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Integrated analysis of water demand

Summary report

16 July 2024

Issue and Revision Record

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Introduction

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Project overview

Background

The Planning Service within the Mayor of London's Infrastructure Coordination Service (ICS) previously developed a pilot Subregional Integrated Water Management Strategy (SIWMS) for East London around the River Lea. Numerical findings from the study found that reductions in per capita consumption (PCC) had benefits to reducing water stress in the catchment across different future scenarios. However, it also highlighted in parts of the study area which drain to Deephams Sewage Treatment Works (STW), there is a risk that more ambitious water demand reductions could negatively impact on low flows and water quality.

To reduce the modelling complexity of the pilot, the Beckton sewage treatment works (STW) drainage area was excluded from the study.

As part of the '90-day actions' to begin implementing the SIWMS, the GLA have been allocated an action 'S7: Investigate potential for further PCC reductions in the Beckton catchment.' This summary report addresses this action by assessing the impacts on the water environment from different water demand reduction ambitions in Tower Hamlets, City of London, and Newham (which drain to Beckton STW).

Alongside this, City of London and the London boroughs of Newham and Tower Hamlets are currently going through Local Plan reviews and are at Regulation 18 and 19 Local Plan review stages.

- Regulation 18 is the draft local plan consultation stage.
- At Regulation 19 stage the draft local plan is updated to reflect the responses received during the Regulation 18 consultation and represents the plan the council would want to see adopted. At this stage the plans go through the next round of engagement.

As part of the Local Plan reviews, improving water efficiency and reducing per capita consumption (PCC) in both existing and new developments has been raised as one of the priorities.

This draws on other drivers to improve water efficiency and reduce PCC within UK Government policy, such as: The Environment Act 2021; The 25 Year Environment Plan; the Water Resources Planning Guidelines 2023; The Environmental Improvement Plan 2023; and the Plan for Water 2023, for example. These all aim to reduce PCC to 110 l/p/d by 2050 as well as various targets for reducing non-household water use.

Project objectives

The objectives of the integrated analysis of water demand project are to:

- Provide evidence for planners of catchment benefits and trade – offs associated with different levels of ambition for water efficiency policy in new developments (both residential and commercial).
- Provide evidence for planners of catchment benefits and trade – offs associated with different levels of ambition for existing water demand reductions in existing developments (both residential and commercial).
- Provide understanding of deliverability of water efficiency policy levels by identifying water efficiency measures needed (fixtures & fittings, recycling etc) for different target ambition levels.
- Provide context of how localised findings may fit into the wider context of planning policy across London, including considerations of spatially varying water demand targets and policy variations.

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Method Overview

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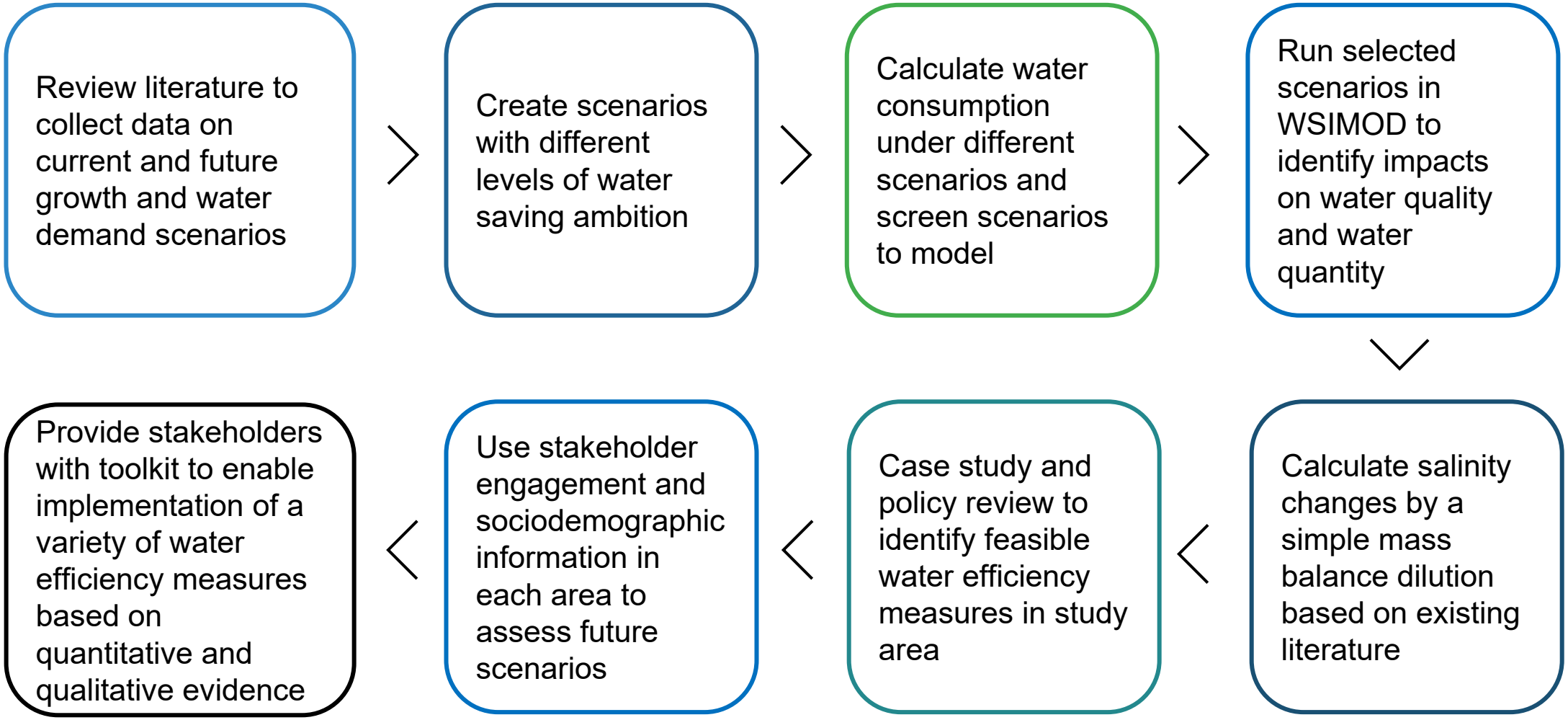
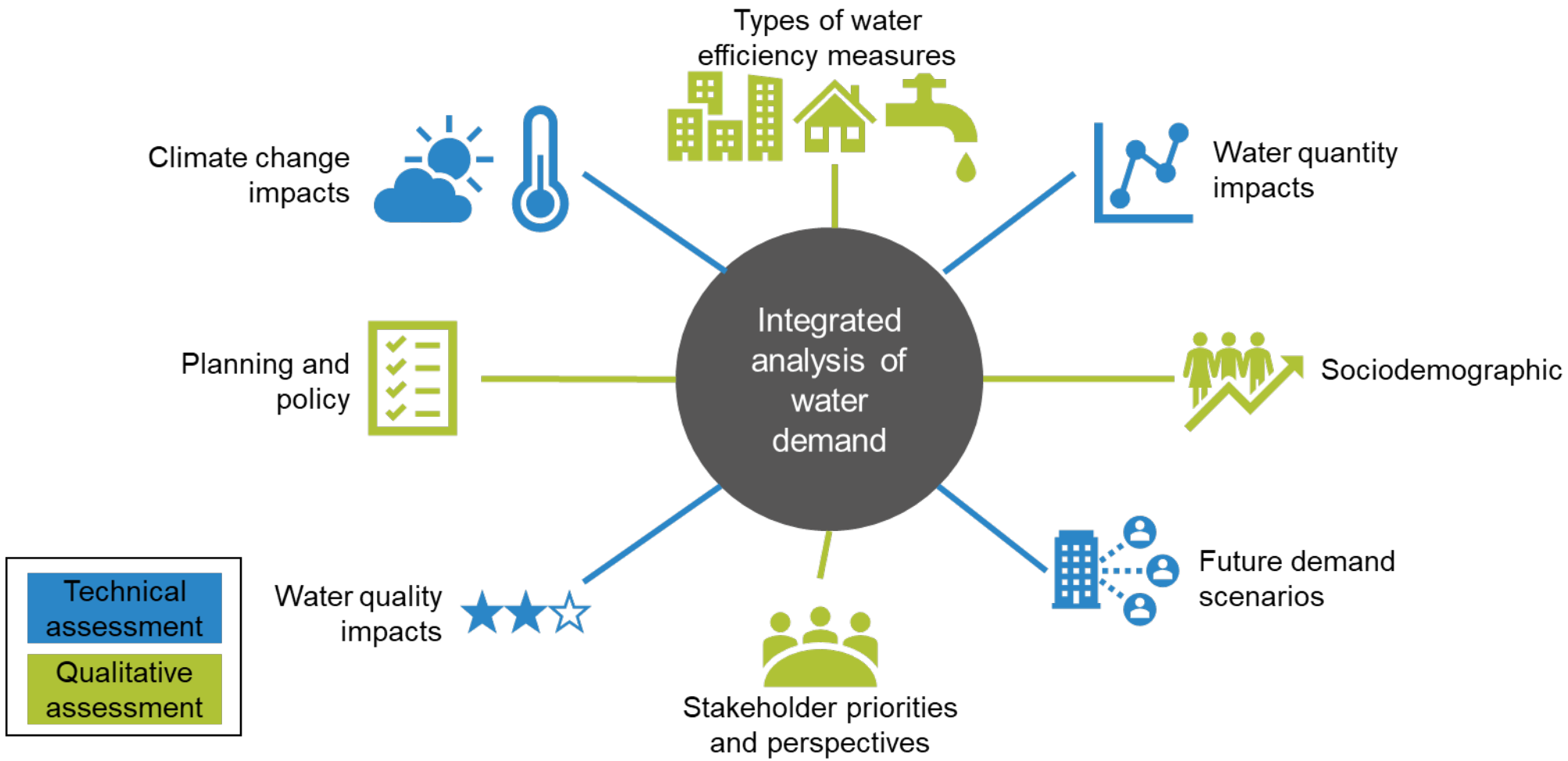
Overview of method



Overview of technical and qualitative assessment

To provide stakeholders with a toolkit to enable implementation of a variety of water efficiency, the quantitative assessment involved creating future demand scenarios to model in WSIMOD water quality, water quantity and climate change impacts. This was assessed against a qualitative review on types of water efficiency measures available, stakeholder perspectives, sociodemographic information, and planning and policy.

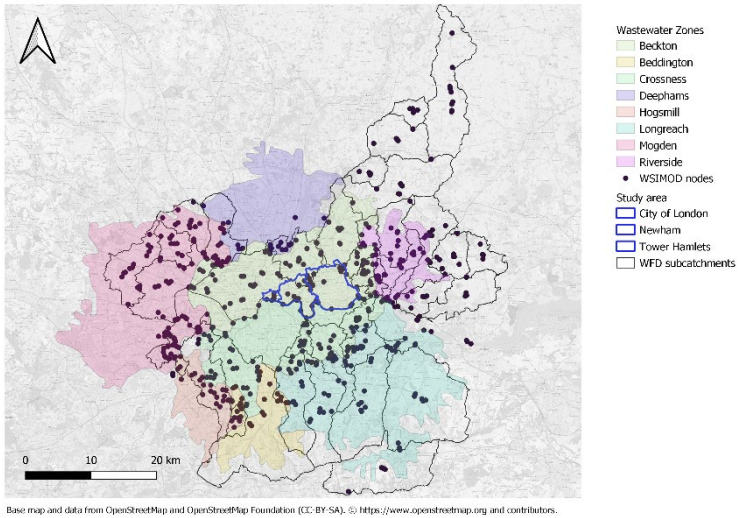


Water Systems Integrated Modelling (WSIMOD)

Location of model boundary (1), water quality and water quantity outputs measure points (2), and salinity assessment measure point (3)

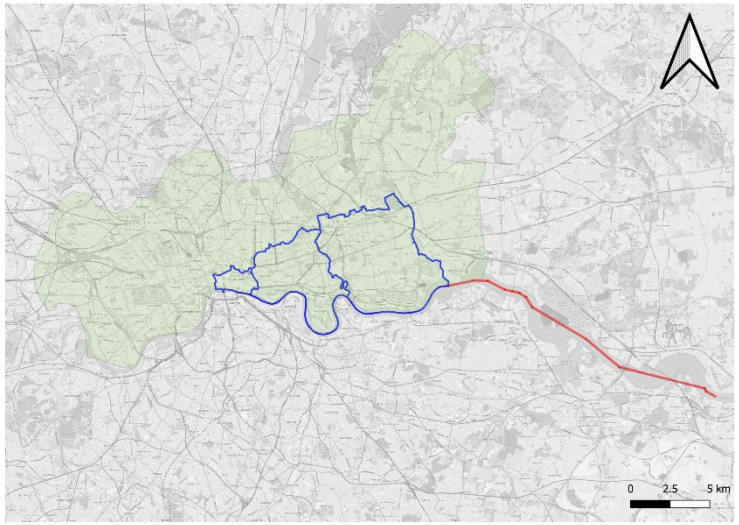
1.

WSIMOD boundary showing study area of project (City of London, Newham and Tower Hamlets). Water consumption levels changed for study area only depending on scenario.



2.

WSIMOD outputs downstream of Beckton Sewage Treatment Works (represented by the red line).



3.

WSIMOD flow outputs at Swanscombe for salinity assessment where Alkmaria romijini likely to be present (represented by red line).

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Results

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Results overview

This section provides an overview of the key findings from the quantitative and qualitative evidence provided by the study.

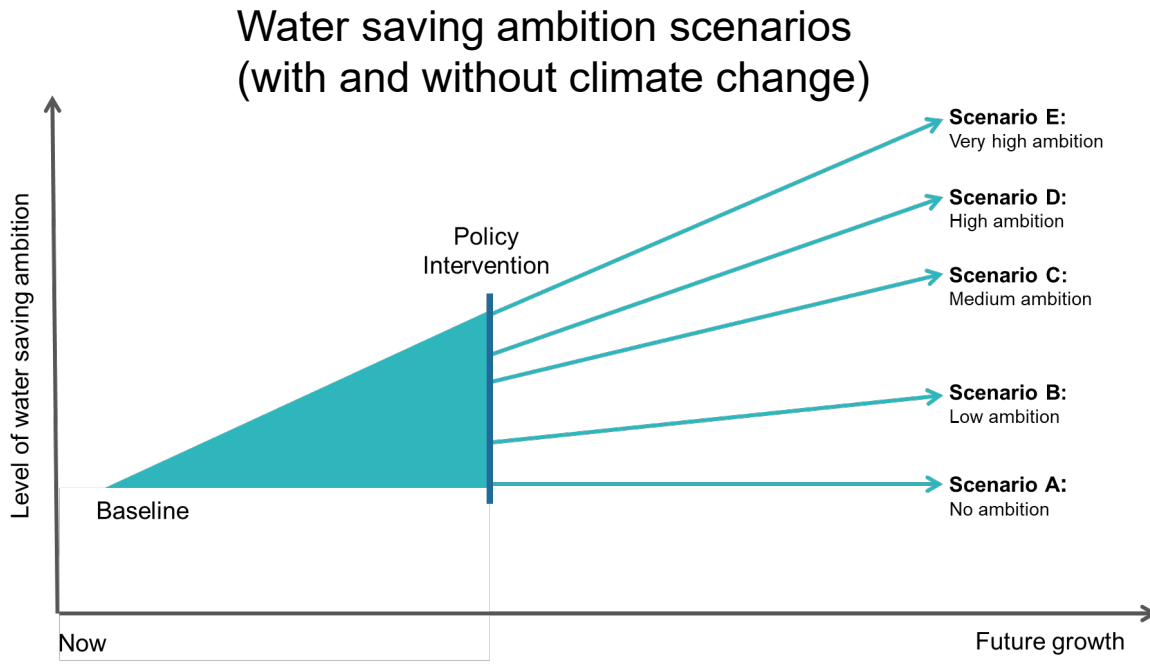
Page 13 provides an overview of:

- The total combined PCC for both new and existing residential units for the three study areas across baseline and the five water ambition scenarios illustrated in the diagram.
- The total combined commercial water demand from both new and existing commercial units for the three study areas across baseline and the five water ambition scenarios.
- The combined water demand from both residential and commercial, new and existing units, across the three study areas across baseline and the five water ambition scenarios.

Page 14 outlines the five key findings from the study.

Page 15 summaries the impacts to the water environment from the different water saving ambition scenarios (with and without climate change).

Pages 16, 17 and 18 highlight the key messages for City of London, Newham and Tower Hamlets, respectively, following the Scenario D: High Ambition. This scenario closely follows the targets outlines in areas Local Plans.



Scenarios for water consumption

Scenario name	Scenario technical description	Total PCC (l/h/d)	Total commercial water demand (Ml/d)	Combined water demand (Ml/d)
Baseline	This scenario investigates current residential and commercial water consumption in each borough	146	34.47	132.27
Scenario A: No ambition	This scenario investigates combined residential and commercial growth with current levels of water demand (e.g. no additional water efficiency)	146	40.33	163.43
Scenario B: Low ambition	This scenario investigates combined residential and commercial development with lower water consumption but no retrofitting of existing units	135	39.19	153.25
Scenario C: Medium ambition	This scenario investigates combined residential and commercial development with lower water consumption and 100% uptake in residential retrofitting. New residential developments have consistent 105l/p/d targets across boroughs.	109	34.19	126.07
Scenario D: High ambition	This scenario investigates combined residential and commercial development with lower water consumption (aligned with Local Plans) and 100% uptake in residential retrofitting of existing units	107	34.19	124.13
Scenario E: Very high ambition	This scenario investigates combined residential and commercial development with lower water consumption and 100% uptake in residential retrofitting. New residential developments have consistent 80l/p/d targets across boroughs.	104	34.19	121.74

Key findings

1. The current water efficiency ambitions in the Local Plans for City of London (CoL), Tower Hamlets (TH) and Newham provide a water saving benefit whilst having no significant impact on low flows in the River Thames, and insignificant impacts to the water environment.

2. Water efficiency scenarios that exceed the current ambitions have a water saving benefit. Should CoL, TH and Newham want to increase their ambition, findings suggest it will have minimal impact to low flows and on the water environment.

3. Even where policy determined new developments are designed to water use of 80lpd, this alone does not offset the increase in total water use due to growth. Therefore, retrofitting of existing homes is a critical leverage point for achieving water efficiency ambitions.

4. To achieve different levels of ambition, a variety of water efficiency measures and strategies are required for CoL, TH and Newham depending on the ambition and sociodemographic of each area.

5. Depending on the policy we are trying to inform, the spatial resolution of the model can be applied at local, sub regional or city-wide scale to provide the appropriate evidence base and steer guidance/incentivisation for uptake.

Water saving ambition: Summary impacts

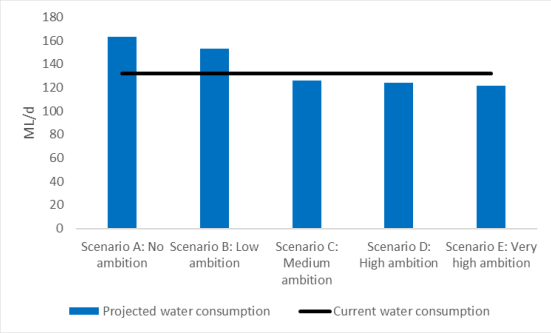
Scenario inputs

Residential
- Current population
- Current PCC
- Efficiency target (existing units)
- Population growth projection
- Target* PCC for new developments

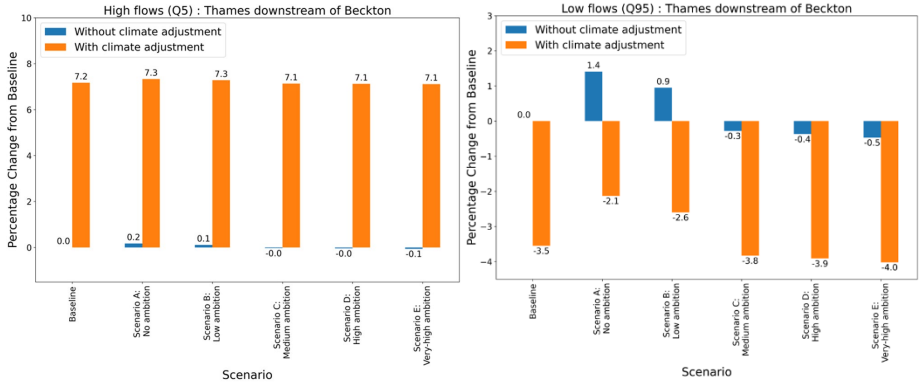
Commercial
- Current water demand
- Projected additional demand from new offices
- Projected additional demand (other)
- Efficiency targets (existing units)
- Efficiency targets for new developments (Office based)
- Efficiency targets for new developments (other)

* Based on current local plan (or local plan in consultation)

Total water consumption across City of London, Newham and Tower Hamlets under each scenario



Water quantity impacts



Salinity assessment

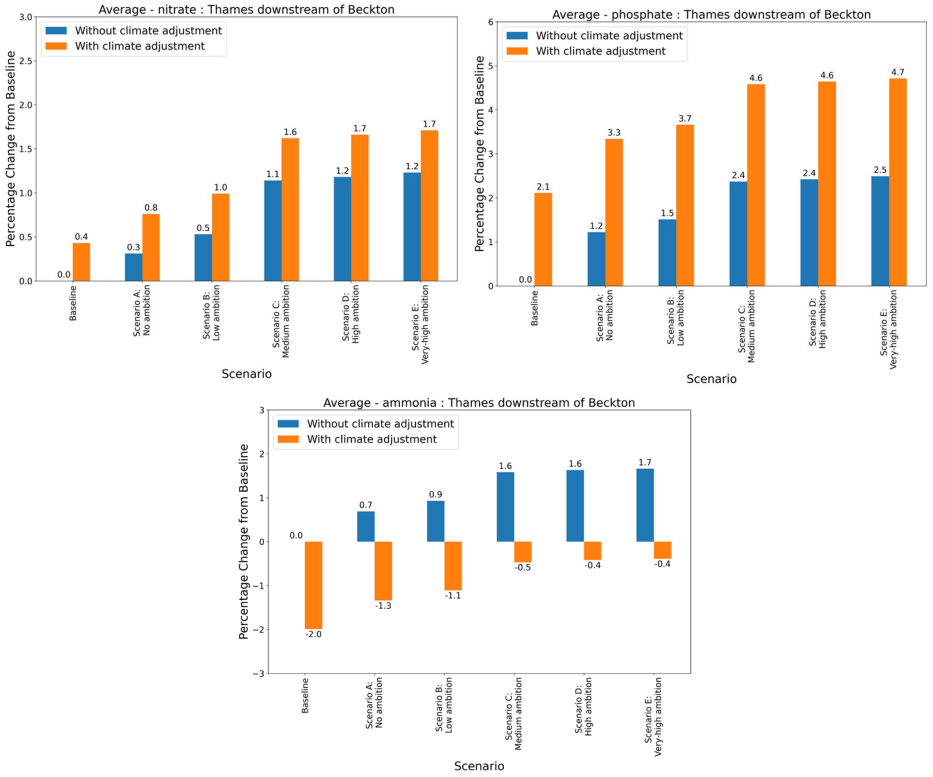
A salinity assessment based on a comparison of flows between the baseline and the different scenarios modelled at Swanscombe on the River Thames was carried out. Calculations show a small impact to the range of salinity values, due mainly to climate change impacts. However, the upper value of salinity remains within both the preferred and recorded limit for Alkmaria romijini.

Water saving ambition: Summary impacts

Key assumptions

- 100% uptake in retrofitting (when applicable to scenario)
- Based on 2050 growth projections
- Water consumption data does not account for leakage
- Mass balance modelling only enables an assessment on relative change
- Climate change scenario uses RCP2.6
- Modelling does not capture peak concentrations of pollutants and low tides

Water quality impacts



Overall, findings suggests even the very high water saving ambition scenario will have minimal impact to low flows and on the water environment.

For more detail, see the following documents: Workstream 1 technical note, Workstream 2 technical note, risk register, water efficiency measures and case studies, method statement

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Key findings for City of London, Newham and Tower Hamlets

Data sources, underling calculations and modelling results summarised in these slides are fully described in the Workstream 1 Technical Note and Workstream 2 Technical Note

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City of London: High ambition scenario

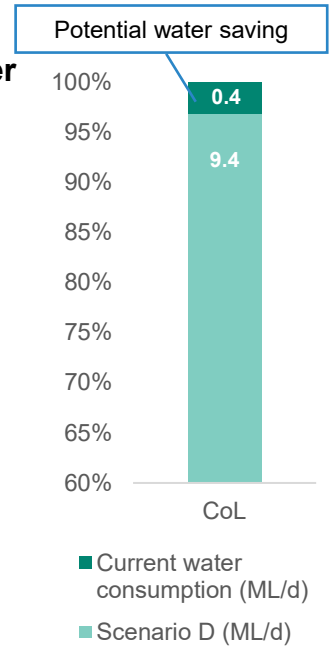
Scenario inputs (for CoL only)

Residential
Current population: 8,600
Current PCC: 146l/p/d
Efficiency target (existing units): 110lp/d
Population growth projection: 9,500
Target PCC for new developments: 105l/p/d

Commercial
Current water demand: 8,166 m^3/d
Projected additional demand from new offices: 180 m^3/d
Projected additional demand (other): 1,208 m^3/d
Efficiency targets (existing units): 15% reduction
Efficiency targets for new developments (Office based):40% reduction
Efficiency targets for new developments (other):15% reduction

Description of high ambition water saving scenario

All residents in each borough have decided to retrofit their homes to maximise water efficiency and reduce the amount of water they use in their day-to-day activities. All business owners also retrofit their units to save water. Local boroughs set their own ambition for water efficiency for new development depending on their own needs and constraints. For commercial developments, there are differing opportunities to save water depending on if the development is office-based or industrial units.



This scenario would enable City of London to implement their residential and commercial growth ambitions whilst reducing their water consumption to below baseline levels.

Water efficiency measures currently promoted within CoL Local Plan (a-d) and other measures outside of policy remit (e-f) to move towards this water saving ambition:

a) Retrofit fixtures and fittings for LA housing stock
b) Greywater recycling (non-potable)
c) Rainwater harvesting (commercial)
d) Construction and operating standards / water efficiency ratings for buildings (commercial)
e) Internal plumbing loss (leakage) reduction
f) Retrofit fixtures and fittings for other properties

City of London: High ambition scenario

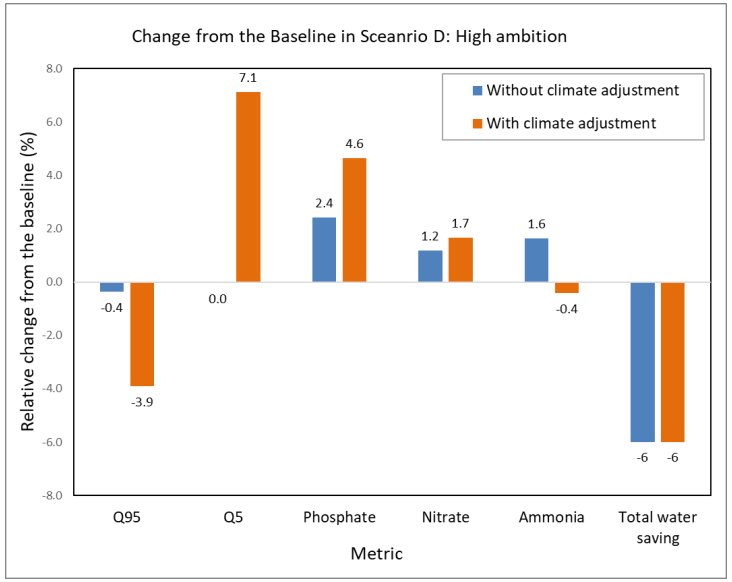
Key assumptions

- 100% uptake in retrofitting
- Based on 2050 growth projections
- Water consumption data does not account for leakage
- Mass balance modelling only enables an assessment on relative change
- Climate change scenario uses RCP2.6
- Modelling does not capture peak concentrations of pollutants and low tides
- Water efficiency measures do not consider situational characteristics or other savings outside of water

Further measures that would support water efficiency within remit of CoL Local Plan (a-e) and other measures outside of policy remit include:

a) Water neutrality, offsetting, water credit schemes
b) Additional greywater recycling (non-potable)
c) Rainwater harvesting (residential – private and community)
d) Water sensitive planning
e) Stakeholder and innovation networks
f) Innovative tariffs
g) Smart metering

Residential and commercial growth under high water saving ambition for the study area has minimal impacts (<8% change) to water quantity and water quality.



For more detail, see the following documents: Workstream 1 technical note, Workstream 2 technical note, risk register, water efficiency measures and case studies

Newham: High ambition scenario

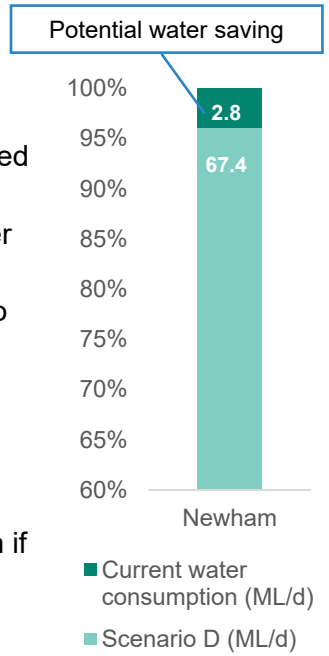
Scenario inputs (for Newham only)

Residential
Current population: 351,000
Current PCC: 146l/p/d
Efficiency target (existing units): 110lp/d
Population growth projection: 445,700
Target PCC for new developments: 105l/p/d

Commercial
Current water demand: 16,108 m^3/d
Projected addition demand: 2,738m^3/d
Efficiency targets (existing units):15% reduction
Efficiency targets for new developments: 15% reduction

Description of high ambition water saving scenario

All residents in each borough have decided to retrofit their homes to maximise water efficiency and reduce the amount of water they use in their day-to-day activities. All business owners also retrofit their units to save water. Local boroughs set their own ambition for water efficiency for new development depending on their own needs and constraints. For commercial developments, there are differing opportunities to save water depending on if the development is office-based or industrial units.



This scenario would enable Newham to implement their residential and commercial growth ambitions whilst reducing their water consumption to below baseline levels.

Water efficiency measures currently promoted within Newham Local Plan to move towards this water saving ambition:

a) Construction and operating standards/water efficiency ratings for buildings (commercial)
b) Construction and operating standards/water efficiency ratings for buildings (residential)
c) Rainwater harvesting (residential – private and community)
d) Rainwater harvesting (commercial)
e) Grey water recycling (potable)

Newham: High ambition scenario

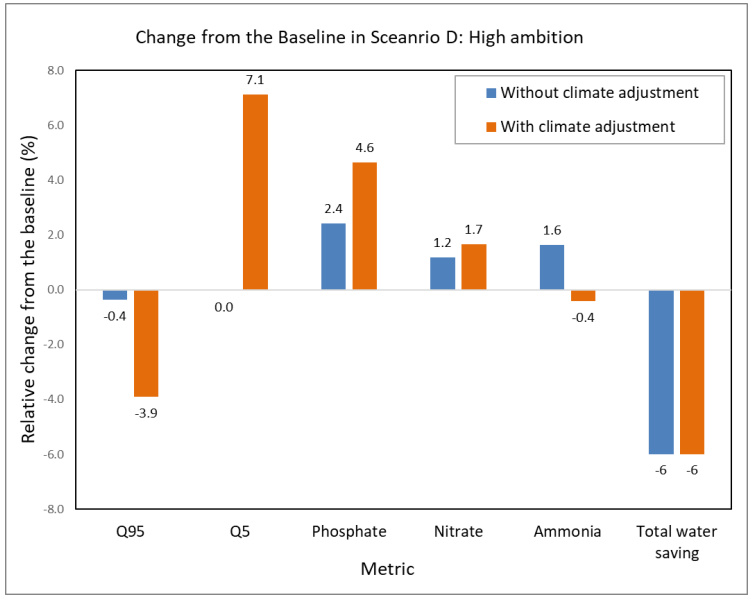
Key assumptions

- 100% uptake in retrofitting
- Population based on 2021 Census
- Most commercial development is industry based
- Based on 2050 growth projections
- Water consumption data does not account for leakage
- Mass balance modelling only enables an assessment on relative change
- Climate change scenario uses RCP2.6
- Modelling does not capture peak concentrations of pollutants and low tides
- Water efficiency measures to not consider situational characteristics or other savings outside of water

Further measures that would support water efficiency within remit of Newham's Local Plan (a-c) and other measures outside of policy remit (d-e) include:

a) Retrofit fixtures and fittings for LA housing stock
b) Additional rainwater harvesting (residential – private and community)
c) Financial incentives for customers
d) Innovative tariffs
e) Retrofit fixtures and fittings for other properties

Residential and commercial growth under high water saving ambition for the study area has minimal impacts (<8% change) to water quantity and water quality.



For more detail, see the following documents: Workstream 1 technical note, Workstream 2 technical note, risk register, water efficiency measures and case studies

Tower Hamlets: High ambition scenario

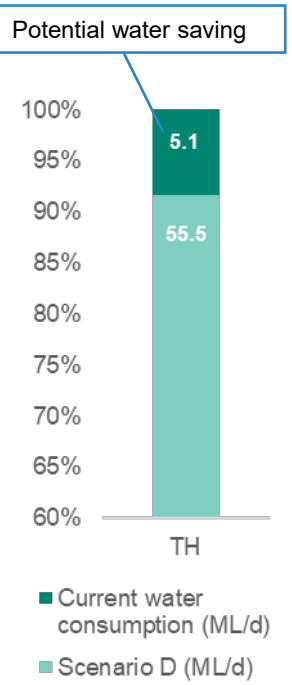
Scenario inputs (for TH only)

Residential
Current population: 310,300
Current PCC: 146l/p/d
Efficiency target (existing units): 110lp/d
Population growth projection:387,875
Target PCC for new developments: 80l/p/d

Commercial
Current water demand: 10,193 m^3/d
Projected additional demand from new offices:173 m^3/d
Projected additional demand (other): 1,560 m^3/d
Efficiency targets (existing units):15% reduction
Efficiency targets for new developments (Office based): 40% reduction
Efficiency targets for new developments (Other): 15% reduction

Description of high ambition water saving scenario

All residents in each borough have decided to retrofit their homes to maximise water efficiency and reduce the amount of water they use in their day-to-day activities. All business owners also retrofit their units to save water. Local boroughs set their own ambition for water efficiency for new development depending on their own needs and constraints. For commercial developments, there are differing opportunities to save water depending on if the development is office-based or industrial units.



This scenario would enable Tower Hamlets to implement their residential and commercial growth ambitions whilst reducing their water consumption to below baseline levels.

Water efficiency measures currently promoted within the LBTH Local Plan (a-c) and other measures outside of policy remit (d) to move towards this water saving ambition:

a) Water neutrality, offsetting, water credit schemes
b) Construction and building standards/water efficiency ratings for buildings (residential)
c) Construction and operating standards/water efficiency ratings for buildings (commercial)
d) Financial incentives for developers

Tower Hamlets: High ambition scenario

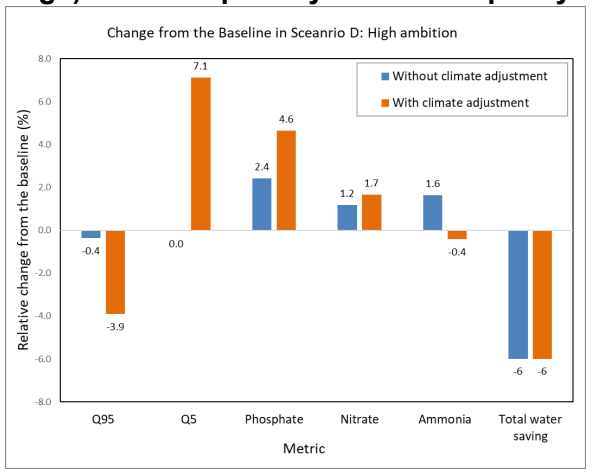
Key assumptions

- 100% uptake in retrofitting
- Based on 2050 growth projections
- Water consumption data does not account for leakage
- Mass balance modelling only enables an assessment on relative change
- Climate change scenario uses RCP2.6
- Modelling does not capture peak concentrations of pollutants and low tides
- Water efficiency measures to not consider situational characteristics or other savings outside of water

Further measures that would support water efficiency within the remit of TH Local Plan (a-g) and other measures outside of the policy remit (h-j) include:

a) Retrofit: fixtures and fittings for LA properties
b) Rainwater harvesting (residential – private and community)
c) Rainwater harvesting (commercial)
d) Education and awareness
e) Communication interventions
f) Changing user behaviour
g) Water sensitive planning
h) Financial incentives for customers
i) Innovative tariffs
j) Retrofit: fixtures and fittings for other properties

Residential and commercial growth under high water saving ambition for the study area has minimal impacts (<8% change) to water quantity and water quality.



For more detail, see the following documents: Workstream 1 technical note, Workstream 2 technical note, risk register, water efficiency measures and case studies

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Recommendations and actions

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Summary of recommendations

Share

Disseminate report to stakeholders beyond study boundary, including:

- London boroughs
- Water companies
- Developers and other committees (such as Enabling Water Smart Communities) and regulatory bodies with a role in setting and/or delivering water efficiency targets

Collect

- Data on planning applications to quantify uptake of water efficiency measures
- Water usage data to measure long-term water trends and effectiveness of water efficiency measures
- Socio-demographic data for water users (both commercial and residential) at borough level to inform impact of potential policy measures

Investigate

- Further integrated modelling for all of London to understand spatial implications of any widespread changes in water consumption
- Potential viability of different water efficiency measures to input into policy and more stringent policy targets in future iterations of local plan

Establish

- Potential cross-sector working groups to encourage uptake of water efficiency measures more widely, including funding, rebates and tariffs
- A toolkit of measures available to improve water efficiency, to align with water efficiency targets in policy

Share Actions

Action	Action owner	Timescale
Share supporting data and findings from this study with Local Authorities on wider London opportunities, strategic objectives, and targets relating to water efficiency	GLA	Short
Share outcomes of project with water companies: - Available measures suitable for retrofitting to improve water efficiency - Evidence base to support more widespread retrofitting to reduce water stress	GLA	Short
Share this report and its findings with developers and other committees (such as Enabling Water Smart Communities) and regulatory bodies to enhance understanding of wider priorities and considerations, and to avoid duplication of effort where other bodies have already taken a lead.	GLA	Short
Share common headlines with steering group members so that these can be shared internally within their organisations	GLA	Short

Collect Actions

Action	Action owner	Timescale
Collect planning data related to social and commercial water demand needs to tailor water efficiency measures	**Local Authorities**	**Medium**
Collect data on planning applications across boroughs to identify where planning applications indicate water efficiency measure are included, how they are demonstrating they meet the targets set in local plans/BREEAM and evaluate how this changes over time	**GLA and Local Authorities**	**Medium**
Collect water usage data to measure water trends, at a granularity to support boroughs with their policy making and assessment of long-term water trends and effectiveness of water efficiency measures	**Thames Water, GLA**	**Long**
Collect data from MOSL and other stakeholders who were engaged with as part of this study to get a better view of large commercial water users	**GLA**	**Medium**

Investigate Actions

Action	Action owner	Timescale
Investigate current policy shown in the area-specific water efficiency portfolios table (WS2 report) and identify opportunities to develop stretch targets for future local plan iterations	**Local Authorities**	**Medium**
Investigate viability for a range of water efficiency measures to identify which opportunities may be most suitable - local characteristics and needs will help with assessing the implications of different measures on specific site allocations	**Local Authorities**	**Medium**
Investigate integrated modelling for all of London to understand water quantity and water quality impacts to identify any trade-offs with water quality from larger changes in water consumption, and across different spatial constraints	**GLA**	**Medium**

Establish Actions

Action	Action owner	Timescale
Establish cross-sector working groups to identify opportunities between public and private organisations to help deliver water efficiency targets through consideration of technical, economic, social and policy factors. Coordinate with existing groups identified throughout the project such as BusinessLDN, MOSL etc.	**GLA**	**Medium**
Establish a toolkit of measures available to improve water efficiency, to align with water efficiency targets in policy based on the longlist provided in the WS2 report, drawing on local borough knowledge, appetite and demographics	**Local Authorities**	**Medium**

Conclusion

The integrated analysis of water demand project aims to provide:

- Evidence for planners of catchment benefits and trade – offs associated with different levels of ambition for water efficiency policy in new developments (both residential and commercial).
- Evidence for planners of catchment benefits and trade – offs associated with different levels of ambition for existing water demand reductions in existing developments (both household and non-household).

Findings suggests the very high water saving ambition scenario provides a water saving benefit which enables growth whilst having a minimal impact to low flows and on the water environment.

- An understanding of deliverability of water efficiency policy levels by identifying water efficiency measures needed (fixtures & fittings, recycling etc) for different target ambition levels.
- Context of how localised findings may fit into the wider context of planning policy across London, including considerations of spatially varying water demand targets and policy variations.

Findings suggests a suite of measures to achieve certain levels of water saving ambition are required and outlines measures available for local authorities to influence developers based on the characteristics of their area.