

Adapting to Climate Change



Update Report to the Secretary of State

December 2015



Contents

1. Introduction.....	1
2. Information on the Organisation.....	2
3. Understanding Climate Risk	6
4. Understanding Uncertainty.....	13
5. Details of actions	16
6. Addressing barriers and understanding interdependencies	18
7. Monitoring and evaluating	20
8. Opportunities and benefits	23
9. References.....	24
Annex 1 Policies and Strategic Plan.....	25
Annex 2 Review Meeting – 6 March 2013.....	37
Annex 3 Evaluation Matrix 2015 review.....	39
Annex 4 Evaluation matrix.....	42
Annex 5 UKCP09 Assumptions	45

1. Introduction

1.1. *Invitation*

- 1.1.1. The Port of London Authority (PLA) submitted its Climate Change Adaptation report to Defra in 2011. In December 2013 the Minister invited the PLA to submit a review under the voluntary approach. The PLA confirmed, in March 2014, that it would participate in the voluntary reporting round and would be submitting an updated report by the end of 2015. This report is the result of that work.

2. Information on the Organisation

2.1. Organisational Changes

2.1.1. Since the submission of the PLA's Climate Change Adaptation report in 2011 and its subsequent acceptance by Government, there have been a number of pertinent changes and initiatives within the PLA: -

- In undertaking the organisation of the Queens Diamond Jubilee Pageant and in support of the security forces stationed on the Thames during the London Olympics in 2012, the PLA accommodated unusual activities as well as formulate and refresh a number of emergency plans and systems to manage risks to the river, its users and the general public.
- The PLA has undertaken a review of its functions and activities with an aim to improve the synergy and efficiency in the delivery of its services to customers and stakeholders.
- The Strategic Plan, Environment Policy and other associated policy documents continue to be reviewed annually; the most recent versions are attached at Annex 1.
- The PLA's most recent Thames Byelaws were adopted in 2012. Those Byelaws on swimming and restrictions on vessel speed are relevant to this report.
- The PLA has developed a comprehensive risk register with standing committees chaired by an Executive Board Member that are responsible for risks relevant to the organisation in relation to Operational, Internal and External risks. The various risks and associated mitigation measures are reviewed quarterly by the

committees and the results formally reported to the PLA Board.
Climate change is included in the External register.

2.1.2. Following the retirement of Richard Everitt, Robin Mortimer was appointed the PLA's Chief Executive in March 2014. In addition to specific interest in climate change issues, Robin also chairs the External Risk Committee.

2.1.3. In early 2015, the PLA initiated an exercise to develop a 20 year vision for the tidal River Thames, engaging with the wider Thames community across many themes including infrastructure, recreation and the environment. Climate change forms a necessary context for this vision. The final vision document is expected to be published in Spring 2016.

2.2. *River Changes*

2.2.1. Since the submission of the PLA's Climate Change Adaptation Report in 2011 and its subsequent acceptance by Government, there have been a number of changes affecting the river and its use: -

- The closure of the Coryton Refinery in 2012 with the net loss of five million tonnes throughput to the Port of London meant the end of oil refining on the River Thames.
- The closure of Tilbury Power Station after its short, albeit successful, trial using biomass fuel.
- The opening of two berths at London Gateway, developed and operated by DP World, with a third under development represents the largest new major capacity in container handling in the UK in twenty years. Container ships of up to 400m in length are now visiting the terminal regularly and are the largest vessels ever to transit the River Thames.

- The Port of Tilbury has diversified its cargo and now provides a construction hub to support major construction and infrastructure projects in London and the South East.

2.2.2. Research commissioned by the PLA estimates that the Port of London generates over 40,000 full time equivalent jobs, resulting in over £4bn Gross Added Value to the regional economy.

2.2.3. The Thames within London has seen a sharp increase in passenger journeys over the last four years with 10 million passenger trips made in 2014. Last year, due to the transport of construction materials associated with the Crossrail project, saw a record 5.5 million tonnes of inland freight transported on the river, keeping over one million lorry movements off London's roads.

2.2.4. There has been an increase in the numbers of recreational users throughout the river, with research by the PLA estimating that over 5,000 rowers regularly use the upper reaches of the tidal Thames.

2.2.5. The outer Thames has seen an increase in environmental protection with the designation of Margate Long Sands SAC as a result of the valuable moving sub tidal and intertidal habitats.

2.3. *Review of Adaptation Plan*

2.3.1. The PLA has periodically reviewed the Adaptation Report submitted to Defra in 2011: –

- Undertaking an interim review of the proposed actions.
- Undertaking a formal review as part of the provision of this report.

2.3.2. As part of this update, a review was initiated into changes and/or evidence of further impacts and whether further actions were required. The minutes of this meeting are attached at Annex 2. The findings were as follows: -

- Actions proposed in the 2011 report had been mostly been completed, in addition to the completion of a number of related actions that had not been identified at the time.
- A number of new actions were also proposed.

2.3.3. The most recent evaluation was further updated to reflect the refinements in the approach to risk assessment methods now consistently used within the PLA. Additionally, a number of the risks were revised and refined to be more effective and the structure of the evaluation was expanded to demonstrate the most directly affected and influential areas of the organisation and the River Thames.

2.3.4. This evaluation, which utilised the full range of professional expertise available within the PLA, concluded that there were no significant differences in either the identified risks or required actions from those within the earlier report. The full detail is described in Annex 3.

2.3.5. The evaluation matrix prepared as part of the 2011 report was also reviewed. The updated matrix is attached at Annex 4.

3. Understanding Climate Risk

3.1. *How has your understanding of climate risks, impacts and their effects on your sector/organisation and stakeholders advanced since your first round report?*

3.1.1. While the PLA had, following its previous assessment, an understanding of the severity of both high and low fluvial flows on navigation in the upper reaches of the River Thames, the probability of such an event requiring intervention came much sooner than expected in the winter of 2013 – 14. The very high levels of fluvial flow coming over Teddington Weir, combined with the strength of the ebb tide, had a very major and adverse effect on navigation, particularly on rowers, as can be seen from Figure 1. However, as a result of considerations made during the preparation of the 2011 report, the PLA was able to manage the risk likelihood by swiftly implementing appropriate mitigation measures.



Figure 1 – Still from RNLI footage of a rowing eight pinned under a moored vessel in Hammersmith during the ebb tide at the winter of 2013.

3.1.2. As can be seen from Figures 2 and 3, the volumes of water arriving at Teddington from the non-tidal river entering the tidal Thames during the 2013 – 14 winter

were exceptional, less for the peak volume, but for the sheer longevity of high flow. Those rowing on the tideway were, for the most part, completely unused to these conditions, especially when the flows were combined with the ebb tide, which is stronger than the flood tide, and flowing in the same direction as the fluvial flow.

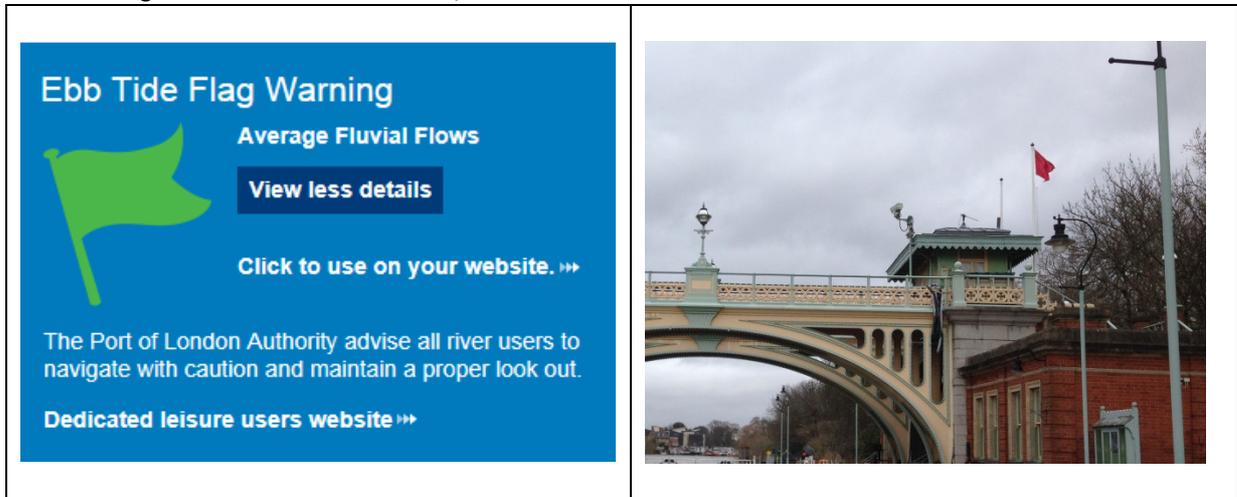


Figure 2 - Flooding in the Upper District, caused principally by fluvial flows, winter 2013 – 14.

3.1.3. Following incidents the PLA, in conjunction with rowers and their representatives, initiated a set of flag ‘warnings’ to notify those participating on the tideway of the current conditions. Although the approach taken was not proscriptive, the guidance offered was generally well adhered to and incidents reduced accordingly. The system remains in place on the PLA website and on the river itself, as can be seen in Table 1. The 2011 Adaptation Report, which first alerted the PLA to the possible issues associated with high (and low) fluvial flows on navigation, enabled

the Authority to consider appropriate mitigation measures, albeit that these were required somewhat sooner than initially considered within the 2011 report.

Table 1 - Flag indicators on the PLA website, and at Richmond Lock



3.1.4. The extensive data now available to the PLA on the River Thames and its users, together with the 2011 report, has identified that it's not only the wet winters that might affect navigation on the Thames. Whilst severe weather can cause significant negative impacts, prolonged periods of hot weather will result in greater numbers of recreational users visiting the tidal River Thames, increasing the risk of incidents, including collisions and groundings.

3.1.5. Habitat loss was identified as a result of coastal squeeze during the development of the TE2100 plan by the EA and has been further supported by the IPCC (2014) and the Adaptation sub committee of the Climate Change Committee (2014). However, the TE2100 project will be looking to offset space for habitat where socially or economically critical protection is not required, and is continuing to review whether all interventions are still necessary based on current observations.



Low winter flow over Teddington Weir – 4 cumecs. 4 December 2011



Normal winter flows over Teddington Weir – 40 cumecs. 17 December 2011



Exceptional winter flows over Teddington Weir – 500 cumecs. 10 February 2014

Figure 3 – Flows over Teddington Weir in periods of low, normal and exceptional fluvial flow; the bottom picture was experienced throughout the 2013 – 14 winter.

3.2. *What climate change evidence or research have you used to better understand the implications for organisational functions?*

3.2.1. The 2011 report was based on very accurate and robust forecasts as a result of the EA's work for its TE2100 project. The PLA is, following a review of the data, content that these forecasts are still valid and so has not undertaken any additional research or sought further evidence into possible climate change scenarios. Using existing and available climate change research, the PLA has kept abreast of the predictions for additional relevant conditions including fog and wind.

3.2.2. The Met Office review of the UKCP09 projections highlighted that, whilst mostly still relevant, further projections need to be taken into account in relation to rainfall. Climate Modelling Inter-comparison Project (CMIP5) confirms that there is a predicted reduction in average summer rainfall but further predicts that the reductions are less (i.e. CP09 is the worst case), and a larger chance that the rainfall will remain comparable with today. In view of this, the PLA considers the assumptions it included within its 2011 report and attached at Annex 5, to remain the worst case scenario for this review.

3.2.3. Improved data collection since the 2011 report' has included the EA's fluvial flow data collected under the Lower Thames Operating Agreement (LTOA). This has highlighted low flows in summer creating reduced depths and increased winter flow rates. These both impact on recreational use in the upper reaches of the tidal River Thames.

3.3. *Has your understanding of thresholds of climate impacts advanced to better pinpoint organisational vulnerability? If so how?*

3.3.1. The thresholds are now better understood across the organisation, as PLA operations become affected. The events of the 2013 – 14 winter and the subsequent PLA response, shaped as it was by the 2011 Adaptation Report, assisted considerably in this regard. Increased awareness has focussed efforts to pinpoint vulnerability, including the review of risk registers and business continuity planning.

3.4. *How have you developed your quantified assessment and analysis of risk likelihood and impacts?*

3.4.1. Since the 2011 and 2013 interim evaluations, the PLA has increased its understanding and refined the use of risk assessments across the organisation, including better definition of risk. Minor revisions to risks were made in the 2015 review, principally by merging or clarifying risk definition. Additionally, there were very few new risks that required mitigation by existing actions and no new actions have been highlighted.

3.4.2. Both severity and probability of risk have also further been defined. In terms of severity, the definition of the impact upon organisational or operational activity was clarified. The probability was also addressed, with a definition of the period in which the impact will be felt (1 – 5 years as the short term and up to 2080 for the long term).

3.4.3. The result of this exercise was the creation of five categories for severity and probability, creating a matrix of 25 possible outcomes, providing low, medium and high overall risk, as can be seen in Figure 4.

Climate Change Adaptation Matrix

Severity or consequence of impact	Likely to threaten the survival or effectiveness of the organisation, likely to have major impact of whole operation	5	5 Low	10 Medium	15 High	20 High	25 High
	Significant impact on the organisational strategy or operational activities, likely to have major impact on many areas of business	4	4 Low	8 Medium	12 High	16 High	20 High
	Moderate Impact on organisational strategy or operational activities	3	3 Low	6 Medium	9 Medium	12 High	15 High
	Primary impact on the internal business, likely to have minor effect on many areas	2	2 Low	4 Low	6 Medium	8 Medium	10 Medium
	No Significant Impact on business as a whole	1	1 Low	2 Low	3 Low	4 Low	5 Low
			1	2	3	4	5
		Longer Term (to 2080)	Long Term (20-50 Years)	Medium Term (10-20 Years)	Short Term (5-10years)	Very Short Term (1-5 years)	
Probability short or long term impact							

Figure 4 - New Risk Matrix for Climate Change evaluation.

4. Understanding Uncertainty

4.1. What uncertainties remain in monitoring and evaluating climate risks to your sector's/organisation's functions?

4.1.1. Assumptions previously centred on the evidence base used in the 2011 report remain, as this review still relies upon the CP09 projections and modelling undertaken by the EA for the TE2100 project. As the EA's flood risk project for the Thames Estuary develops and further monitoring is undertaken, it is likely that uncertainties could be reduced, although with such long forecast timescales, there is always likely to be a degree of uncertainty.

4.1.2. As Figure 5 indicates the Thames Barrier has been used more regularly for both fluvial and tidal flooding, although in recent years fluvial events have been predominant. The PLA is evaluating, with the EA and operators, the impacts of more frequent closures on river trade and transport and continues to work with the EA in liaison with the river users to minimise the impact where possible.

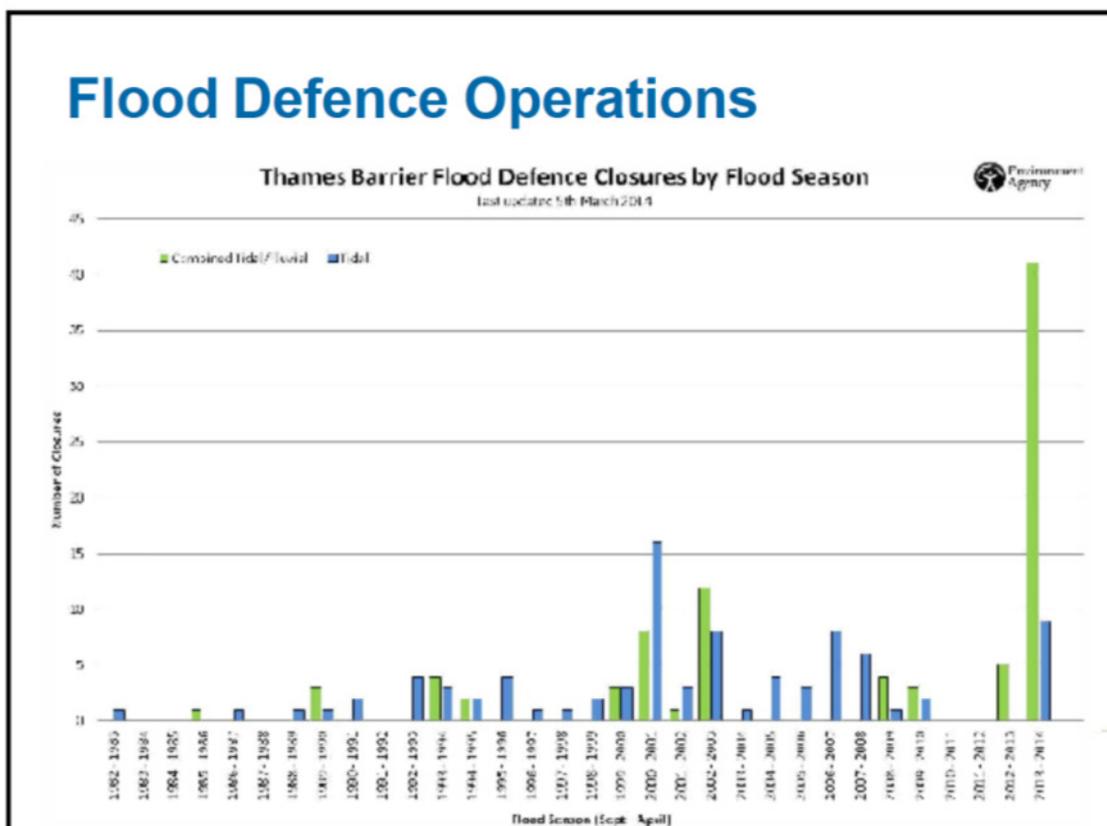


Figure 5 - Thames Barrier Closures since 1982. Note the high number of closures in 2013 – 14.

4.2. *What new uncertainties have come to light?*

- 4.2.1. Tidal surges were identified a risk in the 2011 assessment. Although these events have occurred subsequently, they have had only limited impact on the tidal River Thames. Should a surge coincide with high tide, and inclement weather also caused by a low pressure funnelling down the North Sea, it has the potential to have effect on operations on cargo-handling operations on the River Thames and PLA operations.
- 4.2.2. The prediction of these events and their severity is still under development and therefore, at this point, remains uncertain. The flood warning systems available from the EA and the Met Office have, to date, been used to help manage the scale of the impact on the River Thames.
- 4.2.3. Notifications of closures of the Thames Barrier are sent out by the PLA and EA to river operators and predicted events where high tides and surge events coincide. However the principal uncertainty for the organisation is centred on the lack of any coordinated approach as to how operators collectively react to a severe event.
- 4.2.4. As the terminals within the Port of London are all in private ownership, the PLA's activities in relation to them is the provision of pilotage and VTS services to maintain navigational safety, which would itself be critical in surge tide events. It is currently unclear how different emergency service and land owners will respond to such incidents and their impact upon the PLA and its statutory duties.

4.3. *What further implications do uncertainties have on action you sector/organisation has taken or plans to take?*

- 4.3.1. Using the TE2100 predictions of climate change used in the 2011 report, the PLA has taken an active role in bringing experts and industry together consider the impact of tidal surge to the Thames, whilst accepting uncertainties over their probability and severity.

4.4. *What progress have you made to address information gaps?*

4.4.1. The PLA did not identify any information gaps within the submitted (2011) report. Whilst some adjustments were made to the risk assessment as part of this review, no additional information gaps were identified.

4.5. *What are the strategic business and methodological assumptions that underpin your analysis of impacts and risks?*

4.5.1. The previous assumptions used the PLA were based on the predictions by CP09 and TE2100 and are attached at Annex 5. The Met Office has reviewed more recent models and still believes CP09 is acceptable, even with CMIP5 as it provides the most extreme cases to manage. The PLA will continue to review various model data where relevant as part of its commitment to continued monitoring.

5. Details of actions

Table 2 - Implemented Actions

Summary of actions (as set out in first round report)	Timescale over which actions were planned	Progress on implementation of actions	Assessment of extent to which actions have been mitigated risk	Benefits/Challenges experienced
Towpath Tree management	10-50 years	The PLA's Tree Management plan has been implemented and works are carried out on a regular basis	Having the management plan in place rather than working reactively has managed the impact on the business but risk of tree works being needed as a result of climate change has not reduced. Tree species that were selected for replanting were considered for their 'adaptation ready' characteristics	Good planning has reduced the risk of fallen trees, and significant damage to property and people. It is also a cost effective mechanism.
PLA approach to climate change		PLA's External Risk register considered Climate Change. Registers are reviewed by the committee on a regular basis and are approved by the PLA Board	Acknowledgement of additional actions such as ebb tide flags and east coast surges have been evaluated.	Increased awareness of the staff across level increasing organisational ability to prepare and respond.

5.1.1. During the review of the 2011 report, it was apparent that most of the actions had been completed. Monitoring is a continual requirement of the PLA and will therefore remain in the risk assessment as an action.

Table 3 New Actions

Further or new actions planned	Risks addressed by action	Timescale for new/further actions planned
<p>New action -Ebb tide flags. Already completed</p>	<p>Risk of increased rowing incidents during times of high flows due to the combined ebb and fluvial flows.</p> <p>Electronic and physical flags indicating to users the level of water as at 0600 at Richmond;</p> <p>Below Chart Datum - black flag</p> <p>At Chart Datum – green flag</p> <p>Over 1.7m above Chart Datum – yellow flag</p> <p>Over 2.5m above Chart Datum – red flag</p>	<p>Implemented during the floods in winter 2013/14</p> <p>The system has now been found to be useful during periods of low flow and the black flag is used regularly to increase awareness of rowers and other river users of shallow waters.</p>
<p>New action- Review of contingency & resilience in the event of an east coast surge at the same time as the related unsettled or stormy weather of a Low Pressure moving south down the North Sea.</p>	<p>Internally, the PLA has prepared for another winter season having reviewed the business continuity plans, and highlighting weaknesses</p> <p>Awareness of the scale of the issues with other events, and ports increasing focus on managing the problems.</p>	<p>Review of plans ready for the winter, to prepare any severe events.</p> <p>Ongoing monitoring and understanding will continue to contribute to understanding.</p>

6. Addressing barriers and understanding interdependencies

6.1. *Where you've identified interdependencies, how have these assisted or hindered actions to address climate risk?*

6.1.1. The interdependency with the Environment Agency was identified in the 2011 report and remains of crucial importance following this review. The relationship has been developed between the two organisations to increase awareness and data sharing with regard to fluvial and tidal flow levels - both low and high - and increased risks arising from flooding events on the Thames. The increased levels of data sharing have been beneficial to both organisations in operational activities and strategic planning. This relationship will be under review as the TE2100 project develops and relevant projections and observations made available.

6.1.2. Resilience forums are now regularly attended by PLA technical staff which has helped to develop emergency plans that are practicable and necessary. This has assisted internally with increasing awareness of the PLA's role, but work remains to be done to improve collective understanding.

6.2. *What were the main barriers to implementing adaption action and why?*

6.2.1. Section 6.1 of the 2011 report noted that there was a lack of awareness of the likely impacts of climate change amongst the wider river community which was exacerbated by the number and diversity of stakeholders. The PLA has been working throughout the range of resilience forums and other stakeholder groups to improve awareness amongst these groups. This work continues.

6.2.2. Understanding the consequences of an east coast surge event is an emerging risk that has developed following the major events of 2014, particularly in the River Humber. The scale of a possible event and the likelihood are a challenge to evaluate and as such create a barrier to implementation in relation to preparedness and risk evaluation.

6.3. *Have new barriers been identified? Are these being addressed? If so, how?*

- 6.3.1. The lack of a single point of coordination on emergency or contingency planning for the extremes of weather and the resultant impact on infrastructure providers across the estuary has been identified as a new barrier. Work is ongoing with the DfT and relevant stakeholders on this issue.

7. Monitoring and evaluating

7.1. *How effectively has consideration of climate change risks been embedded within your section or organisation?*

7.1.1. The PLA has been able to thoroughly embed climate change within the organisation in a number of ways: -

- Climate change adaptation is within and will be reviewed by the External Risk Committee and subsequently reviewed by the PLA Board.
- The PLA monitors and records tidal heights, fog and carries out regular bathymetric surveys and this data is now, in addition to operational requirements, used as part of its climate change monitoring programme.

7.2. *How effective have organisational monitoring and evaluation processes been to ensure adaptation responses are implemented and on track? If these have not been effective, what barriers prevented this?*

7.2.1. The identified risks continue to be monitored, both specifically and within the context of the PLA's External Risk Committee to provide the organisation with the appropriate planning tools and information.

7.2.2. Monitoring of tide heights, flows and river depths prompted the early implementation of the ebb tide rowing flags in the upper district; this mitigation was implemented directly as a result of the 2011 report.

7.2.3. Working collaboratively with the Thames Regional Rowing Council (TTRC) helped the PLA to identify where the issues arose and to secure appropriate actions. Collectively, the PLA & TTRC were able to communicate quickly and appropriately with individual rowers.

7.3. *How effective were monitoring and evaluation processes in determining how the organisation/sector handled recent extreme weather conditions?*

7.3.1. Monitoring fluvial flows identified the risk to rowers for high flows initially, but experience in using the ebb tide flag system has shown that there is not only a need to identify high flows, but also low flows and the resultant hazards to navigation from shallow water.

7.3.2. The combination of increasing leisure use and predicted lower flows caused by drought means it is expected that the black flag will become increasingly important in protecting river users from grounding.

7.3.3. Wider communication of the increase of the high and low water levels to all users is an ongoing priority to the PLA.

7.3.4. While tidal heights both predicted and actual can be reported via VHF broadcasts to vessels in the port, the impact of fog can only be evaluated on site, and then communicated more widely to the Port.

7.3.5. The evaluation matrix shows that regular bathymetric surveys identify chart corrections for users. However, the level at which a change might require reporting are currently set for large vessels with significant drafts. The PLA is monitoring changes and may in the future consider that a significant change to a rower will be very much less than larger vessels.

7.3.6. Surveys of the river, the calibration of tide boards and promulgation of the relevant information changes will continue to assist stakeholders.

7.4. *Has the sector/organisation identified any financial benefits from implementing adaptation actions? Perhaps through cost benefit analysis, fewer working days lost, more efficient operations etc.?*

7.4.1. There has been no specific savings to the business identified by implementing adaptation actions. However there is a significant reputational benefit: -

- Avoiding collisions and/or other incidents by planning with climate change adaptation embedded within relevant risk registers.
- Developing actions proactively to minimise impact on users and PLA operational during extreme events.

7.5. *Has there been sufficient flexibility in the approach to adaptation within the sector/organisation, which allowed you to pursue alternative courses of action? If not what remedial measures could you take to ensure flexibility?*

7.5.1. The approach set out in the 2011 report has provided the PLA with flexibility to plan and act accordingly.

8. Opportunities and benefits

8.1. *What action have you taken to exploit opportunities?*

8.1.1. The ebb tide flag system provide a good example of using the opportunities as they arise. There was a significant need to act quickly and the 2011 report provided the basis for the resulting swift implementation; the issue had already been identified and consideration given to it and appropriate mitigation measures. The system takes advantage of data produced by the PLA which reduces any reliance on interdependencies.

8.1.2. Being aware of updates and projections through our partnership working allows for collective awareness within the organisation, which in turn allows the flexibility to take opportunities at short notice.

8.2. *How effective were your efforts?*

8.2.1. Monitoring of the issues identified in the 2011 report has demonstrated that the issues considered and actions proposed have been effective.

8.2.2. Since the ebb tide flags have been introduced, there has been a corresponding reduction in navigational incidents resulting from tidal flows. Additionally, the tree works are now managed on a regular basis which prevents the need for significant interventions and reduces the risk of damage to property and persons. Tidal surges are being monitored and the PLA is preparing for any significant events.

8.2.3. The actions implemented according to the 2011 report and indeed the act of preparing it, have been beneficial to the PLA and the users of the tidal River Thames. This review will continue the progress already made.

9. References

Brown, R. 2014. Transport Resilience Review. [A review of the Resilience of the transport network to extreme weather events](#). Department for Transport

MCCIP, 2013 [Marine climate change impacts](#). A report card

The CCC, 2014 [Managing climate risks to well-being and the economy](#). Committee on Climate Change.

IPCC, 2014. WORKSHOP REPORT IPCC AR5: [Lessons Learnt for Climate Change](#) Research and WCRP

Port of London Authority, 2011. Adapting to climate change.

Port of London Authority, 2015. River Thames [Economic Impact Report](#)

Port of London Authority, 2015. Adding Value: [The River Thames Public Amenity](#)

Annex 1 Policies and Strategic Plan

PORT OF LONDON AUTHORITY

ENVIRONMENTAL POLICY

As a statutory harbour authority, licensing authority and significant landowner for the tidal Thames, the Port of London Authority (PLA) has environmental duties under the Harbours Act 1964, Port of London Act 1968 (as amended), and the Countryside and Rights of Way Act 2000. The PLA is a competent authority under the Conservation of Habitats & Species Regulations 2010 (as amended), and has a range of other environmental duties and obligations under European and domestic legislation. We have a dedicated environment team integrated into the wider organisation.

In discharging our roles, we are committed to compliance with all applicable environmental legislation and other relevant requirements in the pursuit of our duties and powers. Our mission is to conserve and improve the tidal Thames alongside its use as a thriving port and waterway. We are committed to the sustainable development of the river and estuary in accordance with the Marine Policy Statement. It is the Board's policy that we will:

- Maintain an Environmental Management System (EMS) to assess the impacts of the PLA's activities on the environment and, monitor and audit the EMS and its effectiveness for all significant PLA properties and areas of activity.
- Provide appropriate management of the estuary and our estate particularly within designated conservation sites.
- Maintain our accreditation as a European Sea Ports Organisation (ESPO) EcoPort, following the relevant parts of the ESPO Green Guide.
- Implement the recommendations contained in our Adapting to Climate Change report and keep it under review.
- Commit to prevent pollution, particularly from oil products, whilst maintaining a high level of preparedness and taking appropriate action to deal with any incidents, including through the Thames Oil Spill Clearance Association.
- Pursue efficiency in energy and waste reductions where practicable. Monitor and maintain the carbon footprint of our operation and meet our 25% reduction target from our 2014 baseline by 2020.
- Communicate this environmental policy to all staff, contractors and suppliers and provide guidance and appropriate training where necessary.

We are committed to continuous improvement in our performance, in our use of resources to accomplish this, and to maintaining our registration under the ISO 14001:2004 environmental standard.

This environmental policy was approved by the PLA Board on 9th April 2015 and will be reviewed annually.

Robin Mortimer
Chief Executive



PORT OF LONDON AUTHORITY

STRATEGIC PLAN

ORIGINALLY DEVELOPED: 2010

THIS SUMMARY VERSION: 2014

(UPDATED AFTER MANAGEMENT REVIEW MEETING 4 MARCH 2015)

Note added 6 March 2015

During 2015 we will be developing and consulting on a Vision for the tidal Thames. The resulting Vision and stakeholder views gathered in a value-creation review by Ernst & Young are likely to shape the future direction and priorities of the PLA. A full review of the PLA Strategic Plan is likely to take place during Q2/Q3 2016. In the meantime, the objectives of this Strategic Plan, developed in 2010, stand.

Introduction

The PLA's primary purpose and key role is to manage the safety of navigation on 95 miles of the tidal Thames. This is a complex and diverse waterway, with leisure, primarily in the west, a major passenger and freight operation through the complex of bridges in central London and the UK's second largest port in terms of tonnage handled.

The port is an engine for growth of the south east economy, with significant potential in the London Gateway scheme and other developments. The growth and operations of the port seldom raise major issues and generally relations with operators, shipping lines and local authorities are good.

The PLA aims to be 'a constructive and expert safety regulator, developing its expertise as an authority on the environment of the Thames and actively supporting the development of passenger and freight traffic in central London in particular'.

This document explains how the PLA will fulfil its wide range of responsibilities on the river, in the interests of river users.

	PLA STRATEGIC PLAN Owner – Chief Executive Editor: Director of Corporate Affairs	No. ML1308 Issue: 06 Date: 06/03/15
---	--	---

PLA STRATEGIC PLAN: OUTLINE

A. VISION

A vibrant, safe and sustainable river

B. MISSION

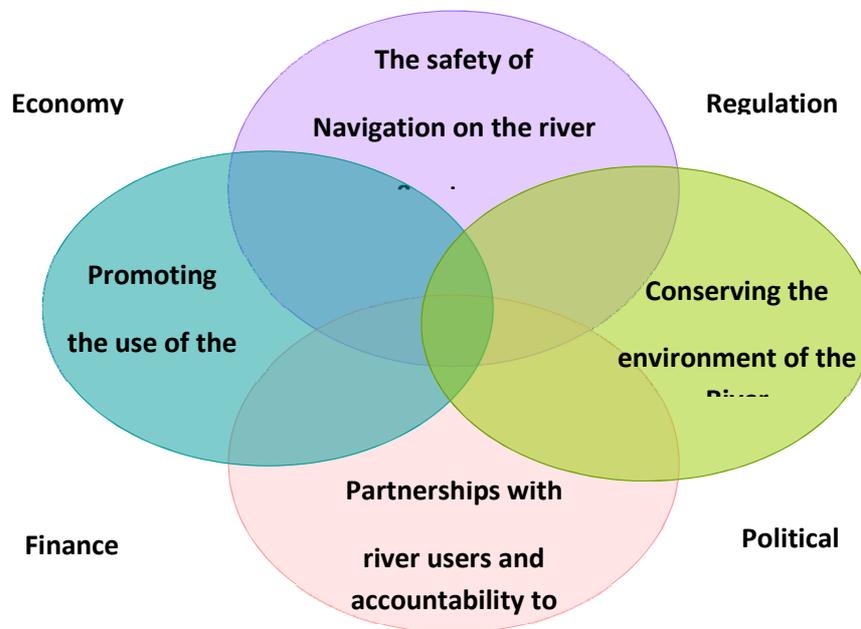
A leading harbour and pilotage authority – safe, sustainable and accountable.

C. OUR STRATEGY IS TO...

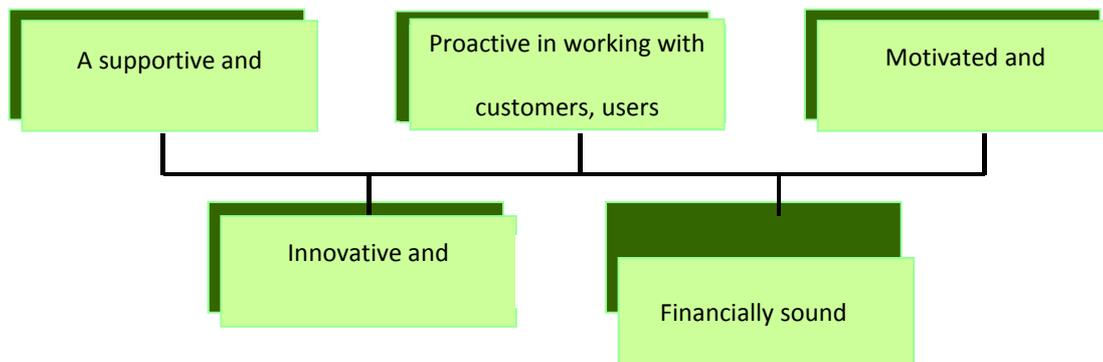
Ensure the safe and sustainable use of the Thames and the port, increasing freight and passenger traffic on the river and its enjoyment for leisure and amenity

D. STRATEGIC PRIORITIES

- The safety of navigation on the river and estuary.
- Conserving the environment of the river and PLA land.
- Promoting the use of the port and the river.
- Partnerships with river users and accountability to stakeholders.



E. OUR VALUES



Our goals are:

Safety

- to be the leading harbour and pilotage authority in the UK: the organisation that other harbour and pilotage authorities and external parties look to as a measure for best practice;
- to ensure the highest standards of navigation safety are practised on the Thames and its Estuary;
- apply rigorous risk management to benefit all users of the river

Environment

- to be an authority on the environment of the Thames and its estuary, using our knowledge and skills to support its sensitive management;
- protecting the marine environment of the Thames
- reduce the environmental impact of our operations;
- Work through the planning system to secure riverside uses that are compatible with growing passenger and freight transport on the river.

River use

- lead initiatives to increase freight and passenger transport and sports on the river and support the terminals to grow trade in the Port;

Stakeholder engagement

- be an open organisation meeting the needs of customers and users and engaging effectively with, and being accountable to, the many stakeholders on the river;

Employees

- ensure we have a well motivated and trained staff and a culture that embraces the highest possible operational standards, leading health and safety practices, good teamwork, flexibility and innovation to meet the changing demands of a growing river, port and estuary;

Finance

- be financially sound with a cost structure that enables us to charge prices that represent good value for money

More on our Strategic Priorities

C.1. The safety of navigation on the river and estuary

- The management of navigation safety on the tidal Thames and the Estuary is the core activity of the PLA.
- Our aspiration is to be a leading harbour and pilotage authority in the UK, operating to world class standards. This will be judged by our ability to be a 'safe pair of hands', while being innovative in traffic and capacity management, and maintaining our good reputation in this field.
- The complex nature of the traffic in the Port and in different parts of the river and estuary means that our systems, practices and expertise need to be tailored to the circumstances prevailing in the relevant part of the river.

Key actions

- Ensure that PLA staff portray the organisation as a willing and adaptable organisation to all river users
- Continuously develop our Safety Management System to identify and mitigate new and emerging risks in order to meet our PMSC obligations.
- Ensure that we produce a high quality three-yearly Marine Safety Plan in accordance with the requirements of the PMSC
- Licensing of river works to ensure that navigational safety is maintained.
- With other organisations on the river, e.g. tug companies, major terminals, boat operators, etc.; identify risks and appropriate mitigation practices.
- Ensure that we have an appropriate number of pilots to meet anticipated future demand.
- Maintain an up to date Vessel Traffic Services for the provision of effective vessel traffic management within the port.

Benchmarks for measuring improvements

- Number of navigational safety incidents compared with other similar ports (we are already playing a leading role in getting DfT to develop a national system).
- Regular external audits of our safety management system (already an established part of the programme).
- Complaint, comments and compliments from the public (via management systems feedback reports)

C.2. Conserving the environment of the river

The PLA will be a champion for a healthy and sustainable river and estuary by:

- Granting licences for activities in, on or over the river, including dredging, to safeguard the marine environment
- Managing our environmental responsibilities as an operator on the river, the owner of much of the river bed and also riparian land part-located in sensitive areas such as Cliffe Marshes to ensure best practice standards are met.

With a reputation as leader in the ports sector for competence in handling port-related environmental issues, we will have an expert environment team. We are the leading authority on the environment of the river and its estuary and a reference point for other agencies with associated environmental interests. Our particular strength will be in sustaining the river corridor for the greatest public benefit.

Key actions

- Reduce our carbon footprint by at least 50% overall, based on 2005 levels by 2020.
- Maintain up to date plans liaising with other authorities to respond to emergencies in order to ensure the protection of the environment
- Prepare plans to improve our resilience to the implications of climate change in London in accordance with the adaptation process instigated by DECC.
- Continue to support the work of environmental charities on the river: Thames21 and Thames Estuary Partnership
- Work with the United Kingdom Major Ports Group (UKMPG), British Ports Association – (BPA) and the European Seaports Organisation to develop environmental codes of practice.

Benchmarks

- Annual comparison of PLA carbon footprint against 2005 (baseline)
- Stakeholders' opinion of PLA environmental capabilities through periodic audit
- Tonnage of driftwood recovered from the Thames

C.3. Promoting the use of the port and the river

The PLA is a passionate advocate for increased use of the river, working with partners including our Government lead, the Department for Transport, the Mayor of London, the Greater London Authority, Transport for London, terminals, shipping lines and river operators.

Use of the river falls into five broad categories:

- Port/trade related
- Inland waterways freight
- Passenger services
- Recreation
- Events

Key actions

- Providing expert, practical advice to river users on how best to make use of the river to achieve their ambitions, safely.

Benchmarks

- Tonnage of goods moved through the port
- Tonnage of materials moved on inland waterways
- No of passenger journeys made
- Tidal Thames Navigators Club membership
- Visits to Boating on the Thames website
- Number of sporting/recreational events

C.4. **Partnership with river users and accountability to stakeholders**

The PLA is committed to working in partnership with and being accountable to river users and the wider community. Clear, open and honest dialogue is the hallmark we aspire to for our relationships.

We focus our efforts on realising the full potential of the river and its estuary. Through building the understanding of politicians, partners and stakeholders we promote and support the safe growth on the river of freight and passengers movements as well as sporting/leisure activities and amenity.

Key actions

- Continued, active engagement with principal stakeholders listed below.
- Open engagement with all those interested in the river, either as users or members of the public through annual stakeholder forum, specific navigational fora, or public open meetings.

Benchmarks

- Monthly feedback reports to ExCo
- Periodic stakeholder audits

Principal stakeholders



D. OUR VALUES

This section considers the development of the PLA's culture. We have a regulatory role which we must discharge in a fair, consistent and transparent way. It inevitably involves restrictions e.g. the speed limit and occasions when we refuse an initiative for sound safety reasons

D.1. Expert Partner

Within the PLA we have a broad range of skills and knowledge in marine and associated disciplines including: Harbour mastering, Pilotage, Vessel Traffic Services, Hydrography, Marine services, Marine engineering, Navigation systems, Planning and Environment.

Our deep 'corporate' knowledge of the river and the requirements for operating all types of craft on the river from large ships to passenger boats to sculls, enables us to support operators whose primary activity may not be marine-based, e.g. Crossrail, Network Rail, Thames Water, etc. to use the river as part of their logistics.

Where we act as a regulator it is vital that people have confidence in our decisions and the process leading to them. We also need to ensure we have the ability to deliver difficult messages in an understanding and reasoned way, e.g. the refusal of swimming in the river in Central London.

Key actions

- be a respected safety regulator making decisions which users and operators generally accept are soundly-based and well-reasoned;
- provide an excellent pilotage service.
- be an open and accessible organisation where users have confidence to draw on our wide expertise;
- To be seen as a 'good partner' to the various interests on the river

D.2. Motivated and well-trained people

The PLA is a relatively small organisation with a very wide range of activities and consequently a lot of different specialists. The value we have to share is founded in our employees' knowledge and expertise.

Key actions:

- Continue the drive to ensure that our people benefit from continued specialist training.
- Provide career development opportunities and generic training to broaden the skills of our people.

D.3. Leading Health & Safety practices

- We work to the highest operational standards, with processes founded on leading health and safety practices.
- Our approach to Health & Safety is underpinned by an OHSAS 18001-certificated Management System which targets continuous improvement in performance.
- Our Golden Rules are the cornerstone of Health & Safety in the PLA.

PLA Golden Rules

You and I:

- Comply with the law, standards and procedures
- Intervene in unsafe or non-compliant situations
- Look after one another's safety

D.4. Innovative and Technical Leaders

The PLA has a heritage of bringing innovative approaches to its operations, founded on technical leadership and our marine understanding.

Key actions:

- Sustain our innovative approach and leverage it to the benefit of the PLA and wider river community.

D.5. Open and Responsive

We have a great advantage in being a small organisation where people can quickly find out who to contact.

Key actions:

- In our interactions with people we will be:
 - Speedy, timely responses.
 - Friendly
 - Plain English
 - Succinct
 - Courteous and polite
 - And we will never use 'the Act' as an excuse
- Where plans or proposals conflict we will ensure that we have sound and well reasoned explanations for our decisions which are communicated effectively to all interested parties.

D.6. Financially Sound

Our goal is to be prudently financed. Normally debt-free, but where debt is taken on, interest charges should be covered at least five times.

Key actions:

- Target level of retained earnings of £2 million per annum excluding one off exceptional costs
- Minimum cash reserve of £10m, with a Treasury policy that is prudent and regularly reviewed by the Audit Committee

Annex 2 Review Meeting – 6 March 2013

In March 2011, the PLA submitted a report to Defra, 'Adapting to Climate Change', in response to their request as part of their national Climate Change adaptation programme. The meeting on 6 March 2013 was held to review the actions proposed in the original PLA report, discuss if there had been any evidence of climate change impacts since March 2011 and consider if any further actions were needed.

Present:

Alan Cartwright, Head of Marine Engineering

Alistair Gale, Director of Corporate Affairs (Chair)

Nicola Jenkins, Environment & Management Systems Manager

Chris McQueen, Harbour Master (Lower)

John Pinder, Port Hydrographer

Garry Shaw, Navigation Systems Engineer

James Trimmer, Head of Planning & Partnerships

Apologies: Jim Denby, Marine Services Manager

Notes:

Actions

The actions set out in Annex VII of the PLA report were reviewed. The immediate actions had been completed:

Changing the species of trees being planted between Beverly Brook and Kew Bridge to ones better suited to the expected climate change.

Adding climate change to the Risk Register (Secretary's Department).

Continued monitor of data that would indicate climate change impact on the river.

Monitoring

It was agreed there was no evidence of climate change on the river since the meeting two years ago; we will continue to monitor this (with the Hydrography team as lead)

London is not included in the top twenty cities listed in a recent report, Ranking of the World's Cities Most Exposed to Coastal Flooding Today and in the Future. (The report was completed as part of an OECD project on Cities and Climate Change.)

Evaluation Matrix (PLA Report Annex VII)

Other actions noted in the Annex but not as a priority had been completed, including:

Better management of swimming related risk through the introduction of greater controls in the new Thames Byelaws

Better management of speed related risk through the introduction of greater controls in the new Thames Byelaws

It was noted that other actions not captured in the Annex has been completed since March 2011 and had increased PLA resilience to climate change, including:

New radar systems being better able to provide data in heavy rain.

Completion of a river traffic study (middle district), with no climate related use patterns identified

Denton Wharf resilience being improved as a result of improvements to the quay and quay wall

Additional actions agreed

Environment Agency data on fresh water flows over Teddington Lock should be provided to Jim Deeny in his new role as Richmond Lock Manager – action: Nichie Jenkins

Monitoring climate change and its impact should be added to the PLA's Environment Policy – action: Nichie Jenkins

Climate change should be added as a specific agenda item for regular PLA and Environment Agency meetings – action: Nichie Jenkins

Conclusion

The principal action around climate change is continued monitoring.

It was agreed that, in line with recommendations in the 2011 report, a note of this meeting should be referred to the Board through the Chief Executive's report and that mention of this review should be included in the 2012 Annual Report.

Next meeting

The next review meeting will be held in March 2014. (post meeting note- 2014 meeting not held as review process had begun for updated submission)

Annex 3 Evaluation Matrix 2015 review

In 2015 the PLA reviewed the existing Evaluation matrix drafted in 2011. Following the previous approach and in order to fully harness the expertise within the PLA, a workshop was held where staff could consider, discuss and review;

- the extent and timing of climate change on the tidal River Thames;
- the PLA's operations and duties likely to be affected by climate change;
- the likely timing and severity of these climate change risks; and
- how the PLA should plan in the short and long-term.

The PLA is now familiar with risk assessment and it was agreed to bring the evaluation matrix into a more familiar format than that presented in 2011, so a 5 by 5 matrix has been developed for the risk evaluation (Figure 1). This is the process under which the evaluation has been completed.

Senior Managers representing the following functions of the Port of London Authority were invited to the session facilitated by the Environment team:

- Harbour Master for the Upper District;
- Deputy Chief Harbour Master (acting as HM for the Lower District);
- Deputy Harbour Master (Safety Management);
- Navigation Systems Engineering;
- Vessel Traffic Services;
- Civil Engineering;
- Marine Engineering;
- Corporate Affairs;
- Hydrographic Surveying;
- Planning;
- Estates & Facilities Management;
- Pilotage;
- Finance (including Risk Register);
- Environment;
- Management Systems;
- Marine Services;
- East Coast Surge Tide Project officer.

Climate Change Adaptation Matrix							
Severity or consequence of impact	Likely to threaten the survival or effectiveness of the organisation, likely to have major impact of whole operation	5	5	10	15	20	25
			Low	Medium	High	High	High
	Significant impact on the organisational strategy or operational activities, likely to have major impact on many areas of business	4	4	8	12	16	20
			Low	Medium	High	High	High
	Moderate Impact on organisational strategy or operational activities	3	3	6	9	12	15
			Low	Medium	Medium	High	High
	Primary impact on the internal business, likely to have minor effect on many areas	2	2	4	6	8	10
			Low	Low	Medium	Medium	Medium
	No Significant Impact on business as a whole	1	1	2	3	4	5
			Low	Low	Low	Low	Low
			1	2	3	4	5
			Longer Term (to 2080)	Long Term (20-50 Years)	Medium Term (10-20 Years)	Short Term (5-10years)	Very Short Term (1-5 years)
			Probability- short or long term impact				

Figure one; five by five matrix for 2015 review.

The significant interest has also been altered to redefine some of the corporate impacts; which are now split into three;

- Corporate Operational- Impact on the organisation's ability to carry out its function
- Corporate Financial- Impact on the organisations finances either in lack of income or cost
- Corporate Reputational- Impact on the organisations reputation

Clarification for the areas was sought and is as below;

- River – Upstream/West of Sea Reach No 1
- Estuary – Below/East of Sea Reach No 1

The following statements from the previous evaluation still apply in the revision;

- In relation to the likely impacts, the PLA continues to base its analysis on the UK CP09 medium emissions scenario at 50% probability and furthermore used the UK CP09 additional products in relation to fog and wind speed. The Marine Climate Change Impacts Annual Report Card 2010 – 2011 was also consulted. These general projections were supplemented by the much more specific research undertaken by the EA for the tidal Thames and its estuary. These projections were used to assess the likely impact on the PLA's duties, responsibilities and activities as Statutory Navigation and Pilotage Authority for the tidal River Thames, and the extent to which these activities would be affected. The assessment was based on the expertise of relevant and senior PLA staff across a diverse range of responsibilities.
- Where this expert assessment indicated that an impact was possible (amber), the evaluation further considered the likelihood of adaptation measures being required within the short-term to 2020, and the form these measures may take.
- In the event the likelihood of impact was in the long-term (beyond 2020), the need for data collection and/or the initiation of a monitoring programme was addressed in order to ensure that future decisions would be well informed and expedited. Where significant data gaps were found to exist, monitoring or data collection will be instigated.
- No specific assessment was undertaken for those actions required more than ten years into the future due to the uncertainty inherent which makes budgeting neither appropriate or possible. However, the identification of a programme of continued and new data collection and monitoring should enable more accurate predictions and hence budget forecasts to be made into the long-term.
- Where a requirement, primarily in relation to capital expenditure, for future proofing has been identified through the evaluation process, it is expected that adaptation measures will ultimately save the PLA money.
- Short term actions identified through the evaluation do not require significant new expenditure or require (already budgeted) expenditure to be used in ways that ensure necessary future proofing. Whilst the data collection or monitoring programmes to be continued or established may necessitate new resources, the total cost is not expected to be prohibitive.
- The evaluation undertaken by the PLA provides details of the various impacts of climate change that have been identified. These impacts have been assessed on a geographical basis, including where necessary a consideration of the approaches to the Port of London. The responsibility within the PLA for those impacts has also been assessed including, where appropriate, third parties.

Annex 3 Evaluation matrix

PLA's Interest & Responsibilities

Issues as recorded	Relevant to			Responsibility or significant interest								Risk			Requiring					Action
	River & upstream	Estuary or downstream	Other	Licensing Planning, & Environment	Marine Services & Engineering	Harbour Master, VTS, & Pilotage	Hydrography	Corporate operational	Corporate Financial	Corporate reputational	Third Party	Risk Probability	Risk Severity	Overall Risk	Preparation Data Collection	Monitoring	Awareness raising	Capacity building	Future Proofing	
PHYSICAL INFRASTRUCTURE																				
Greater variation in water depths	Y	Y			Y	Y	Y	Y	Y	Y	Y	3	3	9	Y	Y	INT/EXT			On going monitoring of shoals and link with EA fluvial flow data
Extremes in Flow	Y			Y	Y	Y	Y	Y	Y	Y	Y	3	3	9	Y	Y	INT/EXT	Y		Flag Systems for rowers already in place, better understanding of risk by users of Thames.
Effects on Richmond Lock and Weir	Y			Y	Y	Y	Y	Y	Y	Y	Y	3	3	9	Y	Y	INT/EXT		Y	Monitor impact on Lock and users over time.
Depths on berths	Y	Y		Y		Y	Y	Y	Y	Y	Y	3	3	9	Y	Y	INT/EXT			Monitor operator's requirements to manage access to own berths under byelaws.
Air draught issues	Y			Y	Y	Y	Y	Y	Y	Y	Y	1	4	4	Y	Y	INT/EXT		Y	
Increasing bank erosion	Y			Y	Y		Y					2	3	6	Y		INT	Y		Regularly review Tree Management to minimise erosion the PLA banks
Bank and wall repair/flood risk				Y	Y					Y		2	2	4		Y		Y	Y	
Changed siltation patterns	Y	Y		Y	Y	Y	Y		Y	Y	Y	2	3	6	Y		INT/EXT	Y		Estuary Morphology Study & continuing review of patterns in sediment
Requirements to modify tide gauges coverage		Y		Y	Y		Y					1	1	1					Y	
Requirements to change protection of navigational systems	Y	Y	Y		Y	Y				Y		1	1	1		Y		Y	Y	
More frequent flooding at Denton Wharf		Y			Y							1	2	2		Y				
Flooding/overtopping pontoons, pile moorings	Y	Y		Y	Y						Y	1	1	1		Y	INT/EXT		Y	

SAFETY: CHANGE IN USE																			
Change in use of River & Estuary - Increasing tourist & commuting traffic in upper river	Y			Y	Y	Y	Y					2	3	6	Y		EXT		Capacity Study for upper district already undertaken, understanding of overall use & limitations wider may be required.
Consider adequacy of existing speed limits	Y					Y						1	2	2			EXT		
Increased desire to use to the Thames for swimming	Y	Y				Y				Y	Y	1	2	2	Y		EXT		
Increased risk to navigational safety	Y	Y			Y	Y				Y	Y	1	2	2	Y		INT/EXT		
Increased patrol requirement	Y				Y	Y				Y		1	2	2	Y			Y	
VEGETATION																			
Towpath Management	Y			Y	Y	Y				Y		4	1	4			INT		Y
Increased tree fall	Y			Y	Y	Y				Y		2	2	4	Y		INT	Y	
Driftwood collection	Y				Y	Y						2	2	4	Y		INT	Y	
Invasive plants	Y	Y		Y	Y	Y				Y	Y	2	2	4	Y	Y	INT/EXT		
WATER QUALITY																			
Increases in Algal blooms causing incidents	Y	Y		Y	Y	Y		Y		Y	Y	2	2	4	Y	Y			
Increases in upriver abstraction	Y					Y	Y				Y	2	5	10	Y	Y	EXT		Liaison with EA & water companies on water availability studies as developed.
Increased turbidity, reduced O2, impacts on marine life	Y	Y		Y								2	2	4		Y	EXT		
Change in marine fauna	Y	Y		Y								2	2	4	Y	Y	EXT		
Modify responses to pollution incidents		Y		Y	Y						Y	2	4	8		Y			Regular review of oil Spill and emergency plan. Evaluation of risk, uses on the river and types of pollutants. Also consideration of time of year/flow rates for chemical incidents
NATURAL ENVIRONMENT																			
More frequent beneficial flooding of marshland, supporting migrating birds/wildlife		Y		Y			Y				Y	2	2	4		Y			
Shift in habitat	Y	Y		Y		Y				Y	Y	3	2	6					Continue to liaise with NE on evaluation of land in PLA ownership & value according to protection. Natural Capital project can value any losses as required
Encroachment due to upgrading flood defences	Y	Y		Y							Y	2	2	4			EXT		
Managed realignment opportunities	Y	Y		Y			Y				Y	2	2	4			EXT		

BUSINESS CONTINUITY																				
Staff travel to work affected			Y	Y	Y	Y	Y	Y	Y	Y		2	2	4	Y	Y	INT	Y	Y	
Health issues of staff			Y	Y	Y	Y	Y	Y	Y	Y		2	3	6		Y	Y	Y	Y	Using occupational health functions to manage ongoing impacts where see, and their impact on the organisation
Change in infrastructure needs			Y	Y	Y	Y	Y	Y	Y	Y		1	2	2						
Effective PLA communications system			Y		Y				Y	Y		2	2	4			INT	Y		
GENERAL																				
Education and communication	Y	Y		Y		Y		Y		Y		2	2	4			EXT			
Corporate responsibility for climate change adaptation			Y	Y	Y	Y	Y	Y	Y	Y		3	2	6	Y		INT	Y		Maintain on risk register, report on progress of action.
PORT - DISRUPTION																				
Increased fog	Y	Y	Y			Y				Y	Y	2	4	8		Y	INT/EXT			Modify working practices
Increased wind		Y	Y			Y				Y	Y	2	4	8		Y	INT/EXT			Modify working practices

Annex 5 UKCP09

Summary of assumed climate change impacts

UK CP09 Climate Change Projections - medium emissions at 50% probability

	2020's	2050's	2080's
Winter mean temperature (degrees C)	+1 to +2	+2 to +3	+3 to +4
Summer mean temperature (degrees C)	+1 to +2	+2 to +3	+3 to +4
Winter mean max temperature (degrees C)	+1 to +2	+1 to +3	+2 to +3
Summer mean max temperature (degrees C)	+1 to +2	+2 to +3	+4 to +5
Winter mean min temperature (degrees C)	+1 to +2	+2 to +3	+3 to +4
Summer mean min temperature (degrees C)	+1 to +2	+2 to +3	+3 to +4
Change in annual mean precipitation (%)	0 to +10	0 to +10	0 to +10
Change in winter mean precipitation (%)	0 to +10	+10 to +20	+10 to +20
Change in summer mean precipitation (%)	0 to -10	-10 to -20	-20 to -30

In relation to rainfall, the projections above have been supplemented by the Environment Agency's (as part of the TE2100 work) forecast that 2080 flows over Teddington Lock could be increased by as much as +40%.

The assumption is, also from the EA's TE2100 work, that sea level rise on the tidal River Thames to 2100 will be between +0.2m to +0.9m, although the project has worked to the current Defra figure of +0.94m, with a maximum sea level rise at +2.7m. The TE2100 research also concluded that climate change is less likely to increase storm surge height and frequency in the North Sea than had been previously thought.

In terms of fog (from the UK CP09 additional product), at 2080's assuming a medium emissions scenario: -

	East of England	London	South East of England
Annual change (%)	-25	-19	-24
Winter change	+7	+20	+7

There are very substantial reductions throughout the rest of the year, but as the issue of fog is primarily a winter issue inasmuch as it affects operations within the Port of London it's only worth considering whether it will increase.