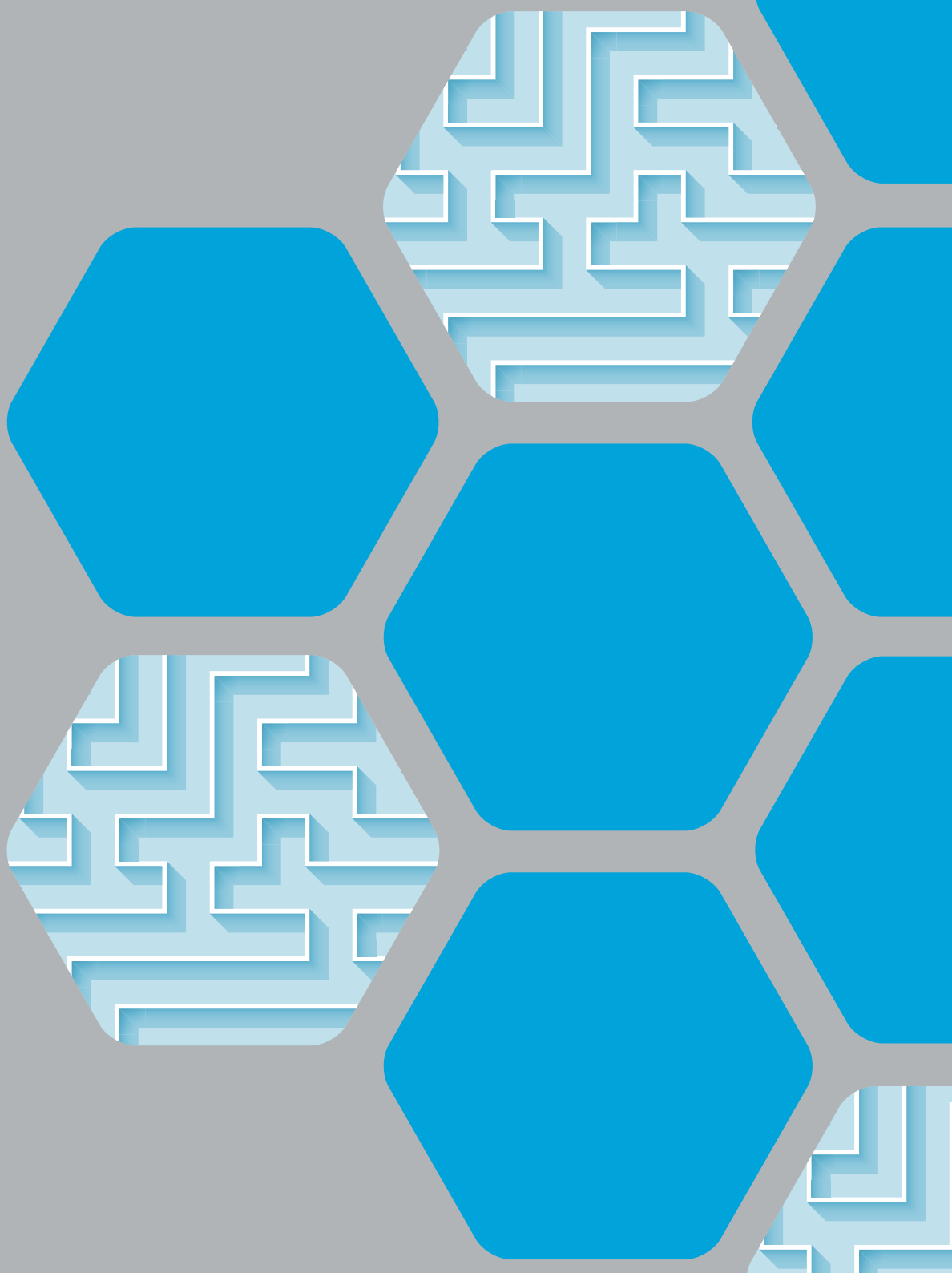
MANAGING FUTURE UNCERTAINTY

An introduction to integrating risks resulting from macro sustainability trends into business decision making

By the A4S Chief Financial Officer Leadership Network



ACCOUNTING FOR SUSTAINABILITY

THE A4S CFO LEADERSHIP NETWORK

The **Prince's Accounting for Sustainability Project (A4S)** was established by HRH The Prince of Wales in 2004 to convene senior leaders in the finance, accounting and investor communities to catalyse a fundamental shift towards resilient business models and a sustainable economy.

The **A4S Chief Financial Officer Leadership Network** was launched by HRH The Prince of Wales at St James's Palace in December 2013. The Network brings together a select group of leading CFOs from large European businesses seeking to embed the management of environmental and social issues into business processes and strategy. We believe it is the first grouping of its kind globally.

The Network has worked on a number of projects during 2014 including looking at ways to integrate risks arising from macro sustainability trends into decision making, the subject of this guide. The outputs from the other projects are available from the A4S website www.accountingforsustainability.org.

The project team would value feedback on this guide from other organisations working in this area. Please send any comments to: accountingforsustainability@royal.gsx.gov.uk.

NETWORK MEMBERS

The following CFOs were Network members during 2014:

Scott Longhurst Anglian Water*

Evelyn Bourke Bupa

Carol Fairweather Burberry Group

Pierre-André Terisse (co-chair) Danone*

John Rogers (co-chair) Sainsbury's*

Rolf-Dieter Schwalb Royal DSM

Alan Stewart / Paul Friston Marks and Spencer

Andrew Bonfield National Grid

Gregor Alexander SSE

Susan Davy Pennon Group (South West Water)*

Lucinda Bell The British Land Company

John Lelliott The Crown Estate*

Jean-Marc Huët Unilever

Russ Houlden United Utilities Group

Richard Mayfield Walmart EMEA (Ex Asda CFO)

Liz Barber Yorkshire Water*

*These companies are members of the Network's managing future uncertainty project.

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INTRODUCTION FROM THE A4S CFO LEADERSHIP NETWORK

Businesses today are operating in an ever more interconnected and globalised world with macro sustainability trends, such as water scarcity, climate change, extreme weather events, rapid population change and increasing resource demand, presenting both risks and opportunities. This challenging environment, coupled with higher stakeholder expectations on business and an increasing ability for people to unite around issues of concern, means that these trends are posing greater commercial risks and opportunities than ever.

Businesses that are serious about integrating sustainability into their core business objectives need to understand the risks and emerging issues arising from these trends, how they are likely to impact the business in the short, medium and long term, and how they should be considered within strategic decision making.

Boards and senior leadership are seeking confidence that these risks are being effectively managed. At the same time, there is growing recognition that a more strategic approach to addressing these risks successfully can help unlock commercial opportunities and add a competitive advantage.

Organisations that are heavily reliant on the natural environment, such as water companies, are at the forefront of embedding these risks into their business processes and this is largely driven by regulatory requirements. Many of the case study examples provided in this guide are therefore from this sector. However, macro sustainability trends impact, and will continue to have an increasing impact, on all businesses, large and small.

Uncertainty arising from macro sustainability trends

The challenge for businesses is the uncertainty that surrounds these trends. Factors that contribute to this uncertainty include: long term time horizons; unknown scale and timing of impacts; lack of clarity regarding future public polices and regulatory frameworks; and shifting customer preferences across market segments. In addition, the benefits from addressing these trends are harder to measure and quantify than 'traditional' risks.

In such cases, as CFOs, we would rely on techniques that can help us reduce this uncertainty of outcome and help us better understand the risks facing our businesses.

This guide

This guide provides practical examples of how to begin to overcome the challenge of uncertainty arising from the macro sustainability trends that have a regional or global impact and the risks arising from these. This guide provides examples of how to identify and assess the risks affecting your business so they can be better integrated into risk management and business decision making processes.

As CFOs we must continuously review and evolve the way our business processes respond to these trends to ensure that we are best placed to foresee changing circumstances, respond to risks, and adapt to maximise our opportunities.

We hope that you will find this guide helpful and would like to thank all those who have contributed to this work. We look forward to receiving your feedback.

Thank you.

Susan Davy, Director of Finance, Pennon Group (previously Finance and Regulatory Director for South West Water), and Liz Barber, Director of Finance, Regulation and Markets for Yorkshire Water.

FOREWORD

A COMMON PURPOSE

I am delighted to introduce this guide to integrating risks resulting from macro sustainability trends into decision making. It has been developed by risk and assurance professionals and sustainability experts in companies that are members of the A4S CFO Leadership Network. We are all involved, as part of our day jobs, in practically applying the approaches that are discussed within this guide. We are also all at different stages of the journey, have various viewpoints and experiences of using a plethora of frameworks and have had a mixture of results. Through the A4S project, we have shared our honest views of what has worked well and where lessons have been learnt. We have aimed not to reinvent the wheel but to simply share our experiences and provide a starting point to stimulate further debate and action.

MANAGING UNCERTAINTY

We have spent many hours debating whether managing uncertainty associated with macro sustainability trends is simply good risk management. The answer is both yes and no! We have shared our different risk management methodologies and experiences and it is clear that there are a wide variety of ways in which organisations conduct risk management. What is equally clear is that many risk management frameworks do not fully consider the matching upside opportunities, do not cope well with uncertainties, lack consideration of the full suite of sustainability issues and can be both short term and inward facing.

We believe incorporating sustainability factors into risk management and decision making frameworks will lead to better, long term commercial outcomes and more sustainable businesses as well as helping society to find solutions to some of the most significant threats we have ever faced. Due to the potentially costly implications of inaction, the main focus of this guide is on risks. However, some of the approaches presented can also be used to identify and assess opportunities and this may be a focus of our future work.

PRACTICAL APPROACHES

This guide describes approaches to integrating sustainability factors into risk management and decision making frameworks. Interspersed within these steps are practical examples and case studies of where Network members have had success in doing this and can share our experiences.

None of the approaches included within this guide are new. Instead we describe how traditional risk management frameworks can be enhanced to include consideration of longer term risks arising from macro sustainability trends. Organisations whose risk management processes effectively consider these long term issues alongside any other business risk, are better equipped to prepare for the future, which in turn leads to better decision making and more successful businesses.

MATURITY

We have included a maturity model to enable organisations to consider a) which stage they are currently at regarding the integration of these risks into risk management and decision making frameworks and b) what next steps might look like.

BUSINESS CASE

Clearly articulating the business case is of utmost importance and this guide summarises some of the key elements you may wish to consider. Senior leadership should be convinced of the business necessity of integrating sustainability into the overall strategy to allow for better and more well-informed decision making.

STARTING THE CONVERSATION

Regardless of which sector you operate in and your particular field of interest, I hope that you will find this guide a useful insight into how risks arising from macro sustainability trends can be integrated, in a pragmatic manner, into risk management and decision making processes.

Please share this guide with your colleagues and start a conversation about what stage you are at on your journey and what more you can do to progress in maturity. All members of the CFO Leadership Network are committed to continuing our journey to better understand the implications from macro sustainability trends and learn from our shared experiences. We sincerely hope you will join us.

Sarah Lund, Head of Strategy, Risk and Assurance, Yorkshire Water

Chair of A4S managing future uncertainty project

SUMMARY

THE WORLD IS CHANGING

The global economy is entering a new era. Issues such as the over-consumption of finite natural resources, climate change, population growth and the associated increase in demand for food, water and energy are creating new challenges and opportunities for both the private and public sector. As CFOs and finance professionals, you need to understand how these 'macro sustainability trends' will affect your organisation's success in the short, medium and long term, manage the uncertainty that often accompanies these trends, and be able to factor this knowledge into the decisions you make today.

RESPONDING TO MACRO SUSTAINABILITY TRENDS MEANS DEALING WITH UNCERTAINTY

Factors that contribute to this uncertainty include long term time horizons; the nature, scale and timing of impacts; lack of clarity regarding future public policies and regulatory frameworks; and shifting customer preferences.

THERE IS LIKELY TO BE A SIGNIFICANT COST OF INACTION

Failure to address this uncertainty may leave you vulnerable to reputational damage, unable to adapt to changing circumstances, unable to meet increased costs, or capitalise on commercial opportunities to invest in products and services which respond to changing consumer demands.

BENEFITS

Benefits for your organisation include:

- Enhanced decision making capacity, agility and adaptability
- Deeper insight, knowledge and intelligence on current risks and emerging issues
- Ability to manage stakeholder expectations and business reputation with greater certainty
- A broader framework and principles for innovation

HOW TO RESPOND

To respond effectively consideration should be given to:

- Managing uncertainty around how these global trends will manifest into multiple future scenarios
- Looking beyond short time horizons to longer term impacts
- Understanding risks and emerging issues across the entire value chain
- Collaborating to identify, assess and address the implications

We recommend three steps to integrating risks arising from macro sustainability trends into business decision making:

1. Identify risks

Adapt current risk identification practices to consider the particular characteristics of risks derived from macro sustainability trends which are often:

- Difficult to define and the extent and time horizon of their impact which is often uncertain
- Interconnected, affect your business on many levels and affect multiple decisions
- Outside your organisation's control
- Heavily influenced by actions by other parties that may not be assigned risk ownership
- Difficult to predict as historical precedence may not be a reliable indicator of future trends
- Require broad stakeholder input to effectively identify the impacts

2. Understand and assess the impact

Traditional impact assessment and management processes need to be adapted to reflect the specific circumstances surrounding macro sustainability trends. Understanding your risk appetite and tolerance for these types of risks and levels of uncertainty, and therefore the level of materiality, is essential. We have found that scenario planning is a useful way to assess business resilience to these risks. This guide also describes other useful approaches to impact assessment, such as qualitative and quantitative risk assessment, trend impact analysis, Monte Carlo Simulation and spatial analysis.

3. Integrate risks arising from macro sustainability trends into business decisions

These trends may impact a range of business decisions, from strategy, capital investment appraisal, mergers and acquisitions to new product and market development. Due to the nature of these risks, it can be challenging for many organisations to integrate them effectively.

Our top tips to enable better integration are:

1. Adapt traditional risk management processes, rather than seeking to develop new, or parallel approaches
2. Consider risks arising from macro sustainability trends alongside 'traditional' financial risks as part of a holistic framework
3. Bridge the knowledge gap by providing management with insight into key risks associated with macro sustainability trends
4. Articulate the business case and commercial rationale for by highlighting the value at risk from inaction and associated costs e.g. rising insurance premiums and costs of supply chain disruption
5. Adopt a longer term focus and plan for multiple possible outcomes and scenarios to accommodate the uncertainty associated with these impacts
6. Source reliable data and contribute to the development of more robust information and commonly agreed approaches for addressing this uncertainty
7. Collaborate with key internal and external stakeholders to ensure broad input and more informed decision making

THE BUSINESS CASE

Macro sustainability trends are already impacting business and this is likely to increase

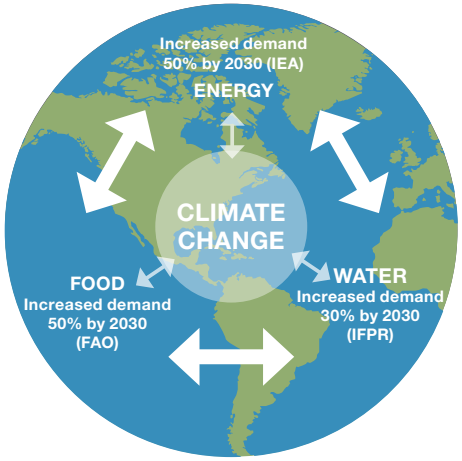
Businesses today are operating in an ever more interconnected and globalised world. Macro sustainability trends, such as climate change, resource scarcity and demographic shifts, are posing greater commercial risks and opportunities than ever before and are already impacting the bottom line. In 2013, extreme weather events such as floods, droughts and heatwaves were behind $37bn of the world's $45bn disaster-related insured losses[1].

Increasing stakeholder expectations on business and an increasing ability for people to unite around issues of concern, coupled with heightened investor awareness and government regulations, means that the value at risk from inaction is increasing.

"PERFECT STORM"

The global population is growing at a rate of approximately 80 million people per year. The UN predicts that the world will therefore need 30% more water, 50% more energy and 50% more food by 2030.

This will create what some refer to as the "Perfect Storm"[2] and climate change will exacerbate these impacts in unpredictable ways.



In 2013, extreme weather events were behind $37bn of the world's $45bn disaster-related insured losses[1]

"Climate change will affect every business regardless of whether they agree with the science or not. Business leaders need to truly understand the potential financial and operational longer term impacts on their organisations.

Business leaders should be building these impacts into their future business plans now. Failure to do so will likely impact business success."

Paul Crewe, Head of Sustainability, Engineering & Energy, Sainsbury's

The world faces a singular challenge – to provide for as many as 9 billion people within a finite set of land, water and natural resources, whilst adapting to the destabilising effect of a warmer, less predictable climate. Business, of course, has a crucial role in responding to the challenge of our critical interdependencies, supporting economic activity that enhances rather than damages the environment and sustains rather than erodes livelihoods and well-being.

The University of Cambridge Institute for Sustainability Leadership

SHIFT IN FOCUS FROM ECONOMIC TO SOCIAL AND ENVIRONMENTAL RISKS

The World Economic Forum (WEF) 2015 Annual Risk Report[3] is based on the annual Global Risks Perception Survey, completed by almost 900 members of WEF's global multi-stakeholder community of experts and decision makers.

The table below shows that economic risks largely dominated over many of the past nine years. However, there has been a shift over the past five years away from economic risks in general to environmental and societal risks – ranging, from climate change and water crises to income disparity.

For the first time, economic risks have not appeared in the top five risks in terms of impact and only one economic risk appears in the top five in terms of likelihood.

Geopolitical risks are back on the agenda following events in Crimea and the rise of the Islamic State. At the same time, health-related societal risks – last considered impactful in 2008 – have made it back into the top five, following the unprecedented spread of Ebola.

Interestingly, this year's report introduces a new distinction between risks and trends, which allows a better understanding of the underlying drivers of global risks. The differentiation emphasises the fact that trends, unlike risks, are occurring with certainty and can have both positive and negative consequences.

Trends are long term, ongoing processes that can alter the future evolution of risks or the interrelations among them, without necessarily becoming risks themselves. Environmental and societal trends feature heavily among the 13 identified, examples being ageing population, climate change, environmental degradation, rising income disparity and urbanisation.

Top 5 Global Risks in Terms of Likelihood

	2007	2008	2009	2010	2011	2012	2013	2014	2015
1st	Breakdown of critical information infrastructure	Asset price collapse	Asset price collapse	Asset price collapse	Storms and cyclones	Severe income disparity	Severe income disparity	Income disparity	Interstate conflict with regional consequences
2nd	Chronic disease in developed countries	Middle East instability	Slowing Chinese economy (<6%)	Slowing Chinese economy (<6%)	Flooding	Chronic fiscal imbalances	imbalances	Extreme weather events	Extreme weather events
3rd	Oil price shock	Failed and failing states	Chronic disease	Chronic disease	Corruption	Rising greenhouse gas emissions	Rising greenhouse gas emissions	Unemployment and underemployment	Failure of national governance
4th	China economic hard landing	Oil and gas price spike	Global governance gaps	Fiscal crises	Biodiversity loss	Cyber attacks	Water supply crises	Climate change	State collapse or crisis
5th	Asset price collapse	Chronic disease, developed world	Retrenchment from globalization (emerging)	Global governance gaps	Climate change	Water supply crises	Mismanagement of population ageing	Cyber attacks	High structural unemployment or underemployment

Top 5 Global Risks in Terms of Impact

	2007	2008	2009	2010	2011	2012	2013	2014	2015
1st	Asset price collapse	Asset price collapse	Asset price collapse	Asset price collapse	Fiscal crises	Major systemic financial failure	Major systemic financial failure	Fiscal crises	Water crises
2nd	Retrenchment from globalization	Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Climate change	Water supply crises	Water supply crises	Climate change	Rapid and massive spread of infectious diseases
3rd	Interstate and civil wars	Slowing Chinese economy (<6%)	Oil and gas price spike	Oil price spikes	Geopolitical conflict	Food shortage crises	Chronic fiscal imbalances	Water crises	Weapons of mass destruction
4th	Pandemics	Oil and gas price spike	Chronic disease	Chronic disease	Asset price collapse	Chronic fiscal imbalances	Diffusion of weapons of mass destruction	Unemployment and underemployment	Interstate conflict with regional consequences
5th	Oil price shock	Pandemics	Fiscal crises	Fiscal crises	Extreme energy price volatility	Extreme volatility in energy and agriculture prices	Failure of climate change adaptation	Critical information infrastructure breakdown	Failure of climate-change adaptation

Economic Environmental Geopolitical Societal Technological

Environmental and social risks have become more prominent in recent years

> While the shift from economic to environmental risks highlights a recognition of the importance of these slow-burning issues, strikingly little progress has been made to address them in light of their far-reaching and detrimental consequences for this and future generations
>
> **WEF 2015 Annual Risk Report**

PERSPECTIVES OF NETWORK MEMBERS WORKING ON THE PROJECT

Members of the A4S CFO Leadership Network, as part of their normal risk management processes, have identified risks arising from macro sustainability trends and sought to embed these within their strategy and operations. Many have an integrated corporate and sustainability strategy and others a distinct strategy that addresses matters such as climate change, affordability and changing demographic trends, which influence key decisions.

Although there are variations by sector, common areas of concern include the impact of:

- Climate change including flooding of assets, increases in temperature and extreme weather events
- Water scarcity
- Changing customer behaviours
- Increasing environmental regulation
- Skills shortage

THE WORLD IS CHANGING AND BUSINESSES NEED TO RESPOND

Anticipating and preparing for future challenges, trends, threats and opportunities is an essential part of any organisation's strategy. The nature of macro sustainability trends means it may be necessary to take action now to avoid costs that could occur sometime in the future. The more complex and global your value chain, the more benefit you will gain from looking beyond the parameters of short term business plans, and looking to build long term business resilience.

Macro sustainability trends are no longer singular and rare, but persistent and growing challenges. The physical impacts of extreme weather events such as flooding or droughts are affecting operations, disrupting supply chains and increasing insurance premiums.

Planning and adapting to this changing world is essential and action today could save significant future costs. Since 2011, companies have spent more than US$84bn worldwide to improve the way they conserve, manage or obtain water[4]. Whilst this expenditure helps to increase resilience, some costs could have been avoided had future water scarcity risks been adequately included in upfront planning decisions.

TOP REASONS TO ACT

We found that responding to the longer term risks from macro sustainability trends helps to:

- Increase resilience by preparing for future multiple scenarios to enable you to respond and adapt flexibly to new circumstances
- Identify new business opportunities which can yield competitive and commercial advantage - or avoid pitfalls and threats that may afflict others
- Reduce future regulatory, resource and price risks
- Make better informed decisions and risk responses
- Create an attractive proposition for employees
- Build trust with key stakeholders

UNCERTAINTY ASSOCIATED WITH RISKS ARISING FROM MACRO SUSTAINABILITY TRENDS

One of the most significant challenges with macro sustainability trends is the uncertainty associated with them:

- They often manifest themselves over a longer term time horizon with timing uncertain
- They are outside the control of your organisation
- The extent of their likely impact, both globally and on the business, can be difficult to predict accurately, although this is improving rapidly with advances in scientific modelling
- The appropriate business response and size of the investment required may change over time depending on the actions of others and may be outside your control
- Innovative technical solutions that could help to reduce uncertainty may not yet have been developed
- They often have a broad impact on the business requiring cross-functional planning and response
- Public policy response and associated regulatory frameworks vary globally and are often heavily influenced by political shifts
- Customer preferences vary across markets and over time

Since 2011, companies have spent more than $84bn worldwide to improve the way they conserve, manage or obtain water as the need to address water-related risk is increasingly being prioritised at board level[4]

INTEGRATING MACRO SUSTAINABILITY TRENDS INTO DECISION MAKING

THE STEPS

Over the following pages, we highlight practical ways in which you can identify and assess the impacts of risks and emerging issues arising from macro sustainability trends, such that they can be better integrated into existing risk management and decision making processes. We also highlight the enabling factors for integration.

Monitor, review and communicate activities and outputs

To ensure that your risk management processes are fit for purpose, you should design them so that they can be periodically revisited. This should not only help inform specific and immediate business decisions, such as mergers and acquisitions, but also feed into the overall strategic direction and business objectives.

Periodic review should also allow for new risks and emerging issues to be included and, conversely, once they cease to be relevant to an organisation, this should be reflected. Senior level accountabilities should be determined for each identified risk with clear reporting lines to the Audit Committee and the Board, as the governing bodies ultimately responsible for on-going monitoring.

Transparent external reporting will help build trust with key stakeholders that material risks are being identified and appropriately managed.

MONITOR, REVIEW AND COMMUNICATE KEY QUESTIONS

1. Have you assigned clear accountabilities for managing and monitoring identified risks arising from macro sustainability trends in accordance with your normal risk management procedures? Do you need to involve external experts?
2. Do you have procedures in place to generate reliable internal and external reporting on how they are being managed? Does this deal effectively with the cross-functional nature of these risks?
3. Are your identified risks revisited based on improvements in scientific predictions to ensure an up-to-date risk profile and mitigation plan?
4. Do the timeframes you have looked at match those relevant to your business, in particular for long lived assets?
5. Are your identified risks and emerging issues reflected in your public reporting and disclosures, along with mitigation actions to demonstrate to investors and wider stakeholders that you are improving organisational resilience?

STEP 1 - IDENTIFY RISKS

We have found that traditional approaches for undertaking risk identification can be applied relatively easily to the identification of those related to macro sustainability trends, including horizon scanning, PESTLE, SWOT / sSWOT analyses. However, these approaches need to be adapted to consider the particular characteristics of the risks arising from these trends compared to traditional financial factors, including the fact that the extent, impact and time horizon is often uncertain.

DIFFERENCES BETWEEN IDENTIFYING 'TRADITIONAL' RISKS AND THOSE ARISING FROM MACRO SUSTAINABILITY TRENDS

Some of the differences we think are helpful to consider are summarised in the table below. In reality, this divide is not 'black and white' but it's useful to highlight some of the important elements to recognise in the risk identification process.

	'Traditional' risks	Risks arising from macro sustainability trends
Definition	• Specific and fairly easy to define	• Difficult to define clearly
Time horizon	• Typically more short term • Can usually be predicted with reasonable certainty	• Typically medium to long term in nature • Often uncertain
Main stakeholder input to identifying risks	• Risk function • Senior leadership	• Multiple business functions (e.g. risk, strategy, supply chain, sustainability etc.) • Senior leadership • Sustainability experts • Industry peers
Source of information	• Trend analysis can be based on historical analysis to predict future events	• Historical precedence alone can be an unreliable predictor of the future as many trends are increasing
Risk type	• Micro risks, primarily related to discreet areas of the business	• Macro risks, multi-faceted and interconnected, affect the business on many dimensions

"A key ingredient to the delivery of long term sustainable value for any business is the ability to look at the future and consider how global trends and themes will affect operations over the medium and long term, and in particular influence the decisions it needs to take today.

A business can only be truly sustainable and deliver value beyond financial return if it considers environmental and societal factors such as the availability of natural resources and shifting global demographics as an integral part of its decision making."

John Lelliott, Finance Director, The Crown Estate

KEY QUESTIONS

1. Do you have an overview of the macro sustainability trends that may influence the success of your business?
2. Do you have procedures in place to identify which of the trends are material to your business?
3. Are you confident in the accuracy and suitability of the procedures to capture these current and emerging risks?

APPROACHES TO IDENTIFYING RISKS ARISING FROM MACRO SUSTAINABILITY TRENDS – HORIZON SCANNING

We have found that horizon scanning is the most useful approach to inform the identification of material risks arising from macro sustainability trends.

What is it?	Horizon scanning is a technique for analysing the future and considering how emerging trends and developments might affect the success of organisations through a systematic examination of potential threats and opportunities.
When is it used?	It is an important precursor to proactive risk management and business continuity. Businesses should consider an appropriate timeframe based on the nature of business activity and the timeframe over which relevant macro sustainability trends are forecast.
Time horizon	The technique explores new and unexpected issues as well as persistent issues and trends and can help challenge past assumptions. A solid 'scan of the horizon' can provide the background for risk management and for developing strategies to anticipate future developments. Organisations can thereby gain lead-time and a competitive edge. Horizon scanning can also be a way to assess trends to feed into the scenario development process. Scenario development is discussed in more detail on page 18.
Challenges	Organisations should take care not to focus too short term as they may miss issues where adaptation or mitigation measures are needed now to prepare for future risks.

WAYS OF UNDERTAKING HORIZON SCANNING

We have found that to be effective, a range of horizon scanning techniques should be used.

Desk-based research

A number of universities, NGOs and consultancies publish assessments of the macro sustainability trends that may be material to your sector. Lists of sustainability issues that may be relevevant provided by sustainability reporting organisations, such as the Global Reporting Institute (GRI) or the Sustainability Accounting Standards Board (SASB) can be a helpful place to start.

Surveys

Surveys can be used to supplement this research and can provide you with a broader reach, particularly where stakeholders are in different countries / regions. We have found this approach helpful to obtain input from our supply chain, customer base, partner organisations or internal stakeholders who are difficult to reach via interviews or workshops.

Interviews and workshops

Personal interviews or workshops can help you to understand matters from research or surveys in more detail. Workshops often consist of a small group of experts and cross-functional representatives that share their perspectives and knowledge to help identify which risks are likely to be most material and how they may impact your business.

Questions to ask

Example questions to help stimulate discussion:

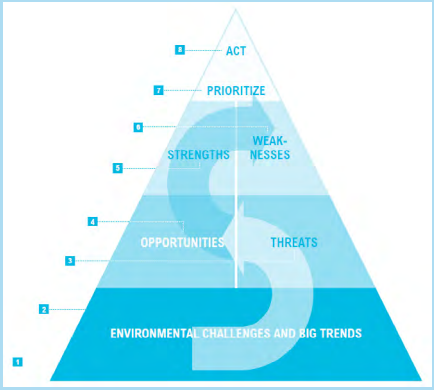
- What are the macro sustainability trends that are impacting our business now, how are these likely to change over time? Are there any new risks we should consider in the future?
- How are these trends likely to impact our value chain e.g. suppliers, customers? Which other external stakeholders may be impacted?
- In what ways do these risks impact the achievement of our strategy and objectives?
- Can we turn these risks into opportunities?
- What sources of information will enable a better understanding of these risks? How can we improve our visibility of these risks and what additional internal / external data do we require?
- What is the direction of government policy and regulation? How does this vary in each of our markets?

"TOP TIPS" FOR DELIVERING EFFECTIVE HORIZON SCANNING

1. Ensure adequate pre-read materials[5] for attendees, setting out your research on macro sustainability trends and how these may be relevant to your sector
2. Focus discussions on the context to which your risk identification relates, e.g. company-wide, region or specific business unit
3. Ensure key decision maker participation so that they are bought into the issues being discussed and can implement and influence the action plans that result
4. Include representatives from a broad range of business areas as a cross functional risk response is likely to be required
5. Involve external stakeholders including suppliers, customers, regulators and partners
6. Think about risks and opportunities across your entire value chain
7. Prioritise the results to ensure the most significant factors are addressed
8. Consider keeping a separate 'watch list' alongside your list of identified risks so that you can revisit the discussion at a later date in light of changing circumstances and as new issues emerge
9. Involve external experts to ensure that a broad spectrum of risks and emerging issues are explored and to help inform the discussion

FRAMEWORKS TO USE

Common frameworks and tools such as the familiar SWOT and PESTEL can be used during a horizon scanning workshop. The BACLIAT vulnerability assessment is specifically designed to help organisations quickly consider the potential impacts of future climate change.

	PESTEL	BACLIAT vulnerability assessment	sSWOT (specific sustainability SWOT)
What is it?	Framework for external factors which may affect activities and performance e.g.: • **Political:** Increased competitiveness of emerging markets, governmental priorities / attitude to environment and social protection • **Economic:** Move towards a circular or sharing economy, supply chain traceability • **Social:** Population growth, expanding middle class, urbanisation • **Technological:** Digitalisation, energy efficiency and renewable energy, social media • **Environmental:** Climate change, resource depletion, water scarcity • **Legal:** Green taxation, carbon trading, mandatory disclosure requirements	• BACLIAT stands for The Business Areas Climate Impacts Assessment Tool[6] • Workshop-based tool to help organisations quickly consider potential impacts of future climate change risks that include: - Past events - Events that will continue to happen as the climate changes - Potential impacts that have not yet been experienced • Framework for considering impacts in the following business areas: markets, process, logistics, people, premises and finance	The sSWOT[7] provides a new twist on the familiar framework which helps drive action and collaboration on sustainability challenges that create material business risks and opportunities. The sSWOT is designed to help identify connections between sustainability challenges and other trends that are creating big changes in future markets.  **Questions to ask when conducting an sSWOT** 1. What (or who) do you want to inform? A specific person, decision or output? 2. What do you and others see changing? What are the challenges and trends? 3. Where are environmental challenges creating broad threats to future business value? 4. Where is there a potential gap in the market where we and others can create new solutions for environmental challenges? 5. What are unexpected ways we can apply our strengths to environmental challenges? Are there partners that can be leveraged? 6. Who else has similar weaknesses or faces similar risks from environmental challenges? Can we assess the risks together? 7. Which insights will influence and resonate with your CEO, CFO, directors, or other decision makers, or what keeps them up at night? 8. What can we do (together with partners) in the near term, mid term, and long term?
When is it useful?	• To help identify current external factors e.g. climate change as well as those that may change in the future e.g. increase in frequency of extreme weather events • The PESTEL analysis can be further expanded to STEEPLED to also consider Demographic and Ethical factors impacting the business • See page 14 for a Yorkshire Water example	• As a standalone tool, or as a step in a risk-based framework such as the UKCIP Adaptation Wizard (a risk-based adaptation resource) • When there is a wide range of participants from different business areas, locations and responsibilities	
Benefits	• Provides a holistic understanding of the wider business environment • Can encourage strategic thinking beyond a short term time horizon	• Can draw on a range of knowledge and experience, raise awareness and generate buy-in to the adaptation process • Increased awareness of the range of threats and emerging issues that climate change could bring to your business • Provides insights into how climate risks are spread across different business functions	
Challenges	• It may be difficult to predict fully, future changes in the business environment as it rapidly evolves • If too much information is gathered, it may be challenging to identify material risks that are directly relevant to the business	• Representatives from across the business are required • Negotiations on the trade-offs between different business interests are likely	

YORKSHIRE WATER

Identifying long term risks and opportunities – Kelda, parent company of Yorkshire Water

Why did you undertake this exercise?

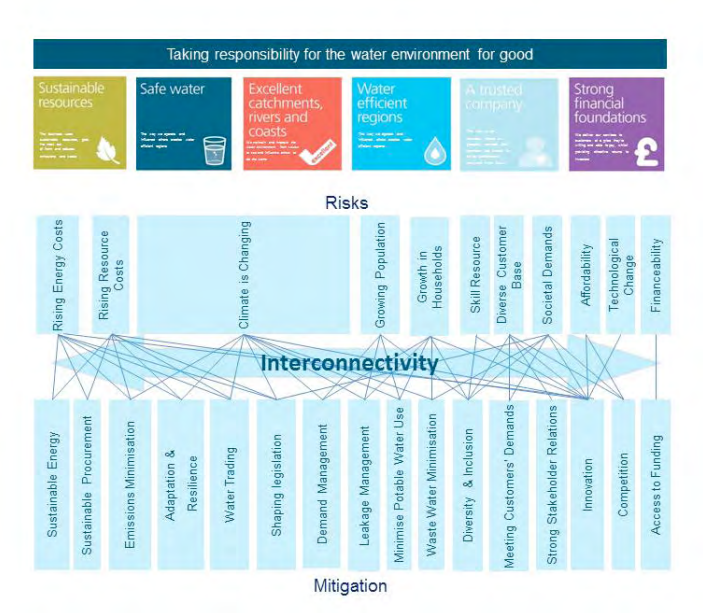
We wanted to understand fully the risks and opportunities the business was likely to face over the next 25 years, the necessary strategic responses and how they aligned to our vision and six Strategic Business Objectives. The approach taken can be illustrated through the three step process.

Step 1: What approach did you take in identifying key risks and opportunities?

We formed an internal cross-business steering group (sponsored at Board level) to determine the key sustainability risks and opportunities using the PESTEL framework – see page 14.

Why did you choose a 25 year timescale?

A 25 year timescale was chosen because it allows the short term business planning to be set in the context of a long term direction (not constrained by, for example, the current regulatory framework or customer base). We wanted to understand, for example, what our customers might expect from us in 10 years' time, what skills there might be in the talent pool in Yorkshire, and how raw material costs might affect our business in the future.



Step 2: How did you further understand how these risks and opportunities are likely to impact your business?

We aligned the risks and opportunities to our strategic risk register and considered appropriate mitigation. The approach identified that further information was needed regarding the uncertainty associated with some of the risks and opportunities that the business would face over the next 25 years. We worked with external sustainability experts to develop evidence based forecasts of what the world (specifically Yorkshire and the UK) could look like in 25 years and the key stages of change between then and now.

Risks and opportunities that are more short term and known are included within our risk register and are assessed, both qualitatively and quantitatively, within a scoring matrix. This establishes whether the risk or opportunity is material (against risk appetite determined by our Executive Team) and the level of control. Our Internal Audit function provides assurance over the effectiveness of the controls.

Step 3: How did this approach inform your business decisions?

Forecasting key risks and opportunities provided an insight to the changing nature of the water sector over the next 25 years. On the back of this work, objectives and targets that are aligned with our business plans, and scorecards were set for milestone years towards longer term outcomes to 2040.

Our objectives and targets are a mix of short to medium term through to the aspirational, where the way in which they will be achieved is yet unknown. An example of an aspirational objective is our ambition for 'global safe water' which has led to a partnership with WaterAid in Ethiopia.

What challenges did you face?

The key challenge was to ensure that the sustainability strategy didn't exist as a separate piece of work but was integrated into the company strategy. This required Board level buy-in to the concept, the work, objectives and targets that the company was signing up to, especially where these were outside of our regulatory contract.

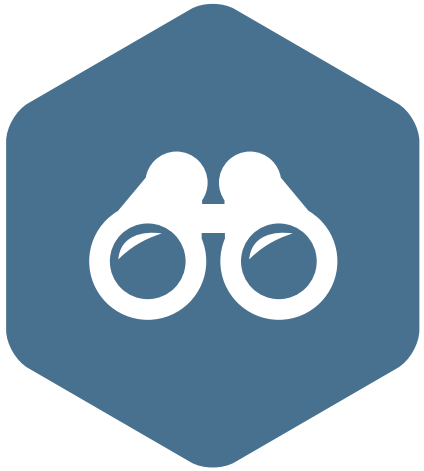
What's next for your organisation?

Progress against the objectives and targets is regularly monitored by our Board and Executive Team and publically reported in our annual report and accounts. We have an aspiration to move towards a fully integrated Annual Report and Accounts.

YORKSHIRE WATER

PESTEL in practice – identifying long term risks and opportunities

Why did you use PESTEL?	It's a useful structure to explore fully our 'risk universe' over varying timescales. It ensures the Executive Team have visibility of risks from different perspectives and stakeholder views, and hence covers a whole range of issues and risk origins.
What were the challenges with using PESTEL as the approach?	Those involved have to be prepared to put in the time and effort to go through the structure in a disciplined manner. Often, debate covers more than one PESTEL area at the same time – it is not always easy to allocate risks to just one area so this can sometimes disrupt the flow of the workshop and make note taking difficult!
What were the benefits of using PESTEL?	The structured approach ensures all areas are covered, generates debate, allows the process to move on naturally through each area, and provides a starter for open discussion. It is an easy format to use in a workshop style with an Executive Team, quick, straightforward and generates information to then explore in more detail.
What was the outcome of the exercise and what's next?	We produced a view of all the risks and opportunities likely to impact our strategic business objectives over longer time horizons including those from external sources (rather than internally driven). This then allowed us to explore likely scenarios and develop appropriate annual and five-yearly goals. The output is a sustainability plan to respond to these risks and opportunities (all logged within our risk register) which is wholly integrated with our corporate strategy.



DANONE

Determining environmental impacts through consultation with key opinion leaders

At Danone, we developed a Key Opinion Leaders (KOL) Board, a consultative committee of ten external industry experts and visionaries from sustainability, business strategy and technical areas to help inform strategic decision making processes. The KOL Board has a strong influence on the decision making process, reshaping Danone's Nature strategy.

Benefits

The KOL Board provides direct access to civil society allowing us to gain a better understanding of key topics and appreciate the complexity of arising issues. Thus, the KOL Board also reinforces our Nature strategy as it truly becomes a product of co-creation between internal and external stakeholders.

STEP 2: UNDERSTAND AND ASSESS THE IMPACT

Once you have identified your key organisational risks and emerging issues, the implications need to be further understood so that responses can be developed. Risks arising from macro sustainability trends require systematic management in the same way as 'traditional' risks.

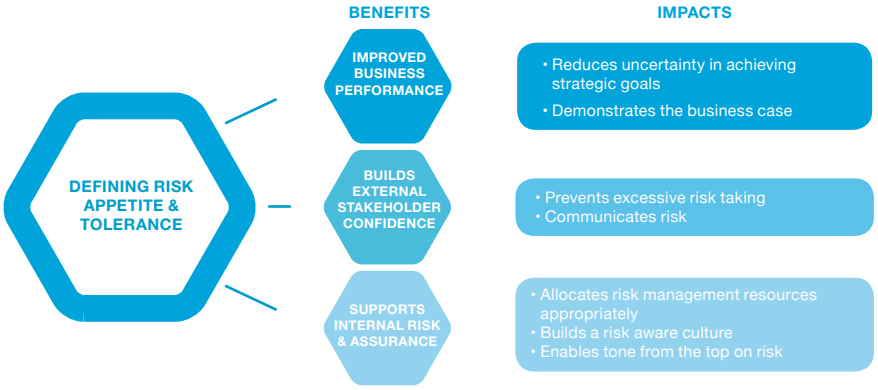
DIFFERENCES BETWEEN ASSESSING THE IMPACT OF 'TRADITIONAL' RISKS COMPARED TO THOSE ARISING FROM MACRO SUSTAINABILITY TRENDS

Some of the differences we think are helpful to consider are summarised in the table below. In reality, this divide is not 'black and white' but it's useful to highlight some of the important elements to recognise in the risk assessment process.

	'Traditional' risks	Risks arising from macro sustainability trends
Business impact	• Micro level, related to discrete areas of the business	• Macro level, interconnected and affect the business on many levels
Measurement	• Primarily financial	• Primarily qualitative and quantitative
Impact and likelihood	• Impact and likelihood can be modelled based on historical events	• Impact and likelihood is difficult to assess and model and relies on external scientific data and information
Factors considered	• Often limited to managing uncertainty around physical and financial assets	• Requires a broader understanding of the interdependences between natural, human and social assets
Cost to the business	• Costs to manage risks and opportunities can be estimated	• Costs are difficult to forecast due to uncertainty around how the risk or opportunity will manifest

UNDERSTAND YOUR RISK APPETITE AND TOLERANCE TO DETERMINE MATERIALITY FOR EACH RISK

It is important to define how much risk your organisation wants to take, and is prepared to tolerate, in pursuit of its objectives.



Risk appetite

Risk appetite is defined as the amount and type of risk that your organisation is prepared to pursue, retain or take in the pursuit of your strategic goals and objectives. For example, can you afford the risk of not addressing flooding as a result of climate change or not designing appropriate mitigation to tackle it?

Risk appetite is a key link between strategy, risk and business decisions. It forms the basis of your governance system that ensures risk taking activities (at strategic, tactical and operational levels) are aligned with organisational strategy.

At a strategic level, risk appetite can be used to understand the risk your organisation is willing to take against longer term sustainability trends and the uncertainty associated with them.

Risk tolerance

Risk tolerance is defined as the maximum amount of risk that an organisation will willingly bear.

Once the risk appetite is known for a specific issue, e.g. flooding as a result of climate change, it can be incorporated into the quantitative risk assessment (see page 17 for detail on quantitative risk assessment). For example, if there is differing tolerance for the individual impacts of climate change, then this will dictate whether a risk would be material or not.

KEY QUESTIONS

1. Do you have an understanding of the impacts arising from macro sustainability trends on your business? How will these affect ability to deliver your corporate strategy and objectives?
2. Do your current risk management processes adequately allow for the assessment and measurement of these trends?
3. What additional information, if any, is needed to facilitate assessment and measurement? What exisiting information can you leverage from across the organisation?

RISK BLIND SPOTS

For macro sustainability trends, their uncertainty coupled with their long term nature, often means that they fall below the materiality threshold for risk assessment. This can become a significant blind spot for organisations in ensuring their long term success. When the severity and likelihood of a specific risk or opportunity is uncertain, there can be a tendency to either disregard it or to assess it as 'low' which reduces the need to manage it proactively, or integrate it as a consideration within decision making.

For example, climate change risk might score as 'low' likelihood in the short term. This can lead to the severity of the risk being assessed as 'low' and therefore not being prioritised. However, if a longer term assessment horizon is used, the impact might be 'medium' but the likelihood could increase sufficiently for it to then be prioritised within decision making.

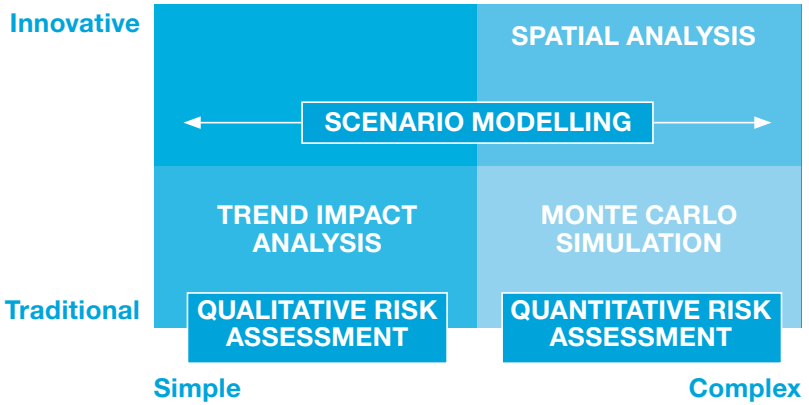
!

When the severity or likelihood of a specific risk or opportunity is uncertain, there can be a tendency to either disregard it or to assess it as 'low' which reduces the need to manage it proactively or integrate it as a consideration within decision making

APPROACHES COVERED IN THIS SECTION

Pages 17 and 18 describe a number of different approaches we have used to assess the impact of risks arising from macro sustainability trends. These approaches are likely to be very familiar and you may be using them already.

1. Qualitative risk assessment
2. Quantitative risk assessment
3. Trend impact analysis
4. Scenario modelling
5. Monte Carlo Simulation
6. Spatial analysis



A typical traditional approach would be a quantitative risk assessment with two axes to measure likelihood of occurrence and severity. Within this, a simple approach may be to designate a subjective 'low', 'medium' or 'high' rating to the risk, whilst increasingly complex methodologies seek to place more objective accuracy on the impact. Whilst useful for an initial analysis, this can result in risk blindness for macro sustainability trends.

More innovative approaches use multiple variables, including time, to develop scenarios which can be more effective for these types of risks. An example is deterioration curves for forecasting future asset performance, predicting the likelihood of failure and the likelihood and extent of a consequence arising from the asset failure caused by an extreme weather event. This information can then be used to target the most appropriate time to make capital investments.

Approach	What is it?	When should I use it?	Benefits	Challenges	How used in practice
1. Qualitative risk assessment	• Approach to scoring risks against a pre-defined rating scale (e.g. 'low', 'medium' or 'high' or 1-5 scale) • Typically, two axes are used to plot likelihood of occurrence and severity	• When there is little quantitative information available • You need a quick, low effort approach • As a precursor to a more detailed quantitative assessment	• Scoring is quick, simple and generally easily understood • Effective high-level communication tool suited to a broad range of stakeholders • Helps identify areas of greatest risk or uncertainty so that efforts can be focused	• Requires development of explicit criteria for the rating / ranking • Scoring may be subjective • Dependent on the knowledge of those carrying out the assessment	• Each risk is evaluated and designated as high, medium, or low, depending on two criteria - the severity of impact and the likelihood of the event occurring • Refer to the Yorkshire Water example on page 19 for a description of how used in practice
2. Quantitative risk assessment	• Assignment of a numerical or financial value to improve your understanding of the implications of risks	• When further analysing the highest priority risks identified following a qualitative risk assessment • To evaluate options to reduce risk • When there is more certainty and data about the implications of the risk	• Compared to a qualitative risk assessment, results are based on more objective measures of the impact of the risk • Supports understanding of the value of business assets in terms of replacement costs, productivity loss, financial impact on brand, reputation, and other direct and indirect business values	• Can be time consuming and complex • May require specialised tools and software	• Refer to the Anglian Water example on page 19 for a description of how used in practice • For more information on measuring and valuing natural and social capital, (for inclusion in a quantitative risk assessment) please refer to the CFO Network's 'Natural and social capital accounting: an introduction for finance teams' guide
3. Trend impact analysis	• Simple forecasting approach that extrapolates historical data into the future, while taking into account unprecedented future events.	• By combining extrapolations with judgements about the probabilities and impacts of selected future events, trend impact analysis provides a basis for building scenarios	• Permits systematic examination of the effects of possible future events that are expected to affect the extrapolated trend	• Requires expert opinions on the impacts of future events and specialist analysts to carry out the analysis	• Once the baseline scenario is constructed using trend extrapolation, expert opinions are then used to identify future events that may affect this scenario and are then evaluated on the basis of their probability of occurrence and degree of impact, the combined effect of these events is applied to the baseline scenario to create future scenarios. • These events can include technological, political, social, economic and value-oriented changes. Examples include forecasting the spread of disease, land use patterns, use of pesticides, sea level rise etc.

Approach	What is it?	When should I use it?	Benefits	Challenges	How used in practice
4. Scenario modelling	• Tool to model a range of future scenarios against which to test potential solutions or decisions	• To inform how the business may need to evolve to meet the need of these future scenarios • To develop appraisals of the cost and benefit of different responses • To assess whether the impacts of future scenarios are going to be negative or positive • To prioritise effort in further analysis or specific research	• Can take advantage of external perspectives and data sources • Collaborative approach, requiring input from experts and key stakeholders • Using the Delphi survey method (a collaborative approach to gathering opinions) to supplement scenario modelling, can lead to a consensus forecast on future trends, as the experts surveyed converge their opinions on a single position	• Development of future scenarios is based on assumptions • A wide range of stakeholder views needs to be incorporated to form a balanced overview • Conceiving realistic scenarios requires a profound understanding of not only the macro trend, its risks and the underlying processes and factors, but also of other events that may be triggered by the trend	• The approach can be simplistic (e.g. through the development of optimistic, realistic and pessimistic scenarios) right through to highly complex computerised modelling tools and techniques using, for example, Monte Carlo Simulation • Refer to the Anglian Water case study on page 28 for an example
5. Monte Carlo Simulation	• A computerised mathematical technique that applies probability distributions to one or more uncertain factors • The simulation lets you see the possible outcomes of decisions, allowing for better decision making under uncertainty. It also provides probabilities of different outcomes occurring	• For key decisions that have major financial consequences • To inform decisions when risk is a significant factor and particularly where financial factors are uncertain	• Allows the sensitivity of impact on a decision to be assessed by varying the key assumptions being tested • Results show the combined impact of factors as well as the relative contribution of individual assumptions • Can be used to assess the probability of breaching risk tolerance limit	• Requires data or judgement on variability of a change driver and its consequences • Does not address the “so what?” that arises from the analysis • The results are based on inputs represented by probability distributions	• Stress testing financial consequences, e.g. distribution for the future level of the price of energy can be used to test what the likely range of the cost of production might be in the future
6. Spatial analysis	• Spatial planning uses GIS (Geographic Information System) tools and business information to map economic, social, cultural and environmental factors with geographic information	• When location is a key factor in a decision • Where environmental and social sustainability factors may combine together to drive localised impacts	• Allows detailed response plans to be prepared as geographic information is often more useful for operational delivery • Presentation on maps is more accessible for many users than data	• Reliability and accuracy of the data that form the inputs • High resource and software licencing costs	• Flood risk assessment • Logistics / retail location planning • See also The Crown Estate case study on page 20 for an example

YORKSHIRE WATER

Qualitative Risk Assessment in practice

As part of our Climate Change Strategy, Yorkshire Water carried out a risk assessment to better understand the impacts on all areas of our business over a time horizon that extended to 2080. As part of this approach, we produced a climate change risk register which informed our strategic risk system. A red, amber and green colour coding was used to show the impact of the current risks and how they were positioned after the first round of proposed mitigation measures. The risk register also acknowledges the many uncertainties that exist in understanding climate change impacts, see extract below:

Risk title	Trend	2013: As we stand today				2020: After our next round of risk mitigation				Risk understanding	
		2013	2030s	2050s	2080s	2020	2030s	2050s	2080s	2012	2013
CS15: Resilient asset maintenance										Low	Low

Future trend forecasts

"We used a number of information sources to help shape future trend forecasts including evidence based expert forecasts, long term scientific models, customer research and historic trend analysis. This can lead to an understanding of how the probabilities of events are changing. For example, new climate models indicating rising sea levels and coastal flooding could change assumptions about site selections for new facilities."

Andy Brown, Head of Sustainability for Anglian Water Services

ANGLIAN WATER

Quantitative Risk Assessment in practice

Using our Business Impact Matrix, we assessed the financial impact of over 200 different risk events. By assigning a probability of the risk materialising per year (where for example 50% = a likelihood of once every two years; 100% = a likelihood of once per year and 200% = a likelihood of twice a year), we can estimate an annualised financial risk to the business.

The table below is an extract from the Matrix showing just two of our risks. As examples, the multiplier is '1' if the event is predicted to happen once per year, '2' if twice per year and '0.5' if once every two years. The multiplier is multiplied by the private cost and separately by the social cost. The two are added together to get the annualised cost of the risk.

Once this has been done, options to reduce the risk can be considered by calculating how much annualised risk each option will remove. By presenting this as a ratio (cost / annualised risk reduction) we have what has been named a 'risk index' and thereby options can be compared. This method provides a way of evaluating options despite the uncertainty of not knowing when a risk will actually materialise. The lower the risk index the more attractive the option.

Category	Service	Severity	Multiplier	Private Cost (£)	Social Cost (£)
Compliance	Volumetric consent	Consent failure (volume) one-off (inc. storm tanks)	No. of Incidents per year	£14,890	£30,760
Compliance	Volumetric consent	Consent failure (volume), dry weather flow exceeds consent	No. of Incidents per year	£29,481	£20,540.

THE CROWN ESTATE

Spatial analysis and planning in practice

The Crown Estate is one of the UK's largest coastal landowners, managing and investing in a hugely diverse range of assets including marinas, moorings, around half the UK's shoreline, and hundreds of aquaculture sites, which provide more than 6,000 jobs in Scotland alone.

What did you do?

We invested in the development of a cutting edge spatial decision support tool, MaRS (Marine Resource System). The GIS (Geographic Information System) tool provides efficient analysis and prioritisation of hundreds of spatial data layers, enabling us to map existing demand and future potential of marine estates, helping pick areas to develop, while mitigating conflicting interests.

Why did you do it?

With a duty to maximise revenue and deliver profit to the Treasury, we need to evaluate competing demands for the same space and balance the diverse interests of stakeholders.

With an unprecedented scale of data to analyse, we needed a quicker, more evidenced-based decision making tool that allowed efficient analysis of many scenarios and opportunities.

We also wanted to manage our proposals proactively, to enable us to manage our estate sustainably and to gain a more comprehensive understanding of the UK's marine environment, the economic value of our marine estate and the often competing interests of marine users and uses to enable long term sustainable decisions to be made.

Key considerations of this approach

- MaRS relies heavily on input data and specialist resources to manage and maintain the datasets
- Standardised input metadata needed
- Applications will always have specialist data requirements

What were the benefits?

MaRS enables us to better manage our marine estate in several ways:

- Enables planning decisions to be evidence based.
- Allows the testing of different priorities through scenario modelling
- Ensures future energy supplies through helping to de-risk the investment opportunity for international wind farm developers
- Balances conflicting interests and enhances stakeholder management
- Provides operational efficiency and significant costs savings through automation
- Evaluates and tracks sustainability implications over time

What was the outcome of the exercise and what's next?

We believe that we've delivered the most comprehensive marine GIS data source within the UK. The substantial outlay is expected to create multi million pound business benefits in potential mitigated losses, efficiency gains and new revenues.

Analysis shows that a typical MaRS model saves nine hours of manual GIS processing tasks. Thousands of models have been run to support business decisions and the estimated resource saving is in the region of 5FTE per year.

We believe that we've delivered the most comprehensive marine GIS data source within the UK

The substantial outlay is expected to create multi million pound business benefits in potential mitigated losses, efficiency gains and new revenues

SOUTH WEST WATER

Understanding and assessing flood risk impact

How do you better understand the impact of flooding on your critical assets?

We have been working with the Environment Agency for a number of years to understand the risk to our service presented by flooding of our critical assets. With our changing climate and unpredictable weather, we need to ensure our sites are sufficiently protected and that systems are in place to enable a rapid recovery if our services are affected.

What data do you use to assess impacts?

We found that, to be useful, historic and forecast data, plus computer modelling techniques should be used together. We use historical rainfall data (Met Office[8], Environment Agency and South West Water records), river level data (South West Water and Environment Agency records), projected climate change impacts (UK Climate Change Projections 2009[9]), Environment Agency flood plans, and computer modelling to identify sites most likely to be affected during flooding events.

Generally, this data is publicly available but we work in partnership with the Environment Agency as the discussions to really 'get behind' the data are very valuable in helping us understand the impacts.

The computer models we use are a mixture of the Environment Agency models (standard hydraulic models) and South West Water operational models about our assets. For major projections, specific models are developed from the standard tailored model framework to make more detailed assumptions.

How do you use this data to shape decisions?

The data enables us to put protections in place and ensure that these measures are as robust as possible.

We also carry out extensive work to understand fully our customers' and stakeholders' priorities for future services via focus groups and an online survey, and to engage customers on how sustainability risks and opportunities affect decisions about which products and services are provided to them in the future. We also ask our customers about their willingness to pay for services and improvements so we can assign a financial value.

What are the challenges?

There is uncertainty surrounding the data, and for climate change projections there is a significant lead time of several years between publication of revised projections by national and international bodies, and being able to include them in local specific decisions.

How do you address the uncertainty surrounding the data?

Uncertainty reflects the range of scenarios presented in these projections or the computer modelling runs we do. Cost Benefit Analysis includes modelling uncertainty through Monte Carlo Simulation to support decision making.

What's next for South West Water?

The approach is used consistently across different business decisions. We will improve our data by comparing outcomes to those predicted. Our business model evolves as risks are managed and market opportunities realised.

Supercomputers are helping scientists predict the future of climate change better than ever before[10]

A £97m supercomputer makes the UK world-leader in weather and climate science. This supercomputer will be 13 times more powerful than the current system used by the Met Office and will have 120,000 times more memory than a top-end smartphone.

The supercomputer's sophisticated forecasts are anticipated to deliver £2bn of socio-economic benefits to the UK by enabling better advance preparation and contingency plans to protect peoples' homes and businesses.

> *"The new supercomputer, together with improved observations, science and modelling, will deliver better forecasts and advice to support UK business, the public and government. It will help to make the UK more resilient to high impact weather and other environmental risks."* [10]
>
> Met Office Chief Executive, Rob Varley

STEP 3 – INTEGRATE INTO DECISION MAKING

Although more and more businesses are aware of macro sustainability trends, many still struggle to translate them into relevance to the business and integrate them into decision making.

Those sectors which are already being affected or who rely most on the natural environment, for example the water sector, are currently leading the way. An increasing number of senior business leaders are now actively participating in discussions on the impact of macro sustainability trends on corporate strategies and operations. However, A4S research in 2012[11] highlighted there is still a lack of awareness of the potential commercial impacts of these risks and how business practices need to be adapted.

Over the following pages, we will discuss the enabling factors that from our experience we believe will assist effective integration into your risk management and decision making frameworks. These factors are supported by practical examples from the Network members featured in the case studies on pages 26 to 29.

Enablers for effective decision making

1. Adapt traditional risk management processes, rather than seeking to develop new, or parallel approaches

Risks associated with macro sustainability trends can be addressed through established risk management practices. Many of the techniques developed to identify and address risks in other areas of business activity are directly applicable.

However, to build a resilient, sustainable business model, we have found that traditional risk management tools need to be adapted to respond more effectively to the uncertainty and longer term horizons involved. They also need the flexibility to address broader categories of risk that extend globally beyond an organisation's immediate control, and may require a co-ordinated management response involving a variety of stakeholders and cross-functional teams.

CONSIDERATIONS

To incorporate a broader spectrum of risk, the following should be considered:

- **Uncertainty:** Businesses will have to consider and accommodate multiple scenarios due to the inherent uncertainty of the risks arising from macro sustainability trends.
- **Longer time horizon:** These risks manifest themselves over a longer timeframe than traditional risks and therefore traditional risk management tools need to be adapted to accommodate those beyond short term time horizons, as some long term risks will require short term action.
- **Entire value chain:** These risks are likely to impact the entire value chain and consideration will need to extend beyond an organisation's immediate control e.g. if supply chains are to be secured.
- **Greater collaboration:** Risk identification and assessment of global risks and emerging issues will be more effectively understood through collaboration with different business functions and with external stakeholders.

KEY QUESTIONS

1. Are the identified risks objectively reflected in your risk management processes?
2. Do you have an understanding of the types of decisions that are impacted throughout the business?
3. Is the management information on how those risks are being managed of sufficient quality to inform decision making now and in the future?
4. Do those responsible for risk mitigation understand the value at risk from inaction?

2. Consider risks arising from macro sustainability trends alongside 'traditional' risks as part of a holistic framework

In contrast to traditional risks, those arising from macro sustainability trends are rarely identified, addressed and managed systematically.

For sustainability to be effectively embedded within an organisation, it needs to shape functional and overall business strategy, objectives and decisions. Risks associated with macro sustainability trends should therefore be considered together with more 'traditional' business risks and captured in the same manner, e.g. risk register, ensuring senior oversight and regular monitoring and review. Risk management processes should be updated periodically to consider new trends, emerging issues and stakeholder concerns.

3. Bridge the knowledge gap by providing management with insight into key risks associated with macro sustainability trends

While risks that can be translated into financial terms are well understood by senior business leaders, it can be more difficult to understand how environmental and social risks and emerging issues resulting from macro sustainability trends translate into the corporate arena and specifically to their sector and organisation.

Risk professionals have a key role to play in raising awareness of macro sustainability trends and the resulting risks - not only among the Internal Audit community who are responsible for monitoring compliance, but also among senior management who are responsible for oversight and monitoring.

The Board, corporate committees and senior management should consider whether they have the necessary skills, knowledge, experience and support to enable them to assess, in a holistic manner, the risks and opportunities the business faces in the short, medium and long term. This can be considered as part of regular effectiveness evaluations.

4. Articulate the business case and commercial rationale by highlighting the value at risk from inaction and associated costs

Senior leaders within the organisation, including those at Board and Executive level, need to be convinced that addressing macro sustainability trends and associated risks will build business resilience and protect against factors that threaten long term value, whilst also potentially providing new business opportunities. The 'downside', i.e. cost of inaction, should also be explored and articulated.

The main reason why companies fail to act is because senior business leaders may not see the relevance of including risks associated with macro sustainability trends into decision making, in part due to their uncertainty. We have found that a good way to address this is to create a cross-disciplinary team, including the CFO and heads of business functions, to establish a business case for action for each functional area.

When articulating the business case, you need to 'translate' sustainability data and information into traditional business language. The more that you are able to quantify the consequences of these trends for your business, the easier it will be to articulate the business case. Show how these sustainability trends will impact future growth, costs and risk profile.

5. Adopt a longer term focus to addressing risk and plan for multiple possible outcomes and scenarios

Whilst many business decisions are driven by short term targets and immediate impacts, macro sustainability trends manifest themselves over a longer and often uncertain time frame. Traditionally, many businesses have taken a 'not in my term of office' approach when it comes to uncertain but impactful risks such as extreme weather events.

We have found that planning for multiple possible outcomes coupled with longer term horizon scanning can help you see beyond the next financial period and determine future business priorities. This will allow your organisation to stay flexible and agile as conditions shift.

Scenario modelling also allows you to understand how the cumulative effects of macro sustainability trends may affect business continuity, or how the impacts of any single event in the value chain could spread to your own business.

When articulating the business case, you need to 'translate' sustainability data and information into traditional business language

6. Source reliable data and contribute to the development of more robust information and commonly agreed approaches for addressing this uncertainty

Reliable data on the risks and opportunities arising from macro sustainability trends can be difficult to acquire. Some of these risks and issues may not be fully evolved or lend themselves to measurement in the same way as economic factors. In addition, the absence of standardised methodologies to account for these trends can hinder effective integration into decision making and may lead to underestimation of impacts, or there may be reliance on personal judgement.

Current data sources and management information systems should be examined to ensure any existing relevant information is being used and analysed. Historic data and learnings from past events can also be used in combination with future forecast information to enable a better understanding of potential future impacts.

Information reported to senior business leaders can often be incomplete. To the extent possible, management should specify the nature, source, format and frequency of information that it needs, and then monitor the quality of the information it receives to ensure it allows for effective decision making.

More robust information and commonly agreed methodologies to assess the impact of these risks should be developed in collaboration with industry bodies, academics, not-for-profit organisations or government agencies.

With improved knowledge and visibility, 'unknown unknowns' that restrict opportunities and allow risks to arise, can be replaced with rational business decisions made on the basis of 'known knowns'.

It is important to recognise that knowledge of macro sustainabilty trends is constantly developing and there is a need to stay current and be prepared for change.

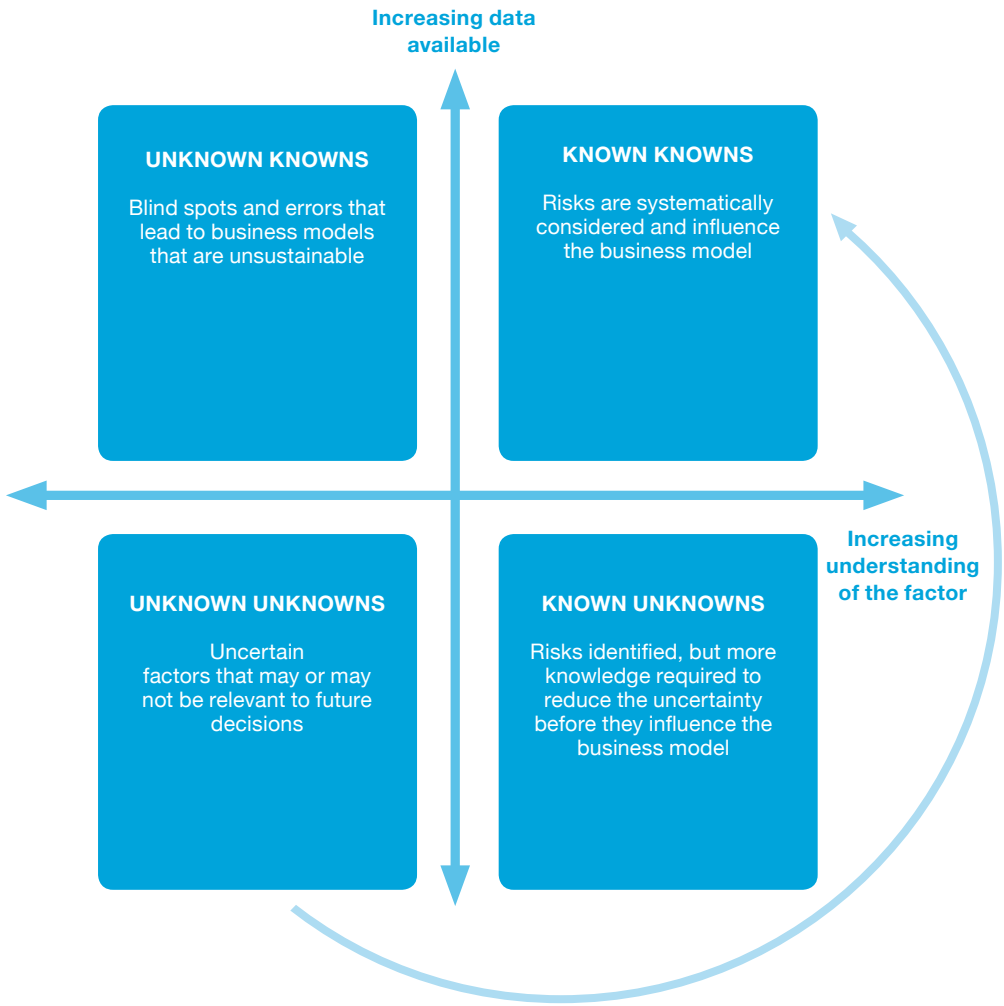
7. Collaborate with key internal and external stakeholders to ensure broad input and more informed decision making

Misaligned values or objectives between different functional areas of the business can make full integration of risks difficult. Furthermore, if the identification and management of these risks sits exclusively within one business function such as the sustainability team, there is a risk that the actions needed are not incorporated into overall strategy, risk management and business decision making processes.

Risks can be more effectively identified and addressed through internal collaborative action by bringing representatives from across the business together. In addition, by working with external parties such as suppliers, industry bodies, experts and other key stakeholders, common challenges and solutions can be identified and the cost and time associated with addressing them, reduced.

Businesses can encourage a culture of collaboration by incentivising employees to think broadly and proactively about risks and opportunities, share learnings across the organisation and work in partnership with others to respond to material risks and opportunities. By working in partnership with others, organisations can pick up on early warning signs, anticipate vulnerabilities and adopt a flexible and adaptable approach, making them more likely to succeed in today's fast changing environment.

INCREASING DATA AND UNDERSTANDING OF MACRO SUSTAINABILTY TRENDS



COLLABORATION - BENEFITS OF USING BROAD STAKEHOLDER INPUT

Many organisations have begun to work with third parties to help frame discussions about potential risks and how they will manifest. These may include political, financial, regulatory, economic, industry, media or environmental professionals and consultants.

Below we highlight some of the benefits of using a collaborative approach. In particular, it can:

- Help you unearth risks that may otherwise not be identified, which provides a more comprehensive view of the potential, possible and likely sustainability impacts to your business such that decisions can be better informed.
- Facilitate identification of cause-and-effect relationships and help identify interdependencies and unintended consequences, that often do not come to light or that sometimes otherwise get missed.
- Enhance relationships between Risk and other business functions that may already be monitoring macro trends to help better identify risks and emerging issues for your organisation, and ensure appropriate trade-off and consistency in decision making.
- Help build strong and lasting relationships with key stakeholders and secure their trust that the appropriate decisions are being made.

A collaborative approach can help you unearth risks that may otherwise not be identified which provides a more comprehensive view of the potential, possible and likely sustainability impacts to your business such that decisions can be better informed

SAINSBURY'S

First retail outlet in the UK to become energy self-sufficient

What did you do?

We developed the first store to be powered entirely by our unsold food. A quarter of our unsold food that is not suitable for donation to good causes is used as animal feed, with the remainder being sent for anaerobic digestion. Of this, the majority is backhauled to depot before being sent the UK's largest anaerobic digestion plant run by Biffa in Cannock, Staffordshire. This facility turns food into bio methane gas, which is then used to generate electricity.

A 1.5km cable has been installed linking the plant to one of our nearby superstores which allows us to receive electricity directly from the plant. We are the first business to make use of this link-up technology and as a result, have closed the loop in a way that's never been done before.

How did you identify this opportunity?

We have a long standing working relationship with our waste partners Biffa, and have over the years used our partnership to make advances in waste management.

Our Cannock site is in close proximity to Biffa's anaerobic digestion plant in Cannock, making it the ideal candidate for the first link-up of this kind.

Why did you do it?

We send absolutely no food waste to landfill and are always looking for new ways to re-use and recycle – as well as to make best possible use of the valuable resources that we generate through these processes.

The approach takes food that could once have only been sent to landfill and turns it into something of value. We believe that the price of energy could double by 2020 from 2010, driven mainly by wholesale energy price increases and environmental levies applied through electricity pricing. It also enhances security of supply. The Cannock power link is a small but pioneering contribution to decarbonising the grid and means that this store will receive a guaranteed low cost and sustainable supply of renewable energy for the foreseeable future.

What's next?

We will continue to work with our partners and suppliers to minimise our operational costs and put our valuable resources to best possible use. We also work with our suppliers to ensure that they have access to the latest technologies, which will reduce waste in our supply chain, and the environmental impact of our supplier's operations.

The Cannock power link is a small but pioneering contribution to decarbonising the grid and means that this store will receive a guaranteed low cost and sustainable supply of renewable energy for the foreseeable future.

SOUTH WEST WATER

Cost Benefit Analysis for water treatment works

What did you do?

We carried out an assessment to compare options for a new drinking water treatment works using social and environmental values; as well as commercial factors to inform the decision making process. We wanted to find the most efficient option to help minimise the cost of water treatment and our impact on the environment.

Why did you do it?

We needed to assess options for a near 60 year old treatment works in the South West of the UK, which was becoming increasingly more difficult and expensive to operate. We also wanted to ensure the long term security of water supplies to our customers.

What was your approach?

A Cost Benefit Analysis was carried out to compare options using social and environmental values as well as commercial factors. We considered three options: maintaining the current ageing site, constructing a new works with conventional treatment processes, or constructing a new works that uses advanced water treatment technology. A wide range of risks and opportunities associated with these options were taken into consideration, including the financial whole life cost, environmental and social benefits.

How did you conduct the assessment?

Specific criteria for social and environmental risks and consequences were assessed including water quality impacts, supply interruptions, energy use, embodied carbon, traffic impacts for construction and maintenance. This enabled us to address the risks and opportunities around design and operation of the options upfront.

As identified as part of our research, the top priority for customers (and that they least want to be postponed until after 2020 because of uncertainty over the costs or risks), is a safe, clean and reliable supply of drinking water. This factor was a key consideration as part of the timing of the project.

What were the outcomes?

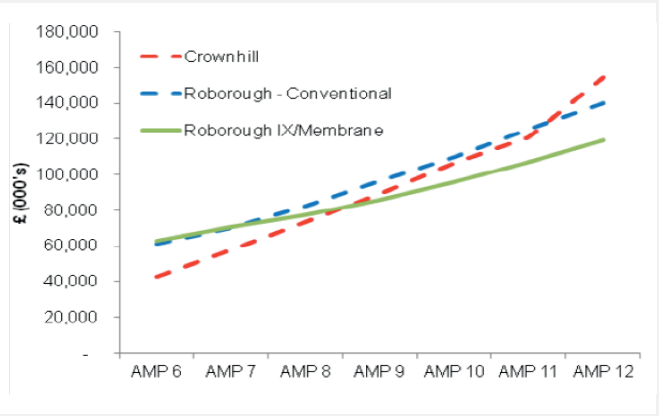
Constructing a new works with advanced water treatment technology (ion exchange and ceramic filters) presented the best case in terms of whole life cost and environmental and social benefits. The new treatment approach represents a move away from traditional chemical and energy intensive treatment processes that produce a lot of waste. In addition, it enables us to release our existing 40 acre site for redevelopment to benefit the local area.

What were the key factors to the success of this approach?

Collaboration with partners to understand better the associated financial, environmental and social benefits and considerations to inform our decision making.

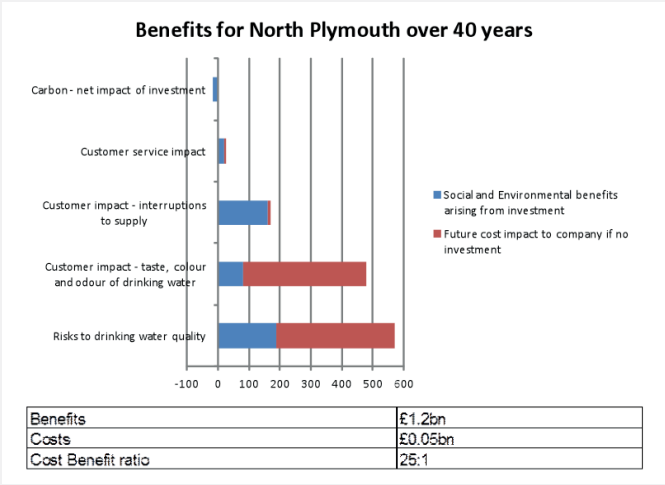
What's next?

We have built a pilot plant to test the new technology with a variety of raw water sources in advance of finalising the new site in 2018.



Financial whole life cost comparison of options

Consideration of environmental and social factors for the new works



Benefits	£1.2bn
Costs	£0.05bn
Cost Benefit ratio	25:1

ANGLIAN WATER

Managing uncertainty in water resource planning

Why did you undertake this project?

We provide water and recycled water services to approximately 6 million people in the East of England. Over the next 25 years, our ability to maintain the balance between supply and demand will be challenged by macro sustainability trends such as population growth, climate change, growing environmental need and deteriorating raw water quality.

To maintain current levels of service we need to develop new reliable, affordable and sustainable systems of supply as well as reduce demand. To select the schemes that deliver this, we need to make trade-offs between various factors including social and environmental costs and environmental performance. Most of the risks arise from uncertainty about timing and the magnitude of the impacts from growth and climate change.

We want to understand the supply and demand scenarios that are considered most appropriate and cost-effective for water resource planning. We also want to understand the trade-offs between customers' willingness to pay and reduced levels of service, and whether we should consider other criteria than cost-effectiveness.

To address these issues, we are piloting the Water Resources East Anglia project (WREA). The WREA is developing a long term water resource strategy for the Anglian region in collaboration with other water companies, the agriculture sector, the Environment Agency, Natural England and other water users.

What approach did you take in identifying scenarios for water resource planning?

The WREA is evaluating new scenario-based approaches to long term water resource planning which is based on application of Robust Decision Making (RDM) and multi-criteria Strategy Optimisation.

Strategy Optimisation uses an automated search algorithm to test different strategies against multiple performance criteria and finds those plans that perform best across all modelled future scenarios, and in respect of all performance criteria. In an RDM analysis, the performance of a small number of different options or strategies is tested using a wide variety of plausible future scenarios. The uncertainties which make the plan vulnerable are identified. Using statistical cluster analysis, the options or strategies are updated and then tested again.

What challenges did you face?

While RDM allows for rigorous testing of a small number of strategies or plans and can be used to explore the order in which the selected schemes are delivered, it does not suggest which combination of schemes should be included in the plans in the first place. We therefore used Strategy Optimisation followed by RDM.

What were the benefits of the approaches used?

By using 1) Strategy Optimisation followed by 2) RDM it is possible to identify optimised, balanced and robust water plans. By presenting optimised plans as performance measure trade-off curves (step 1: Strategy Optimisation), stakeholders and decision makers can debate and select an appropriate balance of system performance criteria.

Trade-off curves allow the identification of which portfolios of new supply and demand management schemes can reach the set objectives. Once one or a few preferred plans are chosen, they can be further refined through iterative testing with a wider selection of future scenarios leading to flexible and adaptive plans (step 2: RDM). This stakeholder-led approach allows for more effective, robust and transparent decision making and is an improvement on the current least-cost planning methods.

How did the approaches inform your business activities?

Over 300 scenarios were developed. In each scenario, the performance of each option or strategy was tracked using a number of different measures, including total capital and operating costs, and environmental performance.

To explore the robustness of a strategy based on combinations of all different options planned for Asset Management Programme 6 (2015-20), a vulnerability analysis was performed. This involved finding future conditions in which the strategy performs relatively poorly. The analysis identified two such scenarios that accounted for 96% of the simulated futures in which the strategy was vulnerable to failure. Iterative amendments can then be made to improve performance, allowing a more robust strategy to be developed.

What will success look like?

The plans will allow us to perform robustly in most plausible future scenarios. Success for the WREA is a flexible and adaptive plan for delivering a reliable, affordable and sustainable system of supply; which also needs to be resilient to the effects of population growth and climate change.

What's next for the project?

The project will be extended into Asset Management Plan 6 and used to inform our next Water Resources Management Plan and Business Plan.

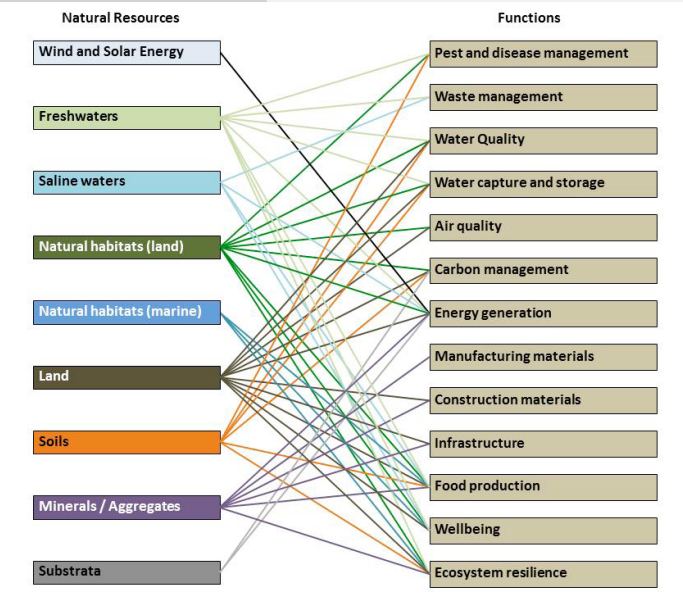
Over 300 scenarios were developed. Their performance was tracked using a number of different measures including total capital and operating costs, and environmental performance

THE CROWN ESTATE

Opportunities for effective management of natural resource use

How do you identify opportunities to affect natural resource management on your estate?

We run futures workshops to identify issues that will impact our business using horizon scanning over 5, 10, 25 and 50 years. Among other areas, we identified tactical priorities for freshwater and soils. This led to an extensive project to identify all of the natural resources that we have in our portfolio and the functions they deliver (see diagram below). For example, there are localised opportunities to affect water catchments in terms of flood risk management and water quality and supply, which in turn is linked to food production and irrigation.



What's the rationale behind the Resource Management Framework?

We have a large and diverse portfolio of natural resources. The status of those resources, and the functions they perform, underpin our performance, both in the short and long term. We are keen to understand this in more detail so that strategic and operational decisions can better reflect the long term viability of our portfolio, rather than just its performance against current markets and returns.

The framework is based on the principle that the value of our natural resources is derived from both the current value and future prospects of the functions they each deliver.

How does the Resource Management Framework assist decision making?

It supports decision making by highlighting priority issues and by putting resources and functions in context, thereby allowing them to be compared against one another.

How does it work in practice?

There are three main stages to the process:

1. Site managers provide information on the resource (one of the nine key resources identified for our business) for each of the functions it performs, looking at the availability of the resource, its value to The Crown Estate and its prospects in terms of risk and opportunity.
2. This information is then automatically fed into a Natural Resource summary scorecard for evaluation by a dedicated Resource Custodian. This indicates major areas for action and potential business opportunities.
3. All resource summary scorecards then feed into a strategic heat map for consideration by the Risk Committee and senior management. An important ancillary output is the ability also to review the status of functions and their dependencies on natural resources.

What challenges did you face?

We faced a few challenges along the way:

- Where to start – with such a vast subject matter it was important to set out a framework that could put the scale of the different resources into context.
- Boundary issues - how to apportion water catchment related functions between the different resources of Land, Soils, Natural Habitats and Freshwater.
- Moderation / calibration – how to ensure consistency.

How is the approach informing your business activities?

It is helping us to identify where we should focus our efforts. This has led to the development of distinct projects such as one with the Freshwater Trust where we are monitoring water quality and sharing this know-how with tenants through an engagement programme. Going forward, we expect it to also help our budgeting decisions and business planning.

What's next for The Crown Estate's Resource Management Framework?

We are running training for site managers on the use of the tool and extending the approach to cover all key resources.

HOW DO I PROGRESS?

We have developed a maturity model (see back page) to support you in assessing where you are in your journey to fully integrating macro sustainability trends into your risk management processes and business decisions. The model should be used to prompt a discussion with your colleagues and help you answer questions such as:

- Where is my organisation at present?
- Where do I go from here?
- What do I need to do to progress in maturity?

Progressing in maturity

Organisations at the earliest stages of development (non-existent / beginner) can begin by addressing the fundamentals such as improving business understanding of the risks and then moving from considering these over the short term to looking at their medium to long term impact.

The challenge of embracing areas of risk associated with macro sustainability trends can be daunting and many companies may become overwhelmed in the early phases of the process. It is important to recognise that you cannot do everything at once and that a fully integrated approach cannot be achieved overnight. In most cases, organisations will move through the stages of maturity over a period of years rather than months to ensure that changes are sustained and embedded.

Once there is a greater understanding of the impacts, and management of them is no longer undertaken in silos, greater collaboration will arise between different business functions supported by strong senior management buy-in and resource. This ultimately results in businesses moving towards a fully integrated approach.

Use the maturity model (see back page) to discuss with your colleagues where you are and where you want to be

ACKNOWLEDGEMENTS

Note from the managing future uncertainty project chair:

I would like to thank all the project team members, including the A4S team, for their commitment and contributions to the project so far and look forward to working together over the next phase of the project.

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MATURITY MODEL

We have developed a maturity model to support you in assessing where you stand in relation to fully integrating macro sustainability trends into your risk management processes and business decisions. Start simple and then mature - the most important thing is to make a start. Use the maturity model to discuss with your colleagues where you are and where you want to be!

	Non-existent	Beginner	Ad-hoc & Reactive	Considered & Proactive	Fully Integrated
Level of understanding and time frame by which macro sustainability trends are understood	Trends are not identified or assessed.	Trends are partially identified and assessed. Limited understanding of how they impact your business.	Understanding of current trends impacting your business and the associated risks, over a short term time horizon only. How these trends impact your business is not well understood.	Understanding of current and emerging trends impacting your business and the associated risks is well understood, over a short to medium term time horizon. Starting to look longer term. Risks are monitored.	Understanding of current and emerging trends impacting your business and the associated risks is well understood on short, medium and long term time horizons. Risks are monitored and periodical reviews are undertaken.
Responsibility for the risks associated with macro sustainability trends	No dedicated responsible person / inadequate competency.	Responsibility of the Sustainability function	Responsibility of the central risk management and internal audit functions.	Responsibility of the central risk management and internal audit functions with input from sustainability specialists.	Responsibility and ownership of all the appropriate business units.
Integration within risk management and control processes	Risks are not included, or are included on an ad-hoc basis. Controls are not defined.	Risks are managed in silos, rather than incorporated into a robust risk management framework. Limited internal control activities.	Selected risks are included within a robust risk management framework. Informal controls are in place but these are not documented or consistently applied.	Risks are included within your organisation's risk management internal audit plan. Consistent application across all business units of the internal controls framework.	Risks are fully embedded into your organisation's key risk functions (risk management, internal audit, compliance, legal etc.). Strong internal controls framework in place.
Level of collaboration and business support	Identification and monitoring takes place in silos.	Limited collaboration on selected risks on an ad-hoc basis	Identification and monitoring is undertaken jointly by the sustainability and risk functions. Limited senior management buy-in.	Involves collaboration between different functions across the entire business, supported by senior management and resource. External input is sought on material risks.	The business relies not only on collaboration between different business functions but also on external stakeholder input for the full suite of risks. Business is supported by strong senior management buy-in and resource.
Board reporting of risks associated with macro sustainability trends	Information is not gathered centrally on risks associated with macro sustainability trends.	Ad-hoc reporting on single risks to selected Board members.	Ad-hoc reporting to the Board on a few material risks.	Periodic reporting to the Board on the full suite of risks.	Reporting on risks is integrated into regular upward and downward Board communications and Board risk reviews..
Incorporation into decision making	Not considered when making business decisions	Considered in business decisions on an ad hoc basis.	Considered but does not necessarily impact the outcome.	Considered and influences business decisions on a project basis.	Fully considered within business decision making procedures across the organisation.

Qualitative judgement ⟷ **Quantitative knowledge**