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REFORMING WATER SECTOR STRATEGIC PLANNING

A REPORT FOR WATER UK

23 APRIL 2025

CONTENTS

1 Introduction and summary

Scope of this report

In October 2024, the UK Government and Welsh Government announced an Independent Commission into the water sector and its regulation, chaired by Sir Jon Cunliffe. In February 2025, the Independent Water Commission ("the Commission"), published its Call for Evidence[1]. The Commission identified a wide range of issues and is seeking evidence to inform its thinking about solutions. Two important areas where the Commission is seeking evidence are:

- Whether improvements are needed to integrate water management – a 'system planner' role has been suggested as a way of overcoming siloed decision-making in the water system; and
- Whether and how the water industry's strategic planning frameworks could be simplified. The strategic planning frameworks are plans that set a long-term direction of travel for key areas of company activities and specify schemes that are required to deliver the plans.

Water UK has commissioned Frontier Economics to develop constructive input to the call for evidence on these two areas.

This report is structured as follows:

- Section 2 outlines how a system planner role for water resources should integrate water management;
- Section 3 explains how the water industry planning system should be simplified and improved.

Within each section we explain how and why the current system is not working and outline the benefits that can be realised from the changes we suggest.

Why do we need a water resources system planner?

Water resources in England and Wales are stretched and as a result of climate change and population growth this strain will worsen over coming years. In England, the Environment Agency projects a shortfall of over 4,800 Megalitres per day by 2050, representing around a third of public water supply. In Wales, there are similar concerns, with water scarcity predicted to become more prevalent across the country by 2050, according to the Welsh Government.[2] This means that we are faced with an enormous challenge to increase water supply and to reduce demand. Both need to be achieved while supporting economic

1 Independent Commission on the Water Sector Regulatory System (Feb 2025) Call for Evidence

2 Ofwat, Water Efficiency Fund, Latest update

growth, protecting the environment and managing the impact on customer bills. As a result, we need to take every opportunity to improve the efficiency of water resources planning and investment. We have identified five opportunities:

(a) To optimise across water company and regional boundaries within public water supply;

(b) To optimise across sectors so that planning includes other sectors that abstract water (e.g., manufacturing, cooling of industrial processes);

(c) To integrate management of abstraction licences with water resource planning;

(d) To plan using a consistent and comprehensive set of assumptions and forecasts and monitor progress to enable agile investment;

(e) To establish a single voice on water resources to advise on the key trade-offs between resilience, economic growth, customer bills and the environment. This single voice should also align industrial and economic growth policies with water availability and environmental targets.

These opportunities can be realised with a new water resources system planner (or planning function). In this report we discuss in detail the types of activities the water resource system planner should undertake. When we use the term 'system planner', we define this as a centralised set of functions that should be carried out. This could be implemented in a number of different ways, including by introducing a function to an existing body (e.g. a regulator) or by establishing a new body. The focus of this report is on the functions that need to be fulfilled.

Why do we need changes to the approach to long-term planning?

The water sector is faced with a range of different planning frameworks that are aimed at ensuring preparedness for the future and/or delivery of specific outputs. Key relevant strategic planning frameworks include:

- The Water Resource Management Plan (WRMPs);
- The Water Industry National Environment Programme (WINEP);
- The Drainage and Wastewater Management Plans (DWMPs);
- Where relevant other requirements such as the Storm Overflows Discharge Reduction Plan and requirements from the Drinking Water Inspectorate (DWI).

We have identified opportunities to reform the planning frameworks across four areas:

(a) More clarity on regulators' roles with regard to investment decisions – removing overlaps between regulators, addressing gaps and ensuring consistency;

(b) Setting a consistent set of planning assumptions for all frameworks – ensuring that the plans are comparable in their preparedness for different future states of the world;

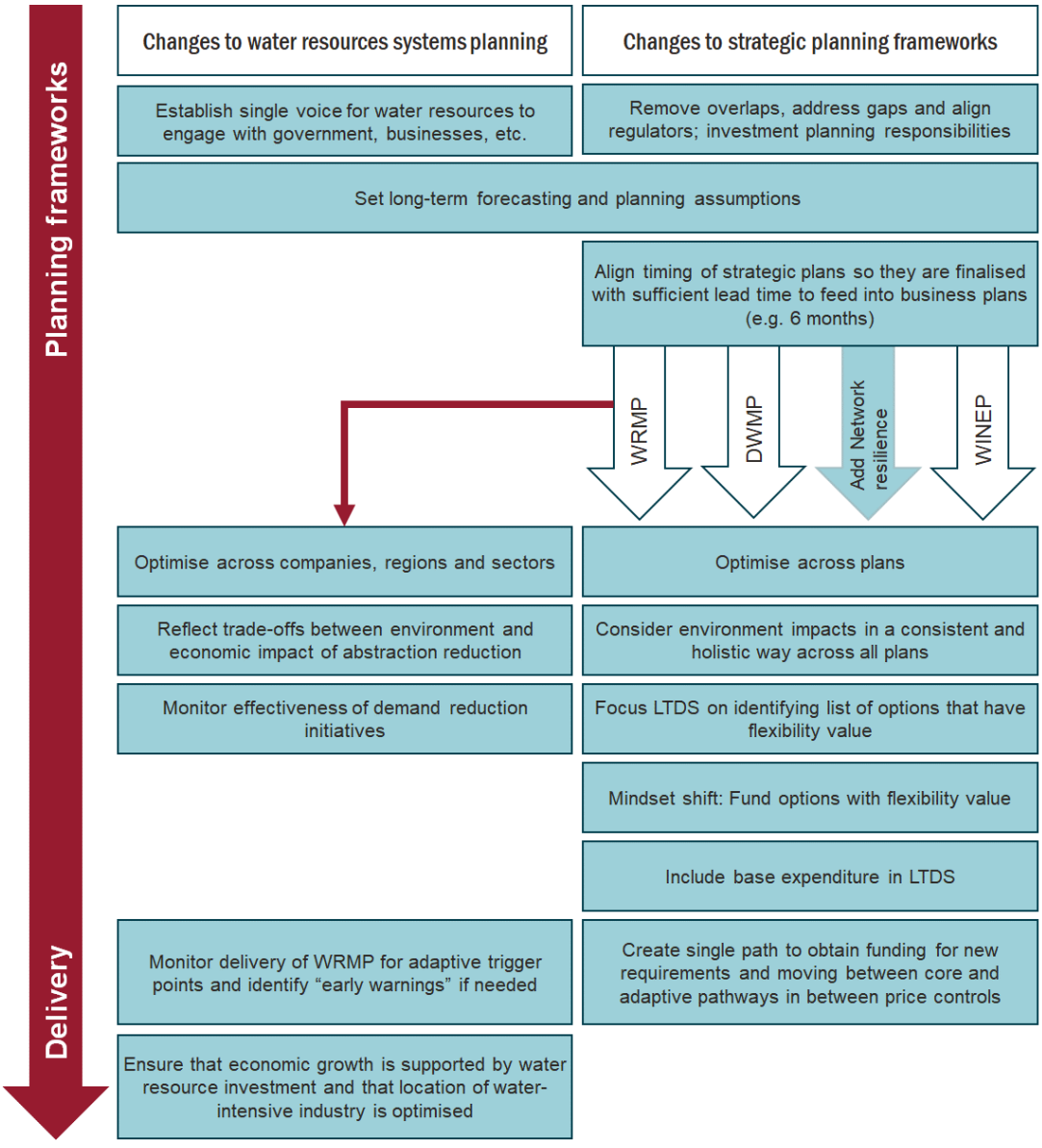
(c) Aligning the timing of the different planning frameworks with each other and with company business plans for the five-year price reviews, to ensure that optimisation between frameworks can happen before business plans are finalised; and

(d) Ensuring that the Long-Term Delivery Strategies play a greater role in funding decisions.

What are the changes we are recommending?

Our recommended changes are summarised in Figure 1 below.

Figure 1 Overview of reform changes



What are the benefits?

In summary, the benefits of these changes include:

- Greater confidence that the sector and wider society are well prepared for future challenges – as a result of better monitoring and the ability to respond to changes in circumstances in an agile way (e.g. by providing a funding path between price controls);
- Reduced delays to investments – as a result of identifying 'trigger points' where plans need to be adapted;
- Support for economic growth – as a result of being able to take a holistic view of water resources, as the system planner can ensure that water resources are developed where they are needed to support economic growth (e.g. location of new water-intensive investments such as data centres);
- Reduced administrative burden - as a result of having clear and consistent future planning scenarios and assumptions, and greater clarity on regulators' responsibilities; and
- Customers, society and the environment getting greater value for money in the short- and long-term – as a result of plans being optimised over a greater set of options across sectors, water company boundaries and regional boundaries.

2 A system planner role for water resources

2.1 Introduction

The Commission has identified that a system planner "could act as a central planning authority at a national, regional and/or catchment level, deciding on the best actions for the water system. They could look solely at the water industry or wider and integrate action across the water system when making long-term plans."[3] As a specific example, it mentions a 'national water grid' which could "act to ensure companies build interconnectors for strategic water transfers between regions and to oversee operation of transfers to ensure fair allocation of water in times of drought."

In response to the Commission's request for evidence, in this section we outline the role that a system planner should take, including the functions and scope. When we use the term 'system planner', we define this as a centralised set of functions that should be carried out; this could be implemented through various institutional arrangements, e.g. a function within an existing regulator or a new body. Our focus is on the functions that need to be fulfilled, rather than institutional arrangements.

We first outline the functions and benefits of a water resources systems planner and then consider interactions with wider reforms in catchment and drainage planning.

The idea of a system planner has been around for a while and has recently been discussed in various papers. For example:

- In January 2024, Ofwat commissioned an Independent Report by Trevor Bishop to consider the case for change to the water resource planning regime in England.[4] The report concludes that the planning framework supports the proposal for a "National System Planning (NSP) function which coordinates planning and provides leadership across the sector."
- Since 2015, Sir Dieter Helm has written about a 'system operator' function for the water system.[5] However, this has been mainly focused on catchment management and operation.

These studies generally agree that more centralised planning or oversight can deliver benefits, for instance by better managing trade-offs and delivering more optimised decision-making.

3 Independent Commission on the Water Sector Regulatory System (Feb 2025) Call for Evidence, para 197

4 Trevor Bishop (Jan 2024) Water Resource Planning – Case for Change

5 Dieter Helm (Feb 2015) Catchment management, abstraction and flooding: the case for a catchment system operator and coordinated competition. See also here.

2.2 Why do we need a water resources system planner?

In England and Wales, water resources for public water supplies are planned for using the Water Resources Management Plans (WRMP) process. Each water company prepares a 25-year WRMP every 5 years that is signed off by the Secretary of State. The WRMP is a well-established process that uses a range of analytical tools to ensure security of supply. Currently, water companies prepare water resources management plans looking at least 25 years ahead. They are required to plan to a '1 in 500 year' level of resilience to exceptional demand restrictions associated with emergency drought orders.

This process has worked well in the past but has limitations. For example, it has not delivered a central, long-term strategic view on what future scenarios water companies and the wider sector should be planning for, nor has it articulated an understanding of the risks and costs associated with different levels of headroom under those scenarios. This means that there is inconsistency in planning assumptions between regions. In addition, there is a lack of information around key policy trade-offs between resilience and cost.

The water system is now faced with significant and growing challenges, and the planning approach clearly needs to adapt and evolve. The overarching challenge is that water resources in the country are stretched and as a result of climate change and population growth this strain will worsen over coming years.

In England, the Environment Agency has stated that companies' water resource plans indicate that, without action, by 2050 public water supply will face a shortfall of over 4,800 Megalitres per day. The projected deficit represents around a third of public water supply. Key drivers of the additional need for water in 2050 which contribute to this projected deficit are:

- The impact of climate change on water suppliers: 642 Megalitres per day;
- Growing population needs: up to 1,180 Megalitres per day;
- Business growth needs: 144 Megalitres per day;
- Protecting and improving the water environment: 2,828 Megalitres per day;
- In addition, more stringent drought resilience requirements are projected to create the need for an additional 755 Megalitres per day.[6]

In Wales, there are similar concerns, with water scarcity predicted to become more prevalent across the country by 2050, according to the Welsh Government.[7]

This means that we are faced with an enormous challenge to increase water supply and to reduce demand. Both need to be achieved while delivering on the following objectives:

6 Environment Agency (Dec 2024) A summary of England's revised draft regional and water resources management plans, section 3.2.

7 Ofwat, Water Efficiency Fund, Latest update

- **Supporting economic growth** – water supply issues have a direct impact on economic activities such as housing development. For example, in April 2024, the Environment Agency objected to the building of around 4,500 new homes in Cambridgeshire. The Environment Agency's objection was based on water scarcity concerns. Specifically, the Environment Agency objected "*on the grounds that it may individually, and/or in combination with other proposed development in Greater Cambridge, increase abstraction and risk deterioration to water bodies in the Greater Cambridge area because of the additional demand for potable water use*" and that Cambridge Water Company had not sufficiently demonstrated that potable water could be sustainably supplied to the development[8]. Barriers to housing development will reduce economic growth – a Government report estimated that building 150,000 new homes in the Cambridge area by 2050 has the potential to add approximately £6.4 billion to the economy, with a fiscal benefit to the UK exchequer of approximately £2 billion in today's terms.[9] The Environment Agency subsequently retracted its objection in 2025 based on improvements to Cambridge Water's WRMP, and the measures subsequently outlined in the *Joint statement on addressing water scarcity in Greater Cambridge,* including the introduction of a water credit system. However, the Environment Agency recognises that the water scarcity challenge for the area remains.[10]

- **Protecting the environment** – water resources have a material impact on the environment. For example, groundwater (water found in underground aquifers) makes up about a third of England's drinking water supply, but also contributes to ecologically vital flows to certain rivers and wetlands. Water resources also impact the health of wetlands. Water levels that are too high, low or mismanaged, and excessive surface and groundwater abstraction,[11] can damage wetlands by altering the availability of water to wildlife and habitats, and changing water chemistry.[12]

- **Managing the impact on customer bills** – at PR24, Ofwat allowed a "£2bn development funding to kickstart £50bn investment for the biggest programme of water supply projects in decades. In total, 30 major infrastructure projects over the next 20 years will build greater resilience to drought by providing

8 Documents related to the relevant planning application can be accessed by searching for case **S/2075/18/OL** here (See document dated 19 April 2024, with description "Environment Agency".): https://applications.greatercambridgeplanning.org/online-applications/

9 HM Government (March 2024) The Case for Cambridge

10 Documents related to the relevant planning application can be accessed by searching for case **S/2075/18/OL** here (See document dated 29 November 2024, with description "Environment Agency".): https://applications.greatercambridgeplanning.org/online-applications/

11 Water abstraction is the process of taking water from various sources (rivers, lakes, groundwater, etc.), for uses including household water supply, irrigation of farmland, and industrial processes.

12 Environment Agency (May 2018) The state of the environment: water resources

enough water to meet the current daily needs of around a third of England and Wales' population."[13] In comparison, the total enhancement allowance for the water price control at PR24 was around £13.5bn.[14] This demonstrates that an expected £50bn on water supply resources are a material challenge in the future.

The material impact of the water resource challenge on the environment, economic growth and customer bills means that any opportunity to improve the efficiency of water resource planning and investment should be taken. We have identified five opportunities:

1. There is an opportunity to optimise across water company and regional boundaries within public water supply. The introduction of regional water resource groups[15] has made significant steps in this direction but we now need to go further. A national, independent view of the actions and schemes needed to secure public water supply provides the opportunity to optimise over a greater set of options.
2. There is an opportunity to optimise across sectors so that planning includes other sectors that abstract water (e.g. manufacturing, cooling of industrial processes). Planning for public water supplies separately from non-public water supplies misses opportunities to identify synergies and interactions.
3. There is an opportunity to integrate management of abstraction licences with water resource planning. Under the current strategic planning arrangements abstraction reductions to protect the environment are seen as an input to the water resource planning process.[16] Changes to abstraction licences are included in the forecast supply. However, this is done without appropriately considering the economic costs. While environmental protection is clearly important, decisions on abstraction reductions should be integrated with wider resource planning to optimise environmental improvements and economic value simultaneously.
4. There is an opportunity to be better prepared for the future and adapt in a more agile way. This includes:
   - A common set of independent planning assumptions (including high growth scenarios);
   - Monitoring the effectiveness of demand reductions to ensure that we can switch to supply side investments (such as reservoirs) with sufficient lead time if needed;

13 Ofwat (Dec 2024) Corporate release

14 Ofwat (2024) Enhancement costs aggregator model

15 There are five regional water groups that coordinate between companies within each region to ensure that the plans are aligned. For more detail on these groups, see Environment Agency, Appendix 2: Regional planning, section 2

16 Defra (Apr 2023) Water resources planning guideline, Section 5.4

- Monitoring the delivery of water resource investments to identify any 'trigger points' and ensure that there are no delays to investments (this would need to be combined with an agreed funding path as discussed in sections 3.3 and 3.4). Importantly, this is different from monitoring the delivery of outputs (as captured by Ofwat's price control deliverables). Instead, 'trigger points' are changes in circumstances that significantly alter the risk position on future water resources (e.g. accelerated climate change). The water system planner can provide an independent voice in setting out how we need to change course.

5. A single voice on water resources that can engage with government on key issues such as resilience standards for water resources, aligning industrial and economic growth policies with water availability and environmental targets and ensuring that trade-offs are explicitly considered by policy makers.

Ultimately this would result in a **central, long-term, strategic, cross sector view for water resources**.

These opportunities are supported by our review of approaches to water management in various states in Australia, the Netherlands and the recent establishment of the National Energy Systems Operator (NESO) in the UK. Whilst the sectors themselves are structured differently to the water sector in England and Wales, meaning that there is not always direct read-across, they still provide valuable insight into how system planning can be approached. Some key centralised planning functions observed in the case studies are:

- All of the water case studies point to planning for water resources in a way that is integrated across public water supply, other sectors and the environment.

- All of the case studies point towards aggregating local and regional plans in a consolidated single plan. The water case studies also show that in each case a specific water resource planning function was identified, for example, the Water Allocation Planning team in Western Australia, and the grid oversight function in Victoria. In each case the specific description of the planning function differs but the common themes are integrated and holistic planning.

Case study 1: Water Sector Strategic Planning in Australia

Australia is facing complex challenges around climate change, drought and long-term declines in stream flows and groundwater levels. For example, in parts of Western Australia, rainfall today has reduced around 20% since the 1970s, resulting in 80% less rainfall runoff into Perth's dams. These reductions in rainfall and dam inflows have led to a major shift away from reliance on dams and groundwater, to desalination and managed aquifer

recharge.[17] New South Wales, which experienced widespread droughts earlier in the decade, has more recently experienced extreme flood events along the coast and parts of the Murray–Darling Basin. Parts of Victoria, especially along the Murray River and its tributaries, have also experienced major to extreme flood events in recent years.

In Australia, individual states and territories are primarily responsible for managing water within their jurisdictions. However, in 2004, the Federal Government and all States and Territories agreed to implement the National Water Initiative (NWI).[18] The NWI provides a framework and principles for managing water sustainably, and is renewed periodically. It aims to make Australia's water use more efficient, provide investment confidence and certainty for the environment, and improve water security.[19] Under the NWI, all states and territories are committed to:

- prepare water plans with provisions for the environment
- achieve sustainable water use in over-allocated or stressed water systems
- introduce registers of water rights and standards for water accounting
- expand trade in water rights
- improve pricing for water storage and delivery
- better manage urban water demands.

In 2020, the Productivity Commission carried out an inquiry into National Water Reform, assessing the progress of different jurisdictions towards achieving the objectives and outcomes of the NWI. The assessment found 'sizeable' benefits associated with adoption of NWI-consistent water planning frameworks. For example:

- Water planning has established transparent processes for deciding how the water in a system is shared between consumptive users (people and businesses) and the environment.
- Assessment processes consistent with the NWI requirements, that investments are economically viable and ecologically sustainable, help to ensure that water service providers avoid uneconomic and potentially environmentally damaging decisions.
- Provision of water for the environment has been a key achievement, including improved native vegetation and wetland condition; protection of rare and threatened biodiversity such as in groundwater-dependent ecosystems; and the migration and breeding of native fish, frogs and waterbirds.[20]

17 Minister for Water (Apr 2024) Submission to the Productivity Commission's National Water Reform 2024 Interim report

18 Intergovernmental Agreement on a National Water Initiative

19 National Water Initiative

20 Productivity Commission (May 2021) National Water Reform 2020

While the approach to strategic planning to achieve the commitments set out in the NWI varies by state, there are a number of common themes that emerge. State-level strategic plans, such as Water for Victoria or the New South Wales Water Strategy, set out a defined set of policy objectives which are optimised over, and there is active consideration of cross-sector pressures or priorities, such as urban growth.

Many of the functions carried out by state governments in their role in strategic planning could be adopted by a water resources strategic planner in England and Wales (e.g. the development of consistent forecasts and guidelines and the identification of strategic water resource options). We set out examples of water sector strategic planning in three states below.

Western Australia

The Government of Western Australia's Department of Water and Environmental Regulation (DWER) is responsible for managing the state's water resources and environment. DWER houses a range of agencies responsible for functions of a water resources system planner. Specifically:

1. **The Water Supply Planning team** works with the government, water service providers and the household and non-household sectors across state, regional and local scales to support a climate resilient long-term supply demand balance. This includes the following functions:[21]
    - Modelling future water availability against population, economic and climate scenarios by region and water use sectors, and disseminating information to government and service providers.
    - Supporting water service providers in planning access to water resource options and the timing of their infrastructure investments.
    - Engaging with planning and development agencies across sectors to integrate water supply planning with land use and infrastructure planning.
    - Identifying new water resource development options of strategic significance to the state and undertaking feasibility assessments.
2. **The Water Allocation Planning team** is responsible for managing water resource objectives through abstraction licencing policies – reflecting the needs of regional industries and the environment.[22] Whilst its water allocation plans are non-statutory, they reflect the policy direction of the National Water Initiative – Australia's plan for water reform.[23]
3. DWER also works with government agencies to assess the **risks of different types of land planning and development proposals on the water system and environment**.

21 The Government of Western Australia (Jun 2023) Water supply planning

22 The Government of Western Australia (Jan 2023) Water allocation planning

23 Department of Climate Change, Energy, the Environment and Water, National Water Initiative

This includes coordinating with the Department of Planning and the Department of Mines, Industry Regulation and Safety and Environmental Protection Agency.[24]

Victoria

In October 2018, the Department of Environment, Land, Water and Planning (DELWP) in Victoria set up the Water Grid Partnership. This was established as a result of a requirement contained in the state-wide long term plan for water resources, Water for Victoria[25], which was launched in 2016. The plan set out and allocated 69 specific actions grouped under ten key policy directions, all aimed at improving outcomes for water security, customers and the environment. Under Action 9.1 the state-wide department, (DELWP) was tasked with **developing a 'grid oversight function'** (Action 9.1), which would take responsibilities including:

- Information and data sharing, including collating and publishing information on the capacity and operation of the grid, and monitoring system-wide capacity and risks.
- In water resources planning, taking a forward view of water availability and risks to inform decision-making, and synthesising a portfolio of potential future grid augmentation options.
- Providing policy advice, by understanding system-wide water security under different scenarios, including stress testing under scenarios including prolonged drought.
- Producing a biennial statement which includes a forward view of water availability, demand and risks to meet all uses and volumes, alongside a portfolio of potential future grid augmentation options.

The Water Grid Partnership was established in direct response to this Action.

New South Wales

In New South Wales, the overarching vision for water is set out in the New South Wales Water Strategy[26], which was launched in 2021. This is a comprehensive 20-year plan developed by the New South Wales Government to enhance the security, reliability, quality, and resilience of the state's water resources. It sits above and provides the framework for 12 regional and two metropolitan water strategies, each tailored to address the unique needs of their respective areas.

As in Victoria, this strategy sets out a list of over 40 actions, across 7 priority areas. A number of these actions were allocated to the NSW Department of Planning and the

24 The Government of Western Australia (Nov 2023) Water and land use planning advice

25 Victoria State Government (2016), Water for Victoria, Water Plan

26 Department of Planning, Industry and Environment (Aug 2021) NSW Water Strategy

Environment (DPE), and represent functions that could be carried out by a system planner. For example:

- Under **Action 4.3: Improve drought planning, preparation and resilience**, DPE was tasked with considering options for improving the management of shared water resources during drought, and investigating options for a consistent approach to water restrictions across NSW, including through the development of common principles.
- Under **Action 4.4: Better integrate land use planning and water management**, DPE was asked to establish "processes to support communication and early engagement to better inform land use, agriculture and industry investment decisions based on a clear understanding of water availability and constraints, and water allocation risk over the immediate and longer term"[27]. DPE was also asked to develop new planning policies for integrating land use and water cycle management decisions under this action.
- Under **Action 1.3: Enhance modelling capabilities and make more data and models openly available,** DPE was tasked with developing 'Best practice guidelines for water modelling and data use' incorporating stakeholder feedback that will ensure that all models are fit for purpose, and that modelling is of the highest quality.

We are not aware of any assessment of the impact of the planning initiatives set out above. However, the Productivity Commission's latest review of National Water Reform in 2024[28] found that planning initiatives have generally delivered benefits across jurisdictions. Specifically:

- Some progress has been made in water security planning. New South Wales and Victoria have created comprehensive water security plans for some regions, guided by detailed climate and water demand modelling.
- Water plans in general include more detailed and measurable environmental and public benefit outcomes.
- Data, accounting, monitoring and reporting of water is becoming increasingly more sophisticated and user-friendly (e.g., automated reporting via telemetry), with many new tools, dashboards and reports being released that can assist water users to make more efficient decisions.
- Separately, the Minister for Water of Western Australia has found that water allocation plans have enabled system-wide adjustments and reductions in

27 Department of Planning, Industry and Environment (Aug 2021) NSW Water Strategy

28 Productivity Commission (May 2024) National Water Reform 2024, Inquiry report

annual water entitlements when required. The first such plan in Gnangara has been developed and accepted by water users and the Government.[29]

However, the Productivity Commission also found that there are still areas where better coordination is needed. In particular, there is "limited national coordination and prioritisation of knowledge and capacity building activities to support water management". There is also limited and inconsistent reporting, monitoring and transparent accounting for environmental water outcomes. Where it does occur, reporting often focuses on the amount of water delivered, rather than the environmental outcomes achieved (e.g., a wetland inundated to facilitate a bird or fish breeding event).

Source: Frontier Economics

Case study 2: Rijkswaterstaat in the Netherlands

The Netherlands is situated on four river deltas, with 26% of the country lying below sea level. Without protective dunes and dyes, two-thirds of the country would be flooded regularly.[30] Its dense population and rate of population growth also create challenges.

Rijkswaterstaat is a Directorate-General of the Ministry of Infrastructure and Water Management of the Netherlands. It oversees the national water infrastructure and collaborates with regional water authorities to manage water distribution. Its functions include:

- Modelling long-term water needs up to 2050 and 2100 (so-called 'Delta scenarios') considering climate change, economic growth and land use policy to inform policy decisions and spatial planning. These scenarios act as inputs into quantitative modelling instruments for long-term policy choices ('National Water Model') which continues to support 5-year water management strategies (most recently, the Delta Programme strategy for 2022-2027).[31]
- Developing the 'National Water Program', which integrates national, regional and local authority plans into a single programme. This includes the Freshwater Delta Programme which:
  (i) sets out long-term drought and water scarcity strategies including adaptive freshwater allocation and improved reservoir and storage systems.

29 Minister for Water (Apr 2024) Submission to the Productivity Commission's National Water Reform 2024 Interim report

30 Judith M van Dijk (Sep 2006) Water assessment in the Netherlands

31 Mens, M., Minnema, B., Overmars, K., van den Hurk, B. (Sep 2021) Dilemmas in developing models for long-term drought risk management: the case of the National Water Model of the Netherlands

(ii) integrates water management considerations into national spatial planning decisions as well as energy, nature and infrastructure policies.[32] With the key goal to gear spatial planning more specifically to the availability of freshwater.[33]

The Centre for Public Impact[34] found in 2019 that the Delta Programme had given impetus and direction to policy development, and that work had begun on several projects within the programme.

Source: Frontier Economics

Case study 3: National Energy System Operator (NESO)

The National Energy System Operator (NESO) was established in 2024 as an independent public agency responsible for planning the transition of the UK's energy networks to enable Net Zero as well as some operational duties. Its functions include (amongst others):[35]

- Producing a Strategic Spatial Energy Plan (SSEP), which will map out the optimal locations, quantities and types of energy generation and storage infrastructure needed to meet the 2030 Net Zero target and the Future Energy Pathways (FEPs), which are developed by NESO and set out credible long-term pathways for the energy sector.
- Evaluating and signalling procurement needs to the market on current and future electricity system challenges (e.g., capacity adequacy) and collaborating with network operators to ensure procurement processes are coordinated and standardised (where this is beneficial to customers).
- Facilitating electricity security of supply by advising Ofgem, Government and industry on existing, emerging and potential future risks to electricity security of supply through continuous assessment and industry engagement. It is also responsible for managing the Electricity System Restoration Standard in the event of a system-wide power failure by procuring restoration services.
- A central repository for data sharing with the sector and regulators, including energy forecasts at regional and national level, ensuring that data is well-organised and engaging market data participants to establish their needs.

32 Government of the Netherlands, Delta Programme

33 Climate Adaptation Platform Netherlands, Freshwater Delta Programme

34 Centre for Public Impact (Founded by BCG) (Sep 2019) The Delta Act: Reinventing the Dutch Approach to Coastal Management

35 Ofgem (Feb 2025) NESO Licence Expectations document 2025 to 26

Given that NESO is a new body, having been established in October 2024, it is not yet possible to assess the impact it has had on energy system planning. However government expects NESO to fill an existing gap, where "there is no single body responsible for overseeing the strategic planning and design of the country's electricity and gas networks", and "breaking down siloes which currently exist between the planning of electricity and gas systems, with independent oversight for the design of all Great Britain's energy networks". Government expects this role to provide investors with more confidence around how new infrastructure fits into the country's clean energy plans, and to support the delivery of net zero.[36]

Source: Frontier Economics

The relationship between WRMPs and the water resources system planner

Introducing a system planner (or system planning function) for water resources does not mean that WRMPs should be abandoned. Detailed spatial planning for public water supply still needs to be carried out by water companies. The system planner would assess WRMPs as part of an iterative process, and provide a holistic view on needs. It would:

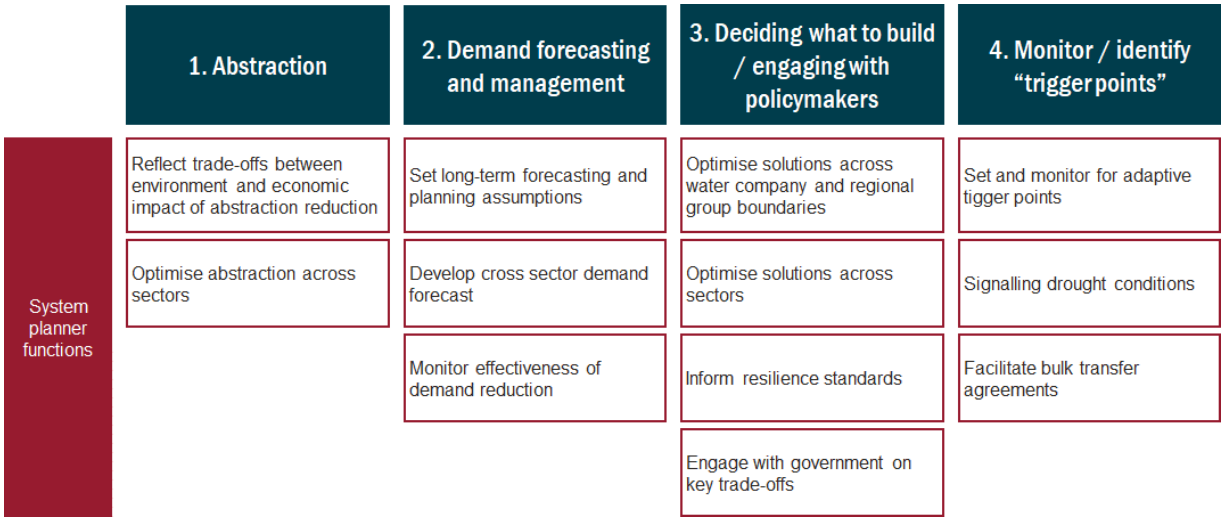
- Specify a set of consistent planning assumptions (see section 3.2 below for more detail);
- Aggregate and integrate water company and regional water resource plans into a national plan that covers all sectors;
- Identify opportunities to optimise solutions – this could be developing new solutions or consolidating solutions across company boundaries or sector boundaries; and
- Importantly, the relationship between water company resource planning and the system planner needs to be collaborative, iterative and focused on finding the best solutions.

2.3 Detailed functions that the system planner should cover

In Figure 2 below, we set out four key areas of water resources management and we have identified the functions that a system planner should cover in each. For each area, we have identified issues and impacts of the current approach and we discuss how a system planner can address these.

[36] Department for Energy Security and Net Zero (Sep 2024) New publicly owned National Energy System Operator to pave the way to a clean energy future

Figure 2 Water resources management and system planner functions



Source: Frontier Economics

2.3.1 Abstraction

Issues with current arrangements

Water abstraction is the process of taking water from various sources (rivers, lakes, groundwater, etc.), for uses including household water supply, irrigation of farmland, and industrial processes. Water companies and other businesses are required to obtain abstraction licences from the Environment Agency to legally abstract more than 20,000 litres per day of water. These licences set limits on volumes that can be extracted over specific time periods. The EA periodically reviews and updates these permits to respond to environmental concerns and changing water availability.

There are two key policy decisions that can be taken: the amount of water that can be taken from a source and how abstraction licences are distributed between different sectors.

On the first, there is a trade-off between the amount of water that can be abstracted for consumption and the environmental outcomes related to that source (for example, the ecological status of rivers). The Environment Agency's Restoring Sustainable Abstraction programme[37], and related WINEP investment programmes, have been an important element of preserving or improving the ecological status of water bodies. However, decisions about abstractions and exemptions from targets for ecological status currently do not take full account of the economic impact of these decisions.[38] This includes the impact

37 This programme was an investigation of 150 potentially unsustainable licences, for more detail see here.

38 We note that they may not take full account of the environmental impact either, e.g. if. groundwater abstraction must be reduced regardless of whether the source is isolated or actually feeds a river system.

on companies' water resilience levels and ability to support population and economic growth.

This is evidenced by the recent report by the Office for Environmental Protection[39] which recommended that the EA's assessments in this area are done *"in co-ordination with the related review of the economic analysis of water use in each RBD [River Basin District]"*. It then noted that this economic analysis of water use had not been updated since 2005. This is leading to decisions around abstraction and exemptions which are not properly optimised because they do not take account of an up to date view of the economic value of water. This is further evidenced as the current system of water resource planning takes abstraction licence reductions as an input to the planning process, but there is no feedback loop that reflects the economic costs of those plans in decisions to reduce abstraction.

Secondly, there are also trade-offs between the distribution of abstraction licences between public water supplies (i.e., water companies) and other sectors (i.e. non-public water supplies that include users such as agriculture, industry, energy production, etc.). The abstraction licensing system has been in place since the 1960s and was not designed for optimising the allocation of available water resources between users. It is difficult to transfer abstraction licences from one sector to another, for example from farming or power supply to public water supply, to reflect changing economic needs and policy priorities. This means that resources are not distributed in the best way to meet societies' needs (so-called allocative inefficiency).

How a system planner should address the issues

A system planner should integrate the trade-off between the environment and demand for water in water resource planning so the system is considered in a holistic way. This does not mean that abstraction reductions should be watered down but instead that decisions are influenced by appropriate consideration of benefits and costs.

The system planner's role would include assessment of:

- the impact of abstraction licence reductions on regional water resilience;
- regional decisions on achieving good ecological status in rivers (i.e. exemptions from the 2027 target), where this was justified by the latest data on economic use of water in the river basin including growth expectations and latest environmental data;
- the optimal allocation of abstraction licences to different sectors in pursuit of policy objectives (e.g., growth, environmental destination, etc.).

39 Office for Environmental Protection (May 2024) A Review of Implementation of the Water Framework Directive Regulations and River Basin Management Planning in England.

This function recognises that there is a trade-off between the amount of water that can be abstracted for consumption and environmental outcomes as well as in the distribution of abstraction licences between sectors. Striking the right balance requires understanding of the environmental impacts of abstraction, impacts on the resilience of public water supplies (which is currently unrepresented) and impacts on different economic policy objectives (also unrepresented).

This function should also advise on how emergency constraints on abstraction should be allocated across different types of licence holder under different circumstances.

2.3.2 Demand

Issues with current arrangements

The growth in demand for water across the system is dependent on many factors including the pace and distribution of population and economic growth, the speed and impact of climate change, wider government policies (e.g. around planning regulations and water efficiency standards) and behavioural changes. Water resources planning involves forecasting demand and ultimately managing demand (e.g. through water efficiency schemes). There are a number of issues that need to be addressed.

First, there are issues at a regional level where the **policy drivers for growth are not managed in coordination with water resource planning**. For example:

- Water companies are not statutory consultees in the planning process for new housing developments with their role limited to local plan development. This lack of coordination between housebuilding and water policy leads to delays and suboptimal resource allocation..
- The UK government classified data centres as critical national infrastructure in September 2024[40] and announced plans in February 2025 to accelerate AI infrastructure via 'AI Growth Zones'[41] with the first AI Growth Zone planned at the UK Atomic Energy Authority campus in Oxfordshire[42] with neighbouring Slough already home to the largest concentration of data centres in Europe.[43] Given the intensity of data centre water use[44], their growth presents a significant challenge for water resource availability particularly in London and

40 BBC, Data centres as vital as NHS and power grid, government says

41 Department for Science, Innovation and Technology (Feb 2025) AI Growth Zones: submit an expression of interest

42 BBC, Concerns UK's AI ambitions could lead to water shortages

43 https://www.datacenterdynamics.com/en/news/thames-water-launches-data-center-water-probe-in-london-slough-amid-drought/

44 An article by Arup estimates a small one-megawatt data centre using traditional cooling methods would consume more than 25 million litres of water each year – enough to supply 200 homes.

the South East where water resources are already considered seriously stressed[45]. Indeed, in 2021 Thames Water objected to a proposed new data centre in Slough[46] and announced in 2023 that it has discussed physically restricting water flow with at least one datacentre operator in London.[47] This pattern of events is symptomatic of a lack of feedback loop between non-public water supply demand and public water supply demand.

These issues can have various impacts such as delays to investment and stifling of business growth. Ultimately, a lack of coordination leads to sub-optimal plans that are more costly than needed.

Second, as we discuss in more detail in Section 3.2 below, the current WRMP guidance requires companies to use local authority population forecasts if a recent set is available or otherwise use ONS data. While the intention of using local forecasts is sensible, using **different types of forecasts is not helpful for consistent planning**. There is also a conflict between the desire to keep water bills low and to plan for high growth scenarios. We have heard that some water companies have experienced that planning on the basis of a high growth scenario in their WRMPs only leads to a challenge by Ofwat on this assumption so funding is not allowed. This reduces the incentive to use higher growth assumptions for planning and ultimately leads to be sector being less prepared for a high growth scenario materialising.

A lack of a consistent and robust approach to forecasting non-household demand also undermines the ability of water companies to credibly demonstrate the need for investment. In creating demand forecasts for the WRMP, companies are directed[48] to develop their household demand forecasts in line with the UKWIR national guidance for household consumption forecasting.[49] In contrast, companies are not directed to equivalent guidance for non-household demand[50]. A lack of consistent, agreed planning forecasts creates a high administrative burden as each water company has to piece together its own set of forecasts. It also means that the plans are not always consistent. It also means that the choice over the levels of risk the country is taking with regard to water supply is left to regulators and not politicians.

Third, while demand reduction plays a big role in ensuring future water supplies, the evidence base on 'what works' is not well developed. Water companies are investing more

45 Since 2021, the Environment Agency has determined that Thames Water and South East Water (amongst other water companies located in the south of England) were in areas of 'serious water stress'. Communities in Oxfordshire have faced acute issues including relying on tankered and bottled water during heatwaves in 2022.

46 BBC, Concerns UK's AI ambitions could lead to water shortages

47 The Register, Thames Water to datacentres: cut water use or we will

48 Defra, WRMP guidance, Section 6.1

49 UKWIR is the UK Water Industry Research body

50 Defra, WRMP guidance, Section 6.1

than £250m in demand reduction initiatives over the next five years. [51] In addition, Ofwat is spending £100m on the water efficiency fund[52] to reduce demand for public water supplies. Despite these significant investments, there is no independent, consistent process of evaluating water demand initiatives. This is despite demand reductions being crucial, particularly in the short-term. The Environment Act 2021 set a target to reduce the use of public water supply in England, per head of population, by 20% by 2037-38 from the 2019-20 baseline.[53] [54] The impact of not having a clear picture of the (cost-)effectiveness of demand reductions includes:

- The costs to reduce demand will be higher as less effective methods may continue to be used;
- Customers may have cognitive overload as they are faced with too many messages and initiatives;
- The ultimate risk is that we are relying on demand reductions that may not materialise to the extent needed. This would mean that more supply side investment is needed. As supply side investments such as reservoirs have a long lead time, we need to know as early as possible the scale of reduction that can realistically be achieved.

How a system planner could help address the issues

Cross-sector policy coordination and direction of demand

This water system planner should actively inform the policy trade-offs associated with demand growth so that government can make better informed decisions across the available policy and regulatory levers. For example, the water system planner would inform the spatial focus of any industrial strategy related to high consumption sectors (e.g., AI, data centres etc.) and vice versa where there is inflexibility. This would then be considered in the context of the constraints and opportunities within regional water resource headroom. Similarly, national water resource investment would also be better informed by government's priorities.

The benefit of this function is an integrated approach to water planning that both accounts for demand across all sectors and, where possible, optimises where additional demand is created. This would benefit the environment, economic growth and water bills.

51 Ofwat (2024) Aggregator model: Enhancement costs, available here

52 Ofwat, Water Efficiency Fund, Latest update

53 EA, 2024, A summary of England's revised draft regional and water resources management plans

54 Whilst there is no equivalent government target in Wales, the Building Regulations Sustainability Review specifies that new dwellings should be designed to a standard of 110 litres per person per day (source) and both water companies in Wales have set a target of 110 l/p/d by 2050 in their WRMP24.

Long term forecasting

The water system planner should develop an independent set of consistent planning scenarios for water resources, to be used by companies and regulators. This needs to cover regional and local population growth, trends in per capita consumption, behavioural changes, climate change impacts and non-household demand across different sectors. Ideally the water systems planner would be independent from the commercial or customer bill consequences of the forecasts that it develops. This will enable the set of forecasts and scenarios to represent the best available planning assumptions. We recognise that this would require detailed spatial forecasts and the water systems planner would have to work closely with local authorities to develop these.

The benefit of this approach is to reduce the administrative burden in the water planning process as the consistent set of forecast is produced by one body. It also increases confidence in the planning process and ensures that plans are integrated, comparable and coherent. Ultimately this leads to the sector being better prepared for the future.

Water Demand Monitoring

The system planner should develop a programme for evaluating and monitoring water demand. Frontier Economics and Artesia have recently proposed a 'Water Demand Observatory' that would involve an ongoing water tracker to identify changes in demand and evaluation of water efficiency initiatives.[55] In its final form, the tracker would provide real time insights into how water demand is changing and the factors that drive those changes. This would enable the sector to understand how demand and the levers for change are evolving. The water system planner would need to ensure that the findings from the evaluations are disseminated widely and applied both in shaping company programmes and in realistic forecasts of the demand reductions that can be achieved. In addition, the system planner could hold the government to account on its actions to encourage water efficiency such as housing regulations and water efficiency labelling. This would ensure that it is clear how and why demand reduction targets have or have not been achieved.

The benefits of this approach include greater cost-effectiveness of demand reduction initiatives that ultimately reduce bill impacts, greater planning certainty and the ability to identify additional supply schemes early on if demand reduction is not as effective as currently assumed.

2.3.3 Deciding what to build

Issues with current arrangements

Under the WRMP, companies identify their individual resource requirements and propose solutions at the company or regional level (where the latter may be assessed by the

[55] Artesia (2023), https://artesia-consulting.co.uk/providing-confidence-in-water-savings-in-a-complex-world/

Regulators' Alliance for Progressing Infrastructure Development, or RAPID[56]). Five regional groups were established in 2020 under Defra's National Framework for Water Resources to deliver more joined-up regional water planning.

Whilst we have heard that the existing process is working well for companies' individual requirements, there is a lack of a top-down strategic view on national water resource adequacy and resilience. Consequently, there is no central view on the level of strategic headroom built into the system nor national assessment of inter-regional water transfers for these purposes (beyond companies' own individual assessments). We have also heard that the capability and maturity of regional groups is mixed due to a lack of statutory basis and necessary funding for their activities.

Additionally, water companies do not have the same duty to meet non-household demand as they do for household demand. This means there are weaker or no investment signals from the non-household sector on where to build new supply options such as reservoirs and interconnectors. Businesses may ask for increased volume of water in the short-run that can only be delivered in the medium -term. Water companies' WRMPs also do not take into account non-public water supply options which may be needed for new industries such as AI and hydrogen production.

In addition, there is no integrated plan for how to meet total water demand across all sectors and the environment. The WRMPs are focused on public water supply and therefore do not reflect significant new demand from other sectors that may interact with public water supply. The lack of an integrated, holistic plan creates inefficiencies as opportunities for synergies are missed.

The level of water supply resilience that water companies need to plan for is a key policy choice. Water companies in England are currently required to plan to be resilient to a 1-in-500 year chance of failure caused by drought, by 2039.[57] However, the level of 'resilience' here relates to the need to trigger emergency drought order restrictions such as rota cuts[58] or standpipes[59]. That is, the triggering of emergency drought orders should only be expected

56 RAPID was set up in 2019. It is a partnership made up of the three water regulators – Ofwat, the Environment Agency (EA) and the Drinking Water Inspectorate (DWI). Its objective is to "identify and address issues relevant to the development of joint infrastructure projects and to analyse the feasibility of nationally strategic supply schemes."

57 Water Resources Planning Guideline. For companies in England: "You should plan so that your system is resilient to a 0.2% annual chance of failure caused by drought, where failure is defined as implementing an emergency drought order. This is described as '1 in 500 year' level of resilience in this guideline. You should aim to achieve this level of resilience by 2039". For companies in Wales: "You should set out the levels of service you plan to provide for your customers over the planning period. You should describe the frequency that you plan to restrict water supplies for your household and non-household customers using temporary use bans, non-essential use bans and emergency drought orders."

58 A rota cut is a period during which the water company only supplies piped water to properties for a certain number of hours each day.

59 A standpipe is a communal water outlet shared between customers, from which those customers must physically collect water during times in which supplies of piped water to properties have been shut off.

to occur with a 0.2% chance each year by 2040. There are other measures that companies can use to manage water supply such as Non-essential Use Bans (NEUBs) and Temporary Use Bans (TUBs) that restrict specific types of water usage and can be applied in less severe drought conditions, but which are not covered in the resilience standard. It is not clear that the trade-offs between different types of resilience, environmental value, customer bills and economic growth are adequately considered on a transparent and consistent basis.

How a system planner could help address the issues

A system planner should take a holistic view of the water supply investments needed to fulfil overall demand from all sectors and the environment and across all regions. This means that instead of optimising WRMPs for public water supply at the water company or regional level, the water systems planner should 'take this up a level' and optimise investments choices across water company boundaries and regions and across all sectors. We discuss how this leads to benefits in more detail in section 2.4 below.

This would allow investment in water resources to better support economic growth. The system planner's overarching plan should be integrated with the government's regional economic growth strategies to identify major infrastructure enhancements which are needed to support new housebuilding and industrial hubs. The system planner would work in close collaboration with water companies to feed back insights from the overarching plan and iteratively develop their WRMPs towards this shared objective. A system planner would ensure consistent and high quality planning which optimises across company boundaries and sectors.

In addition to better supporting economic growth, the system planner can also unlock efficiency gains by encouraging solutions across public water supply regions. This results in lower water company bill impacts.

Ultimately, the water system planner should be in a position to present to government the key trade-offs between resilience, environmental improvements, customer bills and economic growth. This would enable government to provide high level steers on how the trade-offs should be managed.

For example, in 2020, and led by the Environment Agency, the National Framework for Water Resources brought together a steering group representing government, regulators, the water industry, bodies representing other major water users, environmental non-governmental organisations (NGOs) and academia to develop resilience standards.[60] This is a good example of approaching water resources planning in a cross-sector way. However, ideally going forward resilience standards would be considered in a more holistic way by considering trade-offs between the different policy objectives discussed above so that government is well-placed to make choices.

[60] Environment Agency (2020), Meeting our Future Water Needs: a National Framework for Water Resources

2.3.4 Monitoring

Issues with current arrangements

In the water resources planning period, water companies forecast their demand-supply balance in their WRMPs and develop water resource options against a determined level of headroom. Company forecasts include assumptions on the impact of ongoing demand management activities and pressures related to climate change. In companies' Long Term Delivery strategies (LTDS), 'trigger points' are developed which describe the conditions under which adaptive enhancement investments are needed to continue to deliver desired outcomes.

However, there is no central monitoring of the effects of growth or policy on water resource headroom across England and Wales. Moreover, whilst ambitious government targets on the levels of demand reduction are monitored at a company level by Ofwat, there is no top-down view of whether these policies are on course to deliver the required demand reductions nor whether adaptive policy decisions may need to be taken.

In the operational period, water companies are responsible for deciding when they need to apply to the Environment Agency for emergency drought orders for short term additional abstraction. However, as those charged with both the responsibility for maintaining resilience during droughts and for taking (unpopular) actions to restrict usage in extreme circumstances, water companies are not independent arbitrators for determining the right balance between consumption restrictions and emergency orders for abstraction.

How a system planner could help address the issues

Set and monitor adaptive trigger points

This function would monitor whether conditions have been met such that companies and policymakers face a 'trigger point' for adaptive action. This would could include ongoing evidence collection on:

- the effectiveness of demand management policies (e.g., water labelling, building regulations etc.) across different consumption sectors;
- the emerging Representative Concentration Pathways (RCP)[61] and the regional distribution of climate change pressures on rainfall and extreme heat;
- delivery of water supply schemes including any delays; and
- behavioural trends or other factors that mean that water security is at risk.

[61] RCPs are climate change scenarios to project future greenhouse gas concentrations.

Provided that a funding pathway is developed for investment that is required between planning periods[62], the benefit of this approach is that there are no delays to investments and water resources can more flexibly adapt to changes in circumstances.

Facilitate bulk transfer agreements

This function would take on a role in drought resilience operations, including oversight of bulk supply agreements. Whilst commercial arrangements are in place between some water companies for the transfer of water during drought conditions, in practice outcomes could be improved through a trusted and independent arbitrator which monitors compliance and resolves disagreements.

In extreme circumstances, this function could also be empowered to issue legally binding instructions on water companies to deliver bulk transfers where there is a public health or environmental damage risk.

2.4 The benefits of a water system planner

In summary, the benefits of a system planner for water resources include:

- Greater confidence that the sector and wider society are well prepared for future challenges – as a result of monitoring the effectiveness of demand reductions and identifying any adaptive action needed;
- Support economic growth – as a result of being able to take a holistic view of water resource so the system planner can support water-intensive investments; and
- Reduced delays to investments – as a result of monitoring the delivery of water resource and identifying 'trigger points' (this needs to go hand in hand with funding changes identified in section 3.4);
- Reduced administrative burden as a result of providing clear future planning scenarios and assumptions – this means companies do not have to develop their own scenarios;
- Customers, society and the environment get greater value for money in the short- and long-term – this is explained more below.

It is particularly difficult to quantify the last point in the list above as this would require modelling of a reformed process for water resource planning against the counterfactual of the status quo. Not only would this be a complex exercise as it would have to involve multiple sectors over a long timeframe, but it would also require assumptions on the new and optimised options that would emerge. In the box below, we have illustrated the types of benefits we would expect. This is similar to our approach to illustrating benefits in our

62 More detail is provided in section 3.3 and 3.4. We also discuss in more detail the enabling of more flexible funding within price control periods in a separate paper for Water UK, 'Reforming the water sector to maximise the delivery of investment for growth'.

report on Outcome-based Environmental Regulation for Wessex Water that was referenced by the Commission.[63]

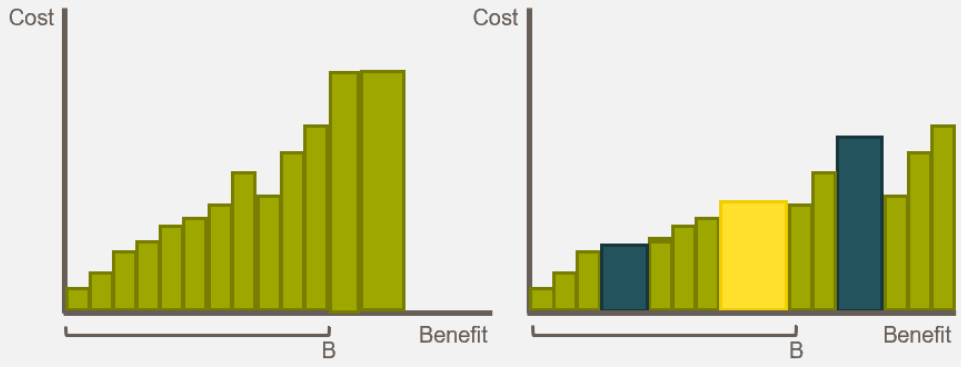
Illustrating the benefits of a system planner

Optimising across regions and sectors

Optimising across regions and sectors provides the opportunity realise efficiency gains in two ways:

- Across regions and sectors, for a given level of water resources that need to be developed (on the demand or supply side) synergies between regions can lead to lower total costs;
- Across regions and sectors, new options can emerge that are currently not considered.

The chart on the left shows, illustratively, the schemes that are currently selected across regions for a given level of benefit (B). Each bar illustrates a the average incremental costs for additional water resources with the total adding up to the amount of demand and supply solutions we need to find to deliver benefit B. The total costs is the area of the green bars added up. The chart on the right shows how optimising these schemes across sectors and regions leads to a reduction in costs. This is because new options can arise across sectors (blue bars) and regions (the yellow bars could represent an expanded scheme that can be used by more than one company). The total costs in the chart on the right is lower for the same level of benefit. This is because the water systems planner can optimise over a greater set of options. The same level of water resources can therefore be delivered at a lower overall cost.



Source: Frontier Economics

63 Frontier Economics (2021) Outcome based environmental regulation

2.5 Expanding the water resources systems planner to include catchment approaches

This scope of this report is focused on a system planner for water resources. We have therefore not considered expanding a role of a system planner in detail. However, we acknowledge that there are potential interactions with catchment planning and system planning for drainage. In this section we therefore consider the overlap.

To provide centralised coordination of catchment planning

In recent years substantial work has been undertaken to argue for a change in how water quality is managed in catchments. This includes initiatives such as SSWAN (Sustainable Solutions for Water and Nature)[64], CIWEM's "A fresh water future"[65] and analysis by Frontier Economics sponsored by Wessex Water on Outcome-based Environmental Regulation.[66] Many of these initiatives point towards water quality being managed at the catchment level with catchment targets being set in a consistent way and more localised planning and devolved decision-making around delivery of environmental improvements. While it is not the purpose of this report to provide a detailed discussion on catchment reform, there are two clear links between water resource planning and catchment reform:

- First, the volume of water in the catchment has an impact on the environmental health of rivers and other environments. For example, all else equal, increasing the river level dilutes the concentration of pollutants in that river (and vice versa). This is where catchment approaches (that are generally about water quality) interact with water resources systems planning (the quantity of water).

- Second, water quality and water resources both require:
  - planning at different spatial levels (local, regional and national level);
  - integrating policy objectives (such as economic growth) with environmental ambitions;
  - a multi sector approach.

This means that there is overlap and some interdependency between the water resources system planner function and catchment management. While reform in each area first needs to focus on resolving the specific issues in each area, at a minimum the water system planner should work closely with catchment planning. Depending on the specific reforms in catchment planning, the water resources system planner could be extended to support

64 SSWAN

65 CIWEM, A fresh water future

66 Frontier Economics, 2021, Outcome-based environmental regulationf

catchment planning. However, the details of this and the pros and cons would have to be considered in detail to reach a firm view.

To identify holistic options for drainage

Another area where reform has been discussed is drainage planning. The combined sewer system manages both untreated wastewater and ground run-off from non-permeable surfaces such as highways and urban developments. With a growing population, urban creep and increasing rainfall due to climate change, the pressures on our combined sewer system are accelerating. Currently, individual water companies need to accept and manage foul water flows from all sources before treating and reintroducing this water to the environment.

The key overlap between water resource planning and drainage planning is the need for a multi-sector collaborative approach, as many of the improvements to drainage have to be implemented in urban environments. Optimising over a greater set of options than those that can be implemented by water companies alone is likely to provide substantial benefits. A system planner for the drainage and wastewater system could bring together the stakeholders which are responsible for creating surface-water run-off, including highways, property developers and industry, to understand system pressures and identify appropriately funded solutions to this problem.

The system planner could interpret relevant standards, understand the associated costs and inform a set of outputs for delivering these outcomes nationally. Moreover, taking a longer-term planning role could enable more holistic solutions such as Sustainable Drainage Systems (SuDS), which are drainage systems that typically mimic natural drainage and can help to reduce surface water flooding, improve water quality and enhance amenity and biodiversity. This function could also play a role in forecasting and improving the evidence base for the Environment Agency in its role of managing fluvial and pluvial flood risk.

While there are parallels between water resources system planning and drainage planning, there is less overlap in these planning areas. This is because the case for greater integration in drainage exists at the more local level (as drainage and wastewater "catchments are smaller") and in mechanisms to improve co-ordination of planning and land use decisions, and investments in housing, transport infrastructure and drainage infrastructure to manage flood risk and deliver wider benefits. More detailed consideration of these mechanisms (including market solutions) for improving these local decisions are outside of the scope of this paper.

3 How the overarching strategic planning system in water needs to change

In addition to the scope for introducing a system planning function for water, there are also improvements that can be made to the co-ordination and functionality of existing long-term planning in the sector. The Commission has heard from stakeholders that "*the fragmented nature of the planning landscape has created confusion for companies, regulators and other stakeholders involved in planning*" and is now seeking views on whether *"the current water industry planning frameworks are effectively producing the desired outcomes, or whether changes could enable better planning in aid of delivery, at both a water industry, regulator and government level".*[67] In this section we discuss the issues in the current arrangements, the impacts, and present solutions around four themes: (i) clarifying investment decision responsibilities, (ii) aligning planning assumptions and forecast scenarios, (iii) aligning the timing of strategic planning frameworks, and (iv) enabling preparatory investment for the future and adaptive investment.

The key relevant strategic planning frameworks included in this discussion are:

- The Water Resource Management Plan (WRMPs);
- The Water Industry National Environment Programme (WINEP);
- The Drainage and Wastewater Management Plans (DWMPs)
- Where relevant other requirements such as the Storm Overflow Reduction Plan and requirements from the Drinking Water Inspectorate (DWI).

Annex A provides more detail on the scope of each of the plans and frameworks.

3.1 Change 1: Assign investment decision responsibilities to increase clarity, accountability and reduce administrative burden

3.1.1 Issues with current arrangements

Each investment that is ultimately funded and delivered goes through a number of stages as shown in Figure 3 below. Each investment is driven by a 'strategic direction' (typically set by government about what outcome it wants delivered) that results in a 'needs assessment' (e.g. we need to ensure water security and we need to deliver an additional 10 megalitres per day of water). The next step is to then identify the 'best value option' to meet the need (e.g. this could be achieved by reducing demand, reducing leakage or increasing supply). Once the best value option is identified the 'cost' of the chosen option is tested for efficiency, and delivery is then 'monitored'.

67 Independent Commission on the Water Sector Regulatory System, Feb 2025, Call for Evidence, para 195

The rows in the table show the most material investment categories. For each type of investment there ought to be clarity and consistency with regard to who is responsible for each of the above steps. This is so that trade-offs between different investment categories can be made in a transparent way. There should only be one policymaker or regulator assessing investments within each step (i.e., consistency within the columns) or at least the same assessment approach should be used. The table shows that the responsibilities are clearly not well-aligned or clear - specifically:

- There are overlaps where more than one agency is responsible for a given investment category or decision-making step;
- Different agencies assess the same step for different enhancement investment lines, with the exception of cost efficiency which is currently always assessed by Ofwat;
- There are gaps, specifically a lack of strategic direction on network resilience.

Figure 3 Mapping of current investment decision responsibilities for major investment programmes

Enhancement programme	Investment decision making step				
	Strategic direction	Needs assessment	Best value option	Cost efficiency	Monitoring delivery
Water resources	Defra + EA	EA	EA	Ofwat	Ofwat
Drinking water quality	Defra	Ofwat + DWI	Ofwat	Ofwat	Ofwat + DWI
Water network resilience	GAP	Ofwat	Ofwat	Ofwat	Ofwat
WINEP	Defra + EA	EA	EA	Ofwat	Ofwat + EA
SODRP	Defra	Defra	Ofwat	Ofwat	Ofwat + EA

Source: Frontier Economics

*Notes: **Defra** sets the overall water and sewage policy framework in England, including standard setting and drafting legislation. It provides strategic direction through various policy and guidance documents, including the Strategic Policy Statement for Ofwat, and on storm overflows.*

*Through its price control process, **Ofwat** assesses the need and best value option for all investments that are not statutory. It assesses cost efficiency for all investments and monitors the delivery of the majority enhancement investments via PCDs.*

*The **EA** is responsible for regulating the environment, including in relation to water quality and resources, and overseeing the environmental performance of water companies. It sets policy direction in areas such as water resources (though the National Framework for Water Resources). It also prescribes the outputs for WINEP which includes need and best value option. It also monitors WINEP delivery. It assesses WMRPs including the needs assessment and best value option It is also monitoring delivery of the SODRP.*

The **DWI** regulates the quality of drinking water in England and Wales (drinking water standards are set out in law). It checks that water companies in England and Wales supply water that is safe to drink and meets the standards set in the Water Supply (Water Quality) Regulations 2018. The DWI assesses the need for water quality investments and monitors delivery.

This creates complexity, fragmented decision making and a lack of clarity over where accountability lies. A key example of the impact of this relates to South East Water (SEW), who have a legal undertaking with the DWI to: 'Conduct a survey of all company and service

pipes to determine composition and the location of lead pipes in AMP8.' [68] At PR24, SEW proposed to undertake these surveys as part of its lead enhancement programme, however, these received a significant challenge from Ofwat at the Draft and Final Determinations as Ofwat failed the 'need for enhanced investment'.[69] Ofwat disallowed this scheme on the 'need for enhancement investment' test by arguing that the investment goes beyond Defra's Strategic Policy Statement (and is therefore that the outcomes pursued by this expenditure are unjustified). However, SEW's undertaking was accepted by the DWI on behalf of the Secretary of State for Environment, Food and Rural Affairs. This example shows that there are areas where the assessment of the need and the best option is not aligned between regulators. This puts companies in an impossible position as there is no clear way to resolve the conflict between regulators.

Inconsistencies between how the needs assessment and best value options assessment is conducted also leads to imbalances in the ultimate funding decisions. As there is not a single, consistent framework for assessing what should be funded, the trade-offs between funding in different areas are not exposed. While it is legitimate for government to direct funding to particular areas, in the current approach there are no mechanisms for assessing the relative costs and benefits across different areas. As funding is not unlimited and bill impacts matter, in practice statutory investment has a higher likelihood of being funded and other areas are at risk of being subject to more stringent needs and best value options assessments. For example, the lack of strategic direction on network resilience means that it is more difficult to obtain funding in these areas than in other areas that are determined on a statutory basis.

Ultimately, this means that customers, society and the environment cannot be confident that the most efficient set of options is funded across different areas.

3.1.2 Recommendations

Clearer assignment of 'ultimate responsibility' is needed in three areas:

- Removal of overlaps in regulator responsibilities – at a minimum there should be clarity over who is responsible to avoid conflicts;
- Fill the gaps – network resilience standards are clearly missing. This is aligned with the National Infrastructure Commission's findings[70] that suggested including a resilience standard for peak demand and single source of supply.

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68 https://www.dwi.gov.uk/water-companies/improvement-programmes/south-east-water-improvement-programmes/sew-2023-00016/

69 In the deep dive assessment Ofwat stated: "*However, we remain concerned that the proposed activity goes beyond the strategic priorities set by Defra, where 'The government supports action by industry to trial approaches to reducing exposure of lead to customers from drinking water, from a public health perspective'*". Ofwat (2024), Water – lead enhancement expenditure model:

70 NIC (2024), Developing resilience standards in UK infrastructure

- Ensure that a consistent assessment is undertaken within each step across different investment areas (this implies consistency in approach within the columns).

Implementing these changes would result in set of investments that are selected and funded on a consistent basis. While government and regulators could explicitly set different standards and hurdles for different types of investment, this would require clear articulation of the policy objectives and reasons for doing so. Even if specific policy objectives take precedent, the way of assessing options to achieve these should be consistent.

A clearer assignment of ultimate responsibility for different areas of strategic planning among the sector policymakers and regulators would have benefits in terms of reducing administrative burden and improving accountability. In addition, the issue of 'double jeopardy' where companies are the subject of overlapping enforcement actions could also be removed.

3.2 Change 2: Aligning planning assumptions and forecast scenarios

3.2.1 Issues and impacts of current arrangements

Currently, there is not a consistent source of planning assumptions or forecast scenarios across planning frameworks. Planning assumptions and scenarios are necessary to be confident that the sector is planning for appropriate future states of the world.

The WRMP, DWMP and LTDS are three key long-term strategic planning frameworks used by water companies. In a number of cases, there are inconsistencies between the forecasts and assumptions used by companies in developing these plans, despite the interdependencies between them. The box below sets out key examples of where the assumptions used by companies are inconsistent across plans, and even across companies within the same plans.

Case Study: Inconsistency of assumptions in the WRMP, DWMP and LTDS

Three examples of inconsistent assumptions between the WRMP, DWMP and LTDS are:

1. **Growth in Demand:** The **LTDS provides guidance** on the assumptions that companies should make about the long term growth in demand. The LTDS guidance specifies two demand growth scenarios. In the high-demand scenario, companies are directed to use high population growth forecasts consistent with their WRMP, assume no change to building regulations and product standards, and assume no changes to consumer behaviour. In the low demand scenario, companies are directed to use the lower of the population growth forecasts consistent with the WRMP, and assume the introduction in 2025 of a mandatory government-led scheme to label water-using products, linked to tightening building regulations and water supply fittings regulations. In this low demand scenario, companies are directed to refer to the 'Water labelling only (with minimum standards)' scenario used in the Water UK study 'Pathways to long-term PCC reduction'. Whilst the LTDS guidance provides clear expectations for demand growth scenarios, this is not reflected in similarly clear or consistent guidance on demand forecasting for the WRMP or the DWMP. For both of these frameworks, much of the choice around assumptions is left up to companies. The WRMP guidance only asks companies to describe the method they have used and explain what is driving any changes over time, and the DWMP guidance then asks companies to make use of the WRMP forecasts.
2. **Climate change and frequency of extreme weather events:** This is another area where while relatively **clear guidance exists for companies developing their LTDS**, there is **no equivalent consistent guidance for the DWMP and the WRMP.** The LTDS guidance directs companies to use reference scenarios for climate change which are set on the basis of the Representative Concentration Pathways (RCPs), as adopted by the Intergovernmental Panel on Climate Change (IPCC) and the latest UK Climate Projections. However, there are no reference scenarios specified in the WRMP or DWMP guidance. Again, the choice here is left largely up to companies. For example, in the WRMP, companies are allowed make an allowance for the impact of climate change on the demand for water. The guidance specifies that the expected impact is likely to be no more than 1% of water demand over the planning period, and should not be more than 3% unless companies can clearly demonstrate an exception. While this provides some ‘guidance’, the choice and justification of assumptions is left almost entirely up to companies, which will lead to inconsistent approaches.
3. **Population Growth:** Assumptions around the growth of population are an example of where **there is inconsistency *within* frameworks, and not just across frameworks**. The WRMP guidance specifies that companies should base their population forecasts on plans published by their local or unitary authorities where possible, despite local authorities being at different stages of publication. Where these forecasts are not available to companies, they are expected to employ alternative methods such as utilising data from the Office for National Statistics (ONS). While there is merit in using the “best available” data, this means that the “error” around the forecast is not consistent.

Source: *WRMP guidance, DWMP guidance, LTDS guidance*

These examples have a clear direct impact on the set of investments that will come out of the planning process. An inconsistent set of forecast and scenarios will lead to a list of investments that is not optimal.

A lack of consistent forecasts has the following negative impacts:

- **Uncertainty around whether the combination of all plans can deliver the outcomes required** - a key example is the common drought resilience standards, where the EA set out environmental destinations for abstraction reduction at the national level. Where there is a lack of common scenarios for population growth and climate change, one region ('region A') may plan to meet the standard based on a lower population growth and/or higher climate change scenario. In this case, if another region ('region B') is reliant on region A for water transfers, it may assume the water is available but, depending on the population growth outturn at region A, this may not be the case (i.e. if population growth is much greater than the low scenario used in the region A's planning, water may be unavailable for transfer to region B).
- **Administrative burden and inefficiency when companies are required by regulators to produce their own forecasts and demonstrate that they are high quality** – for example, the number of severe weather events is an important driver of resilience investment. However, it is not a good use of regulators' or companies' time to debate the forecasts for extreme weather events as this take the focus off the solutions.[71]
- **Lack of clear choices for policy makers** – a lack of consistent assumptions and forecasts means that it is more difficult for policymakers to engage with the trade-offs we are facing. As a simplified illustrative example, consider a situation in which companies are creating long-term plans for climate resilience investment, and in which there are three sets of forecasts covering the impact of climate change – 'low climate impact', 'medium climate impact', and 'high climate impact'. In this example, the higher impact scenarios require more resilience investment which translates into higher customer bills. However, these high impact scenarios mean better outcomes for customers during droughts and for the environment. If all companies used these same climate impact forecasts, policy makers could observe the costs under each scenario, weigh up the trade-offs and take a policy decision on how to strike the balance between customer bills and outcomes. However, if companies use different forecasts, it is not possible for policy makers to observe these trade-offs and take a coherent policy decision.

71 For example, to develop their LTDS and business plans, many companies commissioned a range of climate change forecasts and regional impacts. This could be streamlined so all companies can plan on the basis of a range of consistent forecast impacts.

3.2.2 Recommendations

We recommend that a **consistent set of forecasts and planning assumptions** is developed. The forecasts and assumptions should cover the key set of inputs required in order to forecast system pressures and identify necessary investments over the short- and long term. This should include:

- Population growth and distribution,
- Growth in household and business demand, and
- Climate change assumptions such as the frequency of extreme weather events and rainfall volume.

These forecasts should then be combined into different planning scenarios. In practice, this could look similar to the Future Energy Scenarios (FES) developed by NESO, which have been used as a basis for planning by energy networks (see case study box below for more detail). As with the FES scenarios, it is crucial that the consistent forecasts used for water sector planning are updated periodically in order to account for the emergence of new information. The responsibility for developing and updating these assumptions should be assigned to a single agency.

Once the responsibility for developing consistent assumptions and planning scenarios is assigned (and it could be assigned to an existing regulator, or to a system planner as described in the previous section), all existing frameworks should then refer to these consistent assumptions. These forecasts and assumptions should be used across all planning frameworks (e.g. LTDS, WRMP, DWMP) as the basis for understanding and assessing the need for future investment. For each framework, Ofwat should provide clear guidance on which scenarios companies should use in their planning. The scenarios used do not necessarily need to be consistent across planning areas if there is a policy decision that different outcomes (e.g. different levels of resilience) should be achieved in these different areas.

The benefits of this approach are:

- Greater confidence that plans can deliver the outcomes required;
- Greater accountability if the outturn scenarios are outside of the consistent planning scenarios;
- Reduced administrative burden and increased focus on how the sector should deliver for the future (instead of debating what the future may look like);
- Improved ability of regulators to assess needs cases and compare the efficiency of company proposals. It should also improve the degree of accountability in the sector. That is, where the assumptions behind investment plans are clear, it may be more feasible to distinguish between outcomes that represent actual over- or under-delivery, and outcomes that are the result of a

state of the world materialising that is substantially different from initial planning assumptions.

- Revealing trade-offs for policy makers in a clearer way - this would allow policy makers to engage with the costs, benefits and likelihood and make consistent decisions across the country.

In addition to having consistent forecasts and scenarios across the different water sector planning frameworks, forecasts and scenarios should also be aligned across different sectors and policy areas. There are various examples from Australia where consistent assumptions are used across sectors. The case study below from New South Wales provides an example of where consistent, cross-sector, planning assumptions have been employed elsewhere. The same applies to Victoria's Plan for Water.[72]

[72] Victorian government (2016), Water for Victoria

Case study: Use of Future Energy Scenarios in RIIO-3

The Future Energy Scenarios (FES), developed by NESO, provide detailed forecasts across credible pathways for decarbonisation of the energy system. FES was originally developed to provide data for input into energy network planning processes, including security of supply planning and capacity market auctions. There are currently four scenarios, each representing a different 'state of the world'. The scenarios and associated forecasts are updated annually to reflect the latest energy system data and policies.

For each scenario, FES includes granular data out to 2050 for areas including:

- Energy demand, by fuel type (electricity, gas, hydrogen, bioenergy, oil), and by sector (residential, road transport, industrial & commercial, etc.). Demand is further split by use (e.g. for heating versus appliances) and under different measures (e.g. total demand versus peak demand).
- Installed capacity and energy supply by energy generation type (e.g. gas generators, nuclear, offshore wind, onshore wind, solar).
- Amount of installed energy storage by type.
- Uptake of low carbon technology, including number of electric vehicles, heat pumps, hydrogen boilers.
- Commodity prices (for different fuels and for carbon).
- Carbon emissions by sector, and carbon removals (negative emissions).

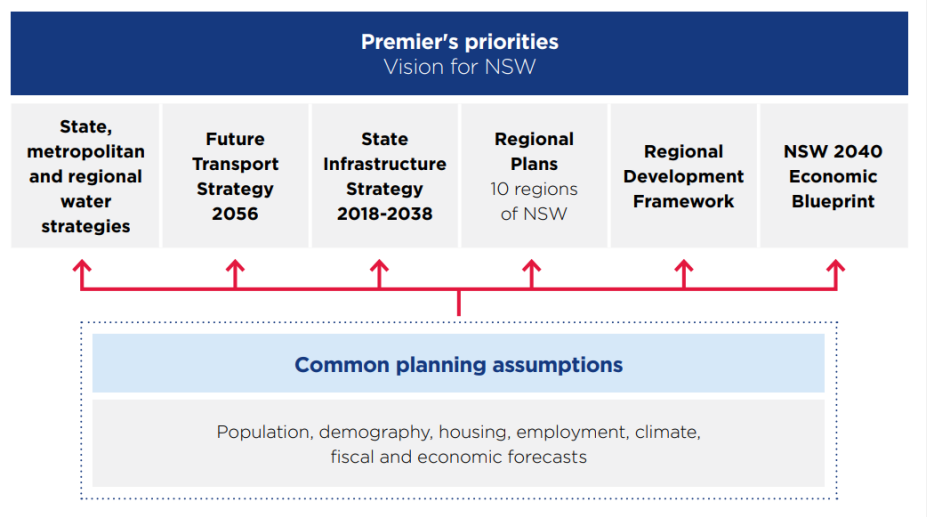
For the forthcoming price controls for electricity and gas network owners, Ofgem asked network companies to develop their draft and final business plans on the basis of these common scenarios. For the draft business plans, which were submitted in July 2024, Ofgem required that **gas companies** base their business plans on the FES 2023 **'Falling Short'**. In contrast, the **electricity transmission companies** were asked to develop their plans based on the FES 2023 '**Leading the Way'** scenario.

For their **final business plans**, which were submitted in December 2024, **all companies** were asked to develop their plans on the basis of the assumptions contained within the FES 2024 '**Holistic Transition'** pathway. It is important to note that this does not mean that Ofgem has to fully 'fund' this scenario. However, it does mean that the plans are developed and can be assessed on a common basis.

Case study: NSW Common Planning Assumptions

The NSW Common Planning Assumptions have been developed to provide a consistent set of assumptions and projections that can be used across New South Wales. These assumptions are intended for use in infrastructure planning, or more generally in the development of any strategies which rely on forecasts.

Within New South Wales, long-term water strategies have been developed at the state, regional, and metropolitan level. Each of these water strategies uses the NSW Common Planning Assumptions, and therefore is developed on a consistent basis with each other, and with the other major state infrastructure strategies. This is shown in the diagram below.



Source: NSW Water Strategy, page 13

3.3 Change 3: Aligning the timing of strategic planning frameworks

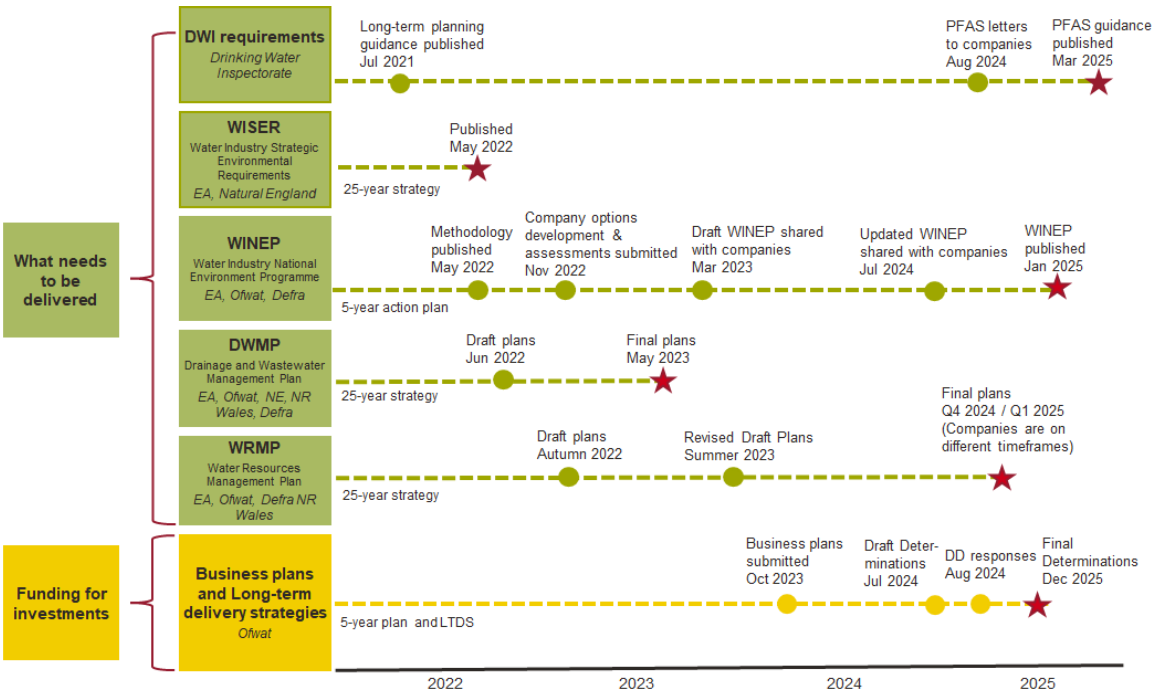
Investment planning in the water sector is complex as it needs to cover a wide range of outcomes from ensuring water supplies to improving the environment. All stakeholders have made efforts in the past to identify and manage interdependencies between different plans. However, to date these efforts have only led to marginal changes and often put the onus on water companies to ensure alignment despite the lack of alignment in timings of wider planning frameworks. In this section we first identify the issues and impacts with the current arrangements and then outline the proposed recommendations.

3.3.1 Issues and impacts of the current arrangements

The current planning framework timelines are not aligned. Figure 4 below shows the timing of each of the strategic planning frameworks around PR24. The figure clearly shows that

there is no coordination between the timelines for "what needs to be delivered" and that the strategic planning requirements are not finalised in time to be properly reflected in business plans, with several planning frameworks and guidance documents (e.g. WINEP requirements, PFAS guidance) being finalised after companies business plans have been submitted. In addition, some planning frameworks are updated at different frequencies to others. For example, River Basin Management Plans (RBMPs, not shown in the image below) are updated by the EA every six years[73], meaning that they are, by definition, misaligned with companies' business planning periods and Ofwat's price reviews. This is a clear area of misalignment and inefficiency which needs to be addressed.

Figure 4 The sequencing of planning cycles in the PR24 business planning process



Source: Frontier Economics

This has the following impacts:

- Lack of optimisation across planning frameworks means that **water companies cannot optimise solutions across different strategic planning frameworks to develop a coherent plan**. For example, the misalignment between the WINEP and WRMP creates barriers for companies in identifying solutions which overlap or have interdependencies. For example, this could mean that companies develop a solution to deliver a WINEP action separately

[73] Environment Agency, River Basin Management Plans – updated 2022

from a WRMP solution when a joint solution could be more efficient. This is particularly relevant for alternative supply solutions to reduce water abstraction that are part of WRMPs but could also appear under WINEP.

- **Delays to investments and lack of clarity for water companies and the supply chain**. For example, in late August 2024 the DWI issued a revised guidance document on water quality regulations specific to PFAS (a group of synthetic chemicals that can be harmful to human health, also known as 'forever chemicals'). This guidance employed a three-tiered risk-based approach, requiring companies with PFAS sources in Tier 2 and Tier 3 to respond immediately. The revised guidance was issued after Ofwat's Draft Determinations, and within days of the deadline for companies to respond to this. As a result, companies did not have sufficient time to consider the impact of the updated guidance on their AMP8 investment plans and reflect this in their Draft Determinations Responses. This creates a danger that companies do not receive adequate funding to meet necessary water quality obligations.
- Another example is the lack of alignment between the Storm Overflows Discharge Reduction Plan (SODRP) and the price review timelines. SODRP was introduced by the UK government to significantly reduce the frequency and impact of sewage discharges from storm overflows into rivers, coastal waters and high-risk locations such as bathing waters. It sets legal targets for the improvements required by 2035 and requires that all remaining overflows are addressed by 2050. A review of the plan is due in 2027, two years into the new regulatory cycle. Major changes to the plan in 2027 could present inefficiencies if companies have to materially adjust their investment strategies.
- **Administrative burden and complexity**. While WINEP actions are linked to other strategic plans such as WRMPs, DWMPs and RBMPs, as these are not produced at the same time, actions that emerge from these plans may enter WINEP at different times. As mentioned above, RBMPs are updated every six years, while WRMPs and DWMPs are updated every five years to feed into companies' business plans for the five year price controls. This creates additional administrative burden and regulatory complexity and reduces short-term certainty for companies' planning investments.
- **Inconsistency between planning framework investments and Ofwat's funding decisions**. For example, Anglian Water's Final Determination is not aligned with the WRMP leakage target in each year of the price control, leading to under-funding. Ultimately all of these impacts mean that the investments that are funded and delivered risk falling significantly short of the optimal set that would deliver the required outputs at the lowest bill impact. This is a clear inefficiency and means that customers, society and the environment are missing out on value for money. To estimate the size of this inefficiency, one would have to develop an "optimised" version and compare this against the status quo. Given the scale of the planning challenge, any simulation is not

likely to lead to robust results. However, there is a strong case for change even in the absence of a quantified benefit. This is because the sector faces a number of unprecedented challenges so it is important take every opportunity to optimise the planning frameworks for an efficient set of investments to be funded and delivered at the right time.

3.3.2 Recommendation

Three fundamental changes are needed to ensure that the planning processes result in an optimal set of investments.

First, timings for **strategic plans should be coordinated and the final plans need to leave enough time to feed into company business plans**. Strategic plans should be developed in parallel with a common end point that leaves a minimum lead time to feed into business plans. Our initial view is that 6 months is appropriate as companies will need to do further optimising across their full business plans and develop their submissions including updating bill models.

Second, we need an **explicit step to optimise across different frameworks** to enable companies to find efficiencies and innovative solutions that address more than one driver. The optimised plan can then be fed into long-term delivery strategies and shorter-term business plans.

Third, to **reduce delays to investments and to account for requirements that materialise after plans are finalised, we need a flexible, efficient process for companies to engage with multiple regulators simultaneously to secure funding**. This can build on newly introduced mechanisms and RAPID and ultimately needs to ensure that new requirements do not have to wait for the next price control to be funded but can be delivered at the optimal point in time. We discuss some mechanisms for flexible funding in detail in a separate paper, 'Reforming the water sector to maximise the delivery of investment for growth'.

3.4 Change 4: Enabling preparatory investment for the future and adaptive investment

3.4.1 Issues with current arrangements

At PR24, Ofwat introduced a new planning requirement: a 25 year adaptive planning framework for enhancement expenditure called the Long-Term Delivery Strategies (LTDS). Ofwat's guidance for the LTDS for PR24[74] instructed companies to test their enhancement investment plans against 'common reference scenarios' in four areas: climate change,

[74] Ofwat (2022), PR24 and beyond: Final guidance on long-term delivery strategies

technology, demand and abstraction reductions. In each area there were two scenarios (adverse and benign). Companies had the option to include additional scenarios.

The guidance stated that companies should assess their enhancement programmes using the principles of 'adaptive planning'. The aim was to establish a core pathway of 'no and / or low regret' investments assessed across the scenarios. Companies were required to ensure that their LTDS is aligned with the other strategic planning frameworks.[75] As we illustrated in Figure 4 above, this was a challenge in itself as the initial LTDSs had to be completed by October 2023 which meant that there was either limited time or a lack of clarity on the final list of investments included in the other strategic planning frameworks. This issue would be addressed by the recommendation discussed in Section 3.3.

Ofwat's approach for companies to identify a core pathway and adaptive pathways is valuable and the methodology explicitly included *"no and low-regret measures as an early priority […] to keep future options open to respond appropriately as the future develops"*.[76] However, despite the intention of the LTDS to move the sector away from short-term focus to long-term planning, there is little evidence that LTDSs informed funding decisions at PR24.

First, the funding decisions at PR24 are focusing on funding investment that can be justified with certainty today. It is not clear that Ofwat has made use of the LTDSs in any meaningful way in their decisions on AMP8 investment. In Ofwat's Final Determination document on expenditure allowances, it only mentioned an assessment for adaptive pathways under water supply options.[77] In Ofwat's cost assessment spreadsheets[78] there are few references to the LTDS or adaptive pathways and most of these are for specific schemes and do not have an impact on funding decisions. The only substantive and systematic use of adaptive pathway analysis that has influenced funding decisions appears to be under water supply costs. But the amount allowed as a result of the adaptive planning is than £25m, an immaterial amount compared to the full price control. This is partly because the investment pressure at PR24 and associated bill impacts were already material so companies and Ofwat have focused on justifying and assessing investment that is urgent now. In some cases companies have had to smooth low regret investments over multiple price control periods to manage the bill impact. This means that despite the opportunity to include low regret investments, in practice companies were already constrained by urgent investment pressures and the associated bill increases.

Second, there is no clear mechanism for companies to move from one adaptive pathway to another in between price controls. This creates uncertainty over the availability of funding

75 Ofwat (2022), PR24 and beyond: Final guidance on long-term delivery strategies

76 Ibid

77 Ofwat (2024), PR24 Final Determinations, Expenditure Allowances

78 Ofwat published the models here under 8. Enhancement feeder models – Water and 9. Enhancement feeder models - Wastewater

when circumstances change or when companies identify that they need to move from one pathway to another.

Third, the way Ofwat has specified the scenarios in its LTDS methodology does not enable 'low regret' longer-term resilience investments to be identified and funded. This is particularly true in relation to population and economic growth. In this case, the high or 'adverse' scenario was defined in terms of local and ONS population projections and consistent with the WRMP.[79] This reinforces a system that tends to expand capacity only when growth is imminent and highly certain. In reality the extent and location of much of the new housing and new businesses is uncertain and the question is how the water sector can prepare for this through anticipatory investment in new capacity, where it is cost effective to do so. The result of not allowing for such investment is a sector that is only funded to meet short-term needs and cannot deploy preparatory investment that would lead to more efficient delivery of future requirements.

Fourth, while the LTDS provides a long-term planning framework for enhancement expenditure, there is no equivalent framework for managing risks associated with base expenditure. Base expenditure is relevant for companies' long-term supply resilience, asset health and ability to meet growth – all of which are important long-term outcomes for the sector which are affected by future uncertainties (e.g. around climate change, environmental destination, and demand).

In addition, in light of the previous four issues, the LTDS created significant administrative burden with seemingly little impact on funding decisions.

Recommendations

There should be a change in the approach to the LTDS on two levels: changes to the scope and impact of the LTDS, and a mindset shift so that preparedness for the future is prioritised over focusing on near term certainty. The benefit of these changes is a water sector that is well-prepared to deliver the required outcomes in the face of uncertainty around future scenarios. This is a more efficient approach and will deliver value for money for customers, society and the environment.

The changes to the scope and impact of the LTDS that are required include:

- **First, there should be a clear 'line of sight' from the LTDS core pathway to the price control funding decisions**. As part of this, the development of WRMP and DWMP should be aligned with the planning cycles for the LTDS (as set out in Section 3.3). This will allow companies to use the LTDS process to more effectively optimise their WRMP and DWMP into an affordable, best value plan. At the price control, there should be a strong expectation that Ofwat will approve and efficiently fund the LTDS core pathway, based on identified

[79] Ibid

need for investments in the next five year period within the context of companies' LTDS 'ambition'[80]. This could be similar to Ofwat's assessment of adaptive pathway water supply options at PR24, but would have to include all investment areas. Where specific programmes are reduced or disallowed, this should have an explicit rationale in terms of either i) some objective weakness in the LTDS modelling or ii) some new information that has emerged since the LTDS was submitted. By rooting price control decisions in the context of each company's LTDS, companies' business plans can become a waypoint in their overall strategy to deliver long-term objectives (as opposed to a full reset every five years). This approach will help give companies more certainty to undertake long-term programmes of work.

- **The core pathway should be extended to include 'low regret' investments that build the resilience of the sector**, particularly to boost the sector's resilience to growth. The LTDS can be used to address this barrier in various ways:
  - By incorporating a more aggressive (i.e. optimistic) growth scenario that is prescribed in the guidance and consistent with national policy objectives. The adaptive planning process of the LTDS can then identify where the investment programme in this scenario incurs relatively little extra expenditure compared to the central case (i.e. where growth can be accommodated at an efficient cost).
  - By adopting an approach that values the flexibility created by investments today (see case study box below).

  There should then be a clear expectation that this additional programme would be approved and funded. This needs to be considered in addition to the urgent or certain investments that are required in the short-term.

  This proportionate and targeted use of preparatory investment would facilitate growth by reducing the time lags between decisions on locating growth and the expansion of capacity. Also, by using common planning assumptions, the LTDS process would reveal valuable information (i.e. to a system planner function, government departments, developers and so on) about where growth can be met on an efficient basis. While, in the short term, this preparatory investment may increase bills for customers, in the medium to long term it will result in lower bills and better outcomes for customers.

- **The scope of the LTDS should be expanded to cover base expenditure**, in order to ensure investment in asset health and network resilience is aligned to the planning scenarios and enhancement programme. The LTDS should be extended to consider the risks associated with long-term base expenditure, in

[80] In the context of the LTDS, the company 'ambition' represents the long-term outcomes and outputs which its investment pathways are designed to deliver and the pace at which this should be delivered

particular with regards to: resilience, asset health and growth. These areas of base expenditure are also impacted by dimensions of future uncertainty such as climate change, environmental destination, demand growth and technological development (as set out in the LTDS).

- **The administrative burden of the LTDS needs to be more targeted on developing a list of preparatory investments.** This would ensure that the resources put into developing the LTDS have a clear positive impact on the water sector being prepared for future challenges.
- There needs to be a **clear process for how to obtain funding if a 'trigger point' is reached,** to move from one pathway to another.

Case study: Identifying low regret preparatory investments

The traditional approach for assessing whether an investment is needed includes analysing the discounted future cash flow of the benefits and costs that results in a net present value (NPV). The drawbacks with this approach have been well-documented, for example by Ofgem in 2012.[81] The key issue is that the NPV approach systematically undervalues flexibility and investment opportunities that provide future options. In a relatively stable world, the NPV approach works well but in a world where there is material uncertainty around the scale and location of population growth, the speed and impact of climate change and the challenge around asset conditions, flexibility to respond to future challenges is more important than ever. Real options analysis and other related analytical tools try to quantify the value of the flexibility that a short-term or longer-term investment brings.

This approach is increasingly used in the transport sector.[82] Consider a simple example of a port. Current demand projections may suggest that the port has sufficient capacity for the next 25 years. But some demand scenarios could require extensions. Should the port buy adjacent land now or wait until the demand has materialised? A classic NPV analysis would value the probability of higher demand and could suggest not to buy the land. A real options analysis would place value on the flexibility. If demand does not materialise, the investment is reversible. But if the investment is not made today, it may no longer be an option in the future. There are various analytical tools that can facilitate such an analysis.

Ofwat's approach in the LTDS was to include "no" and "low" regret investments that are required across various scenario or to keep future options open. This effectively allowed companies to depart from NPV approaches and consider investments that are required to keep options open. However, in practice the investment pressure at PR24 and the use of 'trigger points' (changes in external factors that would move a company from the core pathway to an adaptive pathway) meant that the LTDS did not result in a clear list of preparatory investments that are needed to keep future options open.

In addition to the changes to the scope and impact of the LTDS, **we also need a mindset shift**. The current approach is focused on facilitating investment that is clearly needed in the short-term. This is partly because the short-term investment needs are already substantial and partly because we do not adequately value flexibility, as described in the box above. In the context of the big challenges we are faced with, particularly on the impact and speed of climate change, we need a mindset shift away from making funding decisions that are certain, towards valuing flexibility to meet future needs. The mindset shift we need in water is to consider preparatory investments for the future of equal importance to short-

81 Ofgem (2012), Real Options and Investment Decision Making

82 Sheng, Jiang (2023), Real options in transportation research: A review

term investments. This would end a situation where short-term needs always crowd out longer-term investments and instead of 'chasing its tail' the water sector could be well set up to face future challenges.

A similar shift has been discussed in the energy sector and was summarised by Maxine Frerk in a recent paper[83] as:

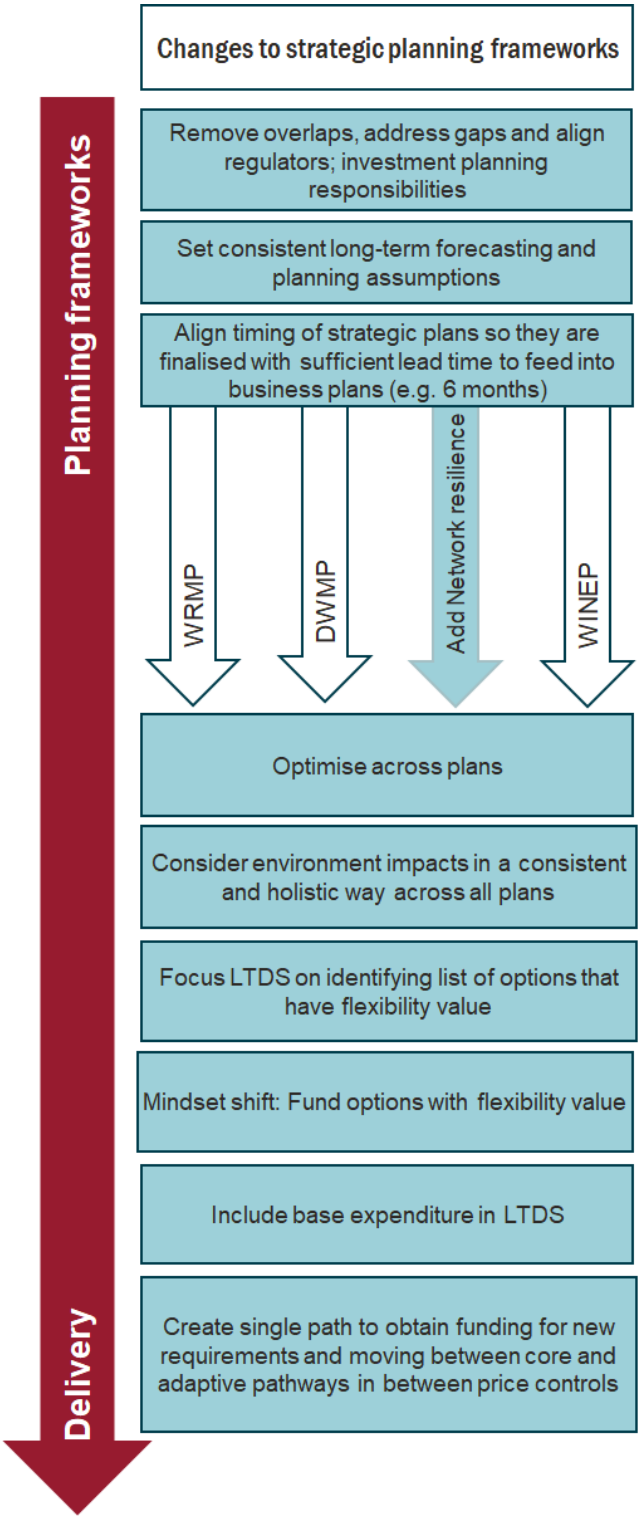
- Resilience is important: spare capacity isn't necessarily wasteful; it contributes to resilience.
- Agility is valuable: options are to be preferred where they allow decisions to flex.
- You may never get certainty: there is value in deferring decisions to get more information but at some point you may just have to jump.

3.5 Summary of recommendations

Figure 5 below provides a summary of the changes discussed in the section. It shows that the changes cover a wide range from the set up of the strategic framework, to coordination and optimisation between frameworks and agile funding decisions.

83 Maxine Frerk, University of Oxford (2021) Investing for net zero in the face of uncertainty: Real options and robust decision-making

Figure 5 Summary of recommendations on strategic planning frameworks



Source: Frontier Economics

Annex A Overview of key strategic planning arrangements

A.1 Strategic Policy Statement

Overview

A.1 The Strategic Policy Statement (SPS), issued by the UK government, outlines its priorities and objectives for Ofwat in regulating the water sector in England. Ofwat must carry out its functions in accordance with the SPS, which are to **protect and enhance the environment**, **deliver a resilient water sector, serve and protect customers** and use **markets to deliver for customers**. Defra sets out strategic priorities for Ofwat, which are presented to Parliament

Scope of Activities and Planning Timelines

A.2 Ofwat has statutory duties to:

(a) **Protect customer interests**, including through effective competition;
(b) Ensure water companies, water supply licensees and sewerage licensees can carry out their statutory and licensed functions properly;
(c) Ensure **financial sustainability** of water companies; and
(d) **Promote long-term resilience** in water supply and wastewater systems.

A.3 Ofwat uses a range of different tools to achieve these objectives, including a five-year "**price control**", where it sets a revenue cap for each company ("allowed revenues"), along with service quality targets and various other parameters, incentives, penalties and funding mechanism. The current SPS was published in March 2022, replacing the previous SPS which was issued in 2017.

A.2 Environmental Improvement Plan (EIP)

Overview

A.4 The Environmental Improvement Plan (EIP 2023) is the first review of the 25 Year Environment Plan (25YEP), setting out progress made and the UK government's five-year strategy to **improve England's natural environment**. It supports the delivery of the **environment goals** outlined in the 25YEP, i.e. to improve nature, environmental quality, use of resources, mitigation of climate change, biosecurity and beauty of nature.

Key Regulators

A.5 **Defra** leads the implementation of the EIP 2023, coordinating efforts across various sectors to achieve the environmental goals. The **EA** monitors and

enforces environmental standards, ensuring compliance with the policies outlined in the plan. **Natural England (NE)** – focuses on policies in the plan that are related to conserving and enhancing England's natural environment, such as habitat restoration and biodiversity initiatives.

Scope of Activities

3.1 The EIP sets out actions to deliver the 25YEP goals through the following focus areas:

(a) **Halting biodiversity loss** by creating or restoring habitats, e.g. via the Species Survival Fund and the National Nature Reserves;

(b) **Reducing water and air pollution** e.g. by reducing ammonia and nutrients emission

(c) **Minimising waste and improving resource use** e.g. by banning single-use plastics and boosting the UK timber supply;

(d) **Mitigating climate change** e.g. by strengthening flood and coastal defences;

(e) Enhancing **biosecurity** by reducing threats from pests, diseases, and **invasive non-native species**

(f) Enhancing **natural beauty** and promoting engagement with the environment

A.6 The EIP was published in January 2023 as a review of the 25YEP, which will be refreshed every five years, in accordance with the Environment Act 2021. The next scheduled review and update of the EIP will take place in 2028.

A.3 Water Resources Management Plans (WRMPs)

Overview

A.7 As part of the WRMP process, water companies must submit to the Environment Agency (EA) their 25-year strategy for managing and developing water resources to ensure there is **long-term balance between supply and demand** and to address challenges to water supply such as population growth, climate change and the desire to reduce water abstraction. WRMPs also encourage companies to look into efficient way of delivering benefits such as water trading or third parties, in order to make best use of resources, improve resilience, drive innovation and deliver public value benefits.

A.8 Companies must prepare a WRMP every five years ahead of price review and review it annually. Companies submit the investment plans from the WRMP in their business plans, which Ofwat evaluates the extent to, and conditions under which, companies can recover costs of investments through charges to

customers. Changes to WRMPs are possible after the business plans are submitted.

Key Regulators

A.9 The key regulators involved in the WRMP process are:

- **EA** – leads on producing guidance for companies to compile the WRMP and acts as technical advisor
- **Ofwat** – assesses the WRMP-driven investments companies submit in business plans
- **Regulators' Alliance for Progressing Infrastructure Development (RAPID)** – made up of Ofwat, EA and the DWI to help accelerate development of strategic water infrastructure by overseeing the gated process for funding and evaluating large-scale water resource projects.

Scope of activities

1.1.2 Companies must forecast the supply and demand for water in their areas over the next 25-50 years. Where there is a forecasted deficit, companies should consider:

(a) Supply-side options to increase the amount of water available; and

(b) Demand-side options to reduce the amount of water their customers require.

1.1.3 Companies then select the preferred programmes based on the 'most likely' future and government policy or wider objectives such as drainage wastewater management plans (DWMPs) or river basin management plans (RBMPs). The WRMP primarily informs the supply-demand balance included in the business plans that the companies submit to Ofwat.

A.4 Drainage Wastewater Management Plans (DWMPs)

Overview

A.10 Water and wastewater companies must submit to the Environment Agency (EA) their 25-year strategy for extending, improving and maintaining **a robust and resilient drainage and wastewater system** while protecting and enhancing the environment.

A.11 The DWMP includes the companies' assessment of the long-term drainage and wastewater capacity and their plans to address risks and pressures for drainage and wastewater services such as population growth, climate change, extreme weather and loss of green spaces. DWMP will become a statutory requirement

for companies from PR29 onwards. Companies must also ensure their plans are consistent with other plans such as flood risk management plans (FRMPs).

A.12 Companies must prepare a DWMP every five years ahead of price review and review it annually. Companies submitted the first non-statutory DWMP at PR24. From PR29 onwards, DWMPs will become a statutory requirement.

Key Regulators

A.13 The **EA** provides guidance on developing DWMPs and ensures alignment with environmental objectives and regulatory requirements. **Defra** sets the overarching policy framework for DWMPs in England, outlining priorities and expectations for the companies. The **Welsh government** sets the policy framework for DWMPs in Wales.

A.14 **Ofwat** informs key objectives and assesses the DWMP-driven investments companies submit in business plans. **Natural England** and **Natural Resources Wales** – provides guidance on DWMPs in relation to protecting and enhancing the natural environment in England / Wales.

Scope of Activities

A.15 DWMPs set out the key challenges for their systems in the future and planning objectives. Companies use a **risk-based approach** to identify **vulnerable catchments** based on indicators such as flooding and pollution. Companies conduct a **baseline risk and vulnerability assessment** (BRAVA) to assess the system performance and wider resilience issues within each catchment.

A.16 Companies then identify the preferred programmes from a set of “best value” solution options for their most at-risk catchments, which are then submitted to Ofwat as part of the business plans.

A.5 Storm Overflows Discharge Reduction Plan

Overview

A.17 The Storm Overflows Discharge Reduction Plan was introduced by the UK government to significantly reduce the frequency and impact of sewage discharges from storm overflows into rivers, coastal waters and high-risk locations such as bathing waters. It was published in August 2022 and updated in September 2023 after public consultations. The plan will be reviewed in 2027.

A.18 The plan sets legal targets for water companies to improve all storm overflows by 2050 and mandates water companies to increase monitoring and transparency and to undertake significant investment to upgrade infrastructure and reduce

storm overflow discharges. The plan aligns with wider regulatory frameworks including WINEP and the 25 Year Environment Plan.

A.19 The plan has set the following targets for sewer system upgrades:

(a) By 2035, improve all storm overflows near bathing waters and 75% near high-priority sites;
(b) By 2045, improve all remaining storm overflows;
(c) By 2050, storm overflows only operate during extreme rainfall and must not cause ecological harm.

Key Regulators

A.20 **Defra** sets legal requirements for storm overflow reductions and published the Storm Overflow Discharge Reduction Plan

A.21 The **Environment Agency** is responsible for issuing permits and regulating all discharges from storm overflows, as well as enforcement actions when permits are breached. **Ofwat** assesses the storm overflow investments companies submit in business plan

Scope of Activities

A.22 Water companies are mandated to **invest in infrastructure**, including increasing storage in the network, expanding monitoring and delivering green schemes such as natural drainage solutions. The plan requires companies to install **real-time monitoring systems** on storm overflows and make data publicly available.

A.23 The plan **frontloads actions in particularly important and sensitive areas** including designated bathing waters and high priority ecological sites such as Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SAC) and chalk streams. The plan also includes a report on the feasibility of eliminating discharges from storm overflows.

A.6 Water Industry Strategic Environmental Requirements (WISER)

Overview

A.24 WISER provides a strategic framework for water companies to enhance **environmental resilience** and manage **flood risks** in their business plans. WISER was published in May 2022, ahead of the PR24 period.

A.25 It aligns with other statutory planning frameworks such as WRMPs and supports the WINEP. EA and NE expect companies to embrace innovation, build stronger and more collaborative catchment and flood partnerships and consider social and

economic value of the water environment; also expects to adopt, promote and encourage green finance.

Key Regulators

A.26 **Environment Agency** and **Natural England** set out the expectations of water companies' overall environmental performance through the WISER. The former oversees environmental protection, water resource management and flood risk management while the latter focuses on conserving and enhancing England's natural beauty. **Defra** provides policy direction and ensures the WISER aligns with national environmental objectives,

Scope of Activities

A.27 WISER sets out the statutory and non-statutory actions expected of water companies. This includes activities that:

(a) Contribute to a **thriving natural environment**, such as improving water quality and restoring habitats;
(b) Enhance **infrastructure resilience** to climate change and future challenges such as security of water supply;
(c) Ensuree **regulatory compliance**, such as 100% compliance with licenses and zero pollution incidents.

A.7 Water Industry National Environment Programme (WINEP)

Overview

A.28 WINEP informs water companies on the statutory and non-statutory actions they need to take to meet the environmental legislative requirements that apply to water companies in England. It is linked to other frameworks and plans such as the UK government's 25 Year Environment Plan, DWMPs etc. WINEP aims to improve outcomes related to:

(a) natural environment;
(b) net zero;
(c) catchment resilience; and
(d) access, amenity and engagement.

Key Regulators

A.29 **Defra** sets the strategic policy statement that outlines environmental priorities. The **Environment Agency** leads guidance on WINEP options, jointly issue the water industry strategic environmental requirements (WISER) with **Natural England**, which provides strategic steer to water companies on the environment,

resilience and flood risk obligations. **Ofwat** assesses the WINEP-driven investments companies submit in business plans

Scope of Activities

A.30 Companies develop options based on the EA's 3-tiered outcome approach. Water companies should ensure WINEP options are co-designed, co-delivered and co-funded, working towards a 20% target of co-funding of non-statutory actions. Companies should pursue **catchment and nature-based solutions** as part of their WINEP options development.

A.31 Companies also prepare Options Assessment Reports (OAR) and Option Development Reports (ODR) to provide transparent analysis of the various approaches/investment/strategies that companies might take, so that Ofwat can select the option that delivers the most value for customers.

A.8 Water Framework Directive (WFD)

Overview

A.32 The Water Framework Directive (WFD) was established by the European Union in 2000 and was transposed into UK law via The Water Environment Regulations in 2017. The WFD aims to enhance the status and prevent further deterioration of surface water bodies, groundwater bodies and their ecosystems, to support sustainable water use, to reduce water pollution and support mitigating the effects of floods and droughts.

Key Regulators

A.33 **Environment Agency** and **Natural Resources Wales** must comply with the WFD e.g. by producing river basin management plans (RBMPs). The Environment Agency has also produced guidance on the WFD assessment process.

Scope of Activities

A.34 The WFD mandates the **development of RBMPs** for each river basin districts. **Nationally significant infrastructure** projects must undergo assessments to ensure compliance with the WFD. The WFD assessment process includes screening of activities, scoping potential risks to water bodies and detailed impact assessments. The WFD also encourages stakeholder involvement e.g. public consultations.

A.9 River Basin Management Plans (RBMPs)

Overview

A.35 RBMPs aim to **enhance nature and natural water resources**, including rivers, lakes, canals, estuaries, coasts and groundwater. They describe the framework used to protect and improve water quality in each river basin district. The plans are developed for each of the 12 river basin districts (RBDs) in England, Scotland and Wales and updated every six years.

A.36 RBMPs are used to inform water management decisions by public bodies and stakeholders, and are in line with the government's 25 Year Environment Plan and are integrated with other strategic frameworks such as WINEP.

Key Regulators

A.37 The **Environment Agency** carries out habitats regulation assessments and manages the seven RBDs in England and jointly manage two of the Welsh RBDs. **Natural Resources Wales** manages the RBDs in Wales. **Natural England** consults on habitats regulation assessments

Scope of Activities

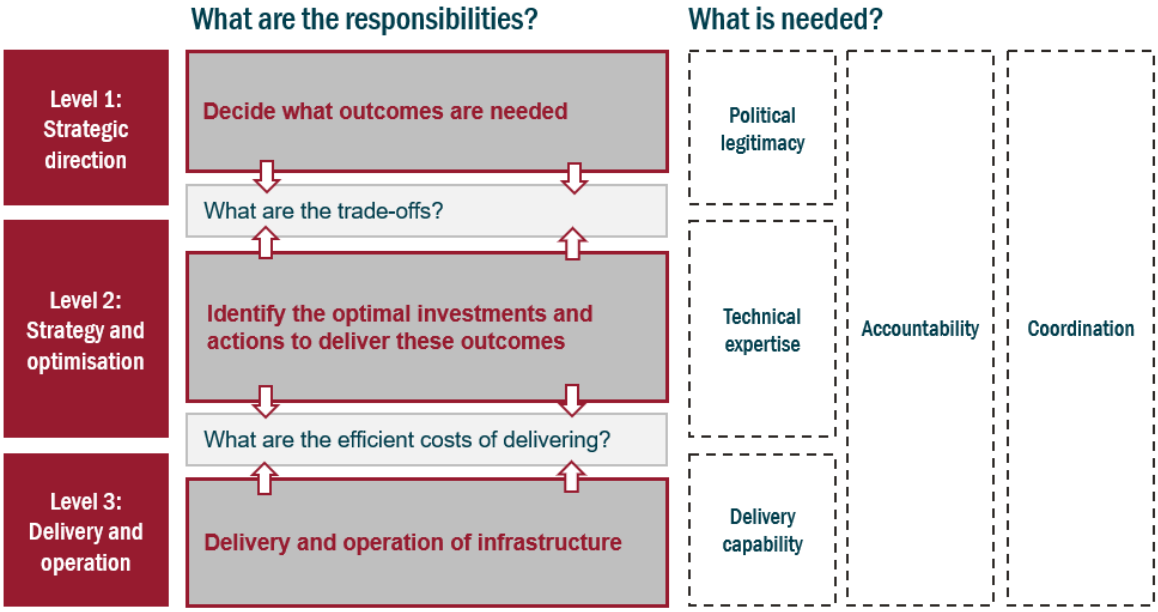
A.38 The EA publishes an **Investment requirements** report, outlining costs and benefits of the actions needed to improve water quality and the likely scale of available funding. The EA also conducts necessary environmental assessments before finalising the RBMPs. In consultation with NE and NRW, the EA carried out **habitats regulation assessments** for each river basins.

A.39 The EA also provides online tools including an interactive river basin district map and datasets so that public and local partners can access water body status information. The government and regulators directs funding to issues identified in the RBMPs, such as by providing additional funding to the EA for the regulation of agriculture and water companies.

Annex B A conceptual framework for strategic planning

Strategic planning needs to be integrated in a coherent and clearly structured approach. Before considering the detail of strategic planning in the water sector, we sought to develop a conceptual framework which is intended to provide a high-level overview of how strategic planning should be structured in general. Our conceptual framework for strategic planning is illustrated in Figure 6 below.

Figure 6 A conceptual framework for strategic planning



Source: Frontier Economics

As described by the diagram:

(a) At the highest level (**Level 1**), we need clarity on the high-level goals and priorities that the water sector needs to deliver. This can include both a high-level 'vision' for the sector, but also more specific policy objectives.

(b) To identify how best to achieve these goals, the next level (**Level 2**) needs to include methods and approaches that help identify the most efficient set of investments and actions by companies (and other agents if relevant).

(c) The final level of delivery and operation (**Level 3**) then involves companies (and other agents) implementing the actions and investments identified in Level 2.

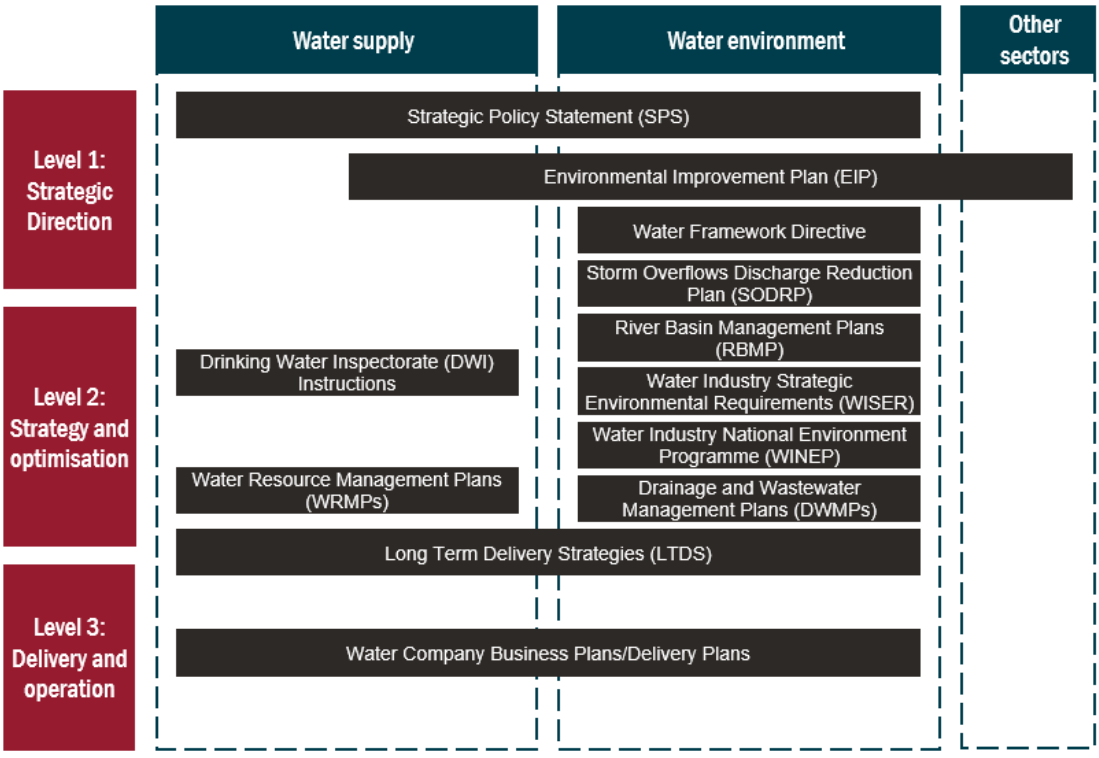
There are two important feedback loops, where it is crucial that there is effective dialogue between different levels of the planning system:

(d) **Between Level 1 and 2:** While high level objectives can be set from a top-down approach, they need to be informed by at least a high level understanding of the costs that are involved in delivering those objectives. This helps ensure that trade-offs between different objectives, and value for money considerations, are taken into account when deciding on priorities for the sector.

(e) **Between Level 2 and 3:** The plan derived in Level 2 needs to take into account cost estimates of different actions, and in many cases the efficient costs of delivery may not be revealed until an action is implemented. It is therefore important to have a feedback loop from delivery and operations back to planning so that optimisation within the planning level can be based on the latest information.

In Figure 7 below we map the current water sector strategic planning arrangements to this three-level framework. This covers the key high-level policy documents aiming to provide overarching steer (e.g. the SPS), planning frameworks developed by regulators, and the delivery plans developed by the companies. We also show whether each strategic of these arrangements is focused on water supply (i.e., water resources and drinking water quality), the water environment (i.e., wastewater and the environment) or other sectors beyond water.

Figure 7 Mapping current arrangements to the conceptual framework



Source: Frontier Economics