



NAVIGATING A CHANGING CLIMATE

Action Plan of the PIANC Think Climate Coalition





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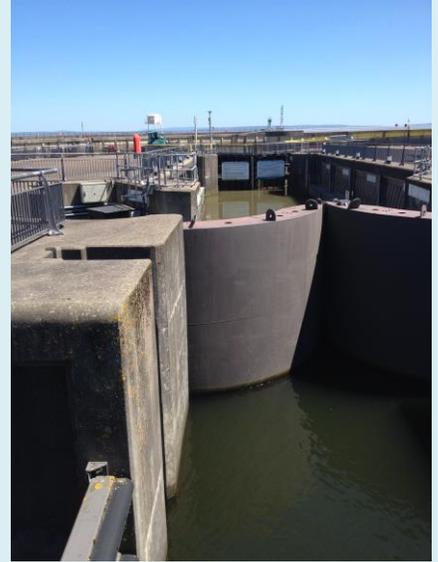
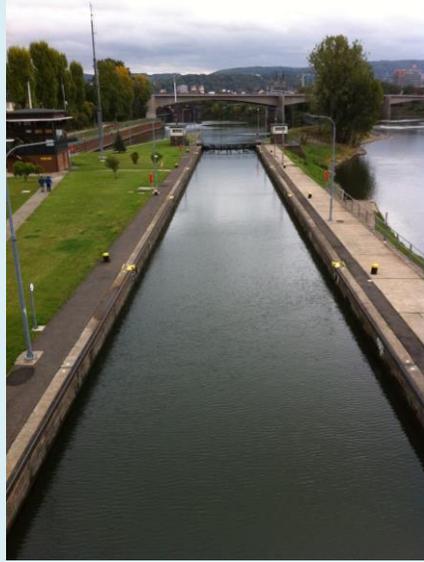
Summary

Through an unprecedented collaboration, the partners in PIANC's Think Climate coalition have committed to work together to help the inland and maritime navigation infrastructure sector respond to climate change. By furthering understanding, providing targeted technical support, and building capacity, the coalition's 'Navigating a Changing Climate' initiative will encourage the owners, operators and users of waterborne transport infrastructure:

- to reduce greenhouse gas emissions and shift to low carbon maritime and inland navigation infrastructure, and
- to act urgently to strengthen resilience and improve preparedness to adapt to the changing climate.

Waterborne transport, both maritime and inland, is an essential enabler to human society. It is also one of the most energy-efficient and environmentally sound means of meeting global transport needs although more can be done to reduce greenhouse gas emissions. Whereas recent years have seen considerable efforts by the International Maritime Organization (IMO) under the United Nations Framework Convention on Climate Change to reach agreement on a global approach to reduce greenhouse gas emissions from international shipping, much less attention has been paid to the infrastructure that supports waterborne transport. **Our initiative is designed to address this gap.**

Waterborne transport needs ports, harbours and marinas, along with locks, docks, quays, wharves, jetties, embankments, pontoons, marinas, dredged channels, breakwaters and many other types of navigation infrastructure



Photos courtesy of Jan Brooke

Added Value

Individually, each partner in PIANC's Think Climate coalition has a mandate that includes raising awareness, building capacity and providing technical support to its membership. By bringing together the key global and regional associations with interests in inland and maritime waterborne transport infrastructure, PIANC's Think Climate coalition specifically aims to add value: by broadening effort, scaling-up activity, and reaching out to an extended audience around the world. Working on a 'stronger together' basis, the coalition will provide a one-stop-shop for information and technical support, enabling participants to understand each other's needs and encouraging them to act – urgently and together – to reduce infrastructure-related emissions, to improve resilience, and to adapt inland and maritime navigation infrastructure to the effects of a changing climate.

Partners

The following international and regional associations have already joined as partners in PIANC's Think Climate coalition. Together, these associations reach more than 250,000 individuals from a variety of state and non-state organisations. Other international associations have expressed an interest in becoming involved, so we are confident the coalition will grow. Further information about each of the existing partner associations is provided in Annex 1.

- The World Association for Waterborne Transport Infrastructure (PIANC)
- International Association of Ports and Harbors (IAPH)
- International Harbour Masters' Association (IHMA)
- International Maritime Pilots' Association (IMPA)
- International Bulk Terminals Association (IBTA),
a coalition of the International Dry Bulk Terminals Group and
the Coal Export Terminal Operators Association
- Smart Freight Centre (SFC)
- European Dredging Association (EuDA)



IAPH
International Association
of Ports and Harbors

**SMART
FREIGHT
CENTRE**



In preparation for the 21st session of the Conference of the Parties to the UN Framework Convention on Climate Change (COP21) the Think Climate coalition partners are collaborating on an initiative entitled 'Navigating a Changing Climate: Towards Sustainable Waterborne Transport Infrastructure'. The coalition will provide a focal point, building on existing activities such as PIANC's *Working with Nature*¹ initiative, the IAPH World Ports Climate Initiative² and the Smart Freight Centre's Global Logistics Emissions Council³ along with other initiatives noted in Annex 2; highlighting new opportunities; providing a platform for discussion; and driving implementation and action across the inland and maritime navigation infrastructure sector.

¹ See <http://www.pianc.org/workingwithnature.php>

² See <http://wpci.iaphworldports.org/>

³ See <http://www.smartfreightcentre.org/glec/what-is-glec>

Our Vision

The multi-stakeholder partners in PIANC's Think Climate coalition share a single vision. We want to see a responsible, well-informed and innovative sector where the owners, operators and users of inland and maritime waterborne transport infrastructure in all countries:

- are aware of the issues associated with navigating a changing climate, and of the need to act now
- have access to existing and new, sector-specific technical and institutional resources aimed at facilitating climate change mitigation and adaptation
- have developed the capacity to make timely and effective decisions on mitigation and adaptation options, and
- collaborate with others within and beyond the sector to identify and deliver integrated, resilient and sustainable solutions, with an emphasis on *Working with Nature*.

Our Mission

In support of this vision, the partners in PIANC's Think Climate coalition will cooperate:

- to improve sector-wide awareness of climate change; of the challenges waterborne transport infrastructure will face; and of potential solutions or opportunities
- to create and facilitate knowledge networks, promoting the sharing of experience and good practice between state and non-state stakeholders at international, regional and national levels
- to develop or facilitate the preparation of technical good practice guidance, training opportunities and web-based resources
- to provide a coordinated, global focal point: a 'centre of excellence' intended to support the owners, operators and users of inland and maritime navigation infrastructure in building the capacity needed to navigate a changing climate.

Coalition Supporters

The value of the coalition's work, and the effectiveness of its products, both increase as visibility of the Navigating a Changing Climate initiative increases. Other organisations in the waterborne transport infrastructure sector are therefore being encouraged to sign up as supporters of the Think Climate coalition⁴. The coalition simply asks that supporters commit to our objectives. In return, they will receive regular updates on the activities of the coalition including notice of relevant events (conferences, workshops, webinars and training) and of new technical publications.

Supporter associations and organisations will play an important role in dissemination and will therefore make an essential contribution to the achievement of the Think Climate coalition's vision.

Registered supporters to date include:

- Society of International Gas Tanker and Terminal Operators (SIGTTO)
- SedNet (the European Sediment Network)
- North Queensland Bulk Ports Corporation (NQBP)
- PIANC UK
- Institut français des sciences et technologies des transports, de l'aménagement et des réseaux (IFSTTAR)
- Compagnie Nationale du Rhône (CNR)
- Bremenports GmbH & Co. KG
- Port of Antwerp
- Cerema
- Ports Australia



⁴ <http://www.pianc.org/thinkclimate.php>

Why Act?

"We can't see CO₂. It is an invisible threat, but a very real one. It means hotter global temperatures, more extreme weather events like heatwaves and floods, melting ice, rising sea levels and increased acidity of the oceans. This is happening now and we are moving into uncharted territory at a frightening speed".

Michel Jarraud, Secretary-General World Meteorological Organisation, 9th November 2015⁵

Navigating a Changing Climate: Mitigation

All sectors must play their part in climate change mitigation. The waterborne transport infrastructure sector is no exception. Port and waterway infrastructure and operations typically account for only a very small proportion⁶ of the total greenhouse gas emissions associated with the shipment of a particular consignment. The most significant proportion by far is associated with the sea voyage, and a varying amount with connecting transport. It is nonetheless important that the owners, operators and users of waterborne transport infrastructure take steps to minimise the emissions associated with their activities if they are to contribute to the 'less-than-2-degrees' pathway. The associations represented on the coalition recognise the importance – and the urgency – of implementing effective mitigation measures and of moving towards low carbon infrastructure. Coalition members further acknowledge the need for innovation alongside conventional emissions-reduction measures: for example initiatives aimed at improving integration to increase energy efficiency⁷ or at creating carbon sinks in coastal areas⁸ by *Working with Nature*. As with other sectors, such innovation has the potential to bring associated social, employment and economic opportunities.

Navigating a Changing Climate: Adaptation

Even if the COP21 meetings in Paris in December 2015 reach agreement on limiting warming to less than two degrees, climate scientists are in general agreement that we are already locked in to further change. If we fail to achieve the two-degrees goal, things will get worse still. The Think Climate coalition partners believe that it is time to stop using uncertainty as an excuse for inaction. Even if there is disagreement on what is causing the change, change is happening. Adaptation of inland and maritime navigation infrastructure is vital, and the time to act is now.

In addition to contributing to mitigation, it is therefore essential that the sector acts to strengthen resilience, to coordinate globally and act locally to adapt waterborne transport infrastructure and the operations that depend on it to the changing climate; and to reduce vulnerabilities to more frequent extreme events. The principles of *Working with Nature* are equally if not more relevant when options to improve resilience and to adapt to climate change are being considered.

⁵ <https://www.wmo.int/media/content/greenhouse-gas-concentrations-hit-yet-another-record>

⁶ See, for example, the following presentation indicating that <1% of the total CO₂ emissions associated with the movement of a single container from China to Scotland derive from port-related activities:

http://www.fta.co.uk/export/sites/fta/_galleries/downloads/international_supply_chain/presentation_decarbonising_the_maritime_supply_chain.pdf

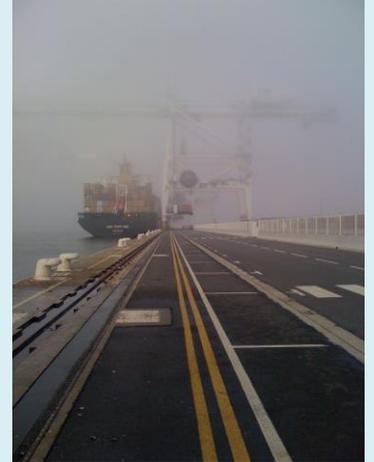
⁷ For example, the World Ports Climate Initiative 'intermodal transport' project <http://wpci.iaphworldports.org/project-in-progress/index.html>

⁸ For example, [Carbon Offsetting? Blue Carbon Provides Opportunities for the Dredging Industry](#) in WODCON XX - The Art of Dredging - June 2013, Belgium. Van der Klis P, Sansoglou P, Mink F.

Waterborne transport infrastructure management and use can be vulnerable to sea level rise, storms, wind damage, flooding and other effects. The frequency and magnitude of many extreme weather events is expected to increase as climate changes.



*Photo courtesy of Aidan Fleming,
Port of Cork, Ireland*



Photos courtesy of Jan Brooke



Photos courtesy of U.S. Army Corps of Engineers Galveston District

Efficient adaptation will often involve modifying existing physical infrastructure. New infrastructure design will have to accommodate the changing climate whilst also taking steps to avoid becoming locked-in to high carbon futures. Many operational activities, maintenance regimes and management practices will need to be adapted to cope with changes in ambient (mean or seasonal) conditions or more frequent extreme events or both. Other practices will need to be fundamentally changed. In some situations conventional designs or operational solutions may no longer be sustainable. Climate change is therefore a key driver for innovation across the maritime and inland navigation infrastructure sector.

THINK CLIMATE: LEARN, MONITOR, REVIEW, UNDERSTAND, PREPARE, CHOOSE, CHANGE

Climate change effects will vary regionally and often locally; change will not be equally distributed and the most profound effects may be felt in countries that are least well-resourced to adapt. The following table highlights some of the main areas in which measures to improve resilience or other adaptation action may be needed according to current projections.

Maritime navigation infrastructure may need to adapt to:	Inland navigation infrastructure may need to adapt to:
Increases in the frequency or severity of flooding due to sea level rise and/or changes in precipitation	Increases in the frequency or severity of flooding or low flows/drought due to changes in precipitation characteristics
Increased frequency of extreme wind, wave or storm conditions potentially exacerbated by sea level rise, affecting the frequency and duration of periods of disruption of operations and requiring improved infrastructure resilience	Variations in estuarial or river current strengths, affecting the frequency and duration of periods of navigation disruption and requiring improved infrastructure resilience
Changes in sediment transport, erosion and accretion affecting navigable depth, or beach, foreshore or built infrastructure integrity	Changes in sediment transport, erosion and accretion affecting navigable depth or built infrastructure integrity
Potential for changes in fog characteristics or other visibility issues	Changes in seasonal precipitation with potential consequences for water supply or storage affecting lock operations
Increases in air and water temperature or changes in ocean chemistry, inter alia leading to changes in characteristic species with consequences for infrastructure integrity or for operations and maintenance (e.g. the spread of non-indigenous or invasive species, or the distribution of target species for commercial fishing, angling or wildlife watching)	Increasing air and water temperature inter alia leading to changes in characteristic species with consequences for river bank integrity; algae or water weed growth; and the spread of non-indigenous or invasive species
Changes in ice cover with potential consequences for navigation infrastructure provision or demand	Changes in icing and snowmelt characteristics affecting both flow and infrastructure integrity



*Damage to waterborne transport infrastructure after Hurricane Ike.
Photos courtesy of U.S. Army Corps of Engineers Galveston District*



Storm damage, Port of Taranaki, New Zealand. Photo courtesy of Peter Atkinson

Key Principles Guiding Action

The new Sustainable Development Goals adopted by the UN General Assembly in September 2015 include a goal to 'take urgent action to combat climate change and its impacts' *inter alia* through strengthening resilience and adaptive capacity, and improving education, awareness and institutional capacity. The December 2015 COP21 discussions will similarly focus on adaptation to a greater extent than has previously been the case at these Conferences.

Reflecting on how the waterborne transport infrastructure sector can navigate the changing climate in an efficient and effective way, our coalition believes that delivery of the UN goal should incorporate four key principles within climate change mitigation and adaptation decision-making: sustainability, resilience, integration and *Working with Nature*.

Sustainability (S): a sustainable system is one where functions are adaptively managed in a way that meets contemporary needs while ensuring those functions are protected so as to be able to meet future needs. Many sustainability initiatives have been undertaken by PIANC concerning *inter alia* life cycle management and environmental issues for both maritime and inland navigation infrastructure. Dredging sustainability issues have similarly been addressed within PIANC, often working together with other associations and stakeholders, and PIANC and IAPH have been actively and jointly involved in promoting the Green Ports initiative.

Resilience (R): the concept of resilience has several meanings. In the waterborne transport infrastructure sector, attention to date has mainly been focused on how structures respond to forces associated with major risks or hazards. In a wider climate change context, resilience should also include designing infrastructure systems that can be adapted to sustain function following disturbance events, and to recover quickly and effectively from such events. Depending upon the local effects of climate change, attention may need to be paid to the effects of storms, floods, low flow conditions and drought amongst others. In this regard, PIANC's ongoing Working Group 178, in which many of the coalition partners are participating, will provide some initial good practice guidance for the wider waterborne transport infrastructure sector and it is intended that more detailed PIANC guidance on strengthening infrastructure resilience will follow.

Integration (I): an integrated system considers the relevant interconnectivities between biophysical, engineered, economic and societal systems and functions. Integrated transport networks and intermodality are already a key consideration for seaports and inland ports, IAPH's intermodal transport project being just one example. However climate change projections mean that a broader interpretation - including integration across sectors - will be beneficial. For example, some measures to improve the resilience of waterborne transport infrastructure might also meet flood protection needs and deliver natural environment or fisheries objectives. Integrated approaches not only achieve sustainable multiple purposes but also realise economies of scale, and will therefore be important in all countries irrespective of their level of development and resource availability.

Working with Nature (W): Thinking about and applying the foregoing principles of sustainability, resilience and integration in fact means adhering to the PIANC *Working with Nature* philosophy. This philosophy has been developed by PIANC in order to ensure that the natural environment is taken into account in the earliest stages of an initiative or project, considering ecosystem services and the role of physical processes alongside logistical and economic issues. The approach allows win-win solutions to be identified, often through collaboration with stakeholders. Technical guidance on implementing the *Working with Nature* philosophy is currently being elaborated by PIANC for publication in late 2016.



An innovative approach to the beneficial re-use of navigation dredged material at Horseshoe Bend⁹ on the Atchafalaya River in the state of Louisiana, USA, relied on natural processes transporting and depositing the sediment to create an island of significant wildlife value. As this island has evolved, multiple other benefits have been realised. The newly established vegetation promotes carbon sequestration, in turn offsetting some of the emissions associated with dredging. In addition, the island has formed a natural 'training wall', facilitating self-scour in the navigation channel and thus significantly reducing local dredging requirements and hence related emissions.

"During the early stages of the project, everyone's attention was focused on engineering uncertainties. This preoccupation made initial surveying of the island's rich floral and faunal communities that much more amazing. But greater benefits were hidden in and around the island. Soil horizons expressed biogeochemical signatures atypical of traditional dredge-and-fill sites, and the physical presence of the island allowed for development of a stable channel. Thus, it became apparent that obvious macro-benefits were outweighed by the island's complementary roles in sequestering carbon in its soils and reducing dredging requirements and emissions."

*Jeff Corbino, Project Manager, U.S. Army Corps of Engineers,
New Orleans District, New Orleans, Louisiana, USA*

The Horseshoe Bend project provides an excellent example of how applying the Working with Nature philosophy within the USACE 'Engineering with Nature'¹⁰ Program can help promote a sustainable solution, improving natural resilience at the same time as delivering significant net carbon savings. Photography by Wings of Anglers, courtesy of Great Lakes Dredge and Dock.

Towards a Plan for Action: to Paris and Beyond

The provision of expert guidance, recommendations and technical advice, together with actions to keep the international community connected, are PIANC's two primary objectives. Other organisations represented on the coalition similarly have a mandate to prepare and promote guidance and/or to facilitate effective communication and dissemination. By working together, the members of PIANC's Think Climate coalition are therefore well placed:

⁹ Suedel, B. et al (2015). Creating Horseshoe Bend Island, Atchafalaya, Louisiana. Terra and Aqua. Number 140. September 2015.

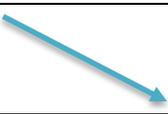
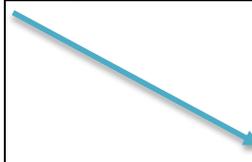
¹⁰ <http://el.erdg.usace.army.mil/ewn/>

- to raise awareness of the implications of the changing climate
- to contribute to building mitigation and adaptation capacity throughout the sector, taking particular account of the technical cooperation needs of developing countries, and
- to provide and promote guidance on strengthening both physical and institutional resilience and on climate change adaptation.

Whilst an interest in or dependence on inland or maritime waterborne transport infrastructure is a common thread, individual members of the coalition partner associations have different interests, different responsibilities, different ways of working and different levels of awareness when it comes to climate change mitigation and adaptation. Our Road Map and Action Plan recognise and accommodate these differences, ensuring not only that existing initiatives can be consolidated, disseminated or scaled-up as appropriate, but that the future needs of the wider sector will be identified, new actions promoted to address gaps, and progress in delivering and disseminating new resources monitored.

The 'Navigating a Changing Climate' Road Map (overleaf) summarises the objectives and agreed actions that will be promoted by the Think Climate coalition partners to support the owners, operators and users of waterborne transport infrastructure in the period to 2020. These actions are elaborated in the following Action Plan.

Navigating a Changing Climate: Road Map

2015	Objectives	Actions	Underway by	2020 and beyond
Some exceptions, but typically low levels of awareness; uncertainty leading to inaction				
	1. Expand network; identify new coalition partners and supporters; raise awareness	Work together to: 1a. Increase the number of Think Climate partner associations and supporter organisations 1b. Promote the work of the Think Climate coalition 1c. Create a new website to connect the sector and facilitate sharing of experiences 1d. Organise two new international conferences on the theme 'Navigating a Changing Climate' 1e. Organise or facilitate at least 25 climate change workshops 1f. Prepare and promote webinars and web-based tools 1g. Undertake a gap analysis to understand the wider needs of the waterborne transport infrastructure sector	2015 2015 2015 2016 2015 2016 2016	
	2. Reduce greenhouse gas emissions; promote shift to low carbon infrastructure	Work together to: 2a. Promote awareness of and scale up relevant IAPH World Ports Climate Initiative activities 2b. Promote uptake of the GLEC framework for emissions calculations 2c. Raise awareness of and promote Blue Carbon pilot studies 2d. Raise awareness of relevant partner initiatives to reduce emissions from vessels 2e. Prepare and disseminate technical guidance on carbon management for port and navigation infrastructure projects 2f. Establish an effective means of documenting and monitoring emissions from dredging and infrastructure construction projects 2g. Facilitate the preparation of new technical guidance on mitigation and offsetting measures and low carbon alternatives 2h. Facilitate the development and delivery of training and capacity building in relation to emissions reduction options	2016 2016 2016 2016 2015 2017 2016 2017	
	3. Improve preparedness; strengthen resilience; adapt	Work together to: 3a. Prepare and disseminate technical guidance on climate change adaptation for inland and maritime navigation infrastructure 3b. Update PIANC's Task Group 3 report Climate Change and Navigation 3c. Improve awareness of the implications of climate change for operational practices and supporting infrastructure 3d. Raise awareness of existing technical guidance on risk assessment and on climate proofing waterborne transport infrastructure 3e. Facilitate the preparation of new technical guidance on navigation infrastructure adaptation and strengthening resilience 3f. Facilitate the development and delivery of training and capacity building on adaptation options for navigation infrastructure	2015 2016 2016 2016 2016 2016	
	4. Work with Nature; seek integrated and sustainable solutions	Work together to: 4a. Promote awareness of and scale up relevant <i>Working with Nature</i> activities 4b. Continue to build knowledge and practical experience of Building with Nature and Engineering with Nature solutions 4c. Promote the adoption of sustainable, integrated solutions for shippers and supply chains such as those advocated by SFC 4d. Promote the adoption of intermodal transport principles such as those promoted by the WPCI Intermodal Transport Initiative 4e. Disseminate information about integrated initiatives such as Early Contractor Involvement	2015 2016 2015 2015 2015	
				An informed waterborne transport infrastructure sector, aware of the issues; with access to relevant knowledge resources; making informed mitigation and adaptation decisions; collaborating with others; Working with Nature; delivering integrated and sustainable solutions

NAVIGATING A CHANGING CLIMATE: ACTION PLAN

THINK CLIMATE: LEARN, MONITOR, REVIEW, UNDERSTAND, PREPARE, CHOOSE, CHANGE

1. Expand the network of Think Climate partners and supporters; raise awareness of climate-related issues throughout the waterborne transport infrastructure sector

1a.-1b. A vital step in raising sector-wide awareness of climate change, of the challenges inland and maritime waterborne transport infrastructure will face, and of potential solutions or opportunities, is to ensure that as many individuals as possible have access to relevant resources including the outputs of the Navigating a Changing Climate initiative. By increasing the number of international and regional partner associations in the Think Climate coalition, and by encouraging national-level associations, corporate bodies and other organisations to sign up as 'supporters' of the initiative, it is our intention to:

- double the number of individuals who will have access to the coalition's products to 500,000 by end 2016
- increase this to more than 1,000,000 individuals with interests in waterborne transport infrastructure by end 2020.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W		
					Actions	
					1a. Increase the number of Think Climate partner associations and supporter organisations	
PIANC is leading the Navigating a Changing Climate initiative and establishing the initial membership of the Think Climate coalition	✓	✓	✓	✓	1a.(i) Increase the number of international associations signed up as partners in the Think Climate coalition to 8 1a.(ii) Increase the number of regional associations signed up as partners in or supporters of the Think Climate coalition to 10 1a.(iii) Aim to have a minimum of 40 organisations signed up as supporters 1a.(iv) Aim to have a minimum of 100 organisations signed up as supporters	End 2016 End 2016 End 2016 End 2020
					1b. Promote the work of the Think Climate coalition	
PIANC will take relevant opportunities to hold Press Conferences at events around the world between September 2015 and the COP21 meetings. PIANC will also publicise the Think Climate coalition through articles in its newsletter and via social media (Twitter, LinkedIn, Facebook). Coalition partners will take similar steps to raise awareness of the initiative and to help attract new partners and supporters.	✓		✓		1b.(i) Partners to prepare and issue Press Releases; hold Press Conferences and organise similar publicity in the run-up to COP21 1b.(ii) Seek opportunities to publicise the work of the Think Climate coalition throughout the waterborne transport infrastructure sector, and to attract new partners and supporters: publicise the Navigating a Changing Climate initiative via articles in technical publications, magazines, newsletters, etc. 1b.(iii) Post-COP21, develop and agree a media strategy to maintain momentum and ensure longevity of the work of the Think Climate coalition through to 2020	2015 2016 2016

1c. Several members of the Think Climate coalition are already undertaking activities of relevance to the wider waterborne transport infrastructure community but awareness of these initiatives is often limited to the membership of the lead association. It is therefore our intention to facilitate the sharing of experiences relevant to the Navigating a Changing Climate initiative, wherever practicable providing access to existing and new resources throughout the sector.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W		
					Actions	
					1c. Create a new website to connect the sector and facilitate sharing of experiences	
Annex 2 highlights various climate-related initiatives and activities already completed, underway or planned by partners of the Think Climate coalition	✓	✓	✓	✓	1c.(i) Create and maintain a 'master list' of all climate relevant existing initiatives undertaken by members and supporters of the coalition; add new initiatives as they are commenced/completed 1c.(ii) Develop a network for the exchange of knowledge and experience operating via a common Think Climate webpage, also providing members of all partner associations and supporter organisations with a single point of access to relevant resources 1c.(iii) Prepare 'overview' brochures and similar summary documents for distribution to association members at conferences and workshops, etc. <i>inter alia</i> describing the Navigating a Changing Climate initiative and directing readers to the Think Climate webpage	2016 2015 Mid 2016

1d.-1f. Conferences, seminars and workshops provide an important opportunity to raise awareness of climate-related challenges and opportunities whilst at the same time disseminating good practice. In this regard the coalition partners will collaborate to organise and publicise a range of climate-specific events, taking care to ensure that events make provision for and accommodate the needs of owners, operators and users of waterborne transport infrastructure in less developed and less well-resourced nations.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W		
					Actions	
					1d. Organise two new international conferences on the theme 'Navigating a Changing Climate'	
Most partners in the Think Climate coalition currently organise conferences or seminars dedicated to the interests of their membership. In some cases these include sessions on climate change issues, for example at the 33 rd PIANC World Congress in San Francisco, USA in 2014; the forthcoming 10 th IHMA	✓	✓	✓	✓	1d.(i) Collaborate to organise a joint international, waterborne transport infrastructure conference in 2017 entitled 'Navigating a Changing Climate' with the following three themes:	2016

<p>Congress in Vancouver, Canada, in 2016; and the PIANC-COPEDEC developing countries congress also in 2016.</p> <p>However, exchange of information and experiences <i>between</i> the partner associations is currently somewhat ad hoc and often relatively limited. There are therefore many opportunities associated with improved, well-planned cooperation.</p>				<ul style="list-style-type: none"> reducing greenhouse gas emissions and moving towards low carbon infrastructure and operations improving preparedness, strengthening the resilience of infrastructure assets and institutions, and acting to adapt <i>Working with Nature</i> to adapt navigation infrastructure, and identifying integrated and sustainable solutions <p>1d.(ii) Organise a second, similar international conference four years later, <i>inter alia</i> to disseminate the outcomes of the Navigating a Changing Climate initiative</p> <p>1d.(iii) Ensure major conferences and congresses organised by partner associations include at least one session dedicated to climate change issues. Ensure other coalition partners are invited to participate wherever practical</p> <p>1d.(iv) Offer technical case study or preparedness 'process' presentations, or submit abstracts thereon, to conferences organised by other organisations or in related sectors, disseminating relevant findings from the Navigating a Changing Climate initiative and in turn drawing attention to the work of the Think Climate coalition</p>	<p>2020</p> <p>2016; ongoing</p> <p>2016; ongoing</p>
				<p>1e. Organise or facilitate at least 25 climate change workshops</p>	
<p>Most of the associations in the coalition run technical events such as workshops to facilitate the continuing professional development of their members. For example, EuDA together with CEDA¹¹ organised a workshop on the contribution of the dredging industry to climate change adaptation at the ECCA¹² 2015 Conference in Copenhagen, Denmark; and NordPIANC ran a workshop on climate adaptation for arctic navigation infrastructure at Lappeenranta, Finland in 2015. Similar, climate-specific workshops should be organised for members of all partner associations.</p>	✓	✓	✓	<p>1e.(i) Promote, support, organise or facilitate a minimum of five climate change-themed workshops or similar events annually, including in developing countries; document and share the outcomes with other coalition partners. Amongst others, a collaborative workshop between PIANC and the Philippine Ports Authority is already planned for 2016, and climate themed workshops will be held in South Africa and in the UK, also in 2016</p> <p>1e.(ii) Use these workshops to co-promote relevant activities of coalition partners, either by invitation or using agreed standard materials</p>	<p>2015</p> <p>2015</p>
				<p>1f. Prepare and promote webinars and web-based tools</p>	
<p>Some coalition partners promote live/interactive or pre-recorded webinars and similar. The advantage of web-based awareness raising is that it can be made widely available, globally, and that it can cover topics at a variety of levels of detail.</p>	✓	✓	✓	<p>1f(i) Identify themes for technical webinars or web-based 'tool box talks' on climate-related topics; agree on lead partners to prepare and run each event. Promote and advertise events through the website and via relevant partner and supporter associations.</p>	2016

¹¹ Central Dredging Association

¹² European Conference on Climate Change Adaptation

1g. Awareness of the potential effects of climate change, and the resulting need to improve the resilience of waterborne transport infrastructure, varies considerably within the membership of the coalition partners. As such, it is a priority for the Think Climate coalition to understand not only how climate change will affect waterborne transport infrastructure and the operations reliant thereon, but also the requirements of association members. In other words, it is important to establish what support the owners, operators and users of waterborne transport infrastructure need to enable them to build capacity and deliver effective mitigation and adaptation measures. Developing this understanding will help to ensure that future actions are properly targeted and that they address the real needs of those responsible for navigating a changing climate across all parts of the sector.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W	Actions	
					1g. Undertake a gap analysis to understand the wider needs of the waterborne transport infrastructure sector	
Associations joining the Think Climate coalition have provisionally indicated known gaps in knowledge and understanding insofar as climate change issues are concerned.	✓	✓	✓	✓	1g.(i) Undertake a gap analysis (possibly based on a questionnaire or similar survey, but supplemented by other activities such as discussion sessions at workshops, conferences, etc.) to identify the needs of waterborne transport infrastructure owners, operators and users	End 2016

2. Promote action to reduce (net) greenhouse gas emissions and encourage a shift towards low carbon waterborne transport infrastructure and operations

2a.-2d. The waterborne transport infrastructure sector needs to play its part in reducing greenhouse gas emissions. Whilst port and waterway infrastructure and operations typically account for only a very small proportion¹³ of the total greenhouse gas emissions associated with the shipment of a particular consignment, it is nonetheless important that the owners, operators and users of waterborne transport infrastructure take steps to minimise the emissions associated with their activities, thus contributing to the 'less-than-2-degrees' pathway. The associations represented on the coalition recognise the importance – and the urgency – of implementing effective mitigation measures: to reduce greenhouse gas emissions; to avoid decisions that lock in to fossil fuel-based systems; and to move towards low carbon infrastructure.

Several of the partners in the Think Climate coalition already have activities and initiatives ongoing to help their members manage greenhouse gas emissions associated with waterborne transport infrastructure but awareness of these initiatives is often limited outside the lead association. Most of these initiatives would benefit from further dissemination and promotion both to raise awareness and encourage increased uptake. Where existing activities are not directly relevant to other parts of the wider sector they may nonetheless provide inspiration - a model or ideas on which other organisations might build to create an equivalent resource. Such opportunities need to be identified and exploited.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W		
					Actions	
					2a. Promote awareness of and scale up relevant IAPH World Ports Climate Initiative activities	
IAPH has produced a 'Tool Box' to give ports easy access to the tools needed to address port-related air quality and climate change issues. This includes a range of resources to reduce greenhouse gas (GHG) emissions developed through the World Ports Climate Initiative (WPCI):	✓		✓		2a.(i) Improve awareness and take-up of each of these resources, for example via presentations at conferences, dedicated workshops, webinars and tool-box talks, <i>inter alia</i> emphasising the opportunity for significant potential for cost savings as well as carbon savings	End 2016
<ul style="list-style-type: none"> • <u>a carbon foot-printing</u> reference helps ports to develop or improve their GHG emissions inventories, both from landside operations' emissions and from ships and other equipment outside their boundaries • the promotion of <u>intermodal transport</u> – reducing or avoiding handling of cargo improves efficiency and productivity as well as reducing emissions to air 					2a.(ii) Promote these initiatives, with modification as appropriate, to other types of owner and operator within the wider waterborne transport infrastructure sector. For example work with representatives of inland ports and with terminal operators to promote the adaption and uptake of relevant WPCI resources.	End 2017

¹³ See, for example, the following presentation indicating that <1% of the total CO₂ emissions associated with the movement of a single container from China to Scotland derive from port-related activities:

http://www.fta.co.uk/export/sites/fta/galleries/downloads/international_supply_chain/presentation_decarbonising_the_maritime_supply_chain.pdf

<ul style="list-style-type: none"> support is provided to ports promoting the installation and use of <u>onshore power supply</u> (OPS) via practical information on measures to improve air quality in ports and port cities including reducing vessels' dependence on auxiliary engines 						
					2b. Promote uptake of the GLEC framework for emissions calculations	
Smart Freight Centre leads and coordinates the Global Logistics Emissions Council (GLEC) which is working across the various modes, industry sectors and global regions to develop a common framework for the calculation of logistics emissions as an enabler to design, selection, reporting and tracking of more efficient logistics and global supply chains.	✓		✓		2b.(i) Engage the wider sector in promoting the uptake of the GLEC framework for the calculation of logistics emissions, for example through presentations, workshops and articles in technical publications	2016
					2c. Raise awareness and promote Blue Carbon pilot studies	
EuDA is developing a CO ₂ strategy to facilitate the capture and long term storage of atmospheric CO ₂ . 'Blue Carbon' initiatives will be delivered through the restoration of habitats that are natural carbon sinks such as saltmarshes, seagrasses and mangroves. This initiative could provide valuable, transferable experience for emissions associated with both existing and new waterborne transport infrastructure.	✓	✓	✓	✓	2c.(i) Other coalition members will work with EuDA to identify and promote pilot studies to improve understanding and facilitate take-up of Blue Carbon (offsetting) initiatives 2c.(ii) Raise awareness of the potential for and experience with Blue Carbon restoration as an offsetting measure, through presentations, workshops and technical briefing notes and guidance 2c.(iii) Explore the viability of setting a legal framework for emissions rights to facilitate the development and maintenance of such environments	2016 2017 2018
					2d. Raise awareness of relevant partner initiatives to reduce emissions from vessels	
Other initiatives being implemented, particularly by infrastructure owners and operators, are seeking to reduce emissions from vessels using, or involved in the development of, waterborne transport infrastructure. For example: <ul style="list-style-type: none"> an <u>Environmental Ship Index</u> (ESI): an IAPH-WPCI tool to evaluate the amount of nitrogen oxide (NOX) and sulphur oxide (SOX) released by a seagoing vessel, enables ports to identify and reward clean ships IHMA's promotion of '<u>time stamp</u>' structures for use in port entry software, will not only contribute to safer and more efficient ports but also improve fuel efficiency. 	✓		✓		2d.(i) Raise awareness of these initiatives, promote their uptake and seek opportunities to replicate or scale-up such initiatives through presentations, webinars, technical articles and briefing notes	2016

Whereas these activities are associated with vessels rather than directly with the infrastructure, they are nonetheless important in contributing to an overall reduction in emissions, including in the vicinity of waterborne transport infrastructure.

The World Ports Climate Initiative promoted by coalition partner IAPH provides an important example of the work already underway in the sector to reduce greenhouse gas emissions associated with waterborne transport infrastructure

The Smart Freight Centre's Global Logistics Emissions Council provides an example of integrated action on emissions reduction, working across the various modes, sectors and regions to develop a common tool for calculating logistics emissions

2e.-2g. Whilst some tools do already exist to help identify and reduce emissions associated with the use of waterborne transport infrastructure, general awareness of emissions reduction or offsetting options remains low and there are some significant gaps in knowledge and experience. Some low carbon technology relevant to waterborne transport infrastructure already exists or is being developed, but awareness of these initiatives could be improved. Low carbon options are also being developed in other sectors (road, rail, flood risk management) some of which have the potential to be applied in the port or waterway environment, but cross-sectoral dialogue is needed to help highlight such opportunities, followed by awareness-raising within the waterborne transport infrastructure sector. Establishing the needs of the owners, operators and users of waterborne transport infrastructure sector will enable both technical guidance and research and development requirements to be identified.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W		
					Actions	
					2e. Prepare and disseminate technical guidance on carbon management for port and navigation infrastructure projects	
PIANC's new technical Working Group (WG188) will develop guidance on carbon management for port and navigation infrastructure projects. The Working Group will collate available international experiences including those of other coalition partners; review navigation-relevant case studies; and report on methods to quantify and manage navigation infrastructure carbon footprints as well as describing good practice for conservation of carbon-sequestering coastal ecosystems (blue carbon). These methodologies and best practices will be relevant not only to the international PIANC community but also to other coalition partners and supporters.	✓	✓	✓	✓	2e.(i) Invite coalition partner associations to nominate representatives to Working Group 188, and confirm the relevance of the Terms of Reference to all associations 2e.(ii) Ensure effective dissemination of the resulting guidance on carbon management for port and navigation infrastructure projects; advertise and distribute the guidance via partner associations; deliver or facilitate workshops; submit conference papers, etc.	End 2015 End 2017
					2f. Establish an effective means of documenting and monitoring emissions from dredging and infrastructure construction projects	
In relation to new dredging and infrastructure projects in particular, EuDA and its members are contributing to policies aimed at reducing CO ₂ emissions from construction projects (e.g. Netherlands CO ₂ performance scale)	✓		✓		2f.(i) EuDA and other coalition partners will cooperate locally and regionally as appropriate to establish datasets and methodologies with the objective of deriving an effective means of documenting and monitoring emissions from dredging and other waterborne transport infrastructure construction projects.	2017
					2g. Facilitate the preparation of new technical guidance on mitigation and offsetting measures and low carbon alternatives	
Whilst some resources exist, there are also gaps in experience. In some parts of the sector, the owners, operators and users still lack knowledge, both about the measures that can be taken to reduce or offset greenhouse gas emissions from existing waterborne transport infrastructure and about the options available to shift to low carbon alternatives. Action is therefore needed to identify gaps and determine priorities with regard to the need for new technical resources, guidance documents and similar.	✓	✓	✓	✓	2g.(i) Use discussion sessions at workshops, conferences, etc., to identify gaps in knowledge and understanding about GHG emissions and mitigation and offsetting measures for existing and new waterborne transport infrastructure. Highlight tried-and-tested and potential new measures, low carbon alternatives and options that avoid locking into fossil fuel futures. Consider measures and alternatives used by other sectors that may be of relevance to waterborne transport infrastructure. 2g.(ii) Where relevant information is available from existing initiatives, develop and disseminate briefing papers and checklists to enable the owners, operators and users of waterborne transport infrastructure to make more informed choices about GHG mitigation and/or offsetting 2g.(iii) Identify outstanding gaps in technical resources to help with the selection and delivery of mitigation, offsetting and low	2016 2017 2017 onwards

					carbon alternatives (e.g. briefing papers, detailed technical guidance or knowledge gaps requiring research and development) 2g.(iv) Facilitate the preparation of international good practice technical guidance on priority topics 2g.(v) Agree on a strategy to enable identified research and development priorities to be communicated and realised.	2018 2018
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2h. Capacity building is another vital step towards achieving the coalition's vision. Where inland or maritime waterborne transport infrastructure owners, operators or users are unfamiliar with options for reducing or offsetting greenhouse gas emissions, for shifting to low carbon infrastructure, or for avoiding locking in to fossil fuel futures, technical guidance can usefully be supplemented by a campaign of awareness raising and training.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W	Actions	
					2h. Facilitate the development and delivery of training and capacity building in relation to emissions reduction options	
Whilst there are various ad hoc awareness raising activities associated with the existing initiatives listed in Annex 2, there has been no coordinated, sector-wide campaign of activity dedicated to mitigation i.e. reducing or offsetting emissions from waterborne transport infrastructure and to promoting low carbon alternatives. Any capacity building initiative should both seek to provide training in relation to existing products and resources (e.g. introduction to WPCI resources; combined training sessions to support integrated calculations of logistics emissions according to GLEC framework) as well as identifying possible new initiatives.	✓	✓	✓		2h.(i) Coalition partners will take steps to identify their members' key capacity building requirements in relation to mitigation and offsetting measures and low carbon alternatives 2h.(ii) Coalition partners will then plan for and facilitate the delivery of relevant sector-specific mitigation training based both on existing coalition products and newly identified needs. This could include: <ul style="list-style-type: none"> classroom (face-to-face) or internet-based (virtual), formal or informal training courses; other types of training (e.g. workshops, toolbox talks, webinars) facilitation of secondments or peer review opportunities (for example via the creation of networks within or between associations); virtual meeting places and chat-based forums for the exchange of information. <p>This action could lead to the identification of new coalition supporters in the form of training providers.</p>	2017 2018

3. Improve preparedness, strengthen resilience and enable the waterborne transport infrastructure sector to adapt to climate change

3a.-3c. Levels of preparedness to deal with the effects of climate change vary considerably within the Think Climate coalition partners' members. Many organisations and individuals are not yet well prepared. Uncertainty is a real issue, often culminating in a lack of action, and there are plenty of examples where significant improvements in planning and preparedness are needed to reduce vulnerability and to strengthen the resilience of waterborne transport infrastructure.

Awareness raising and capacity building are fundamental prerequisites to improving resilience. Access to technical advice and guidance is similarly essential for effective delivery. Most of the associations in the coalition have a mandate that includes the preparation and/or dissemination of good practice guidance; and the provision or signposting of training and other activities aimed at capacity building. Ensuring that their members have access to sector-specific resources will be vital for these associations if the owners, operators and users of inland and maritime waterborne transport infrastructure are to become better informed and hence better-prepared to navigate the effects of a changing climate.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W		
					Actions	
					3a. Prepare and disseminate technical guidance on climate change adaptation for inland and maritime navigation infrastructure	
<p>PIANC's Working Group 178 is preparing guidance on climate change adaptation for inland and maritime navigation infrastructure. This guidance, due for publication in 2017, will describe good practice - from understanding the climate science, collecting locally-relevant data, building capacity and carrying out risk assessments through to the evaluation and selection of appropriate measures to strengthen both institutional and structural assets, and otherwise adapt to climate change. Part of this initiative is the organisation of workshops which aim to:</p> <ul style="list-style-type: none"> raise awareness of climate change; of adaptation planning and delivery options; of the guidance document provide a platform for the presentation of regionally-specific examples and the exchange of experience identify and collate case study information for the PIANC WG 178 guidance document. 	✓	✓	✓	✓	<p>3a.(i) Ensure all interested coalition partners are participating in WG178 and are encouraged to organise workshops or other WG 178 events</p> <p>3a.(ii) Confirm the relevance of the WG178 project to all partners. Where interests are different, explore the need for and promote opportunities to produce equivalent guidance for other parts of the sector (e.g. for terminal operators, freight handlers)</p> <p>3a.(iii) Ensure effective dissemination of the final WG178 report and any equivalent guidance documents. Advertise and distribute the guidance via partner associations; deliver or facilitate workshops; submit conference papers, etc.</p>	<p>End 2015</p> <p>2016</p> <p>End 2017</p>

These and other case study examples collected to inform the report will be presented as part of the guidance.						
					3b. Update PIANC's Task Group 3 report Climate Change and Navigation	
PIANC's Task Group 3 report 'Climate change and navigation' was prepared in 2008 using the 2007 IPCC outcomes. This guidance needs to be updated to include the 2014 Fifth Assessment Report and to include reference to regional assessments.	✓	✓	✓		3b.(i) Prepare Terms of Reference for the update and issue call for Task Group members including for members from coalition partner associations; prepare updated TG3 report. 3b.(ii) Advertise and disseminate the revised PIANC TG3 report; use for reference in workshops; submit and prepare conference papers, etc.	End 2016 End 2017
					3c. Improve awareness of the implications of climate change for operational practices and supporting infrastructure	
IMPA is continually monitoring and disseminating to members, information about operational practices, new equipment and techniques, etc. to facilitate safe operation and ship manoeuvring in increasingly challenging environmental and meteorological conditions, whilst meeting the continuing and improved goals of shipping trade efficiency		✓	✓		3c.(i) Improve awareness amongst port authorities, national administrations, shipowners and managers, class and trade associations and others about the implications of climate change for ship movements in port and how operational practices and supporting infrastructure may need to adapt to these demands	2015; ongoing

3d.-3e. In addition to raising awareness and building capacity, providing access to sector-specific technical support and guidance on adaptation options and delivering more resilient infrastructure is another fundamentally important aspect of improving resilience and adaptation capability.

A key role of PIANC and many of the other associations in the coalition is the promotion of technical excellence. This is achieved *inter alia* through the preparation and publication of good practice guidance. Such publications enable individuals throughout the sector to access up-to-date international or regional documents - for example sector-specific summaries and interpretation of factual information; technical good practice guidance; and in some cases standards. These reports typically set out the key guiding principles to be applied in the national or local context. In the specific case of climate adaptation, guidance and other resources will be needed to cover the spectrum of decision-making, from initial risk assessment through to design guidance.

Existing relevant good practice may need to be reviewed and developed to more explicitly accommodate climate change issues. Effective dissemination of relevant existing publications and, on completion, of the various technical guidance documents currently in preparation will be an essential action in the coming years. Equally important, however, will be the identification of critical gaps in knowledge/understanding and guidance. Coordination between coalition members in setting up relevant initiatives leading to the preparation of new resources is therefore another priority action.

3f. As indicated above, capacity building is another vital step towards achieving the coalition's vision. For a variety of reasons, many organisations with interests in inland or maritime waterborne transport infrastructure currently have a limited capacity to adapt to the changing climate. This might be an institutional or resourcing issue; it may be a function of the scale of the organisation; or there may be a lack of access to relevant, sector-specific training. In addition to providing guidance and technical reference materials, the associations represented on the coalition will therefore instigate a number of actions dedicated to training and capacity building.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W	Actions	
					3f. Facilitate the development and delivery of training and capacity building on adaptation options for navigation infrastructure	
<p>Some of the associations represented on the coalition have a reasonable appreciation of the needs of their members in relation to climate change preparedness issues; others have a less mature understanding. If effective steps are to be taken to strengthen the resilience of waterborne transport infrastructure assets and institutions in the face of a changing climate, and to promote relevant adaptation measures, all partner associations need to properly understand the needs of their members.</p>	✓	✓	✓		<p>3f.(i) Coalition partners to take steps to identify their members' key capacity building requirements in relation to climate change implications for waterborne transport infrastructure</p> <p>3f.(ii) Coalition partners will plan for and facilitate the delivery of relevant sector-specific training; this could include</p> <ul style="list-style-type: none"> • classroom (face-to-face) or internet-based (virtual), formal or informal training courses; • other types of training (e.g. workshops, toolbox talks, webinars) • facilitation of secondments or peer review opportunities (for example via the creation of networks within or between associations); • virtual meeting places and chat-based forums for the exchange of information <p>This action could lead to the identification of new coalition supporters in the form of training providers.</p>	<p>End 2016</p> <p>2017; ongoing</p>

4. Encourage new ways of thinking about waterborne transport infrastructure: Working with Nature; identifying sustainable and integrated solutions

4a.-4b. The partners in PIANC's Think Climate coalition recognise that navigating a changing climate will often require changing the way we think about challenges. As climate changes, doing 'more of the same' may no longer be sustainable. New problems may need new solutions. PIANC's Working with Nature philosophy provides an example of such an approach – focusing on achieving project objectives in an ecosystem context rather than assessing consequences of a pre-defined design; and identifying win-win solutions rather than simply minimising ecological harm.

Working with Nature encourages waterborne transport infrastructure owners, operators and users to identify solutions that reduce the vulnerability of natural ecosystems and improve their resilience, at the same time as realising resilient and sustainable infrastructure projects that can help to offset carbon emissions.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W		
					Actions	
					4a. Promote awareness of and scale up relevant Working with Nature activities	
<p>Working with Nature is an established philosophy with web-based resources, a Position Paper and a system of certificates and awards. PIANC's Working Group 176 is now preparing technical guidance on the practical application of the Working with Nature philosophy to inland and maritime navigation infrastructure projects.</p> 	✓	✓	✓	✓	<p>4a.(i) Ensure that WG 176 considers the application of the Working with Nature philosophy to the adaptation of waterborne transport infrastructure, providing technical guidance on options for working with natural processes, improving the resilience of both infrastructure and nature, and often reducing (net) carbon emissions as a result.</p> <p>4a. (ii) Finalise and disseminate the PIANC good practice guidance document on Working with Nature. Dissemination should include facilitating or delivering workshops, submitting and preparing conference papers, etc.</p> <p>4a.(iii) Scale up the promotion of the Working with Nature certificate and award scheme, amongst others by reaching out to coalition partners and supporters</p>	<p>End 2015</p> <p>End 2016</p> <p>2016</p>
					4b. Continue to build knowledge and practical experience of Building with Nature and Engineering with Nature solutions	
<p>EuDA and its members are actively involved in raising awareness of the Building with Nature¹⁴ approach to the design, management and implementation of infrastructure</p>	✓	✓	✓	✓	<p>4b.(i) Continue to build knowledge and experience; work with Think Climate coalition partners to identify additional pilot projects; monitor and record experience to improve techniques</p>	2015

¹⁴ <http://www.ecoshape.nl>

projects. EuDA members are already implementing Building with Nature pilot projects in tropical and temperate climates. The 'Engineering with Nature' program is an initiative of PIANC member USACE, which is developing and delivering similar practical solutions.

and maximise their effectiveness for both climate mitigation (through carbon sequestration) and adaptation (through improved resilience).



Applying the Working with Nature philosophy enabled Mersey Docks and Harbour Company Ltd. to identify potential beneficial uses for maintenance dredged sediment from Liverpool Docks, England. Discussions with stakeholders identified that rather than transporting the dredged silt to the existing disposal site 20 km offshore it would be preferable to deposit it at the Mid River licensed disposal site less than 1 km from the Docks. Modelling and tracer studies demonstrated that disposing of the dredged material at this site on the flood tide would facilitate the natural up-estuary transport of sediment. This would in turn encourage a proportion of the silt to remain within the estuarine system to sustain the inner estuary saltmarshes, strengthening their resilience in the face of climate change. In addition to this ecological gain, another benefit of disposal at Mid River would be the reduced distance that 800,000 tonnes of dredged material will need to be transported every year for disposal. This will significantly reduce emissions and hence the carbon footprint of the port's maintenance dredging operation.

4c.-4e. The Think Climate coalition partners recognise that adaptation is not simply about increasing the resilience of waterborne transport infrastructure. Other sectors must also navigate the changing climate, and their requirements may bring new opportunities. Integration and collaborative action - not only within but also beyond the waterborne transport infrastructure sector - will be key drivers to realising effective, cost-beneficial and sustainable solutions.

What are we already doing?	Which pillars?				What else will we do?	Underway by
	S	R	I	W		
					Actions	
					4c. Promote the adoption of sustainable, integrated solutions for shippers and supply chains such as those advocated by SFC	
Multinationals' logistics supply chains are vast and complex, involving combination of trucks, trains, ships, and planes and their associated infrastructure. Improving freight efficiency will both reduce emissions and increase profits. Individual companies cannot do this alone so look to collaborate, including through green freight programmes. Think Climate coalition partner SFC helps industry to demonstrate leadership and drive change, <i>inter alia</i> by defining and driving "Smart Freight Leadership"; making connections between green freight programmes to maximise cooperation and alignment; and supporting the development of new programmes and partnerships.	✓		✓		4c.(i) Promote the adoption of sustainable, integrated solutions such as those advocated by SFC, working across and beyond the sector, including shippers and supply chains, and understanding these groups' requirements of waterborne transport infrastructure providers.	2016
					4d. Promote the adoption of intermodal transport principles such as the WPCI Intermodal Transport Initiative	
IAPH, through the WPCI, is actively involved in the promotion of intermodal transport, an initiative that relies on an integrated approach to reduce or avoid handling of cargo - improving efficiency and productivity and reducing costs, as well as reducing emissions to air.	✓		✓		4d.(i) Raise awareness and promote the adoption of intermodal transport principles throughout the waterborne transport infrastructure sector, worldwide.	2016
					4e. Disseminate information about integrated initiatives such as Early Contractor Involvement	
EuDA is active in promoting initiatives such as 'Early Contractor Involvement' (ECI), an approach to contracting <i>inter alia</i> for waterborne transport infrastructure that promotes integration through teamwork and innovation, in turn contributing to just-in-time, value for money navigation infrastructure projects.	✓		✓		4e.(i) Collate and disseminate relevant experience with such initiatives, enabling members of partner associations to adopt integrated practices leading to both cost and carbon savings.	2016

NAVIGATING A CHANGING CLIMATE: ANNEX 1

PARTNER CHARACTERISTICS

Partner name*	Membership types	Geographic coverage	Members in how many countries?	Existing levels of climate awareness amongst membership?	Key objectives of association relevant to the Navigating a Changing Climate initiative
World Association for Waterborne Transport Infrastructure PIANC www.pianc.org	Government, corporate organisations, public and private sector, individuals	Global	65	Varied. Some members well informed; larger ports or waterways operators may be well-prepared. But low levels of awareness elsewhere in the sector	<ul style="list-style-type: none"> Keep the international waterborne transport community connected Bring together the best international experts on technical, economic and environmental issues pertaining to waterborne transport infrastructure to prepare high-quality technical reports Provide expert guidance, recommendations and technical advice
International Association of Ports and Harbors IAPH www.iaphworldports.org	Port authorities and port-related businesses	Global	90	Varied. Some members well-informed; larger ports and terminal operators may be well-prepared. But low levels of awareness elsewhere in the sector	<ul style="list-style-type: none"> Strengthen relationships among the member ports by facilitating interaction, dialogue, problem-solving and formulation of best practices. Leverage member expertise through strong technical committees and programs that create platforms focused on resolving complex port and maritime industry concerns and building greater efficiency and sustainability for ports worldwide. Promote and demonstrate IAPH members' leadership and commitment to a cleaner, safer and more environmentally sustainable industry for the benefit of the global community. Proactively coordinate with other international maritime and related organisations (such as IMO, UNCTAD, WCO, PIANC, etc.) and advocate for global solutions to issues that impact IAPH members
International Harbour Masters' Association IHMA www.harbourmaster.org/	Individuals	Global	40	Some recognition of the risks associated with climate change	<ul style="list-style-type: none"> Promote safe, secure, efficient and environmentally sound conduct of marine operations in port waters Develop and foster collaboration and good relations among harbour masters world-wide Represent the professional views of harbour masters internationally, regionally and nationally Collect, collate and supply information of professional interest to the membership
International Maritime Pilots' Association IMPA www.impahq.org	National pilot associations	Global	44	Variable. Some, who rely on freshwater levels daily are very aware. Others are sceptical.	<ul style="list-style-type: none"> Represent the international community of pilots Use the resources of the membership to promote effective safety outcomes in pilotage as an essential public service Constantly seek out the best available knowledge and information and make it available to members in order to

					advance the profession and maintain its relevance to the modern world
European Dredging Association EuDA www.european-dredging.eu	European dredging companies and national dredging associations	European (but most member companies operate globally)	50	Generally high: EuDA gathers emissions data; has studied specific dredging vessels' emissions patterns; and prepared targeted communications papers with industry-backed methodologies to estimate CO ₂ emissions from dredging projects.	<ul style="list-style-type: none"> • Provide the official interface between European dredging companies and the EU's Institutions and some international organisations (e.g. IMO, HELCOM or ILO) • Support the dredging companies in developing knowledge and capacity to tackle new challenges <i>inter alia</i> through specialised working groups • Promote investment in marine/maritime research and innovation; strong emphasis on social and environmental affairs
International Bulk Terminals Association IBTA www.drybulkterminals.org	Corporate organisations	Global	28	Mostly low but some exceptions	<ul style="list-style-type: none"> • Exchange of experience and expertise among members on matters of operational safety and efficiency in a non-commercial environment • Some members participate at IMO and in other UN Committees via the joint venture IBTA organised through the Dry Bulk Terminals Group Secretariat • Operational and safety benchmarking
Smart Freight Centre SFC www.smartfreightcentre.org	Global network across stakeholder groups	Global	40	Variable. Many initial contacts at the forefront taking action in respect of GHG reduction in the logistics sector but there is less awareness elsewhere in the sector	<ul style="list-style-type: none"> • Make global freight sector more efficient and environmentally sustainable • Focus on industry (shipper-carrier relationship) whilst also working with government and civil society • Remove market barriers and leverage existing initiatives to catalyse uptake of practical solutions and proven technologies • Create a universal and transparent way of calculating logistics emissions across the global supply chain

* International associations are invited to join the coalition as partners; regional associations may join as partners or supporters; national associations, corporate bodies and other organisations are encouraged to sign up as supporters of the Navigating a Changing Climate initiative.

NAVIGATING A CHANGING CLIMATE: ANNEX 2

EXISTING PARTNER INITIATIVES

Planned, ongoing and completed climate-related initiatives relevant to waterborne transport infrastructure

Description of initiative and link to further information	Lead association	Status	Topic or theme ¹⁵				Pillars ¹⁶			
			A	M	P	N	S	R	I	W
World Ports Climate Initiative										
<p>In 2008, the International Association of Ports and Harbors (IAPH) requested its Port Environment Committee to provide a mechanism for assisting the ports to combat climate change. The C40 World Ports Climate Declaration was adopted later that year, as 55 ports from all over the world committed to jointly reduce the threat of global climate change. Since that time, the WPCI has developed a website and formed subgroups focusing on themes that are developing guidance to ports seeking to monitor and reduce their GHG emissions. These themes currently include:</p> <ul style="list-style-type: none"> • Carbon Foot-printing and Modelling Tools • On-shore Power Supply • Environmental Shipping Index • Cargo-handling Equipment <p>Further information about these and other related initiatives can be found via the WPCI website at: http://wpci.iaphworldports.org/index.html</p>	IAPH	Ongoing	✓	✓			✓		✓	
WPCI Intermodal Transport										
<p>Intermodal transport involves the transportation of cargo using multiple methods of transportation (i.e. rail, ship, and truck) without any handling of the cargo itself when the transportation mode changes. Intermodal transport enhances the economic performance of a transport chain by using modes in the most productive manner. It reduces cargo handling as well as improves security and reduces damages and loss. Intermodal transport allows cargo to be transported more efficiently and thus reduces transportation cost and congestion on the roads as well as air emissions. In the World Port Climate Initiative (WPCI) one of the projects concerns the improvement of intermodal transport and the role port authorities can play in this international logistical network. For further information, see http://wpci.iaphworldports.org/project-in-progress/index.html</p>	IAPH	Ongoing	✓	✓			✓	✓	✓	

¹⁵ Topics or themes: **A** = Awareness raising; **M** = Mitigate emissions; **P** = improve Preparedness; **N** = New ways of thinking

¹⁶ Pillars: **S** = Sustainable; **R** = Resilient; **I** = Integrated; **W** = Working with Nature

Description of initiative and link to further information	Lead association	Status	Topic or theme ¹⁷				Pillars ¹⁸			
			A	M	P	N	S	R	I	W
Global Logistics Emissions Council (GLEC)										
GLEC is a voluntary industry partnership, led and coordinated by the Smart Freight Centre, which operates at global level, with involvement from major shippers, LSPs carriers, the main industry programs (e.g. Green Freight Europe, Lean & Green, SmartWay and Green Freight Asia) and global industry associations. GLEC has developed a draft Framework for Logistics Emissions Methodologies for the calculation and reporting of emissions from logistics covering all modes, transfers and regions. This has been out to consultation, as well as undergoing practical testing with industry partners, during 2015. A revised version will be formally launched for more widespread application during 2016. http://www.smartfreightcentre.org/glec/what-is-glec	SFC	Ongoing	✓	✓		✓	✓		✓	
Working with Nature										
The conventional approach of designing navigation infrastructure and then assessing its potential environmental impacts relies on damage limitation, and is not sustainable. PIANC's <i>Working with Nature</i> philosophy sets out four-steps to be followed early in the project development process in order to identify options for sustainable navigation infrastructure: <ol style="list-style-type: none"> 1. Establish project need and objectives 2. Understand the environment 3. Use stakeholder engagement to identify win-win options 4. Prepare project proposals to benefit both navigation <u>and</u> nature <p>The <i>Working with Nature</i> initiative has several strands http://www.pianc.org/workingwithnature.php. A Position Paper is available in several languages; a certificate and award scheme has been established; and work is ongoing to prepare technical guidance on Working with Nature in practice (PIANC Technical Working Group 176). Case study examples of <i>Working with Nature</i> projects can be found on the website at http://www.workingwithnature.pianc.org/wwnprojectoverview.php#bottom</p>	PIANC	Ongoing	✓	✓	✓	✓	✓	✓	✓	

¹⁷ Topics or themes: **A** = Awareness raising; **M** = Mitigate emissions; **P** = improve Preparedness; **N** = New ways of thinking

¹⁸ Pillars: **S** = Sustainable; **R** = Resilient; **I** = Integrated; **W** = Working with Nature

Description of initiative and link to further information	Lead association	Status	Topic or theme ¹⁹				Pillars ²⁰			
			A	M	P	N	S	R	I	W
Building with Nature										
<p>Building with Nature is a new design philosophy in hydraulic engineering, administered by EcoShape. Natural elements such as wind, currents, flora and fauna are utilised in designing a hydraulic engineering solution, thereby promoting resilient solutions and creating additional benefits for nature, recreation and the local economy. Building with Nature projects relevant to waterborne transport infrastructure have included:</p> <ul style="list-style-type: none"> • Sustainable delta cities e.g. use of willow or other vegetation as protection against sea level rise whilst providing more natural 'soft' quays in urban harbour areas • Tropical coastal areas e.g. stabilising coastlines and reducing erosion risk by integrating mangrove restoration, small-scale hard engineering, and sustainable land use; development of tools to protect sensitive tropical marine ecosystems by adaptive management of construction operations • Shallow coastal seas e.g. disposal of fine dredged material to provide a semi-continuous source of sediment that should be transported by natural processes to contribute to salt marsh development. • Information on Building with Nature projects is at http://www.ecoshape.nl/en_GB/examples.html 	EuDA (in that EcoShape has several EuDA members amongst its partners)	Ongoing	✓	✓	✓	✓	✓	✓	✓	✓
Technical Guidance on Climate Adaptation for Ports and Navigable Waterways										
The consequences of climate change will affect both existing and new seaport and inland waterway infrastructure: adaptation (to reduce vulnerability or increase resilience) will therefore be vital. New designs will need to take into account the effects of climate change and some existing infrastructure may need retrofitting. Non-structural measures including modifications to management activities, maintenance regimes and other port, harbour and waterway operations are also likely to be needed. In addition to accommodating changes in mean or typical conditions, the implications of an increase in extreme event frequency and intensity need to be better understood and appropriate adaptation options need to be identified. This Technical Guidance, due for completion at the end of 2016, will provide guidance on climate change adaptation planning and delivery for inland and maritime navigation infrastructure; generate a toolbox of adaptation options including non-structural (e.g. management) as well as structural measures; evaluate the effectiveness of different adaptation options; and provide an overall guidance framework for decision making.	PIANC	Ongoing	✓		✓	✓	✓	✓	✓	✓

¹⁹ Topics or themes: **A** = Awareness raising; **M** = Mitigate emissions; **P** = improve Preparedness; **N** = New ways of thinking

²⁰ Pillars: **S** = Sustainable; **R** = Resilient; **I** = Integrated; **W** = Working with Nature

Description of initiative and link to further information	Lead association	Status	Topic or theme ²¹				Pillars ²²			
			A	M	P	N	S	R	I	W
Technical Guidance on Carbon Management for Port and Navigation Infrastructure										
Starting in February 2016, PIANC Technical Working Group 188 will investigate the carbon footprint of navigation infrastructure development, operations and maintenance and will draw on existing approaches worldwide to identify good practices for management of the sector’s carbon footprint. It will raise awareness of the carbon sources and sinks relevant to waterborne transport, focusing on the unique carbon contributions of - and opportunities to reduce and offset emission from - waterways navigation infrastructure development, including dredging and the beneficial use of dredged sediments. The group will review navigation-relevant case studies and report on methods to quantify and best manage navigation carbon footprints. These methodologies, lessons-learned, and best practices will provide sector-specific technical information on carbon management for navigation and infrastructure projects to decision makers globally.	PIANC	Planned	✓	✓			✓	✓	✓	

²¹ Topics or themes: **A** = Awareness raising; **M** = Mitigate emissions; **P** = improve Preparedness; **N** = New ways of thinking

²² Pillars: **S** = Sustainable; **R** = Resilient; **I** = Integrated; **W** = Working with Nature



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