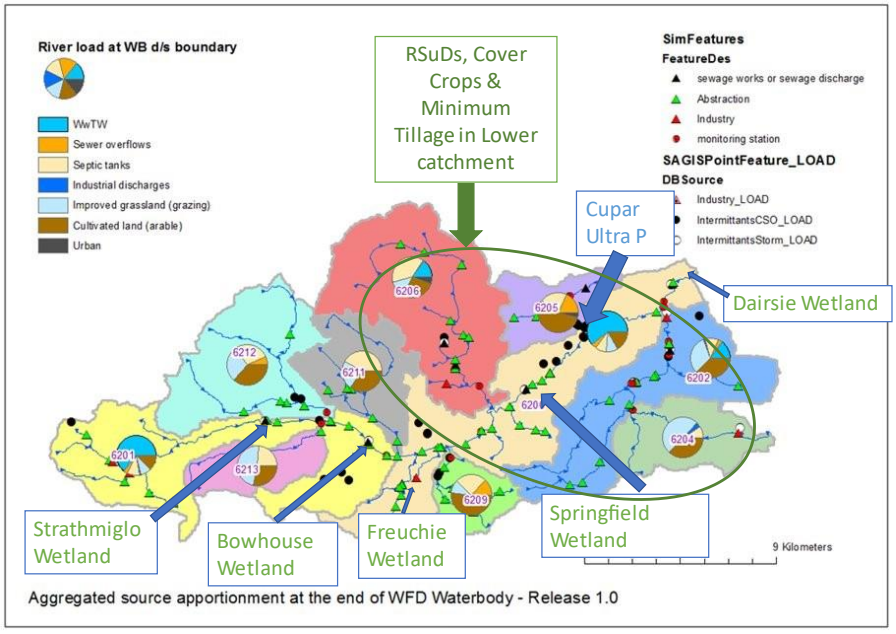
Figure 15 presents location information on how the interventions would be targeted under each scenario. This helps stakeholders picture the scale of removal represented by the width of the arrow, and location of changes.

Scenario	Growth & 100% GBR	Septic Tank P Filters	Water Efficiency Campaign	Ferric dosing	Ultra low P Nereda	Struvite fertilizer	Wetland polishing of Final Effluent	40% Irrigation Reduction	RSuDs & Magic margins	Cover crops & min tillage	Irrigation lagoons
A Future BAU	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
B Standard	✓	✓	✓	✓ 8	✗	✗	✗	✓	✗	✗	✗
C Nature Based	✓	✓	✓	✗	✓ 1	✗	✓ 5	✗	✓	✓	✗
D BAT	✓	✓	✓	✗	✓ 6	✗	✓ 1	✗	✓	✗	✓
E Resource Centres	✓	✓	✓	✗	✓ 2	✓ 2	✓ 3	✗	✓	✓	✓

Figure 14: Example of power point slide presenting the management interventions in each scenario

OFFICIAL

Locations for Scenario C



OFFICIAL

Figure 15: Example of map to illustrate targeting locations for interventions in a scenario

↑ *Return to Summary of stage*

Detail for steps at stage 4

Using the option appraisal tool

The option appraisal tool enables the user to set criteria and preferences for maximising and minimising each resource type. It is easy to compare the options using the dashboard and select those which best achieve resource efficiency criteria and have lower CO_2 emissions.

For example, early in the decision-making process, this stage may be used primarily for screening the best options to take forward for further development. During screening, the information used in the appraisal dashboard is predominately qualitative and relative to enable a quick comparison between the scenarios.

Later, once more detailed proposals have been developed and refined, the criteria can be quantified to inform a detailed options appraisal.

In the dashboard, the highest scoring scenario indicates the one which best achieves the outcomes measured by the criteria. The darker blue indicates the scenario that best achieves the outcome for that criterion.

This enables a transparent discussion about the justification for the preferred scenario. The score is for information and is not intended to dictate the decision. The decision is taken by the relevant decision makers with their discussion and reasoning recorded.

↑ *Return to Summary of stage*

4.1 Refine and agree assessment criteria

Assessment criteria are used to compare and rank the different scenarios.

The SMART objectives developed at stage 1 provide the starting point for identifying the appraisal criteria. In the case studies, the measure of success for the SMART objective provided the foundation criteria for the appraisal. These were adjusted at this stage, once more information had been gathered at stage 2 about the issues, and it was clear what could be measured based on available information.

The six capitals provide a guide to ensure criteria selected consider implications for all resources in the system when making the decision. This means that if at the framing stage objectives have been narrowly defined, wider resource implications are still considered at stage 4.

To help identify suitable appraisal criteria, the One Planet Choices Appraisal tool suggests criteria for each capital that could be used for appraising options. The user can add new criteria under each capital if these are agreed as more suitable for the framed decision.

The following considerations should be discussed with stakeholders and decision makers:

Criteria limits: The Appraisal Tool limits criteria to no more than three per capital to keep the output easy to comprehend.

Equally weighting capitals: limiting criteria to three per capital also ensures a balanced decision across all six capitals. It is possible to have different numbers of criteria against each capital, which effectively weights the final scores towards those capitals with more criteria. If equal weighting is required, the tool provides this in brackets in the dashboard.

Preference: For each criterion, agree the preference to "maximise" or "minimise" the criterion. This sets a direction for comparing the values for each scenario. The preference should be suggested to the decision makers based on the framing statement and objectives for the decision. For example, minimise costs such as financial costs and carbon emissions; maximise benefits such as biodiversity or amenity value of green space.

Other criteria: information on the certainty of achieving outcomes and timescales for delivery could have a bearing on the final decisions and are also included on the dashboard, although they don't contribute to the overall score.

SELECTING CRITERIA TIPS:

1. Involve the decision makers and critical stakeholders in selecting the criteria to ensure buy-in to the final decision, and information key to decision is presented from their perspectives.
2. Consider significant risks, such as reputational or health and safety risks.
3. Conventional value for money criteria are available under the heading of financial capital in the appraisal tool.
4. For public investment decisions, follow Treasury Green Book rules to decide which value for money criteria are most appropriate for the decision being made.
5. Generally, stakeholders and decision makers find it easier to decide between suggested criteria than developing appraisal criteria from scratch, then ask them if they think any critical criteria are missing.
6. If more than three criteria are identified for a capital, use a short, facilitated session to agree with decision makers which criteria would be most meaningful to the decision in a short, facilitated session.
7. Use the SMART objectives to set the goal to maximise or minimise each criterion, then check with stakeholders and decision makers if they agree with the preference selected. If there is difference in opinion between decision makers and critical stakeholders this should be recorded, and the alternative tested to see if it makes any significant difference to the overall score

↑ *Return to Summary of stage*

4.2 Determine how each criterion will be measured

The level of appraisal and stage in decision making for an investment determines whether criteria will be measured using qualitative relative values or quantified values.

Some scenarios may be too difficult for stakeholders to estimate relative values. For example, in the Aberdeen City trial, the scenarios all included some level of underground storage with increasing levels of blue-green infrastructure and corresponding decreasing levels of underground storage to achieve a defined level of effectiveness. These are difficult scenarios to elicit relative values from stakeholders, as they are not distinct, and were measured from an opportunity map. Therefore, only criteria that could be quantified were included in the assessment.

Generally, the advantage of this appraisal method is that a mix of quantified and qualitative criteria can be used.

4.3 Assigning a value for each scenario

Quantified criteria: the user calculates quantities using existing calculator tools. The One Planet Choices Appraisal tool does not contain calculating tools. The calculated values are inserted manually into the Options appraisal tab of the One Planet Choice Appraisal tool.

The tool automatically compares the values in the pairwise comparator and presents the results in the dashboard tab. Values can be presented in the dashboard by selecting “yes” in the column “Mark whether coefficients are actual values”.

A quantified threshold for values to achieve can also be set in the Options appraisal sheet in the “Enter thresholds for primary criteria” column. This is used to inform the decision maker about a threshold value the options must meet and usually is informed by the effectiveness testing phase.

Enter quantified criteria prior to the decision-making workshop.

Qualitative criteria: the user gathers information on relative values for each criterion based on expert elicitation. A workshop is an effective way to elicit values as experts and/ or decision makers discuss and reach consensus on whether one scenario would have a higher value than the others for a particular criterion. This results in a broader range of expertise being brought to this decision. The participants agree the underlying assumptions. Leading to greater trust in the output in the screening dashboard by the decision makers.

Qualitative values are determined for each criterion based on relative values “higher or lower or about the same” compared with the other scenarios. These are assigned relative scores in the One Planet Choices Appraisal Tool, and therefore treated the

same as any quantified values by the pairwise comparator. Online tools such as Mentimeter, Microsoft and Google forms can be used to record the views of participants and the degree of consensus on the relative value provided by participants. An average value is selected for input to the tool where there is a good degree of consensus. Where there is not a good degree of consensus, the reasons for choosing the value should be discussed between participants, before asking participants to reassign a value and taking the average. Sometimes participants have considered different assumptions when assigning a relative value.

The assumptions and basis for determining the relative values are recorded as part of the workshop. This provides an audit of the decision and helps inform other decision makers and stakeholders who did not attend the workshop about the basis for the relative values.

↑ *Return to Summary of stage*

4.4 Final Decision dashboard

The appraisal dashboard presents quantified and qualitative values for criteria together, enabling decision makers to quickly see which option delivers best against the outcomes they want to achieve. The One Planet Choices Appraisal Tool automatically scores and presents the outputs of the screening in the “dashboard” tab. The “refresh button” on the dashboard updates any new values. It presents values and thresholds where these have been quantified. The relative values are represented by shading alone.

The darker blue shading indicates where an option is expected to deliver closest to the preferred outcomes for certain criteria, and white indicates those that are furthest away. There are a range of shades of blue representing intermediate categories between these two. If colours are the same for any criterion, then the value for these scenarios are about the same. The score indicates overall which scenario best achieves multiple outcomes. The bar charts help the decision makers to identify which of the criteria contributed towards the overall score.

Figure 16 provides an example of the output from a rapid assessment from the pharmaceuticals in the environment trial. This compares each management scenario to the other scenarios using relative values for each criterion.

The best achieving scenario against all the criteria overall is the highest scoring. The score in brackets is the equally weighted score.

Figure 17 provides an example of a more quantified assessment of management interventions for the same catchment.

The tool also prepares a graph to present the contribution of each capital type to the overall score for each scenario. The decision makers can easily see which capitals the scenario will influence most.

ONE PLANET CHOICES — Pharmaceuticals in the environment, Scotland

FRAMING QUESTION:	What are the most sustainable ways of reducing the risk and impact on the environment from pharmaceuticals through a one health approach?
SMART OBJECTIVE:	To improve environmental quality (air, soil, water) to reduce impact of pharmaceuticals on wildlife by 2030 To enable sustainable health care by : achieving net zero carbon by 2040; optimising quantities of pharmaceuticals used; and improving resource efficiency for water, energy and materials To help ensure that anti microbial resistance is effectively contained and controlled by 2040

SEPA Scottish Environment Protection Agency — Scottish Water Trusted to serve Scotland

Refresh dashboard

CI

Capitals	Resource types	Appraisal Criteria	Preference	Future BAU by 2030/40	Management scenarios: Scenario B	Scenario C	Scenario D
Natural	Water	PNEC exceedance for ecotoxicity & AMR	Minimise				
	Biodiversity	Impact on populations of affected wildlife	Minimise				
Manufactured	Resource efficie	CO2 Emissions from pharmaceutical and water sectors	Minimise				
	Resource efficie	Virgin materials used	Minimise				
Social	Public health	AMR - prevalence and incidence of infection in recreational	Minimise				
	Public health	Improved health outcomes - visits to GPs/hospitals	Minimise				
	Health inequali	Improved health outcomes for socio-economic groups most	Maximise				
Financial	Cost	Cost to deliver (initial capital)	Minimise				
Human	NHS staff	Workload for NHS staff	Minimise				
Intellectual	Research	Value from improved understanding of pharma/environmen	Maximise				
		Overall preference scores (equally weighted by capital score in brackets)	Highest	3 (3)	15.5 (9.3)	26.5 (14.8)	15 (8.8)
		Certainty of achieving outcome	Most likely		Fairy Certain	Fairly Certain	A little Certain
		Time to achieve outcome	Minimise		Short	Short	Moderate
					0	0	0

Key for dashboard

Relative proximity to preference
Closest to preference
Furthest from preference

Note: the appraisers assume the criteria applies to all relevant stakeholders, as defined in the critical dependency diagram, except where the stakeholder is specified

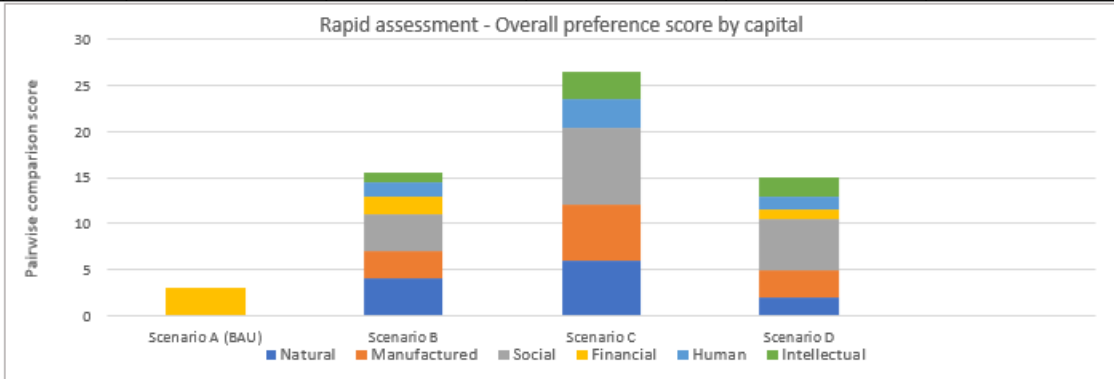


Figure 16: Example of an option screening dashboard for a rapid assessment

ONE PLANET CHOICES

Eden, Fife

FRAMING QUESTION:	**What combination of management options across all sectors enables good status to be achieved whilst optimising resource efficiency, now and in the future?**
SMART OBJECTIVE:	1. Achieve good status for the River Eden by 2027 by addressing catchment pressures 2. Optimise use of energy, chemicals and other materials contributing to net zero by 2045 3. Ensure reslience to futurechange scenarios to 2050 through collaboration in ways that maximise benefits to all stakeholders and the environment 4.Ensure that food production is optimised in accordance with other goals

SEPA Scottish Environment Protection Agency — Scottish Water Trusted to serve Scotland

Refresh dashboard

Capitals	Resource types	Appraisal Criteria	Preference	Future BAU by 2050	Management scenarios			
					Scenario B	Scenario C	Scenario D	Scenario E
Natural	Water	No. of water bodies achieving good status	Maximise	2/5	2/5	5/5	5/5	5/5
	Land	Area of land enhanced for biodiversity and soil quality (Ha)	Maximise	19	19	8760	82	8759
	Air	Net Carbon Emissions to 2050 (tCO2e)	Minimise	708499	1440401	738487	739397	535776
Manufactured	Resource efficiency	Demand for chemical use from land and water sectors	Minimise					
	Resource efficiency	Circular economy - Average % resource converted for re-use	Maximise	12	0	77	76	68
Social	Public benefit	Public amenity value from improved access and place	Maximise					
	Behaviour change	Likelihood of engendering +ve change in stakeholder behaviours	Maximise					
Financial	Benefit	Financial benefit to 2050 (£M)	Maximise	0	0	48.3	27.26	78.69
	Benefit	Optimise food production - crop margins £M	Maximise	17.85	17.85	18.89	18.95	20.02
	Cost	Estimated cost (CAPEX and OPEX to 2050) £M	Minimise	0	110.46	49.91	184.16	160.38
Human	Skills	Improvements in people's skills and competencies	Maximise					
	Employment	Improvement in employment opportunities in local area	Maximise					
Intellectual	Reputation	Relative adverse risk to reputation - No. complaints	Minimise					
	IP	Value of innovation/ intellectual capital benefit created that co	Maximise					
		Overall preference scores (equally weighted by capital score in brackets)	Highest	10 (3.5)	11 (4.8)	41 (17.7)	34 (15.2)	44 (18.8)
		Certainty of achieving outcome	Most likely		0.36	0.7	0.74	0.86
		Time to achieve outcome	Minimise		5	10	15	15
					0	0	0	0

Key for dashboard

Relative proximity to preference	
Closest to preference	
Furthest from preference	

Note: the appraisers assume the criteria applies to all relevant stakeholders, as defined in the critical dependency diagram, except where the stakeholder is specified

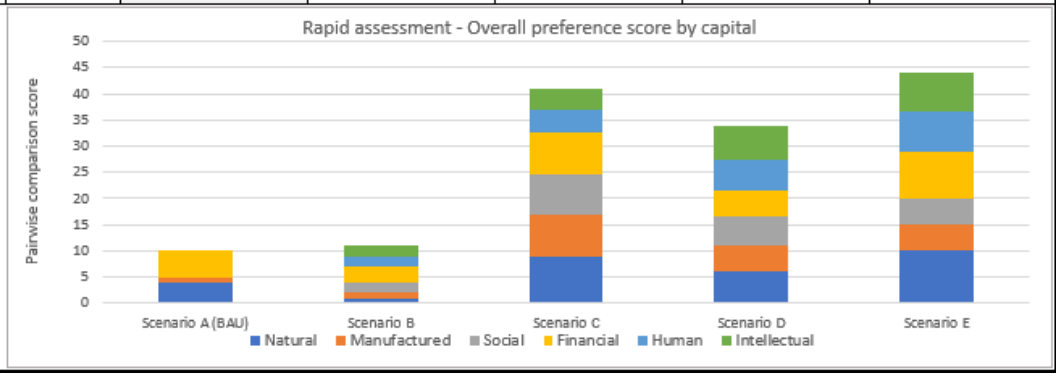


Figure 17:

Example of an option appraisal dashboard for full assessment with stakeholders

↑ *Return to Overview*

↑ *Return to Summary of stage*

4.5 Making the decision and recording the basis for the decision

The level of appraisal and stage of investment planning will influence what decision can be taken. This step is likely to determine the preferred scenario(s) for further development and refinement. Based on the level of detail that will be available at this stage, it could be that two scenarios need to be taken forward before a decision can be made on the most appropriate combination of interventions for a place. For a strategy or plan, the preferred scenario could form the basis of a recommendation that is then consulted on more widely with the public.

The final step at this stage is to ask the decision makers:

> *Based on the information provided in the presentation of the scenarios and screening/ appraisal dashboards, what is your decision?*

The decision makers may determine:

1. There is sufficient evidence to justify engaging external stakeholders in a more collaborative approach to managing resources in a place.
2. Specific scenarios that they would like developed further and presented in greater detail.
3. A single scenario to take forward to the next stage of planning and delivery.
4. None of the scenarios are suitable and further work is needed to develop alternative management options.

The user summarises the recommendation with narrative to explain the preference and the basis for the decision including benefits, beneficiaries and any issues or weaknesses to consider.

For example, after presentation of the dashboard in Figure 17, stakeholders discussed that whilst Scenario E Resource Centres had the highest score indicating it was best overall in meeting their desired outcomes, Scenario C Nature based Solutions delivered well against most of their outcomes and had a significantly lower financial cost. Both scenarios were taken forward as preferred scenarios for further development and consideration at the next stage of the Eden trial.

Next steps to take forward the recommendation are agreed with the decision makers and critical stakeholders. Capture this information an audit of the decision made.

↑ *Return to Summary of stage*

Case Studies

Sustainable Catchment Decisions

Eden Catchment

Situation

The Eden is predominately an agricultural catchment in Fife and a key vegetable growing area in Scotland. However, there is considerable pressure on water resources in the catchment from pollution from nutrients from wastewater treatment works, agriculture, and septic tanks, as well as abstraction. Ground water is a key resource for Scottish Water during periods of water scarcity, and farmers require irrigation water to produce high quality vegetables. However, the river is currently moderate status and these risks to water resources will increase with climate change and growing populations of people which will further increase pressures with increased loads on sewers and use of river water for crop irrigation. No one organisation working alone can fix it.

Task

One Planet Choices was used to enable the main stakeholders to work together to address the issues and manage water resources to get to a more sustainable and resilient state in the future. The multi-stakeholder group framed the decision as:

> *What combination of actions across all sectors would enable good status in the rivers and groundwater to be achieved whilst optimising resource efficiency now and in the future?*

Activity

Prior to engaging stakeholders in a full assessment, a rapid assessment was undertaken by Scottish water and SEPA staff. Key staff involved in the decision developed a dependency diagram and used evidence from SAGIS modelling to identify the critical stakeholders to involve in the trial of the full assessment. This identified the need to involve representatives of land managers, vegetable processors, advisors of land managers and owners of septic tanks. It was not possible to attract all these users to participate in online workshops, due to difficulty finding an available representative.

The stakeholders were involved in three virtual three-hour workshops. The workshops were held online due to Covid 19 restrictions. The workshops were facilitated by professional facilitators Countryscape and coordinated by the Hydronation Scholar leading on development of the resilience tool to enable independence from the participating organisations.

Workshop 1 Framing the decision - presented the need for current action and agreed the shared decision and objectives with the stakeholders.

Workshop 2 Identifying management interventions - presented information on future resilience of assets to different climate scenarios, and the future state of water

bodies. The current and future health of assets in the catchment is summarised in Figure 18 based on outputs from The Eden Catchment Resilience Tool. This trial developed a new tool to assess resilience of assets.[1]

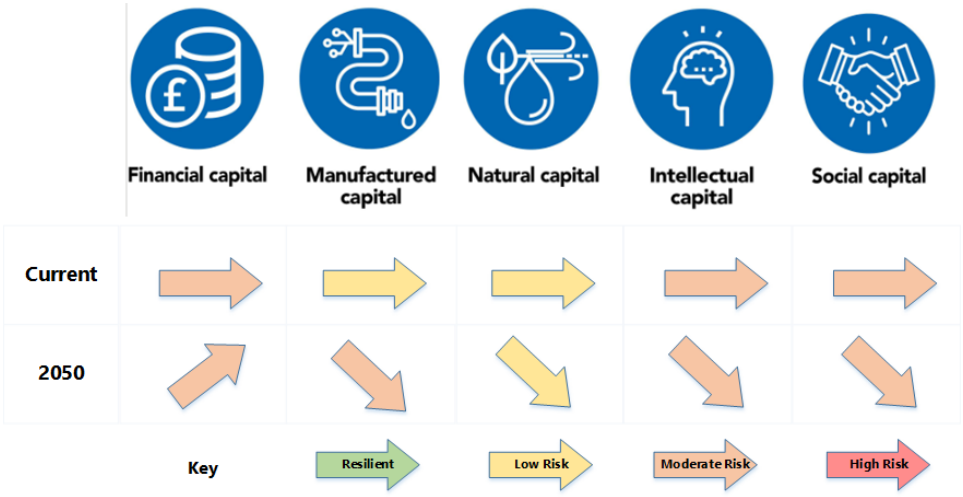


Figure 18: Summary of current and future health of resources in the Eden Catchment

Workshop 3 Decision making - presented the actions grouped into scenarios (Figure 19) and the assessment of effectiveness of the scenarios to achieve good status. The stakeholders decided about the preferred options to take forward for further development.

Summary of scenarios

Scenario	Growth & 100% GBR	Septic Tank P Filters	Water Efficiency Campaign	Ferric dosing	Ultra low P Nereda	Struvite fertilizer	Wetland polishing of Final Effluent	40% Irrigation Reduction	RSuDs & Magic margins	Cover crops & min tillage	Irrigation lagoons
A Future BAU	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
B Standard	✓	✓	✓	✓ 8	✗	✗	✗	✓	✗	✗	✗
C Nature Based	✓	✓	✓	✗	✓ 1	✗	✓ 5	✗	✓	✓	✗
D BAT	✓	✓	✓	✗	✓ 6	✗	✓ 1	✗	✓	✗	✓
E Resource Centres	✓	✓	✓	✗	✓ 2	✓ 2	✓ 3	✗	✓	✓	✓

Figure 19: Summary of the scenarios that grouped the actions from the longlist into broad themes

[1] A pdf summary of catchment resilience tool is available

Decision

The stakeholders used the information in the dashboard (Figure 20) to reach a consensus on which combinations of actions to focus on in the next phase. The stakeholders decided to not include the standard approach as this did not achieve good status and was not as good as other options to achieve their objectives. Most stakeholders supported the Nature-Based Scenario. This had the second highest overall score, however had significantly lower costs and met most of their objectives. The highest scoring in terms of meeting all stakeholders' objectives was the Resource Centre Scenario. Some stakeholders thought the cost was prohibitive, however others in the group felt that this was the better way forward in the long term. They decided the best way forward was to focus on further development of Scenario C, whilst exploring further ways to deliver resource centres to recover nutrient resources, perhaps at a regional scale. As this was a trial of the One Planet Choices method, discussion is ongoing in Scottish Water and SEPA on how to implement the proposed combination of management interventions in practice.

The group reflected in their feedback that it was difficult to provide relative values for some criteria as they did not understand what was involved for elements outside their expertise, and all option combinations were across all sectors. More discussion of the relative merits of the scenarios and clarity over how figures had been derived for quantified criteria would have given them more confidence in the decision.

ONE PLANET CHOICES — Eden, Fife

FRAMING QUESTION:	**What combination of management options across all sectors enables good status to be achieved whilst optimising resource efficiency, now and in the future?**
SMART OBJECTIVE:	1. Achieve good status for the River Eden by 2027 by addressing catchment pressures 2. Optimise use of energy, chemicals and other materials contributing to net zero by 2045 3. Ensure reslience to futurechange scenarios to 2050 through collaboration in ways that maximise benefits to all stakeholders and the environment 4.Ensure that food production is optimised in accordance with other goals

Refresh dashboard

Capitals	Resource types	Appraisal Criteria	Preference	Future BAU by 2050	Management scenarios			
					Scenario B	Scenario C	Scenario D	Scenario E
Natural	Water	No. of water bodies achieving good status	Maximise	2/5	2/5	5/5	5/5	5/5
	Land	Area of land enhanced for biodiversity and soil quality (Ha)	Maximise	19	19	8760	82	8759
	Air	Net Carbon Emissions to 2050 (tCO2e)	Minimise	708499	1440401	738487	739397	535776
Manufactured	Resource efficiency	Demand for chemical use from land and water sectors	Minimise					
	Resource efficiency	Circular economy - Average % resource converted for re-use	Maximise	12	0	77	76	68
Social	Public benefit	Public amenity value from improved access and place	Maximise					
	Behaviour change	Likelihood of engendering +ve change in stakeholder behaviours	Maximise					
Financial	Benefit	Financial benefit to 2050 (£M)	Maximise	0	0	48.3	27.26	78.69
	Benefit	Optimise food production - crop margins £M	Maximise	17.85	17.85	18.89	18.95	20.02
	Cost	Estimated cost (CAPEX and OPEX to 2050) £M	Minimise	0	110.46	49.91	184.16	160.38
Human	Skills	Improvements in people's skills and competencies	Maximise					
	Employment	Improvement in employment opportunities in local area	Maximise					
Intellectual	Reputation	Relative adverse risk to reputation - No. complaints	Minimise					
	IP	Value of innovation/ intellectual capital benefit created that co	Maximise					
		Overall preference scores (equally weighted by capital score in brackets)	Highest	10 (3.5)	11 (4.8)	41 (17.7)	34 (15.2)	44 (18.8)
		Certainty of achieving outcome	Most likely		0.36	0.7	0.74	0.86
		Time to achieve outcome	Minimise		5	10	15	15
					0	0	0	0

Key for dashboard

Relative proximity to preference	
Closest to preference	
Furthest from preference	

Note: the appraisers assume the criteria applies to all relevant stakeholders, as defined in the critical dependency diagram, except where the stakeholder is specified

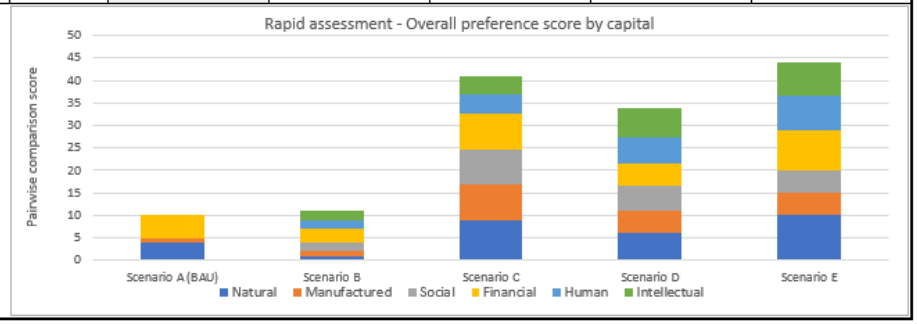


Figure 20: The appraisal dashboard used to inform the decision based on information quantified before the workshop (with figures) and the relative values from group Mentimeter input (without figures)

Key benefits of using the approach

The approach successfully developed new more collaborative approaches to resolving the issues and helped participants to become future focussed.

"…it is a good way of understanding (the catchment system) and maybe farmers do need to think outside to box a bit more and think of the impact it (agriculture) is having…" - LM6

It enabled a structured and informed discussion on which combination of actions best met the objectives they all wanted to achieve. For example, in this case the nature-based scenario was selected for further development even though it had the second highest scoring, it had significantly lower costs. The resource centre scenario, which was designed to recover nutrients for use on food crops was highest scoring. The group decided this could potentially be considered at a regional scale, where economies of scale could make it more cost effective.

It enabled consideration of solutions that addressed future risks, for example the catchment resilience tool outputs highlighted that soil was at high risk, with knock-on consequence for water quality, food production and lowland producers. This led to stakeholders exploring soil management interventions to reduce this risk across the system. The approach highlighted that using current approaches to tackling phosphorus pollution and water scarcity were unlikely to achieve the goal of achieving good status and delivered poorly against their objectives. Enabled discussion by stakeholders of trade-offs between different scenarios for example costs differential between two highest scoring options, compared with benefits such as carbon.

Lessons learnt

Element	Worked well	Improve

Workshops format & structure	• A dedicated facilitator enabled good participation by all stakeholders.
	• It is good to start with what stakeholder know
	• Having time for all to hear each other's views using a roundtable format
		• Face to face workshops would enable stakeholders to get to know each other better and help build relationships for delivery in future.
		• Create more time to:
		  ○ Make the workshops more participant led,
		  ○ Enable participants to group the actions they had proposed into scenarios
		  ○ Have better quality discussion rather

		than using Mentimeter voting. • Some information presented was seen as too technical for a farming audience
Methods & tools	• The method was well received and enabled what it set out to achieve • The appraisal tool was straightforward to use in a workshop setting • The Genie based resilience tool worked well to quickly test the effectiveness of a wide range of combinations of measures	• Time with dedicated experts after workshop 2 to quantify the appraisal criteria and inform feasibility of management options • Transparency of how criteria were quantified, and assumptions made • Better tools are needed for calculating quantified criteria such as carbon emissions and financial costs
Implementation		• Stakeholders requested clarity over future governance and coordination • It is not clear who owns the process and who is responsible for next steps

↑ *Return to Summary of trials*

↑ *Return to stage 2.5*

Prioritising actions in a national strategy
Pharmaceuticals in the environment trial

Situation

Pharmaceuticals are found in water across Scotland and have been found at levels that present a risk to the environment, and there is concern about this risk increasing in future. However, the group was also concerned about the resources required to address the issue through treatment at wastewater treatment works. Further, some pharmaceuticals, such as ibuprofen, are widely available and have high levels of use which cannot be addressed through improving wastewater treatment levels. Therefore, in these circumstances only measures to reduce levels of consumption would be effective.

One Health Breakthrough Partnership is an existing collaborative group and had been working together to identify issues and actions to address the impact of pharmaceuticals in the environment. The partnership represented a range of interests including researchers, SEPA, Scottish Water and NHS Highland. They wanted to take an integrated whole system approach to addressing these issues. However, they had different views on where to focus their limited resources.

Task

One Planet Choices was used to help the partnership develop a strategy and focus for their shared work programme. The group wanted to target their action at the pharmaceuticals that presented the greatest risk to the environment. Eight of the highest risk pharmaceuticals were identified by the group to focus on. They framed their decision as follows:

What are the most sustainable ways of reducing the risks and impacts on the environment from pharmaceuticals through a one health approach?

Activity

The partnership participated in four two-hour workshops. One of these provided a recap after a break due to SEPA's cyberattack and resource issues.

A technical working group was formed from a subgroup of the partners to work on materials and supporting evidence between meetings. The One Planet Choices core team provided the facilitators for the workshop sessions.

The series of workshops finished with a presentation of the outputs from One Planet Choices to a wider range of stakeholders as part of a workshop to develop the partnership's strategy and work programme.

Workshop 1 framed the decision, the objectives the group wanted to achieve and the boundaries for their decision. Then the technical subgroup worked on the system dependency diagram between workshops. Figure 21a provides an overview of the system they mapped out and Figure 21b allows you to zoom into see different parts of the system. However, the group had a lot of ideas and competing priorities for their time.

A One Health approach requires a systems approach

The pharmaceuticals system in Scotland

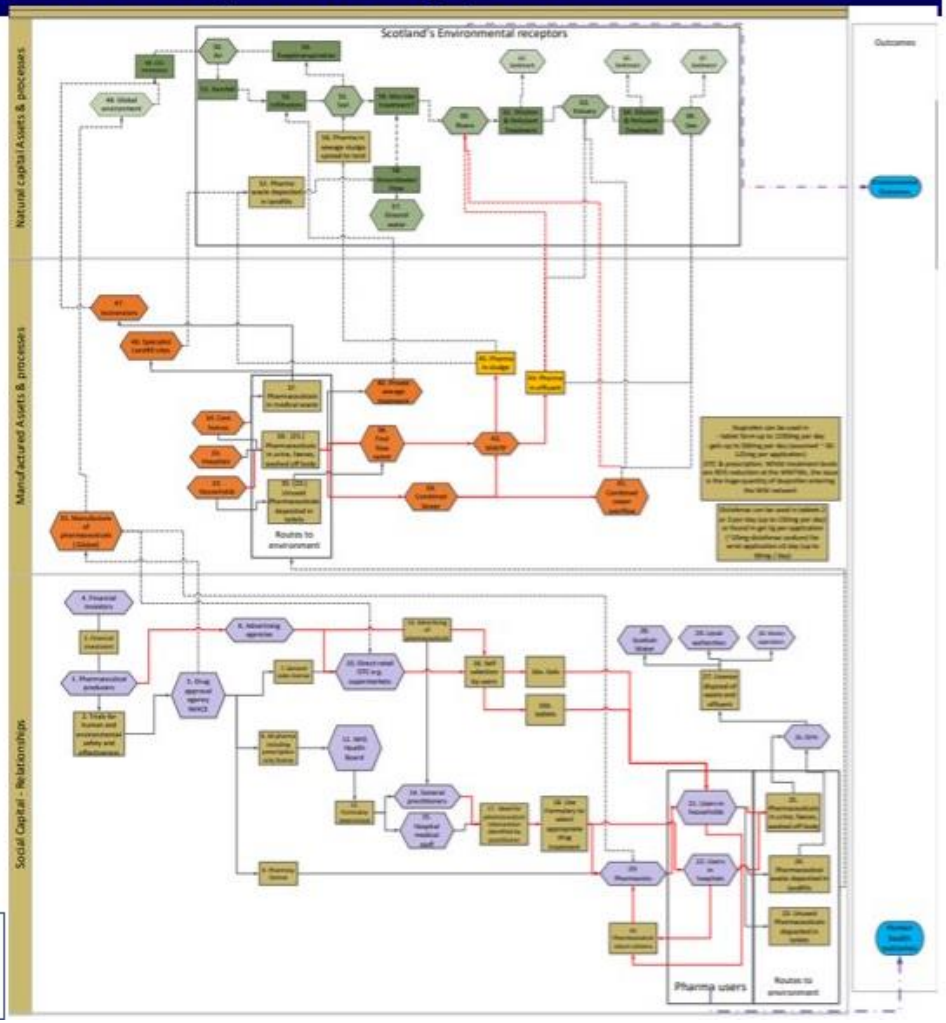
Natural capital (Green) –main receptors and the routes pharmaceuticals take through the environment

Manufactured capital (Brown) man-made infrastructure from user sources to treatment works and solid waste disposal

Social capital (Purple) relationships between organizations who influence use of target pharmaceuticals by users

--- Interlinks in the systems

— Critical path for each target pharmaceutical



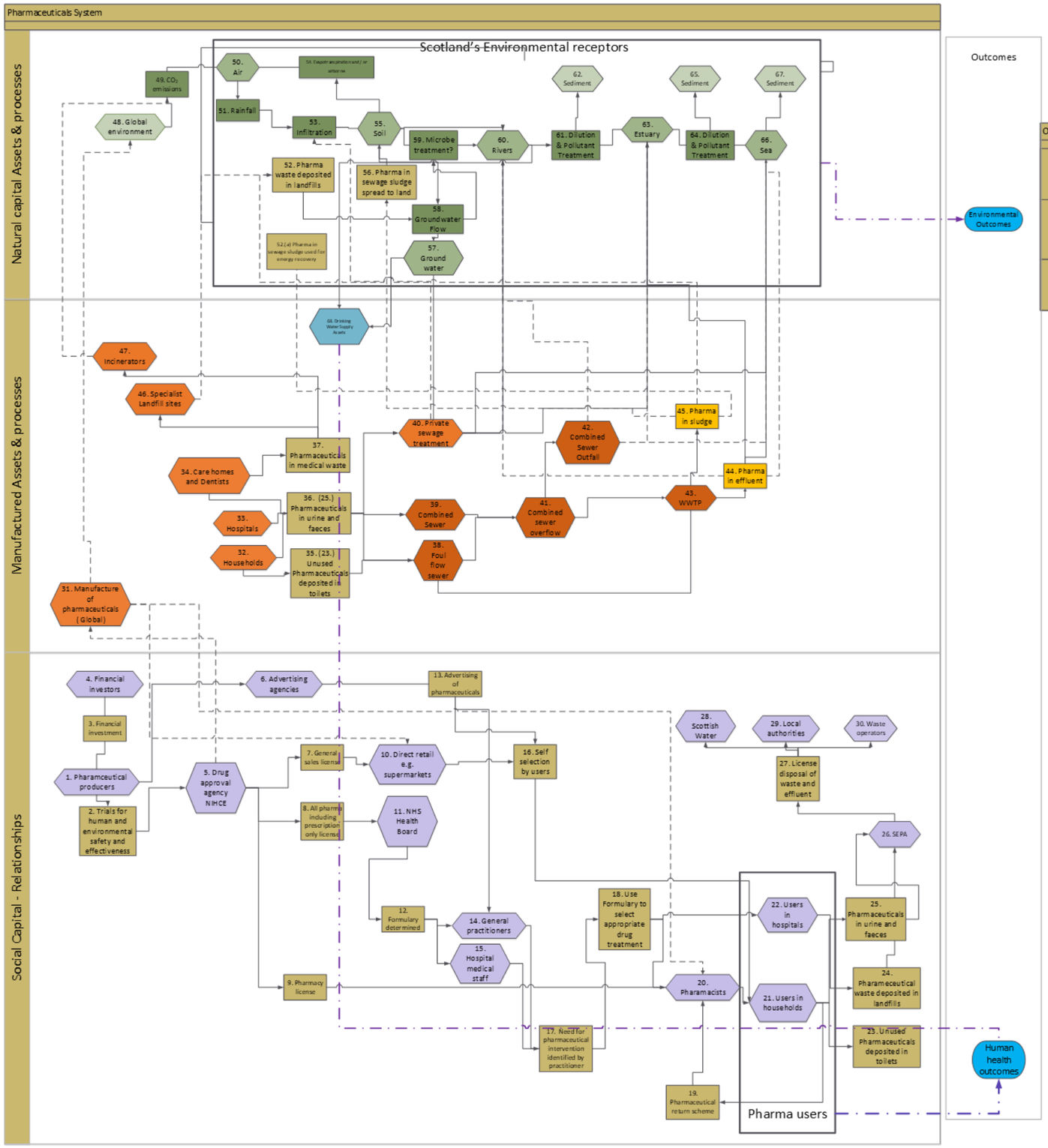
SEPA Scottish Environment Protection Agency

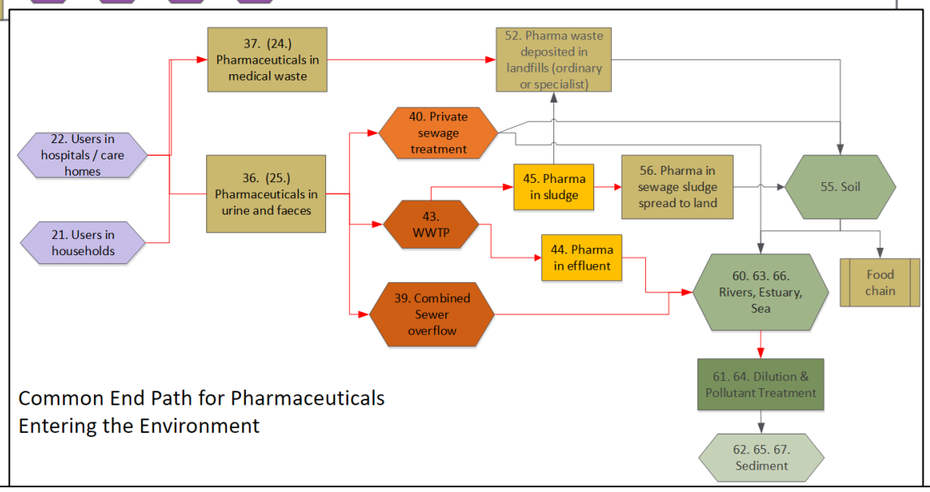
OPC Trial: OHBP and Pharmaceuticals
Presentation on 30th March 2022

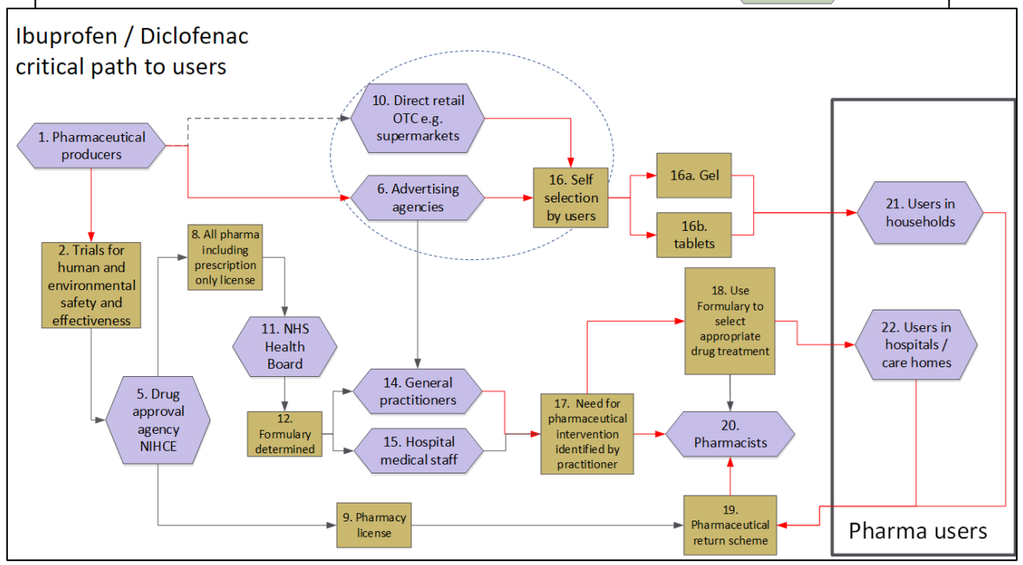
Scottish Water

Figure 21a: Pharmaceuticals system mapped by participants; red lines identify the key pathways they needed to focus on

Figure 21 b: Pharmaceuticals diagram in detail used for workshop and critical paths for all pharmaceuticals and specific to one group of pharmaceuticals presented in workshop 2







Workshop 2 presented the system and the critical pathways for each pharmaceutical (Figure 21b) and worked on SMART objectives to give the group a clear focus for their strategy. It also started to work on future risks and opportunities. Figure 22 shows an example of the output produced by participants in the workshop considering future impacts from climate change.

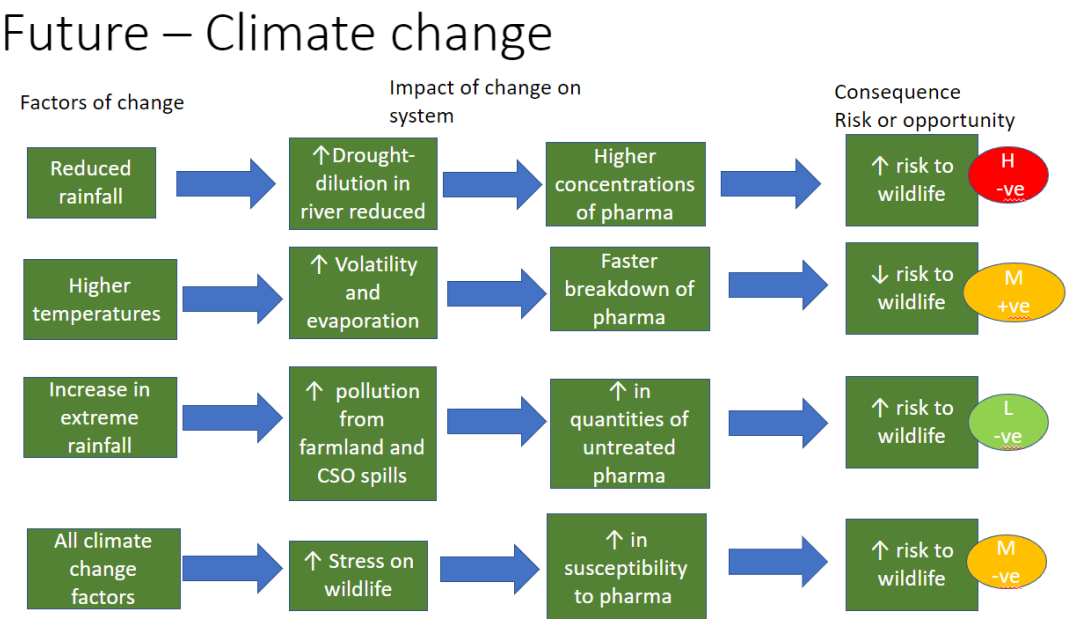


Figure 22: Output produced by participants in workshop for the impacts of climate change on the pharmaceuticals in the environment system

Workshop 3 identified where to intervene in the system. It split the participants into smaller groups which focussed on specific pharmaceuticals, each with their own dependency diagram. They provided evidence on current and future risks and opportunities.

Workshop 4 decided the preferred strategy. Prior to this workshop the technical subgroup had generated strategic scenarios from the long list (Figure 23), assessed effectiveness and estimated costs. Actions judged to have low effectiveness were dropped. A questionnaire format was used in the workshop to gather the group's opinion on relative values for each of the appraisal criteria. The appraisal dashboard (Figure 24) was discussed to decide the strategic focus of the group.

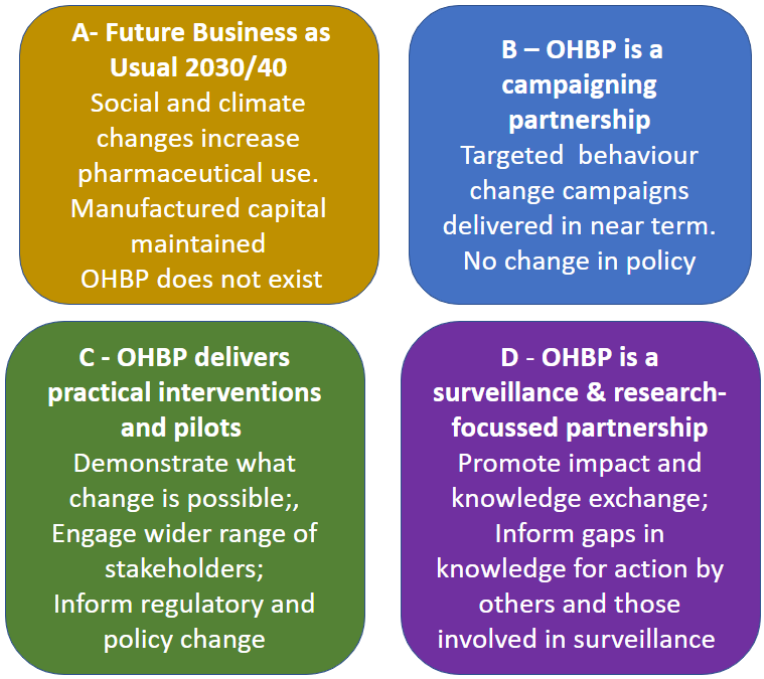


Figure 23: Summary of the strategic options for the focus of the One Health Breakthrough Partnership.

Decision

Based on the appraisal dashboard output (Figure 24), the group selected scenario C as their preferred option. Scenario C consistently scored higher than other scenarios, other than cost. The second favourite was not close in score.

The group agreed that Scenario C generates information for health professionals and specific information to inform future behaviour change campaigns. However, for some specific pharmaceuticals the campaign approach (Scenario B) was the only viable option. Therefore, a campaign for a specific group of pharmaceuticals was also included in the agreed strategy.

The analysis of the decision (Figure 25) demonstrates that in the rapid assessment which relies on the judgement of the group, there are some criteria where the group had a high degree of consensus, in particular those criteria relating directly to the primary objective, however there was less consensus and certainty about relative values for resource use and impact on staff. This related to the differing experience of and knowledge of participants about for example different technologies. Further discussion to share knowledge may have enabled a greater degree of consensus.

The group took this decision to share with its wider stakeholder group and explored specific actions that they could contribute towards the agreed strategy.

ONE PLANET CHOICES — Pharmaceuticals in the environment, Scotland

FRAMING QUESTION:	**What are the most sustainable ways of reducing the risk and impact on the environment from pharmaceuticals through a one health approach?**
SMART OBJECTIVE:	**To improve environmental quality (air, soil, water) to reduce impact of pharmaceuticals on wildlife by 2030** **To enable sustainable health care by : achieving net zero carbon by 2040; optimising quantities of pharmaceuticals used; and improving resource efficiency for water, energy and materials** **To help ensure that anti microbial resistance is effectively contained and controlled by 2040**

SEPA Scottish Environment Protection Agency — Scottish Water Trusted to serve Scotland

Refresh dashboard

cl

Capitals	Resource types	Appraisal Criteria	Preference	Future BAU by 2030/40	Management scenarios			
					Scenario B	Scenario C	Scenario D	
Natural	Water	PNEC exceedance for ecotoxicity & AMR	Minimise					
	Biodiversity	Impact on populations of affected wildlife	Minimise					
Manufactured	Resource efficie	CO2 Emissions from pharmaceutical and water sectors	Minimise					
	Resource efficie	Virgin materials used	Minimise					
Social	Public health	AMR - prevalence and incidence of infection in recreational	Minimise					
	Public health	Improved health outcomes - visits to GPs/hospitals	Minimise					
	Health inequali	Improved health outcomes for socio-economic groups most	Maximise					
Financial	Cost	Cost to deliver (initial capital)	Minimise					
Human	NHS staff	Workload for NHS staff	Minimise					
Intellectual	Research	Value from improved understanding of pharma/environmen	Maximise					
		Overall preference scores (equally weighted by capital score in brackets)	Highest	3 (3)	15.5 (9.3)	26.5 (14.8)	15 (8.8)	
		Certainty of achieving outcome	Most likely		Fairy Certain	Fairly Certain	A little Certain	
		Time to achieve outcome	Minimise		Short	Short	Moderate	
					0	0	0	

Key for dashboard

Relative proximity to preference	
Closest to preference	
Furthest from preference	

Note: the appraisers assume the criteria applies to all relevant stakeholders, as defined in the critical dependency diagram, except where the stakeholder is specified

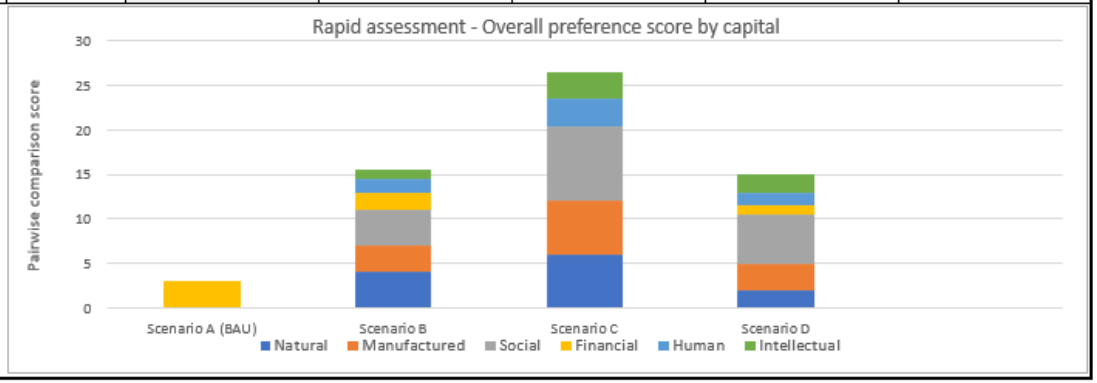


Figure 24: The appraisal dashboard used to inform the decision the relative values from group MS Teams questionnaire average scores.

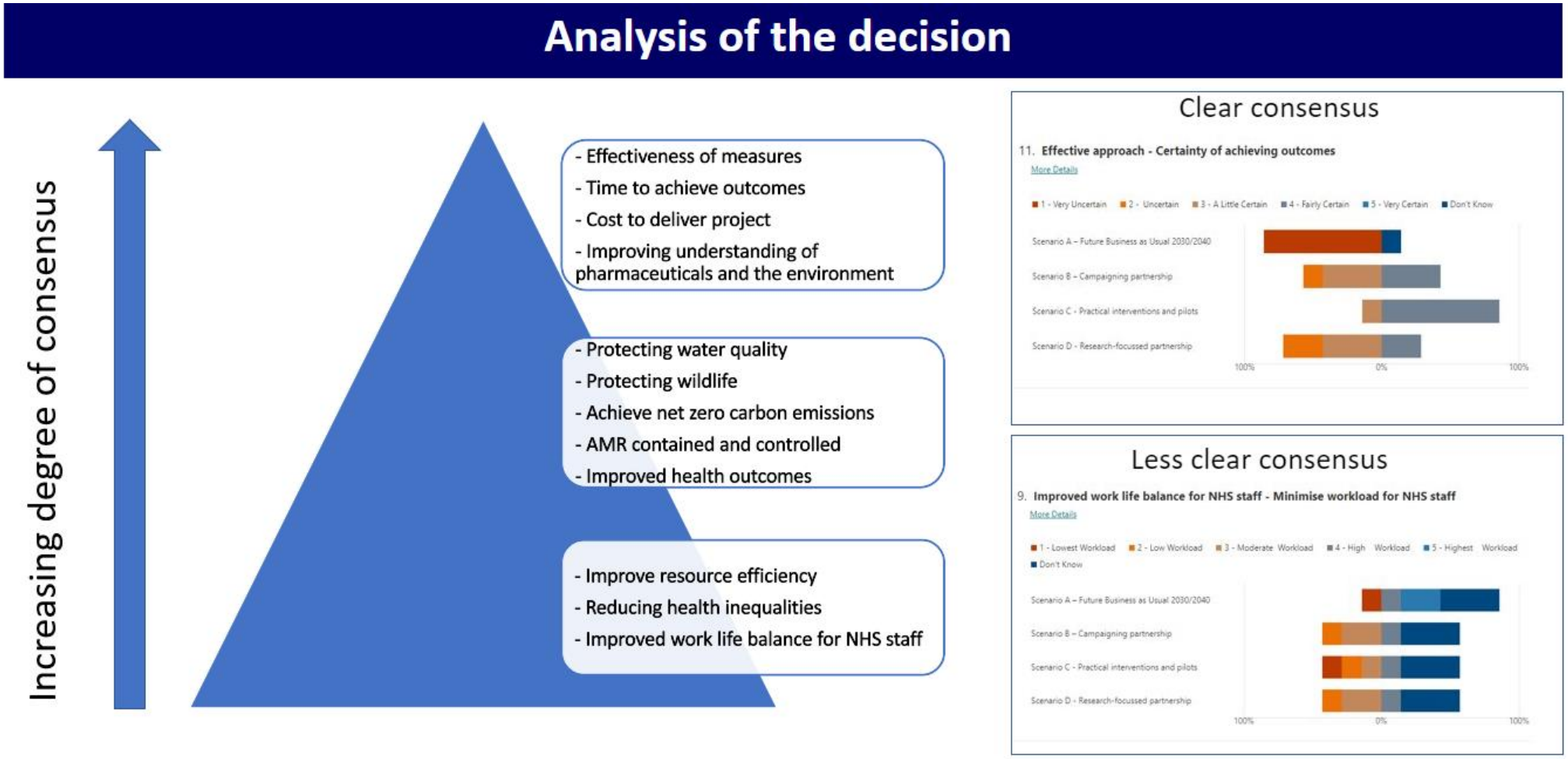


Figure 25: Analysis of the relative values for each criterion provided by participants, illustrating the degree of consensus across the group for criteria

Key benefits of using the approach

The trial successfully demonstrated that One Planet Choices can be used at a national strategic scale. The systems approach helped keep the group focussed on interventions that influenced the critical pathways and enabled them to reflect on the effectiveness of some of their ideas at a systems level.

The approach successfully enabled the partnership to determine the focus for its work, which it presented to its stakeholders at a follow-on workshop. There was greater unity in their position and other stakeholders were able to see where they could contribute.

Comments from participants on the approach were mixed but most felt positive about the experience:

"*It seems quite logical and, whilst initially having some reservations about it, I began to like it more as time went on. It would be useful to have a few key articles to remind us what we've done and help us explain and justify it to others*" R1

- "*This is helpful in directing action and resource. Ultimately, we are trying to change policy, we need the results of actions… There is lots of research undertaken and not much practical implementation on the back of that. The OHBP is in a good position to do this.*" R2

However, one respondent felt frustrated by the amount of time spent on the process and reflected that it would be improved if more information had been provided right at the start, and more time provided for discussion:

"Overall, it feels as if the outcome could have been achieved much more easily in less time." R4

Lessons learnt

Element	Worked well	Improve
Workshops format & structure	• Expert input from the technical subgroup was essential to prepare information to present at each stage. • Providing a summary of evidence in advance of the workshop was valued and could have reduced presentation time. • The structured sessions and facilitators who were not directly involved in making the decision helped the participants to pull	• Less time presenting information and more time on discussion. • Using a professional facilitator may have enabled a better balance and enabled participants views to be fed back in a way that meant they felt listened to • More information for participants about the process at the start so that they could decide where to focus effort and time to meet their needs. • More clarity over the evidence needs, sources and

	back from their detailed knowledge of this work area and make strategic decisions. • The additional workshop required due to the restart enabled more time to work on future risks and opportunities	how it would be used in the process
Methods & tools	• Appraisal dashboard helped to structure the discussion around the decision	• Participants vary in their confidence to define objectives and the evidence they require to inform decisions - there needs to be enough flexibility in the process to iterate between stages. • More shorter sessions could work better to enable iteration. • The dependency diagram was a key element of this strategic approach and was developed between sessions by subgroups, those who had been less involved in developing it felt that they needed more time to digest it and use it

↑ *Return to Summary of trials*

Taking a systems approach to developing options for a specific works

Philipshill Wastewater Treatment Works

Situation

Philipshill Wastewater Treatment Works in East Kilbride pumps its final effluent over the hill to Allers Wastewater Treatment works for discharge into the Clyde rather than discharging into the nearest river Kittoch Water. Corporately Scottish Water is seeking to reduce its carbon emissions, there is concern about the carbon emissions from pumping. Therefore, they wanted to investigate alternatives with SEPA. There had been previous discussions about options however these had become stuck and agreement about the most sustainable way forward could not be reached.

Task

One Planet Choices was used to help Scottish Water and SEPA develop and agree actions that fulfilled the following framed decision:

What actions will lead to an overall environmental benefit to the local community served by Philipshill WWTW whilst achieving WFD objectives for the receiving waterbodies?*

**overall environmental benefit includes net zero emissions and resource reuse, amongst the benefits.*

Activity

Staff from Scottish Water and SEPA participated in seven short (1 hour) virtual workshops to provide a rapid screening assessment. Shorter workshops were employed as senior managers were involved who did not have time to attend longer sessions. There was a technical officer and a facilitator both provided by Scottish Water to work on preparing materials between each workshop.

Workshop 1 focussed on framing the decision and SMART objectives. It introduced the participants to One Planet Choices and provided an overview of the issues for discussion. They started to develop a diagram of the main elements of the system, based on a pre- prepared draft (Figure 26). They were asked to discuss amend and confirm these. The drafts stimulated diverse discussion and several revisions to the framing statement emerged.

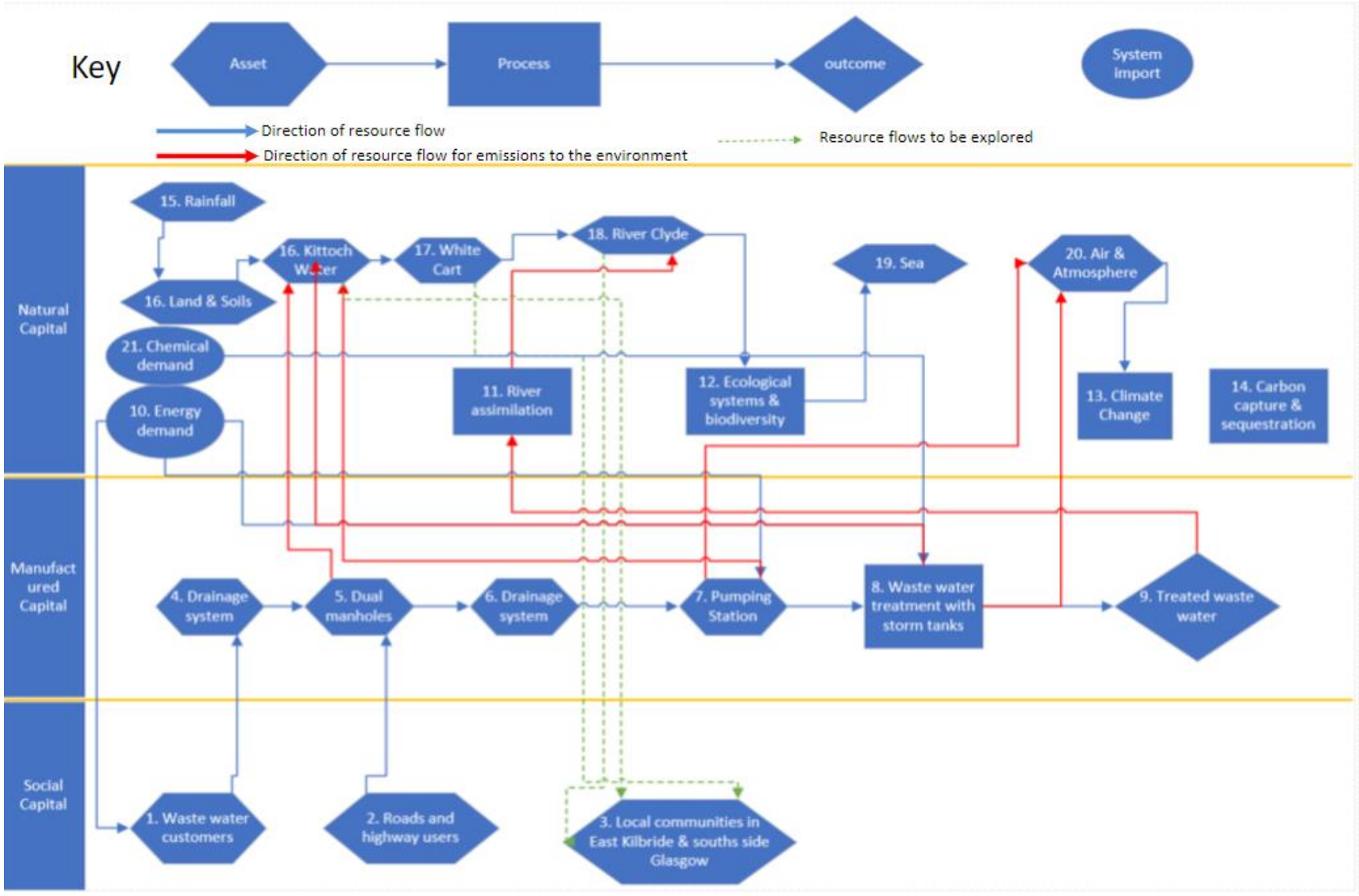


Figure 26: System dependency diagram amended in workshop 1 using Visio

Workshop 2 Developed a shared understanding of current health and future risks affecting the main capital assets identified in the dependency diagram. The workshop helped reach a common understanding of what was known about the system already and where further information needed to be gathered and presented at the next session. The dashboards were simply presented (see Figure 27) and then updated once refined evidence became available. This meant for the rapid assessment, detailed information did not need to be gathered on all the assets.

This session also revisited the framing statement and objectives to make sure there was now agreement on these, however to prevent this from diverting from the focus of the session, these were discussed at the end of the workshop after greater shared understanding had been achieved.

Workshop 3 Consolidated evidence and introduced criteria for appraisal. This session consolidated the information that had been gathered and clearly demonstrated how questions and issues raised by participants in previous workshops had been addressed. This showed to participants that the facilitators were listening, and issues were being addressed.

The participants also were introduced to possible criteria for appraising the options they develop, based on Scottish Water's Benefits Framework

Future Pressures – how will they affect the health of our system? -updated

Resource type	Element	Condition (RAG)	Future Condition
Natural	Kittoch Water		↓↔
Natural	River Clyde		↓↔
Natural	White Cart Water		↓↔
Natural	Energy demand		↑
Financial	Energy cost		↑
Manufactured	Asset base inc. dual manholes		↔
Human	Workforce capability		↔
Social	Community engagement		↑
Intellectual	Operational knowledge		↔

Note: rapid assessment OPC gives no time for discussion of system resilience.

Figure 27: Dashboard on future pressures of the system identifying areas where further evidence was required as there was not consensus about future condition

Workshop 4 Selected criteria and identified management interventions. This session focussed on selecting criteria using voting by the group in between sessions, additional expertise was brought in from a Scottish Water's Economist to help with this stage. The group also focussed on identifying management interventions at this session, using materials developed in previous sessions. They were provided a

template to capture their ideas which required the group to be specific about the location of the interventions and which objectives they would satisfy.

Workshop 5 focussed on judging the effectiveness of the proposed scenarios against the objectives. The long list of interventions had been grouped into scenarios by the facilitator and technical officer in between workshops (Figure 28). The scenarios were all generated from the range of interventions identified by the participants. The complex nature of the problem inevitably meant that they were multi-faceted.

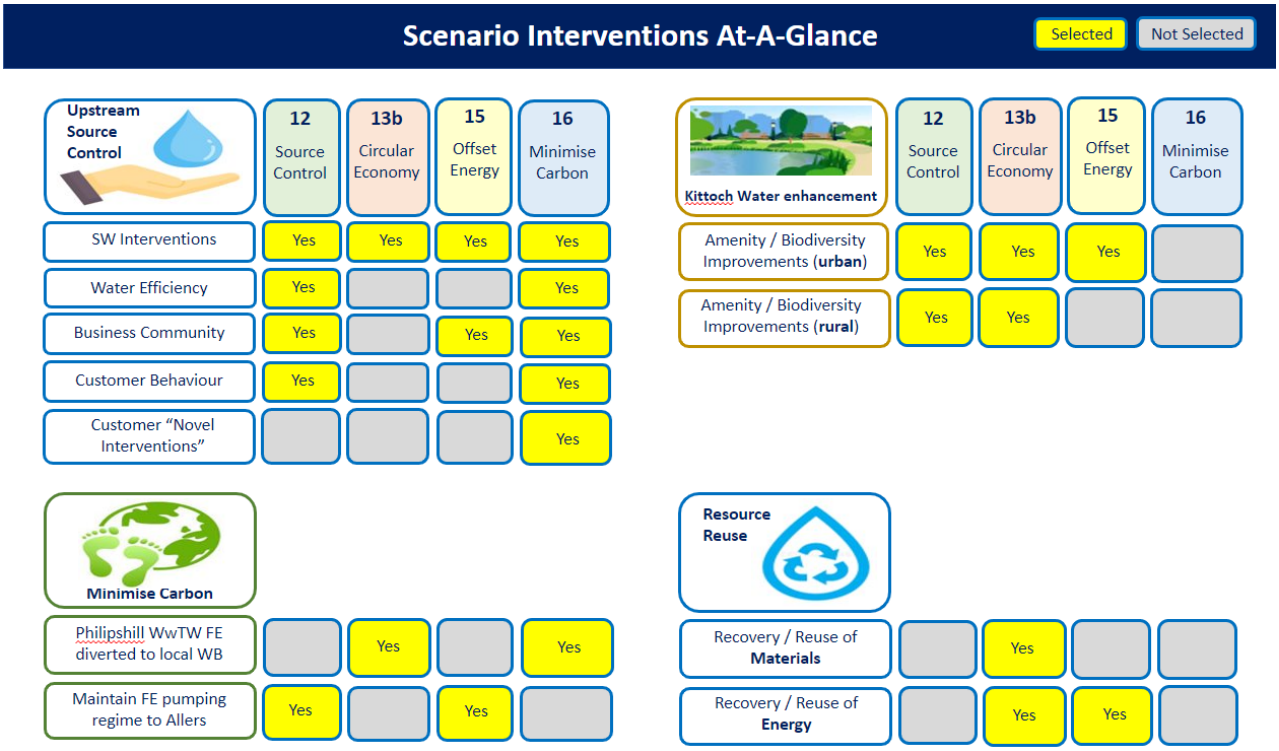


Figure 28: Scenario interventions at a glance diagram helped participants remember what combination of actions was in each scenario

Workshop 6 focussed on the participants judging the relative benefit of each scenario against the agreed Scottish Water benefits criteria.

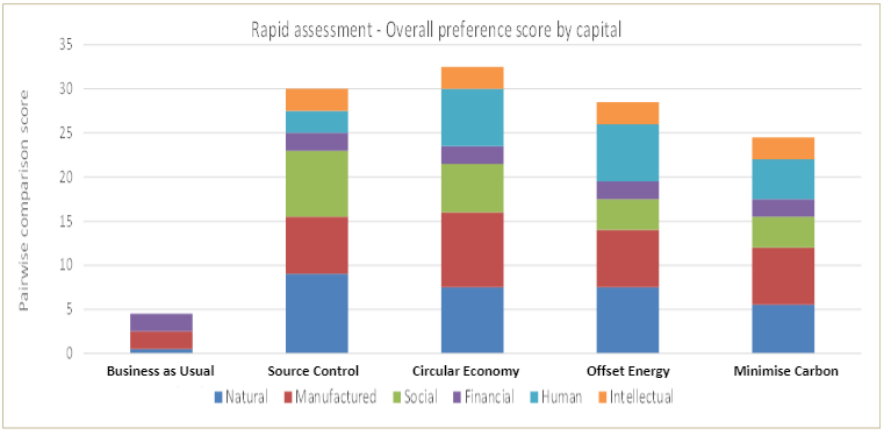
Workshop 7 presented the results of the appraisal and recorded the group's decision. The appraisal tool was used in between session. The outputs were presented in a different way to other case studies. The use of Scottish Water criteria meant that a separate dashboard was used to show the results of scoring of benefits (Figure 29). The bar chart was used to show the share of capitals and final scores (Figure 30). The overall score and score for each capital from the pairwise comparison was shown. The relative scores against each benefit category were also presented. The participants were asked to agree what might happen next. The group agreed to take the two highest scoring scenarios forward into an outline design phase to better understand costs and effectiveness.

Which scenario(s) bring best benefits?

Type of Benefit	Beneficiaries	11 Benefits categories and factors (selected at Workshop#4 & refined)	BAU 2040	Scenario 12	Scenario 13b	Scenario 15	Scenario 16
				Source Control	Circular Economy	Off-set Energy	Minimise Carbon
Direct benefit	Customers / Communities / environment	Improved waterbodies (WFD) (5 votes)	1	3	2	2	1
Direct benefit	Customers / Communities / environment	Less impact from pollution (4 votes)	1	3	2	2	2
Direct benefit	Customers / Communities / environment	Less impact from external sewer floods in public spaces (1 vote)	1	3	2	2	2
Direct benefit	Customers / Communities / environment	Creating better places and spaces (5 votes)	1	3	3	2	2
Direct benefit	Customers / Communities / environment	Reduced impact in the disposal of by-products and wastes (3 votes)	1	3	3	2	2
Direct benefit	Customers / Communities / environment	Reduced SW carbon footprint (5 votes)	1	2	3	3	3
Enabling benefits	The nation of Scotland	Protecting and enhancing the environment (5 votes)	1	2	3	3	3
Enabling benefits	The nation of Scotland	Fair Work and Business (1 vote)	1	2	3	3	2
Securing benefits factor	All above stakeholders / company	More skilled & trusted people (2 votes)	1	2	3	3	3
Securing benefits factor	All above stakeholders / company	More choice of solutions (R&D) (1 vote)	1	2	2	2	2
Securing benefits factor	All above stakeholders / company	Greater adaptability and extendibility (2 votes)	2	2	2	2	2

Scoring Key MAXIMUM Benefit = 3 Medium benefit = 2 minimum benefit = 1

Figure 29: Output from the appraisal using Scottish Water Benefits Framework categories with scores for each criteria in a table



- Circular Economy scenario attains highest score – narrowly
- Key element is focus on resource recovery & re-use
- All scenarios score far higher than BAU
- Scoring is derived from benefit testing with **NO consideration yet given** to cost or effectiveness

Figure 30: Results of pairwise comparison presented as a bar chart

Decision

Scenario 13b Circular Economy was selected as the preferred scenario, as this was highest scoring. However, the rapid assessment was used at an early stage without any financial costs or effectiveness testing. Using One Planet Choices provided the direction of travel and actions to focus on. The implementation phase has started by looking further at the scope and feasibility of some interventions and their effectiveness. In addition, it was agreed to undertake further work to understand the root causes of ecological downgrades in the affected rivers, to inform the decision at the next stage.

Key benefits of using the approach

The trial successfully demonstrated that One Planet Choices can be used at an early stage of developing options for wastewater treatment which delivers a wide range of environmental benefits.

A key benefit is that the deadlock situation prior to applying One Planet choices had moved forward with both organisations able to agree a programme of work for an outline design phase for the preferred scenario.

The approach incorporated Scottish Water's Benefits Framework criteria making it easier to translate the outputs into the full Benefits appraisal at a later stage.

Lessons learnt

Element	Worked well	Improve
Workshops format & structure	• At the start of each workshop, it was effective to re-cap and get people in the zone, this keeps participants effectively orientation within the process and what we will do / make in each session and	• The tight timing in the workshops meant that a lot of time was spent structuring the materials before the session the facilitator and technical officer need to be aware of the time involved when allocated this task.

	how it links to the next session. • Clarity over the evidence enabled joint agreement of the framing statement and objectives over three sessions.	• Deciding the criteria for making the decision felt abstracted from the decision itself, which meant one of the participants was unhappy with the decision. • Orientation to show the output they are working towards would help participants
Methods & tools	• standardised materials for each session helped with participant orientation. • Using Scottish Water Benefits Framework for criteria has the advantage of being standard criteria for their investment appraisal	• Selecting criteria for the specific decision doesn't work so well where decisions must be compared for investment purposes

↑ *Return to Summary of trials*

↑ *Return to Summary of stage 2*

↑ Return to Detailed Method