

令和元年 7 月 3 日 (水)
国土技術政策総合研究所
気候変動適応研究本部

水技術政策に関する海外最新情報
【R1-1 号】

< 定点観測：米英蘭政府機関の動き >

(1) 【英国環境庁：洪水・海岸侵食リスク管理戦略（草案）の公表】

英国環境庁 (Environmental Agency) は、イングランド洪水・海岸侵食リスク管理戦略 (National Flood and Coastal Erosion Risk Management Strategy for England) の草案を公表し、公聴を開始した (2019 年 5 月 9 日)。

<https://www.gov.uk/government/consultations/draft-national-flood-and-coastal-erosion-risk-management-strategy-for-england> (記事本文)

https://consult.environment-agency.gov.uk/fcrm/national-strategy-public/user_uploads/fcrm-strategy-draft-final-1-may-v0.13-as-accessible-as-possible.pdf (戦略草案本文：4.35MB)

2100 年の実現を目標とした 3 つのアンビション、1) 気候に強靱な国土 (Climate resilient places)、2) 将来の気候に強靱であるための成長と社会基盤 (Today's growth and infrastructure—resilient to tomorrow)、3) イノベーションを通じて洪水と海岸の変化に十分に適応することが出来る国家 (A nation of climate champions, able to adapt to flooding and coastal change through innovation) をもとに戦略を立てた。1) ~3) を実現するために、2030~2050 年までの 15 指標が設定され、さらにその目標のために 2030 年までの 36 対策を定めている。下記に指標と対策を抜粋する。

1) Climate resilient places

Strategic objective 1.1: Between now and 2050 the nation will be resilient to future flood and coastal risks. Over the next year the Environment Agency will work with partners to explore and develop the concept of standards for flood and coastal resilience.

Measure 1.1.1: By 2021 the Environment Agency will enhance the appraisal guidance for flooding and coastal change projects, so that investment decisions better reflect a range of climate change scenarios.

Measure 1.1.2: By 2022 the Environment Agency will work with partners to explore and develop the concept of standards for flood and coastal resilience, and will consider the pros and cons of all options. This will feed into the government's flood policy statement in 2019. The Environment Agency will also develop a national suite of tools that be used in combination to deliver flood and coastal resilience in places.

Strategic objective 1.2: Between now and 2050 risk management authorities will help places plan and adapt to flooding and coastal change across a range of climate futures.

Measure 1.2.1: By 2021 the Environment Agency and risk management authorities will identify frontrunner places for developing adaptive approaches for a range of different scales and social contexts, working with local places and partners.

- Measure 1.2.2: By 2024 the Environment Agency will publish a new picture and evidence of current and future flood risk that will help places better plan and adapt for climate change.
- Measure 1.2.3: By 2024 the Environment Agency will develop a national framework to help risk management authorities, people, businesses and public bodies identify the steps and decisions needed to take an adaptive approach to planning for flood and coastal resilience in a place.
- Measure 1.2.4: By 2025 the Environment Agency will produce a new set of long term investment scenarios to inform future policy and investment choices for delivering flood and coastal resilience.
- Measure 1.2.5: By 2026 lead local flood authorities will update their local flood risk strategies to incorporate adaptive approaches to planning for flood and coastal resilience in a place.

Strategic objective 1.3: Between now and 2030 all those involved in managing water will embrace and embed adaptive approaches to enhance the resilience of our environment to future flooding and drought.

- Measure 1.3.1: From 2021 the Environment Agency will use the lessons learned from the Defra £15 million natural flood management projects and other pilot projects to expand and mainstream working with natural processes by all risk management authorities.
- Measure 1.3.2: From 2021 the Environment Agency will work with farmers, landowners and others to identify opportunities for using agricultural practices (through funding, advice and regulation) to manage flooding and coastal change.
- Measure 1.3.3: From 2020 risk management authorities will seek to better align long term planning for flood and coastal change with water company business planning cycles to identify opportunities for managing both floods and droughts.

Strategic objective 1.4: Between now and 2030 risk management authorities enhance the natural, built and historic environments so we leave it in a better state for the next generation.

- Measure 1.4.1: From 2021 risk management authorities will contribute to improving the natural, built and historic environment through their investments in flood and coastal projects.
- Measure 1.4.2: From 2021 risk management authorities will work with partners and others to identify how the nature recovery network, the northern forest and other habitat improvements can help to manage flood risk and coastal change.
- Measure 1.4.3: From 2021 risk management authorities will help to ensure that 75% of all water bodies are in natural or near-natural condition within 25 years.

Strategic objective 1.5: Between now and 2030 risk management authorities will use funding and financing from new sources to invest in making the nation resilient to flooding and coastal change.

- Measure 1.5.1: By 2021 the Environment Agency will work with the government on its green finance strategy to explore new options for funding and financing flooding and coastal change that deliver more private funding in the future.
- Measure 1.5.2: By 2025 risk management authorities will test whether it is feasible to use upfront financing to deliver an adaptive approach in a place which will need very significant investment in future.

2) Today's growth and infrastructure – resilient to tomorrow's climate

Strategic objective 2.1: Between now and 2030 all new development will contribute to achieving place based resilience to flooding and coastal change.

- Measure 2.1.1: From 2021 risk management authorities will invest in planning skills and capabilities to ensure they can advise planners and developers effectively to enable climate resilient places.
- Measure 2.1.2: From 2025 the Environment Agency and lead local flood authorities will advise local planning authorities on how adaptive approaches should inform strategic local plans.

Strategic objective 2.2: Between now and 2030 all new development will seek to support environmental net gain in local places.

- Measure 2.2.1: From 2021 all risk management authorities will achieve biodiversity net gain in all programmes and projects.
- Measure 2.2.2: From 2021 all risk management authorities will seek to work with developers and planners to achieve environmental net gain as part of strategic development

proposals.

Strategic objective 2.3: Between now and 2030 all risk management authorities will contribute positively to local economic regeneration and sustainable growth through their investments in flooding and coastal change projects.

Measure 2.3.1: From 2021 the Environment Agency will identify ways in which flood and coastal infrastructure projects can better contribute to local economic regeneration and sustainable growth.

Strategic objective 2.4: Between now and 2050 places affected by flooding and coastal change will be 'built back better' and in better places.

Measure 2.4.1: By 2025 the Environment Agency will work with government, insurers and financial institutions to review the legal, policy and behavioural changes needed to 'build back better and in better places' and improve the resilience of homes and business.

Measure 2.4.2: By 2021 coast protection authorities and the Environment Agency will refresh the shoreline management plans and keep them under review.

Strategic objective 2.5: Between now and 2030 all flooding and coastal infrastructure owners will understand the responsibilities they have to support flood and coastal resilience in places.

Measure 2.5.1: By 2021 the Environment Agency will work with lead local flood authorities and other expert bodies to develop guidance setting out best practice on local flood infrastructure management and record keeping.

Measure 2.5.2: By 2024 the Environment Agency will require risk management authorities to report on the resilience of their flood and coastal change infrastructure in a nationally consistent way.

Measure 2.5.3: By 2024 the Environment Agency will work with risk management authorities to develop recommendations for flooding and coastal change infrastructure owners that enable greater collaboration, sharing and monitoring between them.

Strategic objective 2.6: Between now and 2050 the Environment Agency and risk management authorities will work with infrastructure providers to ensure all infrastructure investment is resilient to future flooding and coastal change.

Measure 2.6.1: By 2021 the Environment Agency and risk management authorities will work with infrastructure providers to ensure all infrastructure investment is resilient to future flooding and coastal change.

Measure 2.6.2: By 2021 the Environment Agency will establish a Flood and Coastal Infrastructure Task Force to better align the long term investment planning of publicly funded infrastructure bodies.

3) A nation of climate champions, able to adapt to flooding and coastal change through innovation

Strategic objective 3.1: Between now and 2030 young people at 16 should understand the impact of flooding and coastal change, but also recognise the potential solutions for their place, and opportunities for career development.

Measure 3.1.1: By 2021 flooding and coastal change materials will be provided to help teachers deliver existing elements of the national curriculum.

Strategic objective 3.2: Between now and 2030 people will understand the potential impact of flooding and coastal change on them and take action.

Measure 3.2.1: By 2022 government and risk management authority research programmes will identify how best to help people and businesses understand, accept and take responsibility for their risk to flooding and coastal change. This will help all risk management authorities better shape the way they work with people and businesses.

Measure 3.2.2: By 2021 all risk management authorities will develop and use digital tools to better communicate flooding and coastal change. This will help achieve greater awareness and responsibility of the risks people face.

Strategic objective 3.3: Between now and 2030 people will receive a consistent and coordinated level of support from all those involved in response and recovery from flooding and coastal change.

Measure 3.3.1: By 2021 the Environment Agency will work with government and risk management authorities to clarify roles in relation to surface water flooding.

Measure 3.3.2: By 2022 the Environment Agency will have expanded their flood warning service to all places at a high risk of flooding from rivers and the sea.

Measure 3.3.3: By 2025 the Environment Agency will work with government to better join up the

organisations involved in providing incident response and recovery to provide a consistent and coordinated service.

Strategic objective 3.4: Between now and 2030 the nation will be recognised as world leader in managing flooding and coastal change, as well as developing and attracting talent to create resilient places

Measure 3.4.1: By 2022 the Environment Agency will continue to work with standards setting organisations to encourage flood resilience requirements to be incorporated into the building and materials standards for homes and businesses built in places at risk of flooding.

Measure 3.4.2: By 2025 the flooding and coastal change sector, including risk management authorities, will influence universities and colleges to ensure they develop the capabilities and skills required for both the public and private sectors.

Measure 3.4.3: By 2025 all public and private organisations in the flooding and coastal change sector, including risk management authorities, will support development programmes that enable their professionals to continue to develop their flood and coastal risk management knowledge.

環境庁は、公聴を実施するためのウェブサイトを開設して、主にウェブ上で国民からの意見を受け入れている。公聴は5月9日から7月4日まで行われ、結果を検討したのち、議会に提出して、最新版を2020年に発行することを目指している。

2010年洪水及び水管理法（Flood and water management Act 2010）は、英国環境庁がイングランド洪水・海岸侵食リスク管理戦略の作成、管理、実施、検討を行うとともに、国民に意見聴取を行い、国務長官の承認を得ることを義務付けている。

(2) 【蘭国王立水機構：アフスリュイド堤防（締めきり大堤防）のスーパーストームに対する強化】

蘭国王立水機構（Rijkswaterstaat）は、アフスリュイド堤防（Afsluitdijk）強化プロジェクトのために、ワッデン海側に新しい護岸ブロックを設置する予定だ。アフスリュイド堤防は、全長32km、アイセル湖と北海（ワッデン海）の間に建設された堤防で、締めきり大堤防とも呼ばれる。1916年の大洪水を契機に1927年に着工し1932年に完成し、水害と戦ってきたオランダの象徴である。気候変動による海面上昇と異常気象に対抗するために、堤防の強化が行われる予定。10,000年の再現確率のスーパーストームに耐えられる設計となっている。現在、新しい護岸ブロックがスーパーストームに耐えられるかどうか、試験を行っている。

<https://www.rijkswaterstaat.nl/nieuws/2019/04/is-de-afsluitdijk-straks-klaar-voor-een-superstorm.aspx>（蘭語記事本文）

<https://translate.google.co.jp/translate?hl=en&sl=nl&tl=en&u=https%3A%2F%2Fwww.rijkswaterstaat.nl%2Fnieuws%2F2019%2F04%2Fis-de-afsluitdijk-straks-klaar-voor-een-superstorm.aspx>（機械英訳）

<https://www.rijkswaterstaat.nl/english/about-us/gems-of-rijkswaterstaat/afsluitdijk/the-importance-of-the-afsluitdijk/index.aspx>（関連記事）

試験は、オランダ水理研究所（Deltares）の全長300m、幅5mの水路施設を使って

行われている。護岸ブロックはアスリュイド堤防のために特別に開発され、そして生産工場もそのために建設された。下の写真を参照。ブロックの特徴として、 $200,000\text{m}^3$ のコンクリートの節約に貢献することが出来て、40,000 トンの二酸化炭素の排出を削減することが出来る。補強工事は 2019 年に開始して 2022 年に完了する予定である。



Quattroblock

出典：Holcim, <https://www.holcim.nl/quattroblock> (2019/06/20 参照)



XblocPlus

出典：BAM, <https://www.xbloc.com/en/news/introduction-of-the-new-xblocplus> (2019/06/20 参照)

(3) 【米国陸軍工兵隊：海面水位を記録した地図を公表】

陸軍工兵隊 (U.S. Army Corps of Engineers) は海面水位の変化を載せた地図 (ATLAS OF OBSERVED SEA LEVEL CHANGE) を公表した (2019 年 3 月)。

https://www.usace.army.mil/corpsclimate/News_2019/ (記事本文)

<https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/8876>

(地図本文：9.13MB)

米国海洋大気庁（NOAA）が大西洋、メキシコ湾、カリブ海、太平洋沿岸、太平洋諸島に設置した潮位計で計測した、潮位の長期変化（1980年（地点により異なる）～2030年まで）を次の3種類のグラフで記載している。一例を以下に引用する。

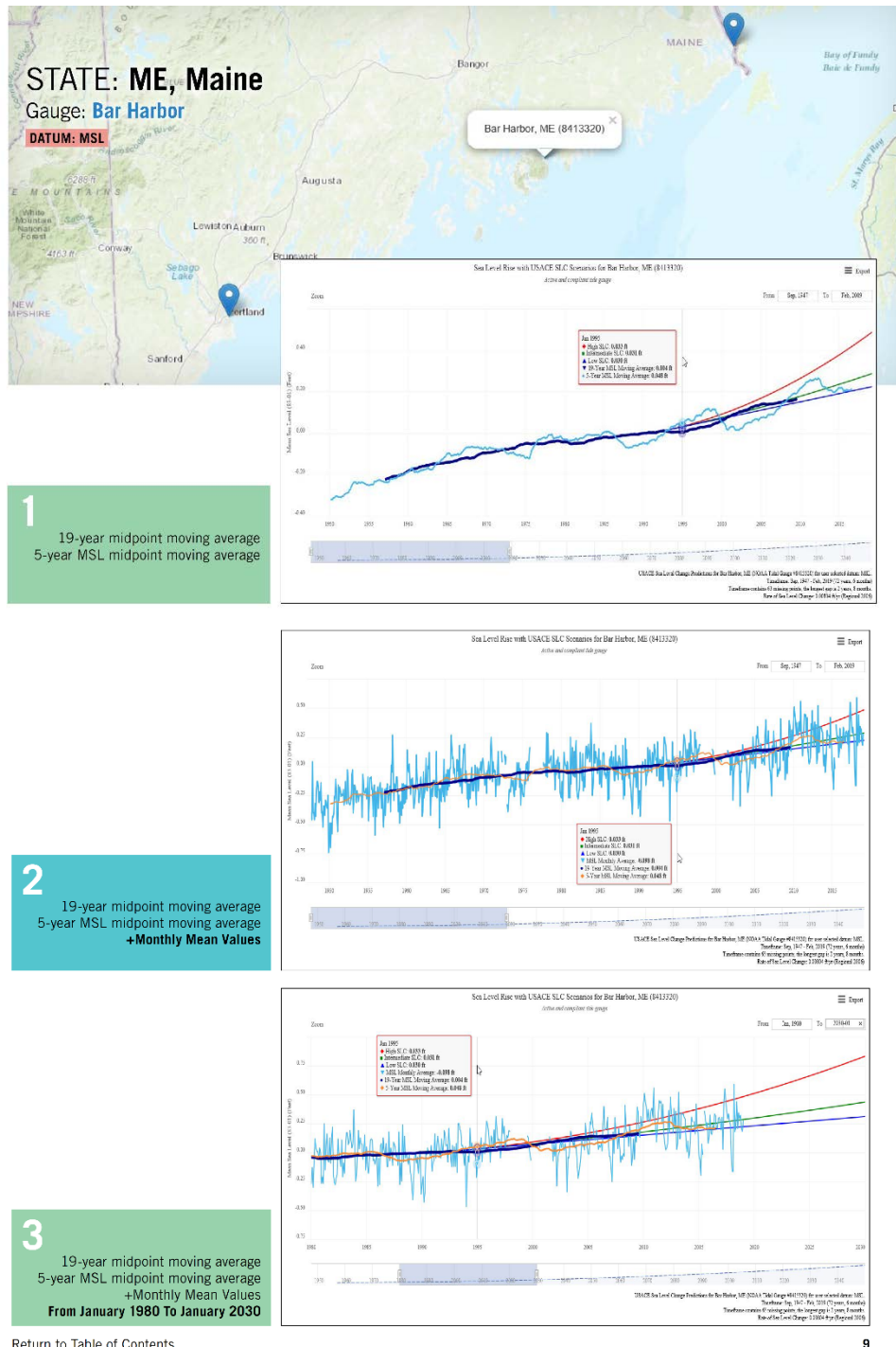


図1 メイン州、バー・ハーバー（Bar Harbor）の潮位の長期変化
出典：ATLAS OF OBSERVED SEA LEVEL CHANGE, 2019（p9）

1)平均潮位の5年および19年の移動平均、2)1)および月平均潮位、3)2)および2030年までの海面上昇シナリオを表している。

陸軍工兵隊・海面水位追跡ツール (USACE Sea Level Tracker Tool) のデータを使用して地図を作成した。今回のものを第1号として、今後も定期的に地図を更新して、公開する予定だ。

3)の海面上昇シナリオは、陸軍工兵隊が2013年に公表した「規則 No. 1100-2-8162 土木工事プログラムにおける海面の変化の組み込み (Regulation No. 1100-2-8162 INCORPORATING SEA LEVEL CHANGE IN CIVIL WORKS PROGRAMS)」で定めた海面上昇シナリオを使用していて、2100年までで“0.5m上昇 (低シナリオ)”、“1m 上昇 (中シナリオ)”、“1.5m上昇 (高シナリオ)”となっている。

https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1100-2-8162.pdf?ver=2014-02-12-131510-113 (規則No. 1100-2-8162 土木工事プログラムにおける海面変化の組み込み：317.35KB)

本地図は、技術者よりも、海面上昇に馴染みが薄い市民のために作られた。

(4) 【蘭国王立水機構：ガイドラインの更新】

蘭国王立水機構 (Rijkswaterstaat) は、RWS Information – Werkwijzer (Work pointer) Design Waterkerende (water turning) Artworks - Design verifications for the high water situation Green version 2018 を公表した。(2018年11月1日)。

<https://www.helpdeskwater.nl/onderwerpen/waterveiligheid/primaire/ontwerpen/> (蘭語関連ウェブサイト)

<https://translate.google.co.jp/translate?hl=en&sl=nl&tl=en&u=https%3A%2F%2Fwww.helpdeskwater.nl%2Fonderwerpen%2Fwaterveiligheid%2Fprimaire%2Fontwerpen%2F> (機械英訳)

https://www.helpdeskwater.nl/publish/pages/158168/werkwijzer_ontwerpen_waterkerende_kunstwerken_-_groene_versie_november_2018.pdf (蘭語報告書本文 7.93MB)

http://www.nilim.go.jp/lab/kikou-site/data/info_data/2019_itagaki1.pdf (機械英訳)

<https://www.helpdeskwater.nl/onderwerpen/waterveiligheid/primaire/technische-leidraden/zoeken-technische/@192635/algemeen-0/> (蘭語関連ウェブサイト)

<https://translate.google.co.jp/translate?hl=en&sl=nl&tl=en&u=https%3A%2F%2Fwww.helpdeskwater.nl%2Fonderwerpen%2Fwaterveiligheid%2Fprimaire%2Ftechnische-leidraden%2Fzoeken-technische%2F%40192635%2Falgemeen->

[0%2F&sandbox=1](#) (機械英訳)

2017年1月に水法(蘭語: Waterwet、英語: Water Act)が改正され、蘭国の主要洪水防御施設の基準が洪水発生確率にもとづくものに改訂された。今後、主要洪水防御施設の補強はこの基準にあわせて行われる予定である。

基準に適しているだけでなく、実用的かつ環境も考慮した設計をガイドラインで示している。これにより、管理者は、様々な設計工程を扱うことが出来る。

また、設計の段階で適切な外力を考慮する事が必要である。その外力を決める、一つの要件として、“design tax”という考え方が示されており、計画期間に予想される気候変動による河川の流量の増加や海面と湖の水位の上昇などを計算に入れる。以下の表で、各プロジェクトごとに公表されているガイドラインの有無を示している。“利用可能な新しい知識”に“X”が付いているプロジェクトは、既に公表されているガイドラインの他に新しい情報がある。蘭国王立水機構のHelpdesk Waterに問い合わせよう薦めている。また、ガイドラインの他にも最も新しいデータベースや関連した水系の統計データ、表に記載されていないプロジェクトに関しても問い合わせる事が出来る。

表1 プロジェクトに関連したガイドラインの有無、新しい情報に関して

No.	Area	Version 2	Version 3	Version 4	New knowledge available
1	Wadden sea East		X		X (via Helpdesk)
2	Wadden sea Weast			X	X (via Helpdesk)
3	Dutch coast & Zeeland coast				X (via Helpdesk)
4	Dunes				X (via Helpdesk)
5	Eastern Scheid	X			
6	Western Scheid	X			X (via Helpdesk)
7	Ijsselmeer				X (via Helpdesk)
8	Marken Lake/Marken/IJburg			X	X (via Helpdesk)
9	Veluwerand lakes	X			X (via Helpdesk)
10	Fox lake (Drantermeer dykes)			X	
11	IJsseldelta	X	X		X (via Helpdesk)
12	Vechtdelta	X	X		X (via Helpdesk)
13	Row branches	X	X	X	X (via Helpdesk)
14	Maas valley			X	X (via Helpdesk)
15	Dike Maas				X (via Helpdesk)
16	Lower rivers Rhine-Lek		X		X (via Helpdesk)
17	Lower rivers Rhine other		X		X (via Helpdesk)
17	Lower rivers Meuse				X (via Helpdesk)
18	Hollandsche IJssel			X	
19	Volkerak Zoommeer				
20	Grevelingen				
Side branches and others:					

21	Oude IJssel (Doetinchem)			X	
22	Apeldoorns Kanaal (IJssel)			X	X (via Helpdesk)
23	Amertak Geertruidenberg	X			X (via Helpdesk)

今回、我々が注目したガイドラインは、治水構造物（水門やポンプ場等）に焦点をあてている。

*引用文献の機械英訳は Google 翻訳を使っており、英訳の精度は Google 翻訳の精度による。

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