ROUNDTABLE DISCUSSION: INTEGRATING WORKING WITH NATURE AND NATURE-BASED SOLUTIONS INTO LONG-TERM SUSTAINABLE SEDIMENT MANAGEMENT

35th PIANC World Congress
29 April – 3 May 2024
Cape Town, South Africa

Future Ready Waterborne Transport
Unlocking Africa

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PANELIST INTRODUCTIONS

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NATURE-BASED SOLUTIONS AND ECOSYSTEM SERVICES: A GROWING PRIORITY

2022

Earth Day EO

BRIEFING ROOM

Executive Order on Strengthening the Nation's Forests, Communities, and Local Economies

APRIL 22, 2022 • PRESIDENTIAL ACTIONS

OFFICE OF SCIENCE AND TECHNOLOGY POLICY

WHITE HOUSE ROUNDTABLE – "KNOWLEDGE IN NATURE: HOW NATURE CAN HELP GROW A BETTER FUTURE"

BRIEFING ROOM

Executive Order on Tackling the Climate Crisis at Home and Abroad

JANUARY 27, 2021 • PRESIDENTIAL ACTIONS

WRDA 2020

Water Resources Development Act

GUIDANCE FOR ASSESSING CHANGES IN ENVIRONMENTAL AND ECOSYSTEM SERVICES IN BENEFIT-COST ANALYSIS

Office of Information and Regulatory Affairs

Office of Management and Budget

Published: August 2023

America the Beautiful

30x30

Justice40 Initiative

SUSTAINABLE DEVELOPMENT GOALS

UNITED NATIONS DECADE ON ECOSYSTEM RESTORATION 2021-2030

WORKING WITH NATURE

WwN: a framework to design new infrastructure or rehabilitate existing infrastructure in a way that works with natural processes

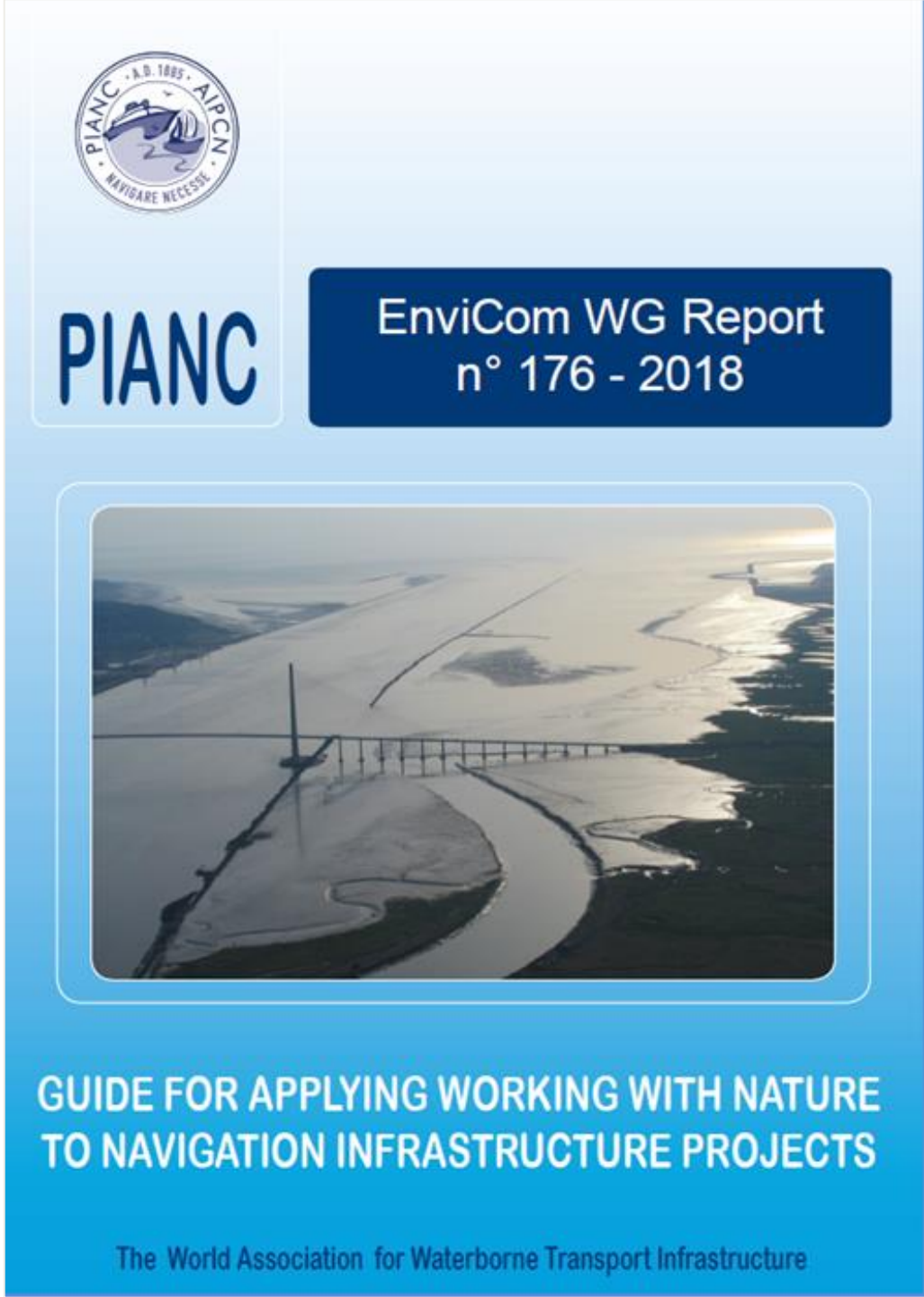
EWN: The intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaboration

Engineering with Nature® (EWN) is a USACE Initiative to align nature and engineering processes (https://ewn.erdc.dren.mil/)

SEDIMENT BU LINKS TO UN SUSTAINABILITY DEVELOPMENT GOALS (SDGS)

2018 PIANC REPORT

- EnviCom Working Group 176
- 90 pages plus appendices
- Free for PIANC Members
- https://www.pianc.org/publications/



WWN FRAMEWORK

Step 1
Establish project objectives

Step 2
Understand the environment

Step 3
Stakeholder engagement

Step 4
Design to benefit navigation and nature

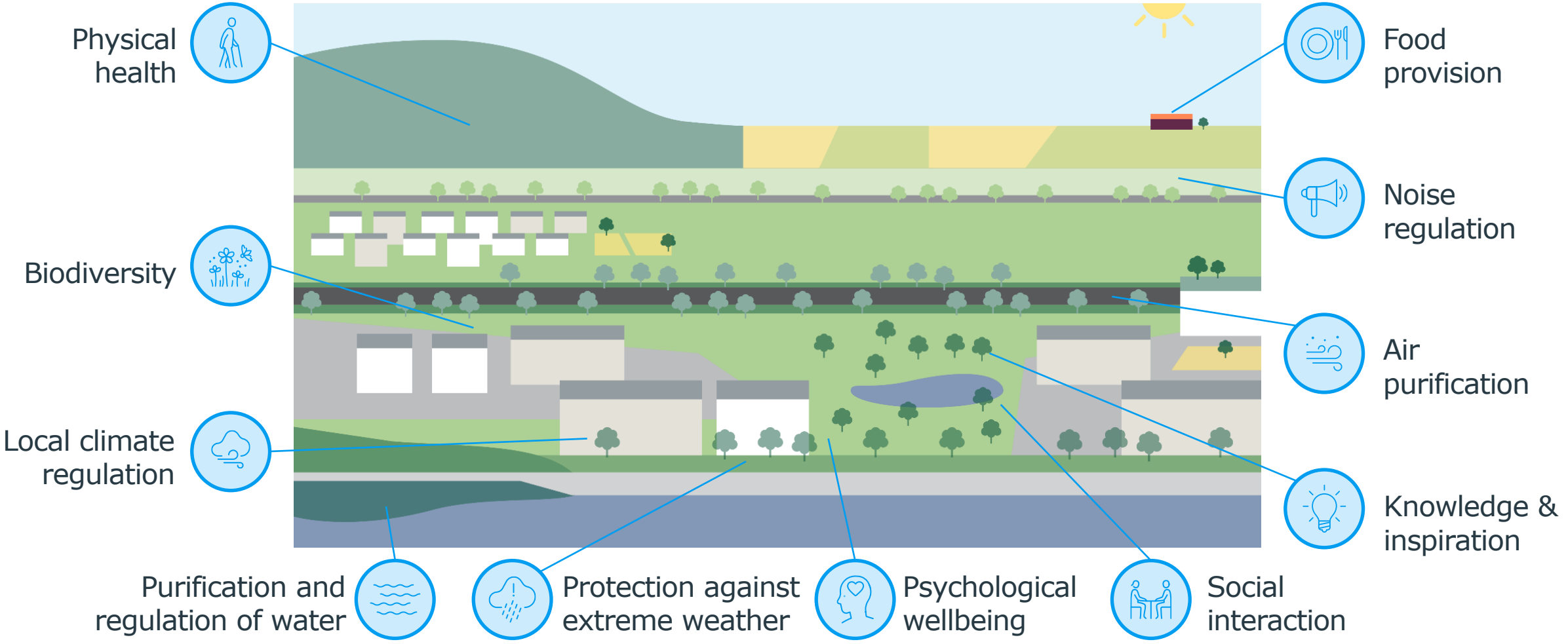
Step 5
Build and implement

Step 6
Monitor, evaluate, and adapt

Nature based Solutions (NbS)

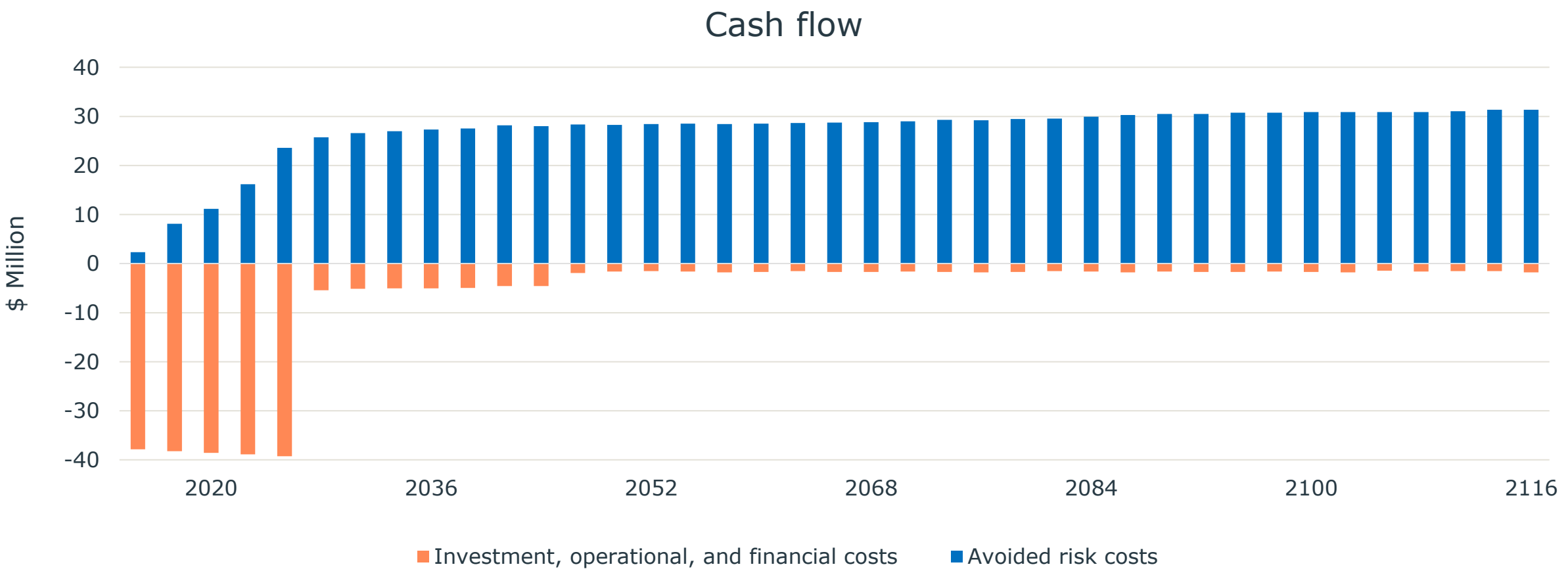
…solutions *inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits, and help build resilience.”*

ECOSYSTEM SERVICES – CHANGING BARRIERS TO OPPORTUNITIES



https://www.pianc.org/publications/envicom/wg195

MEASURING SUCCESS – PROJECT COST FORMULATION



WWN CASE STUDIES

PORT OF OAKLAND, SAN FRANCISCO BAY, BENEFICIAL USE

Ellen Joslin Johnck,

RPA Consulting Oakland,

California USA

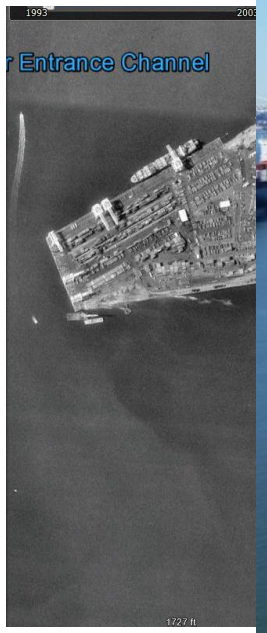
MIDDLE HARBOUR BASIN PROJECT

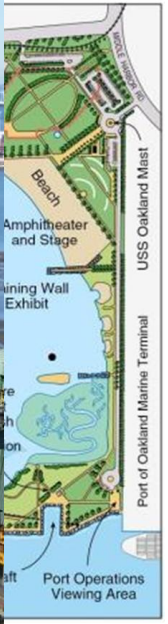
MHEA (180 acre/72 ha)

- Shallow-water habitat
- Eelgrass
- Salt marsh bird roosts
- Fish habitat

MHSP (38 acre/15 ha)

- Public access
- Bike/walk paths
- Bay views and viewing platforms
- Picnicking and BBQ





LE HAVRE-PORT 2000

Paul Sherrer

Deputy General Manager Port of Le Havre Authority

PIANC First Delegate for France Section

Le Havre, France

LE HAVRE-PORT 2000

- Port 2000 container port expansion
  - Built 2001–2006
  - 3,500 m quays with 16+ meters draught
  - 900MM € public + 600MM € private funds
- Commensurate move toward environmental restoration of the Seine Estuary (50 M €)
  - Intertidal wetland (1.5 Million m^3)
  - Built an artificial island two bird resting areas

AFRICA PERSPECTIVES

Roy Roy Ballegooyen

Steven Weerts

EWN AND WwN IN AFRICA - CHALLENGES

- **Multiple sources of funding**
  - Complex projects funded by multiple parties with different priorities
  - Often governed by *modis operandii* and “best practise frameworks”
- **Diverse and uncertain regulatory regimes**
  - Diverse regulatory regimes in the various countries
  - Guidelines and practises from other countries often adopted, “somewhat on the fly”
  - Lacking explicit regulatory requirements, EWN and WwN options often not considered
- **Inadequate consideration of EWN and WwN options during early project phases**
  - EWN and WwN opportunities inadequate in early planning phases
  - Late inclusion of EWN and WwN leads to downstream constraints, lack of preparedness
  - EWN and WwN may result in assumption of liabilities not associated with core business

EWN AND WwN IN AFRICA – POSSIBLE SOLUTIONS

- National or Regional Frameworks & Best Practices
  - Develop National and Regional Policies and Best Practice Frameworks applicable across financing institutions or embedded in regional “ecosystem” initiatives
- Embed EWN and WwN principals in “marine ecosystem” management
  - **Policy -** regional players such as the UNEP (Nairobi and Abidjan Convention),
  - **Communities of Best Practise -** Port Management Association of Eastern and Southern Africa (PMAESA), Port Association on West and Central Africa (PMAWCA)
  - **Guidelines -** PIANC and WIOMSA guidelines so should be easy to develop.

NAIROBI CONVENTION

PMAESA

PMAWCA - AGPAOC

WIOMSA
Coasts Ocean and People

EWN AND WwN – SOUTH AFRICA

South Africa's exposed coastline has limited opportunities for EWN/WwN

- **Sediment Bypass to limit shoreline erosion/beach loss**
  - Port of Durban, Port of Richards Bay, Port of Nqcura**,** Port of East London
- **Habitat Replacement**
  - Port of Durban – Central Sandbank
- **Erosion control & Salt Marsh restoration / protection**
  - Berg River — PIANC WC 2024 – Session F – Parallel 5 (Tuesday 30th) : Maintenance Dredging Risk Minimisation: Beneficial Use Assessments And Implementation of Environmental Windows / Seasonal Restrictions
- **Maintenance Sediment Transport Regimes (contribution of adjacent catchments)**
  - Water Research Commission/River Influenced Bights and Bays – KwaZulu-Natal Coastline
  - ORESECOM / Berg River / Pungwe Basin (Mozambique)

SEDIMENT BYPASS: PORT OF RICHARDS BAY

Aerial view of the existing dredge spoil disposal operations discharging spoil onto the Alkanstrand Beach. *Source: van Ballegooyen, R.C. and G. Jacobs (2020) Nseleni Independent Floating Power Plant (NIFPP) and associated infrastructure, Port of Richards Bay, KwaZulu-Natal: Dredging and Dredge Spoil Disposal Modelling Study. WSP Report 431 001 376-R01, 112 pp.*

	VOLUMES DREDGED				DREDGE SPOIL DISPOSAL	
Year	Sandtrap (m^3)	Channels (m^3)	Basins (m^3)	Sum (m^3)	Northern Beach (m^3)	Offshore Disposal (m^3)
1977	8 500	5 500	37 200	51 200		51 200
1978	413 600	298 300	37 200	749 100		749 100
1979	841 030	271 400	37 200	1 149 630	9 000	1 140 630
1980	604 300	591 550	37 200	1 233 050	264 000	969 050
1981	583 017	114 300	37 200	734 517	361 277	373 240
1982	1 117 944	692 387	37 200	1 847 531	679 374	1 168 157
1983	722 609	1 348 763	37 200	2 108 572	808 134	1 300 438
1984	630 257	1 417 197	37 200	2 084 654	649 621	1 435 033
1985	985 199	1 365 646	37 200	2 388 045	776 198	1 611 847
1986	320 089	1 233 945	37 200	1 591 234	810 569	780 665
1987	5 557	1 609 283	37 200	1 652 040	484 543	1 167 497
1988	346 009	1 128 816	37 200	1 512 025	560 767	951 258
1989	372 206	697 204	34 814	1 104 224	525 541	578 683
1990	531 956	887 361	34 447	1 453 764	574 435	879 329
1991	618 470	720 324	11 789	1 350 583	593 763	756 820
1992	696 688	490 591	11 222	1 198 501	708 209	490 292
1993	648 523	593 351	51 651	1 293 525	624 319	669 206
1994	698 201	499 764	44 596	1 242 561	760 777	481 784
1995	698 248	568 043	18 283	1 284 574	656 277	628 297
1996	167 800	2 210 803	25 750	2 404 353	124 477	2 279 876
1997	338 113	1 294 934	6 985	1 640 032	412 718	1 227 314
1998	371 308	717 277	26 130	1 114 715	826 034	288 681
1999	425 347	1 370 740	45 234	1 841 321	598 715	1 242 606
2000	524 958	638 285	100 443	1 263 686	724 109	539 577
2001	678 410	670 804	37 665	1 386 879	873 380	513 499
2002	796 099	683 644	44 480	1 524 223	824 014	700 209
2003	652 805	681 368	64 505	1 398 678	757 703	640 975
TOTAL	**14 797 243**	**22 801 580**	**1 004 394**	**38 603 217**	**14 987 954**	**23 615 263**
MEAN	**546 046**	**844 503**	**35 200**	**1.410214**	**599 516**	**855 104**

Aerial view of the existing dredge spoil disposal operations discharging spoil onto the Alkanstrand Beach. *Source: Wells, C.P. (2015) Modelling of sand by-pass schemes on the KwaZulu-Natal coastline*

SEDIMENT BYPASS: PORT OF DURBAN

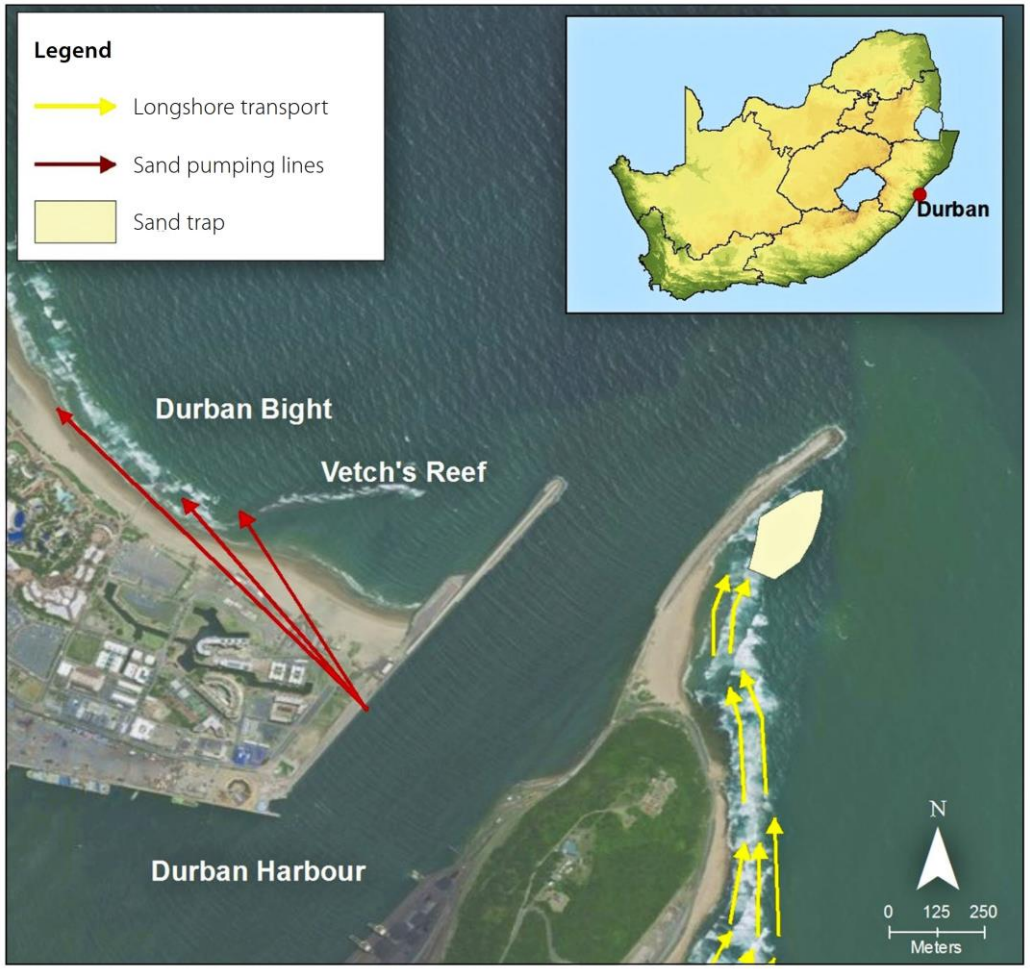


Image of Durban Harbour, indicating the locations of the sand trap, harbour entrance and Durban Bight, with (inset) a map of southern Africa showing the location of Durban. *Source: Rautenbach, C. and A.K. Theron (2018) Study of the Durban Bight shoreline evolution under schematised climate change and sand-bypassing scenarios*

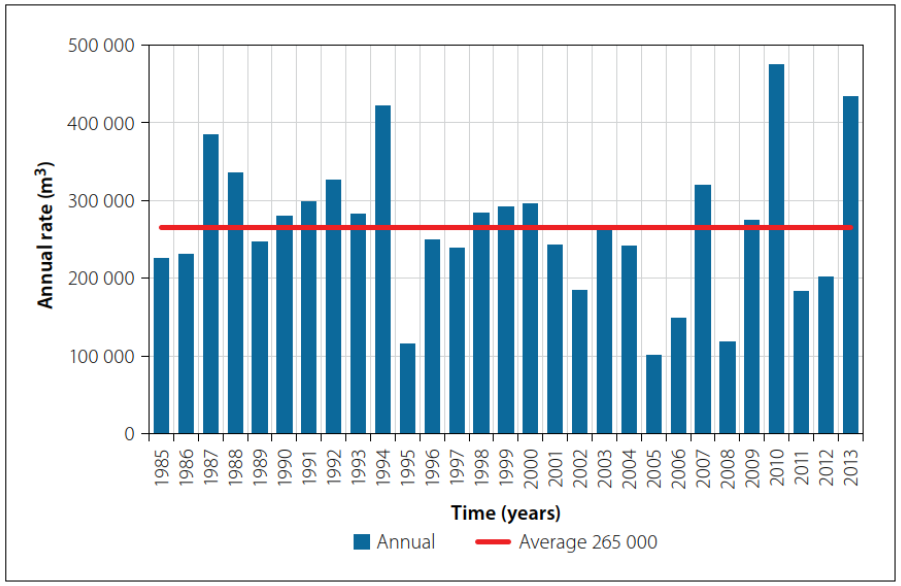
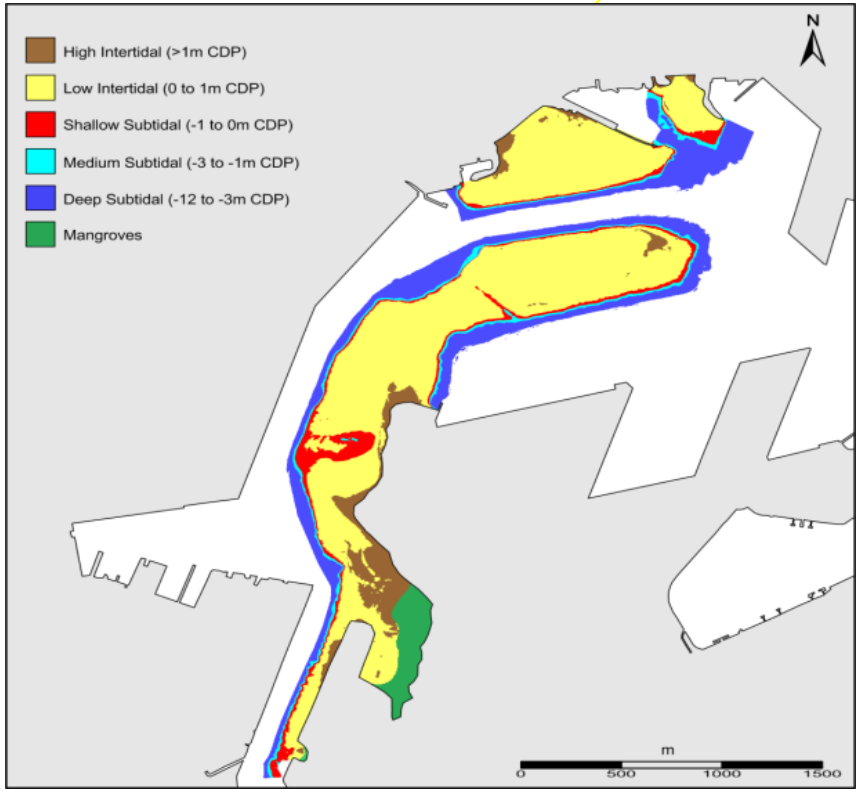


Figure 4 Longterm total sand-pumping rate in cubic metres (Theron & Rautenbach 2014)

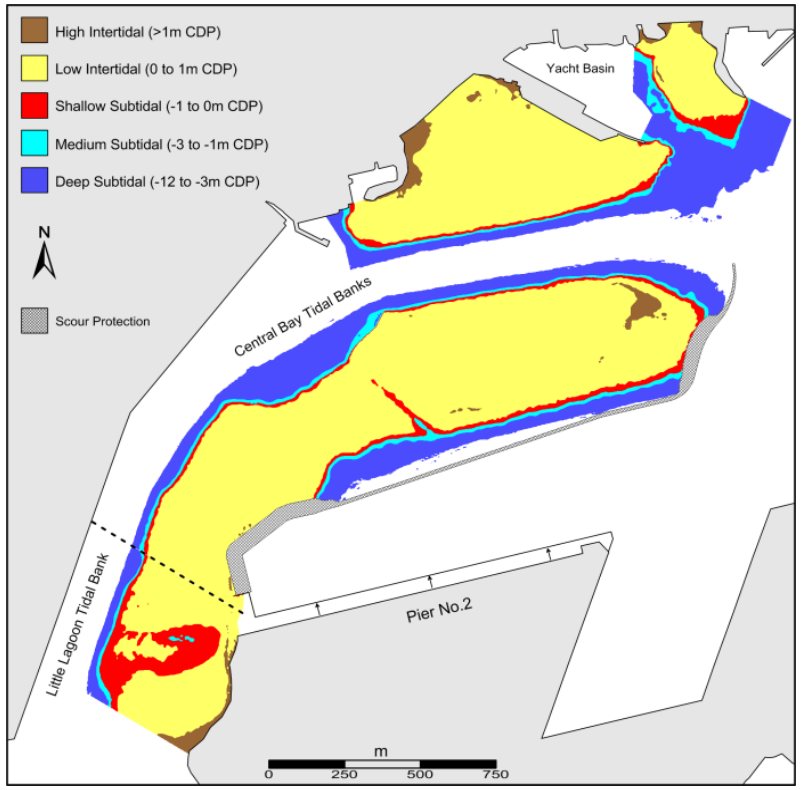
Before

After

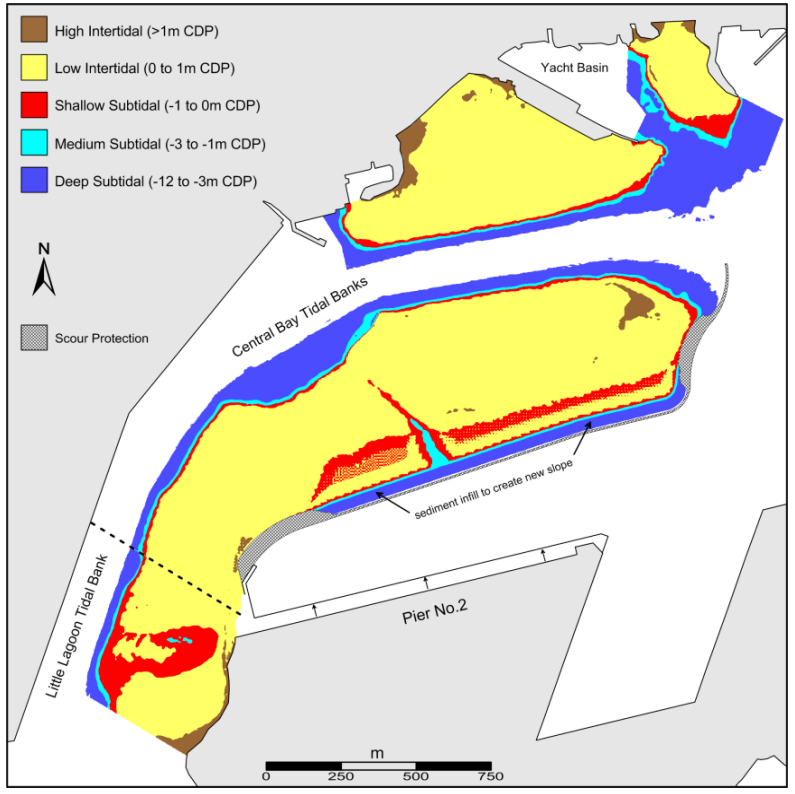
PORT OF DURBAN – CENTRAL SANDBANK HABITAT REPLACEMENT



Existing



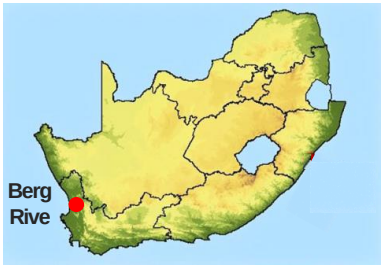
Post-construction

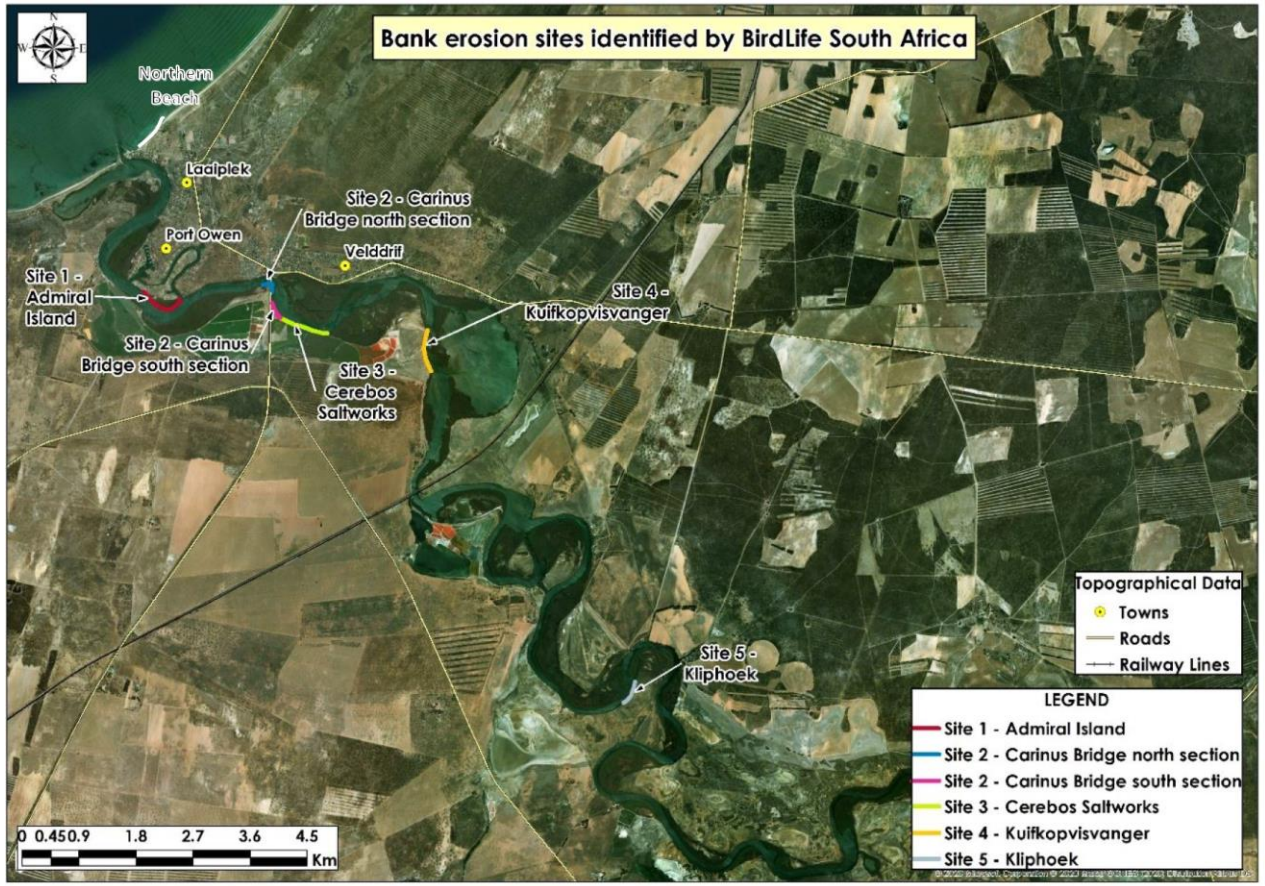


Post-construction EWN/WwN

Habitat change associated with the proposed Berth 203 to 205 Berth Development. *Source: Weerts, S., R. van Ballegooyen and B. Newman (2012) Deepening, lengthening and widening of Berths 203 to 205, Pier 2, Container Terminal, Port of Durban: Potential long-term impacts on sandbank habitats, water and sediment quality. CSIR Report No. CSIR/NRE/ECOS/ER/2012/0038/B.*

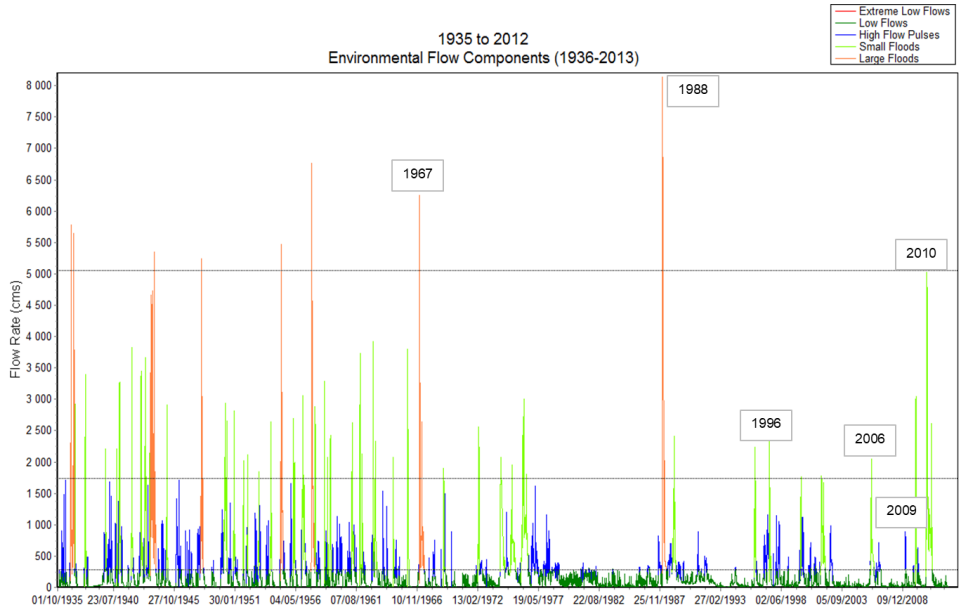
BERG RIVER ESTUARY EROSION AND HABITAT PROTECTION

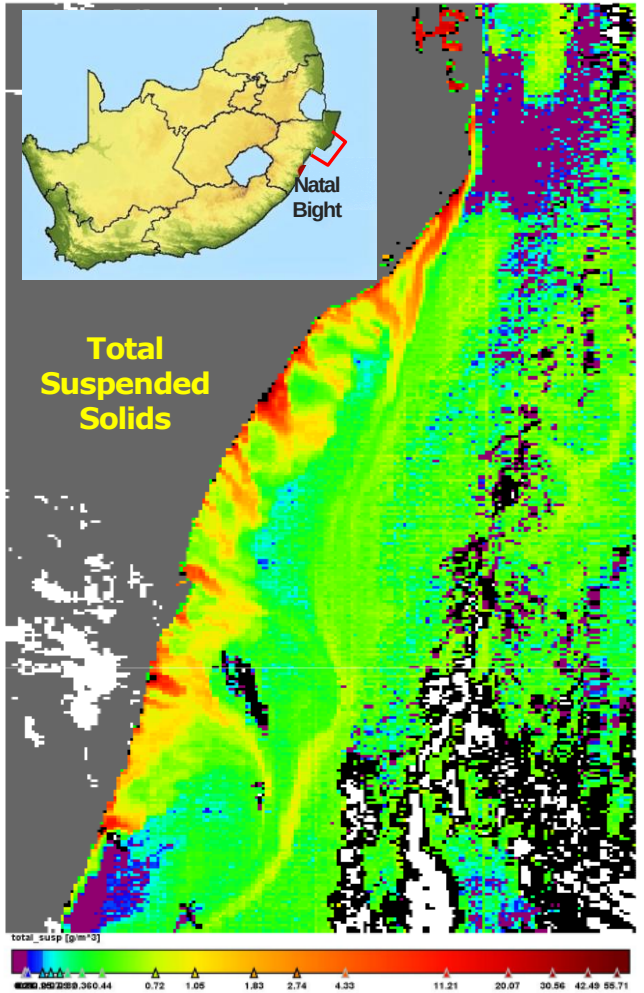


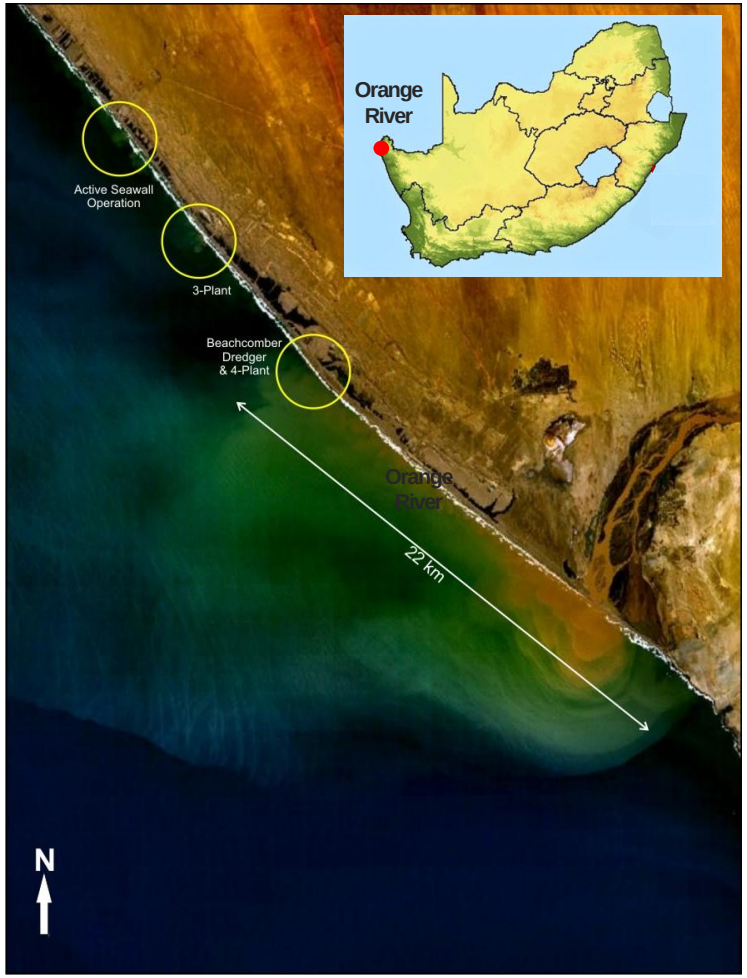


Beneficial use (shoreline and habitat protection) opportunities considered for the Port Owen Marina maintenance dredging *Source: van Ballegooyen, R.C., B. Newman, E. Swart, S. Tonin and G. Smith (2021) Maintenance Dredging Assessment & Technical Support for a Dredging (Dumping at Sea) and Coastal Waters Discharge Permit Application, WSP Report 43101937-R03-F01, 170 pp + 70 pp Appendices.*

MAINTENANCE OF MARINE SEDIMENT TRANSPORT REGIMES: SEDIMENTS INPUTS FROM ADJACENT CATCHMENTS





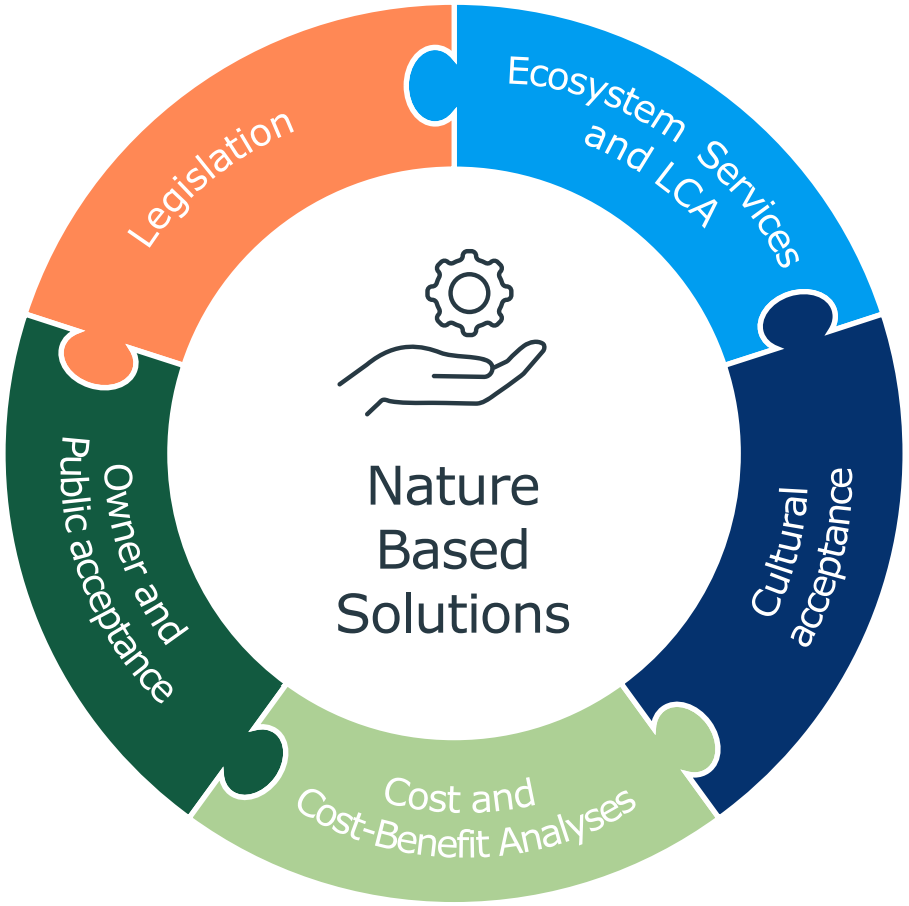


Total Suspended solids based on The Natal Bight MERIS satellite data. *Source: Bernard, S and M. Smith (2011* An investigation of the potential use of ocean colour remote sensing to assess the influence of variations in freshwater inputs to coastal ecosystems: Phytoplankton and sediment dynamics of the Natal Bight, WRC Report No; 1852/1/10,Water Research Commission, Pretoria, 38pp

Sediment fluxes into the ocean at eth Orange River Mouth. *Source: Van Niekerk, L, S. Lamberth, S., M. Luck-Vogel, A. Meyer, A. Pulfrich, S. Taljaard, A. Theron, L. van Niekerk and R. van Ballegooyen (2013) Orangs-Senqu Strategic Action Programme – Estuary and Marine EFR Assessment, Volume 3: Assessment of the role of freshwater inflows in the coastal marine ecosystem, ORASECOM Technical Report 34, 174pp.*

SUMMARY

- **Project delivery** — faster, cheaper
- **Project performance** — complete solutions
- **Adaptability** — scalable, flexible, adaptable
- **Sustainability** — self-repair
- **Social Value** — multi-functional benefits, including ecological benefits
- **Diversified investment** — diversified value and improved partnerships
- **Social license** — community and stakeholder support and participation
- **Regulatory efficiency** — resolves conflict through win-win solutions



THANK YOU

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