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DUURZAME KUSTZONE ONTWIKKELING

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**INTEGRAAL KUSTBELEID
VIA
BOUWEN MET DE NATUUR**

**OMGAAN MET LAND & WATER
IN KUST- EN DELTAGEBIEDEN**

19 juli 2007

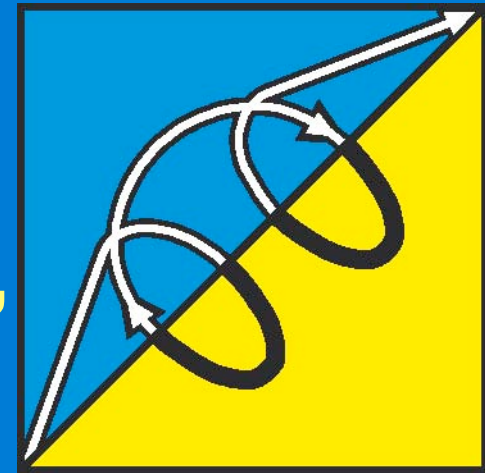
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DUURZAME KUSTZONE ONTWIKKELING



**Flexibele integratie
van land in water
en van water in land**

**Gebruikmakende van in de
natuur aanwezige materialen,
krachten & interacties**



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Ronald E. Waterman



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 - **Senior Adviseur Ministerie Verkeer & Waterstaat**
 - **Senior Adviseur Ministerie Economische Zaken**
 - **Senior Adviseur Ministerie VROM**
 - **Senior Adviseur Havenbedrijf Rotterdam N.V.**
 - **Senior Adviseur Gemeente Rotterdam**
 - **Senior Adviseur College B&W Den Haag**
 - **Adviseur WL / DELFT HYDRAULICS & GeoDelft**
 - **Adviseur TNO-NITG Toegepaste Geo-Wetenschappen**
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DUURZAME KUSTZONE ONTWIKKELING

- **Beschavingen en culturen hebben zich vaak ontwikkeld op de grenszone waterland, in kust en deltagebieden.**

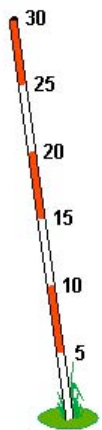
Het is daarom niet te verwonderen dat in het begin van de 21ste eeuw 80% van de dichtst bevolkte stedelijke gebieden zich in die grenszone bevinden.



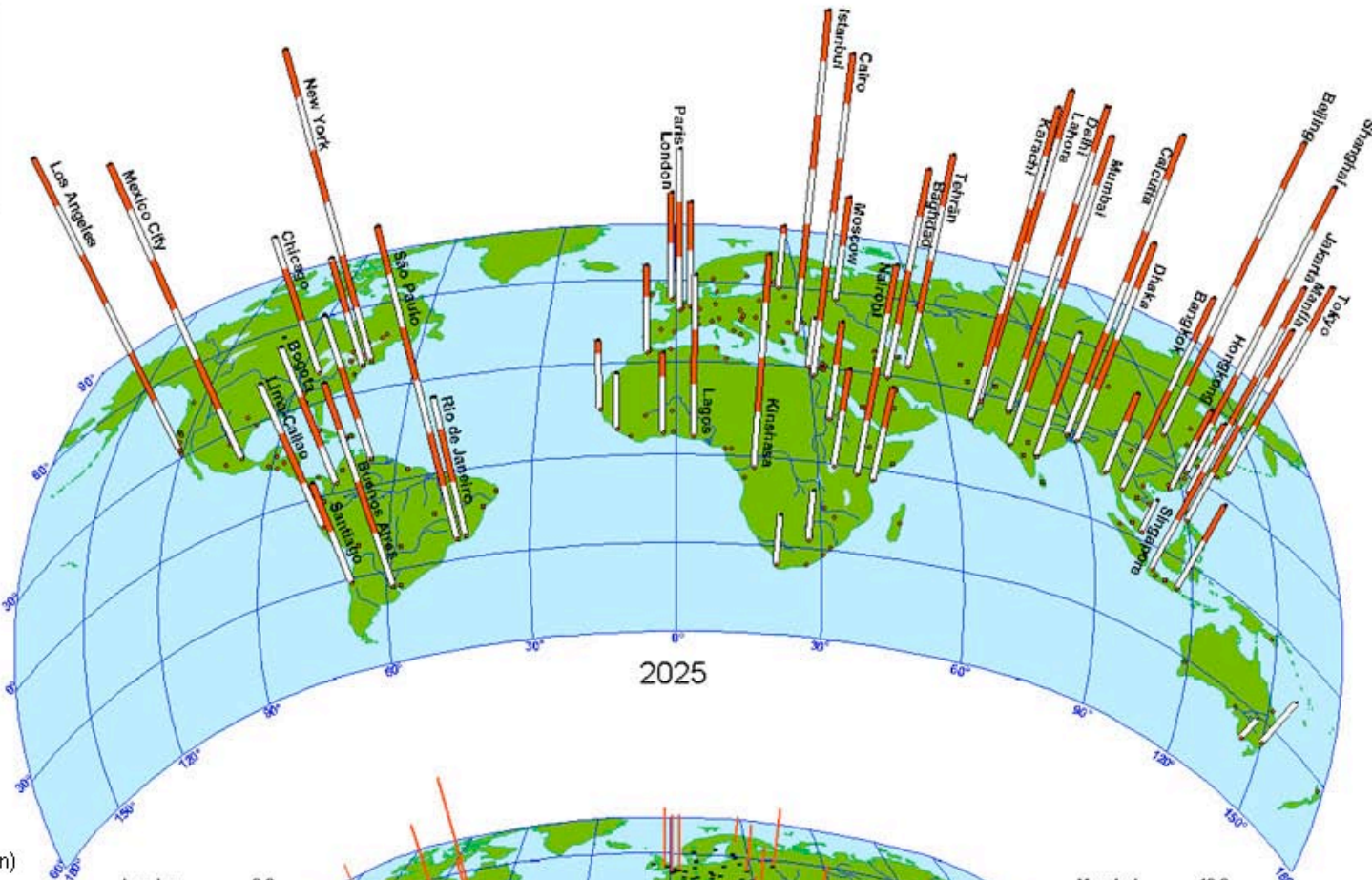
DEVELOPMENT OF MAJOR CITIES IN THE WORLD

About 80% of the major cities can be found in coastal and deltaic areas

Number of inhabitants in millions

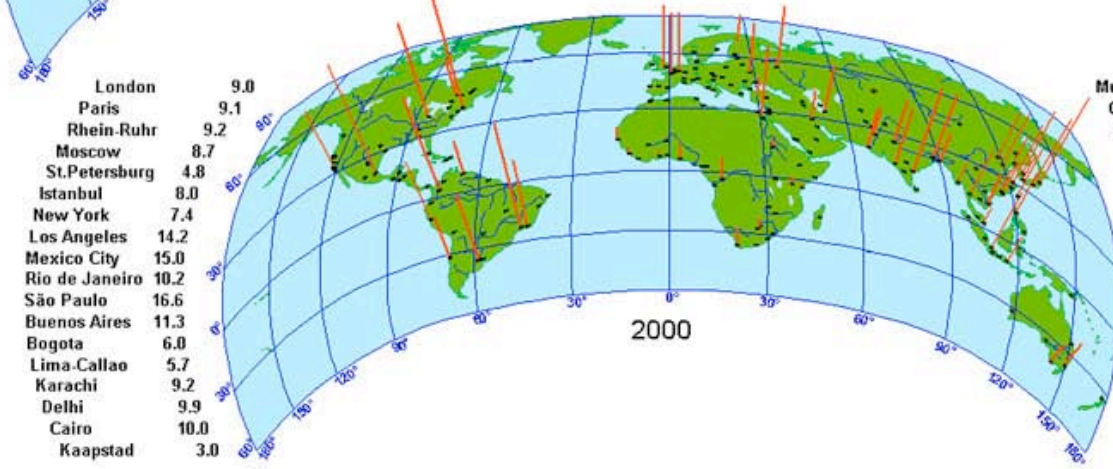
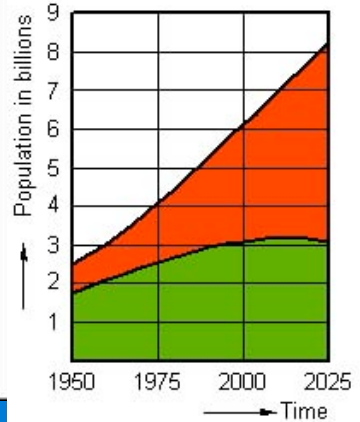


major city (more than 1 million inhabitants)



2025

Growth of World Population in urban (red) and rural (green) areas in billions



2000

London	9.0
Paris	9.1
Rhein-Ruhr	9.2
Moscow	8.7
St.Petersburg	4.8
Istanbul	8.0
New York	7.4
Los Angeles	14.2
Mexico City	15.0
Rio de Janeiro	10.2
São Paulo	16.6
Buenos Aires	11.3
Bogota	6.0
Lima-Callao	5.7
Karachi	9.2
Delhi	9.9
Cairo	10.0
Kaapstad	3.0

Mumbai	10.0
Chennai	5.9
Calcutta	11.7
Dhaka	6.1
Bangkok	5.6
Singapore	3.1
Ho Chi Minh	3.5
Beijing	7.0
Tianjin	8.5
Hongkong	6.9
Shanghai	8.2
Guangzhou	3.1
Seoul	10.2
Pusan	3.2
Jakarta	9.3
Manila	8.6
Tokyo	11.9
Osaka - Kobe	8.6

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DUURZAME KUSTZONE ONTWIKKELING

- In deze dicht bevolkte gebieden is er een schaarste aan ruimte om te wonen, te werken, te recreëren en voor infrastructuur.

Tegelijkertijd is er behoefte aan het in stand houden,
zo mogelijk uitbreiden van milieu-, natuur- en landschapswaarden.

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DUURZAME KUSTZONE ONTWIKKELING

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Voor deze schaarste aan ruimte zijn er 3 ruimtelijke oplossingen:

- ★ Een beter gebruik van de 3e en de 4e dimensie
- ★ Benutten van ruimte in het bestaande achterland
- ★ Zeewaartse optie

of combinaties

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DUURZAME KUSTZONE ONTWIKKELING

- Antwoord op het ruimte-gebrek:

**Integreren van Land in Zee
en van
Water in het nieuwe Land !**

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BOUWEN MET DE NATUUR

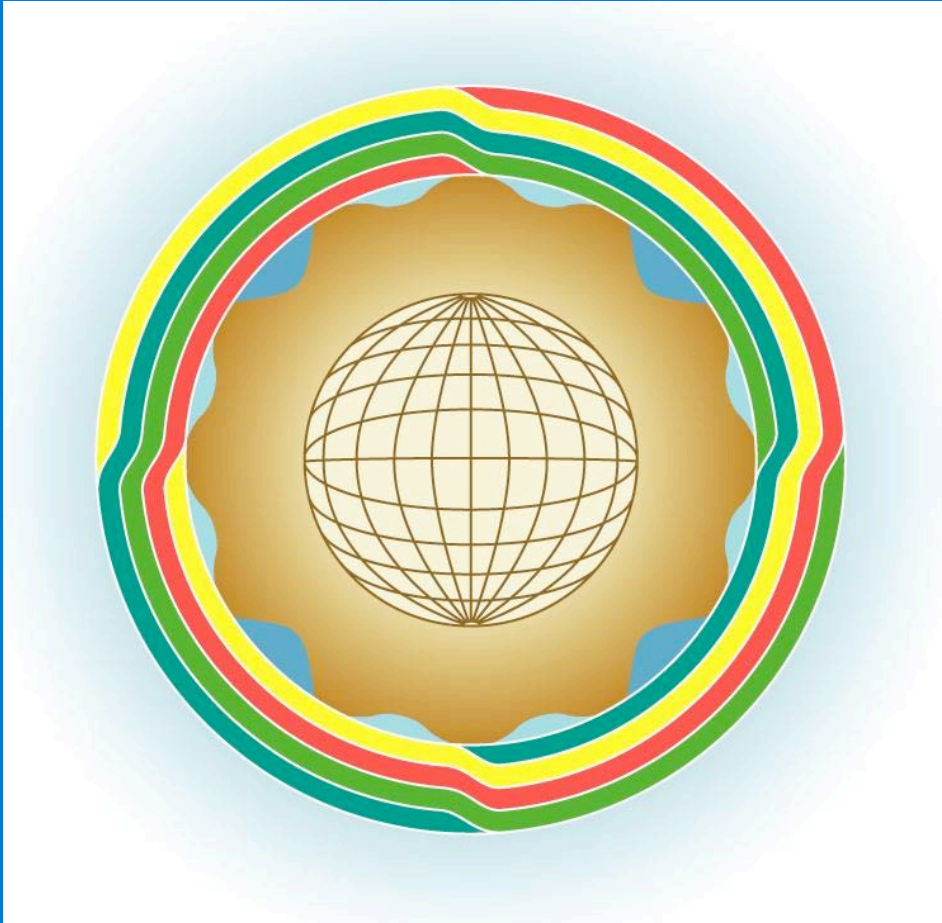
Integrale Beschouwing van de kustzone,
inclusief nieuw en oud land & zee.

Vele functies dienen in ogenschouw genomen te worden onder gebruikmaking van vele disciplines.

Om zo een antwoord te geven op de vraag hoe wij tal van bestaande en komende problemen tot een oplossing kunnen brengen in relatie tot het bestaande achterland enerzijds en de aangrenzende zee anderzijds, onder het creëren van meerwaarde.

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Ruimtelijk Plan via een 6 Lagensysteem



Atmosfeer



Occupatie Laag



Infrastructuur Laag



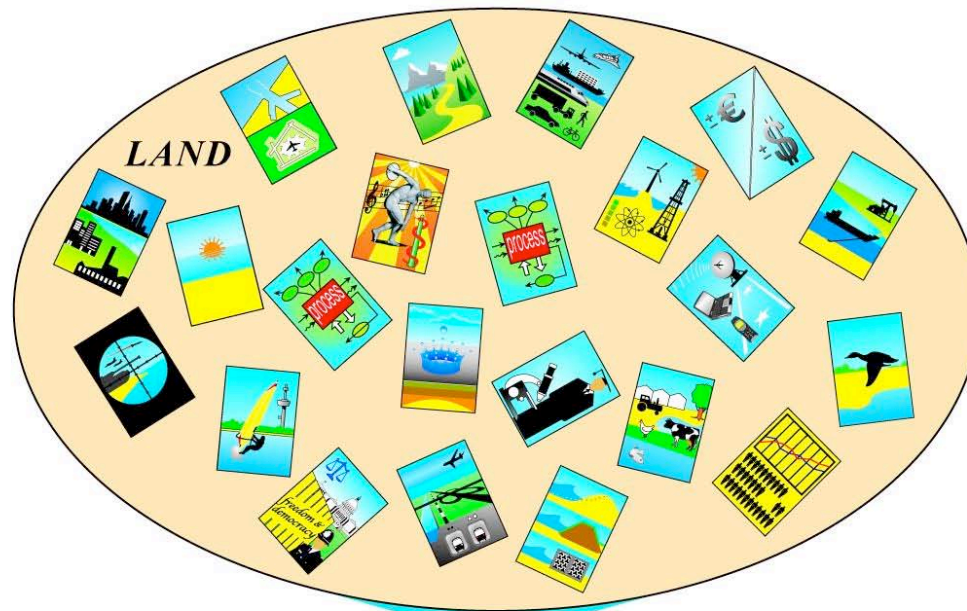
Landbouw &
Aquacultuur Laag



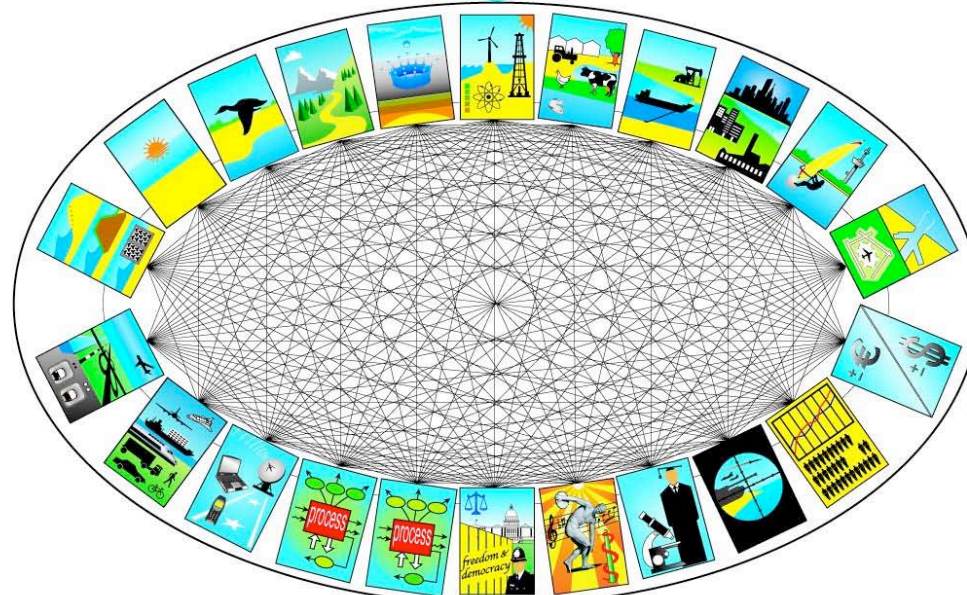
Laag met Terrestrische &
Aquatische Natuurwaarden



Ondergrond / Hydrosfeer



**INTEGRATED MULTI-FUNCTIONAL
SUSTAINABLE
COASTAL ZONE DEVELOPMENT**



FUNCTIES

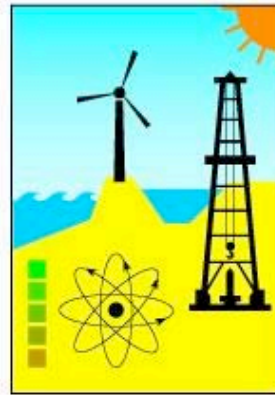


WATER RESOURCES MANAGEMENT

- water quantity
- water quality
- groundwater
- surface water
- dune infiltrated water
- (desalinated) sea-water
- sewer systems
- waste water purification



05



ENERGY

- natural gas, oil, coal, etc.
- biomass (wood, etc.); organic wastes
- nuclear energy
- solar-, wind-, water-, geo-energy
- combined cycle, isolation, etc.



06

AGRICULTURE
horticulture, forestry,
cattle & poultry breeding

FISHERY

AQUACULTURE



MINING / EXTRACTION & STORAGE

in / on

Land / Sea-bed / Sea / Air



07



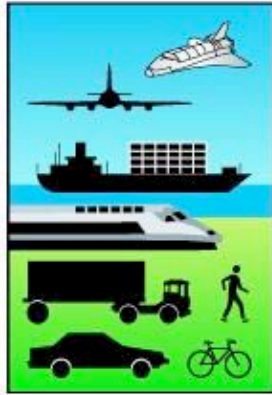
08

FUNCTIES

	<p>BUILDING SITES FOR LIVING & WORKING</p> <ul style="list-style-type: none"> - houses & apartments + facilities - industries & offices + facilities - urban development 		<p>RECREATION & TOURISM</p>
09		10	

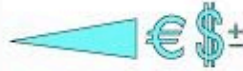
<p>TRANSFER / DISTRIBUTION CENTRES & RELATED ACTIVITIES</p> <ul style="list-style-type: none"> - seaport - riverport, - lake port - airport, - landport 		<p>INFRASTRUCTURE</p> <ul style="list-style-type: none"> - roads - railroads - waterways - underground systems - airlines - electronic highway 	
11		12	

FUNCTIES



TRANSPORT MODULES

- bicycle, motor-car, bus, tram, train, maglev (magnetic levitation train),
- metro
- ship,
- container
- airplane, rocket, satellite

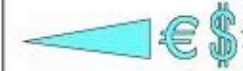


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INFORMATION COMMUNICATION TECHNOLOGY

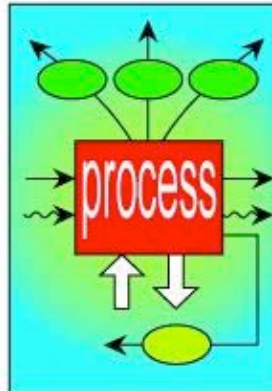
- DATA ACQUISITION
- DATA STORAGE
- DATA TRANSMISSION
- DATA PROCESSING



14

ENVIRONMENT (IN PARTICULAR)

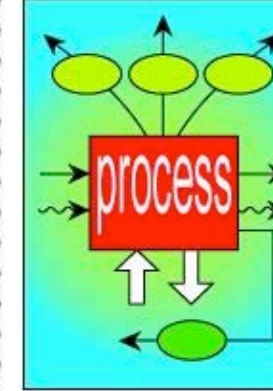
Air- / Water- / Soil-quality
by improvement of
conversion processes
and by end of pipe
purification



15

ENVIRONMENT (IN PARTICULAR)

solid waste reduction
by improvement of
conversion processes and
by environmental friendly
collection - transport -
storage - processing -
recycling - usage



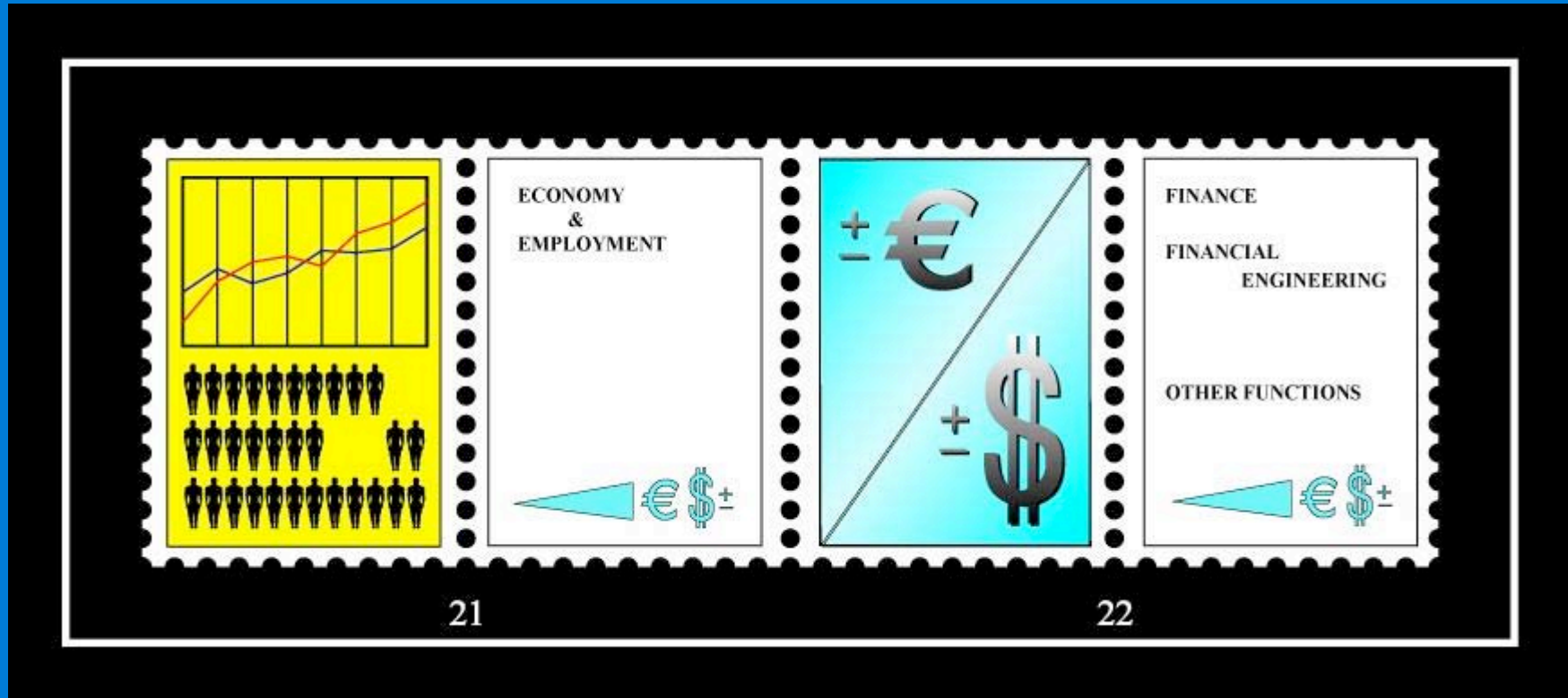
16

FUNCTIES

	<p>GOVERNMENTAL INSTITUTIONS NON-GOVERNMENTAL INSTITUTIONS CITIZEN GROUPS INDIVIDUAL CITIZENS PEOPLE'S PARTICIPATION LAW - JUSTICE - ORDER</p>		<p>HEALTH & WELFARE SPORT / PLAYGROUND HISTORY & CULTURE RELIGION PHILOSOPHY OF LIFE VALUES / STANDARDS SOCIOSPHERE</p>
17		18	

<p>EDUCATION & RESEARCH</p>		<p>DEFENCE & RISK MANAGEMENT SAFETY & SECURITY</p>	
19		20	

FUNCTIES



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BOUWEN MET DE NATUUR

Realisatie van nieuw land, waar de natuur dat toestaat, onder toepassing van het principe *Bouwen met de Natuur*

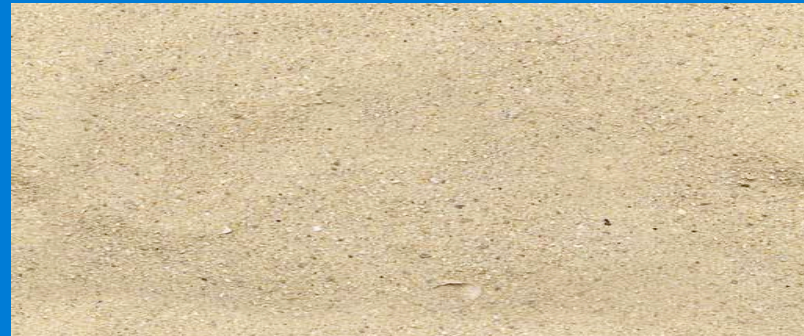
De kern van dit principe is:

Flexibele integratie van land in zee en van water in het nieuwe land, gebruikmakende van in de natuur aanwezige materialen en krachten/interacties, rekening houdend met bestaande en potentiële natuurwaarden en met de biogeomorfologie en geohydrologie van kust en zeebodem.

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BOUWEN MET DE NATUUR

Materialen:



Het losse beweeglijke materiaal zand / slib
van grof tot fijn
en de krachten en interacties
die daarop werkzaam zijn

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Krachten en Interacties:

01. Getijden werking (eb & vloed)

02. Golfbeweging (met name in de brekingszone) en deining

03. Zeestromingen anders dan getijdenstromingen

04. Rivier uitstroming (als kracht en als leverancier van zoetwater en sediment)

05. Zwaartekracht

06. Wind

07. Regen

08. Zonnestraling

09. Interactie duinen - vegetatie (wortelsysteem vegetatie houdt zand/slib vast)

10. Complexe interactie marine organismen - zand/slib.

Biogeomorfologie & Geohydrologie van Kust en Zeebodem

- ① Dune
- ② Coastal strip
- ③ Dune toe
- ④ Flood mark
- ⑤ Dry beach
- ⑥ Creek
- ⑦ Wet beach
- ⑧ Sand drift

- ⑨ High water during storm surge
- ⑩ High water
- ⑪ Low water
- ⑫ Geo valley in surf zone
- ⑬ Geo ridge in surf zone
- ⑭ Undercurrent
- ⑮ Rip current

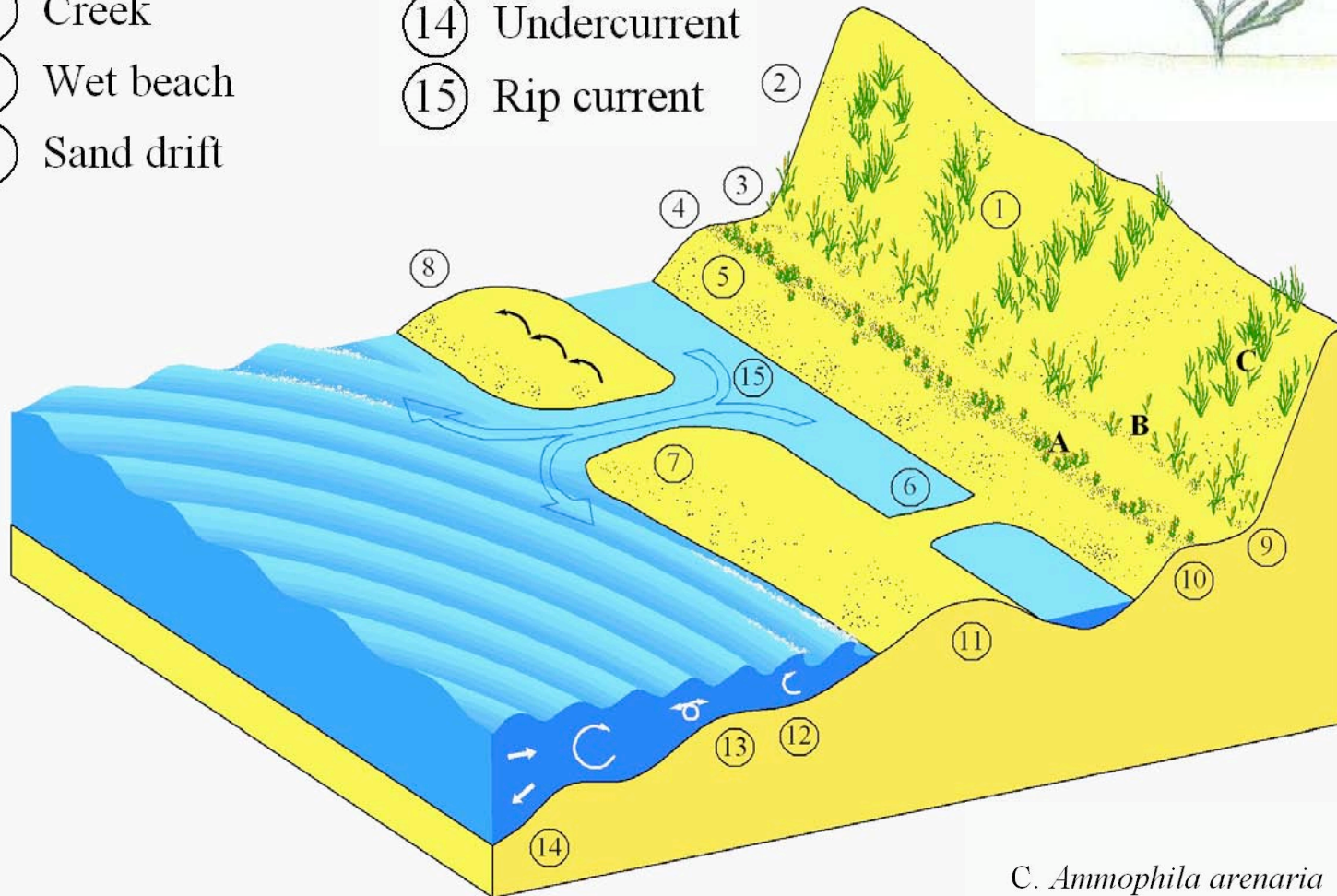
A. *Cakile maritima*



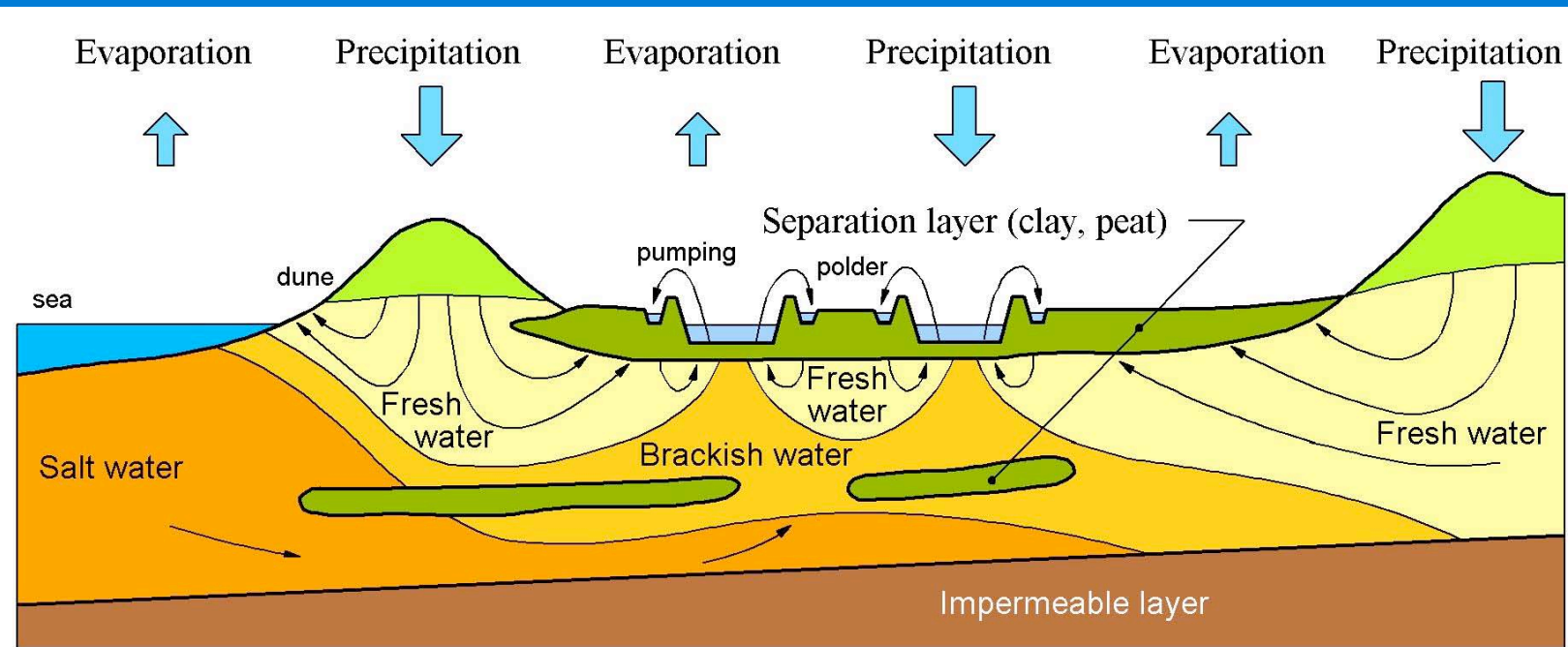
B. *Elytrigia juncea*



C. *Ammophila arenaria*



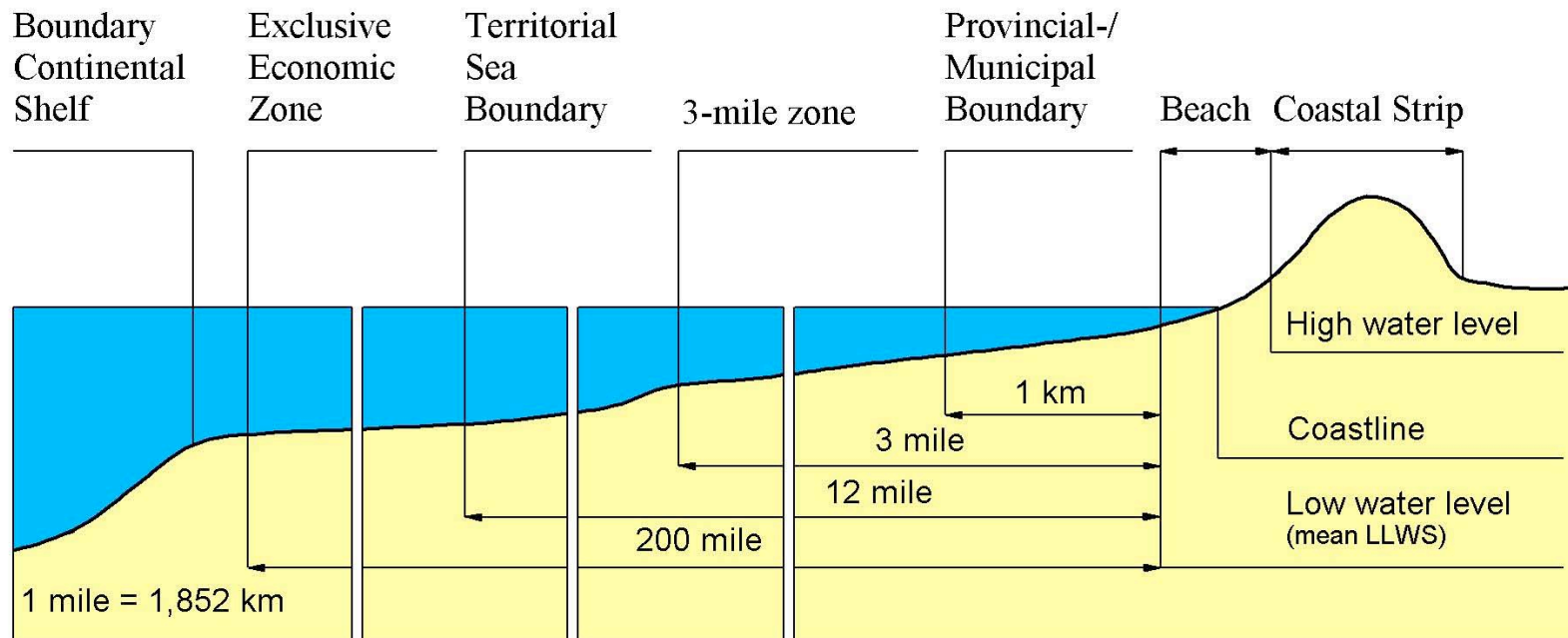
BOUWEN MET DE NATUUR



CROSS SECTION SUBSOIL OF WEST-HOLLAND

Data: Rijks Geologische Dienst - S. Jelgersma

BOUWEN MET DE NATUUR



CROSS SECTION COASTAL ZONE

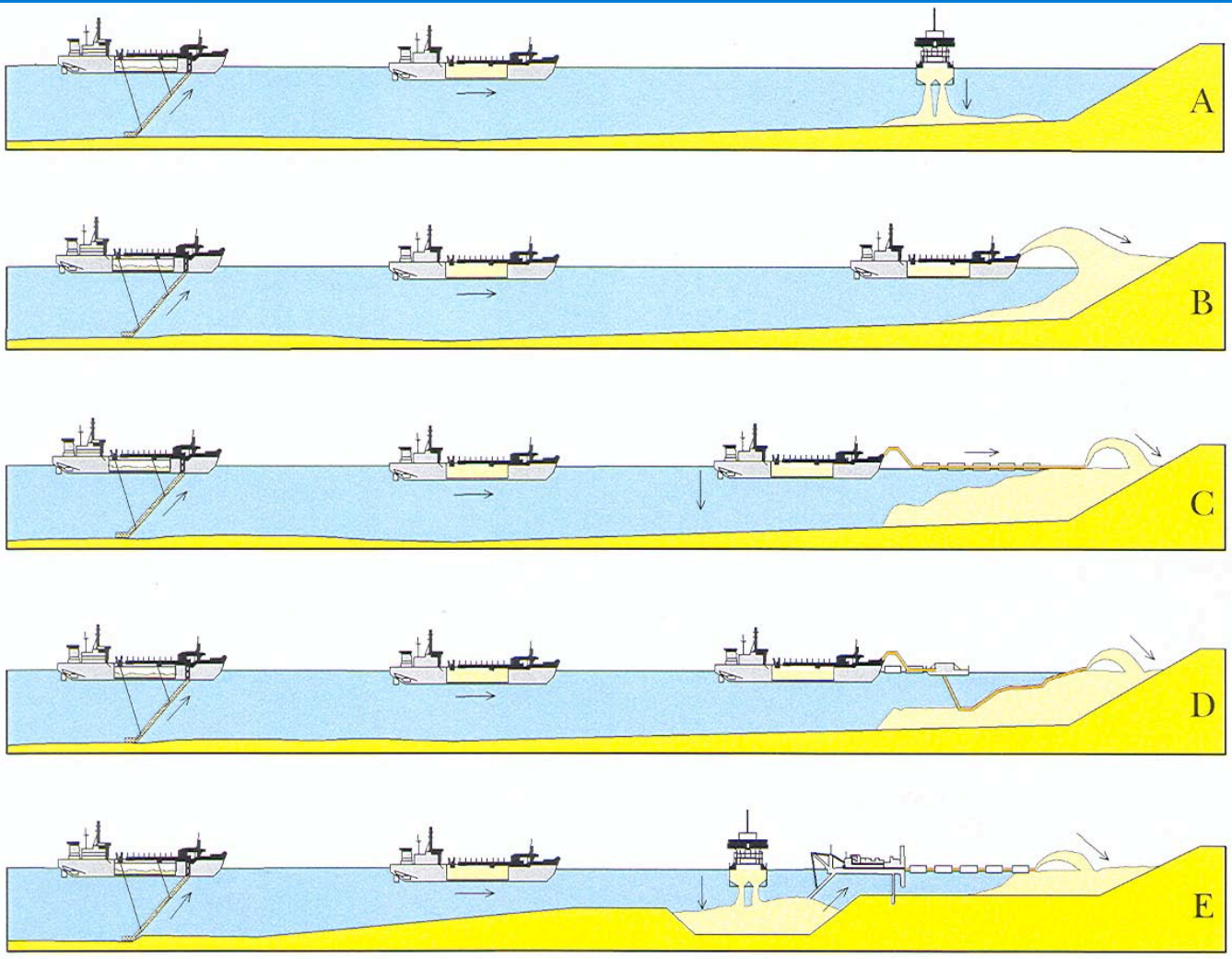
with national & international boundaries

Data: Chef der Hydrografie W.A. van Gein

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BAGGERTECHNIEKEN VOOR LANDAANWINNING

BOUWEN MET DE NATUUR

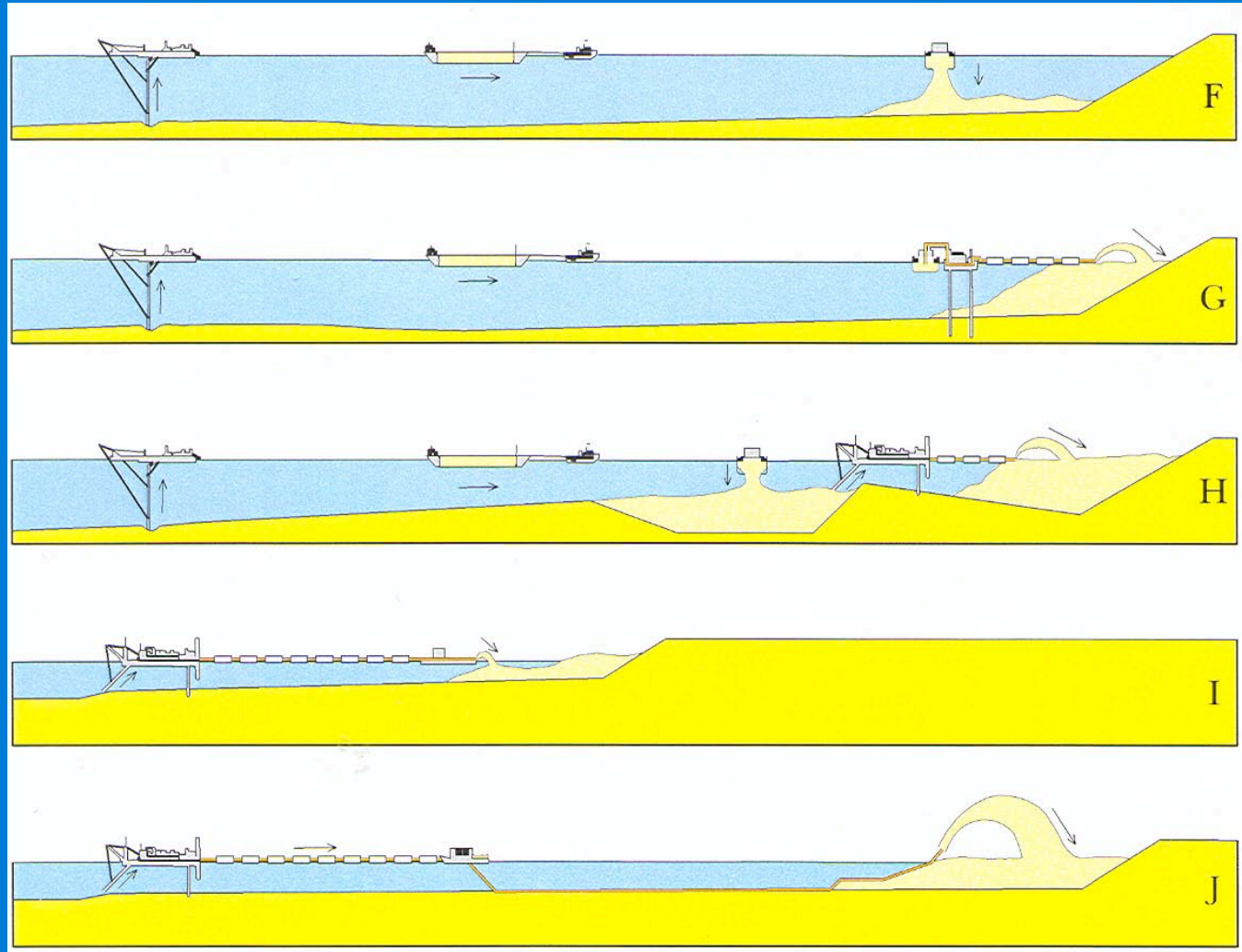


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BAGGERTECHNIEKEN VOOR LANDAANWINNING

BOUWEN MET DE NATUUR



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EUROPA



NEDERLAND



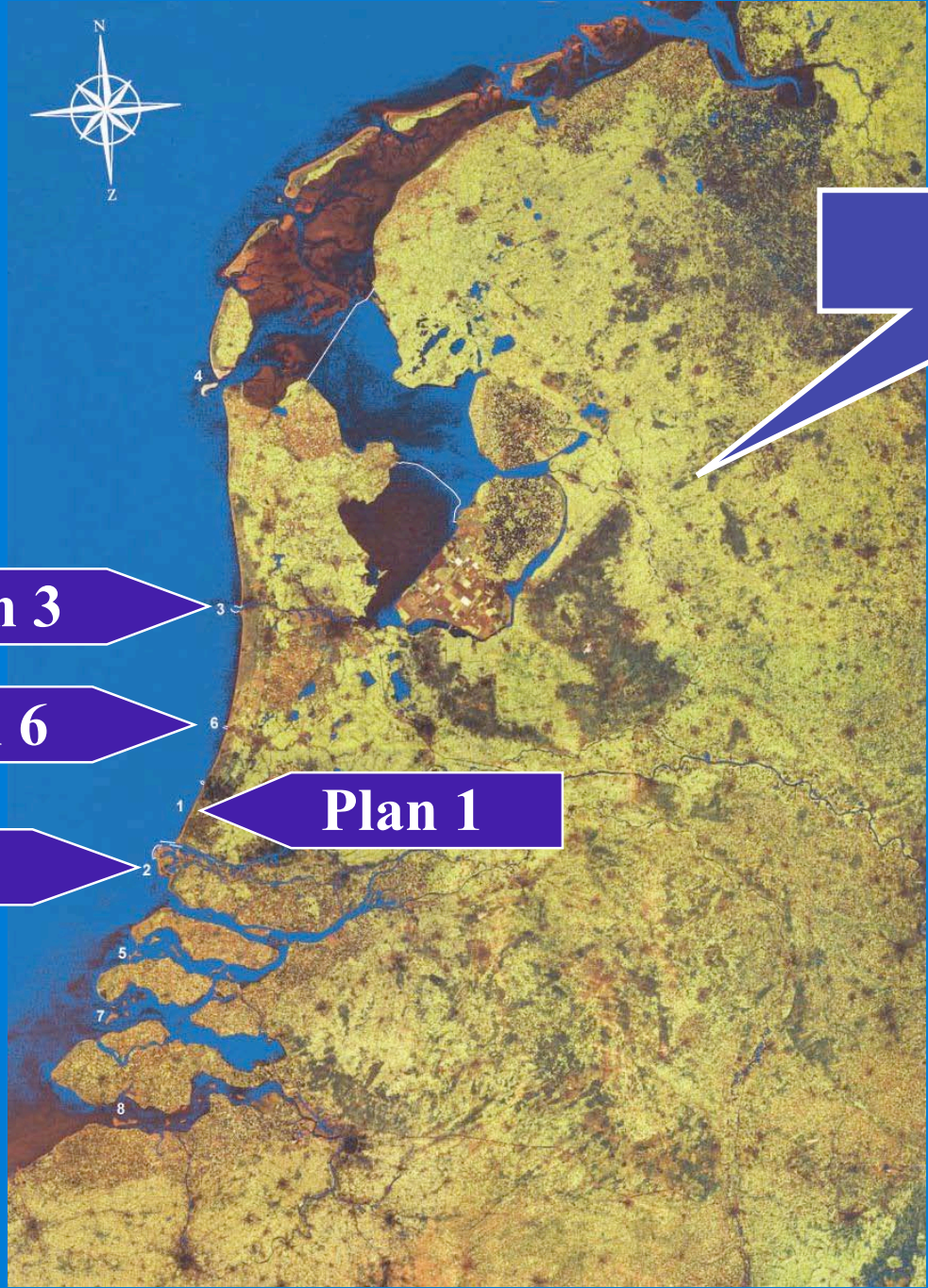
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GEODESIE

Bij het ontwerpen vervult de Geodesie een essentiële rol.

Dat geldt zowel voor het verkrijgen van belangrijke historische en actuele gegevens met betrekking tot land- & zee- oppervlak/bodem, als voor de vervaardiging van de uiteindelijke kaartbeelden.

Metingen, inclusief remote sensing, zijn daarvoor vereist.



Nederland

Plan 3

Plan 6

Plan 2

Plan 1



TOWARDS AN INTEGRATED COASTAL POLICY FOR ZUID-HOLLAND

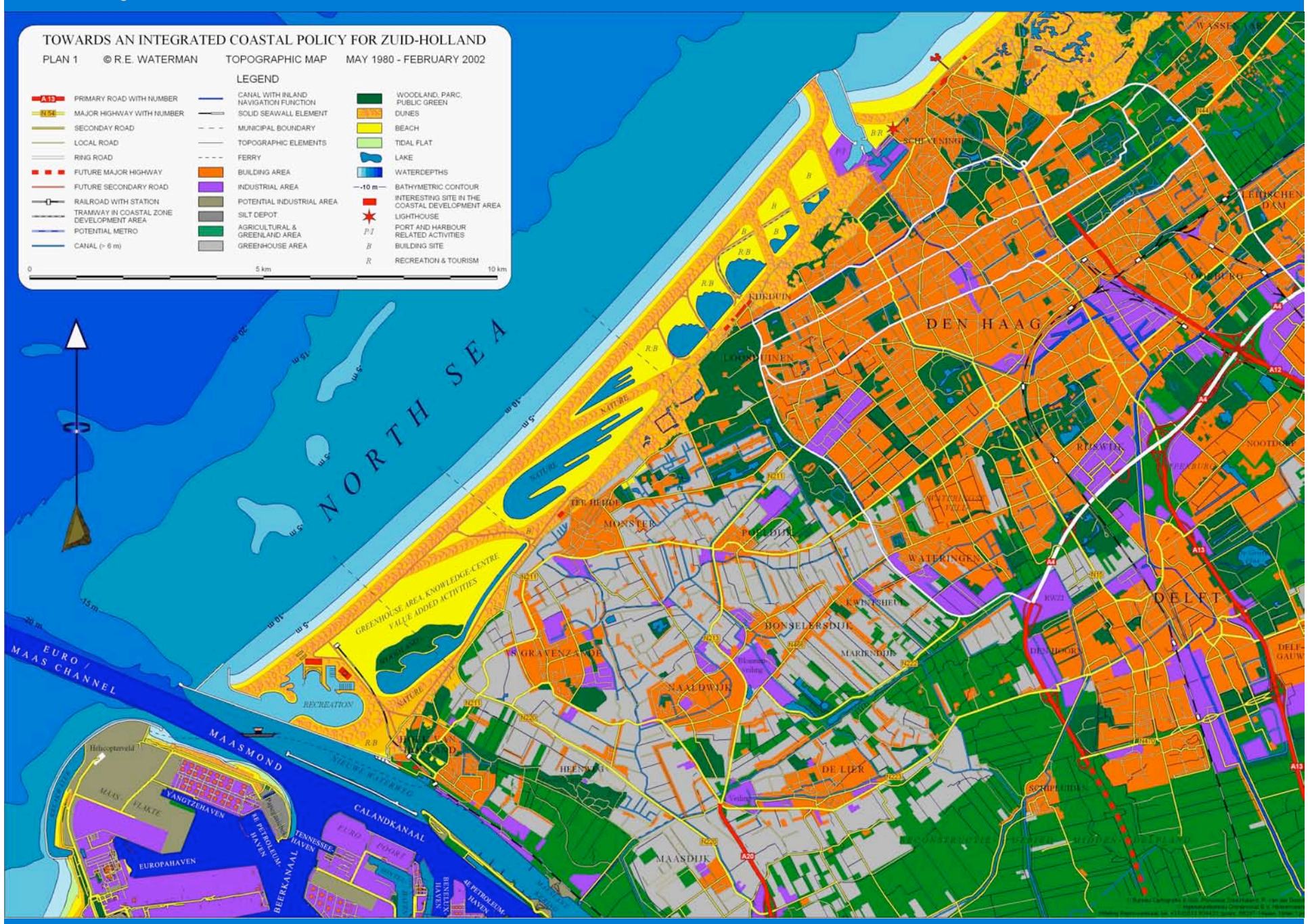
PLAN 1 © R.E. WATERMAN TOPOGRAPHIC MAP MAY 1980 - FEBRUARY 2002

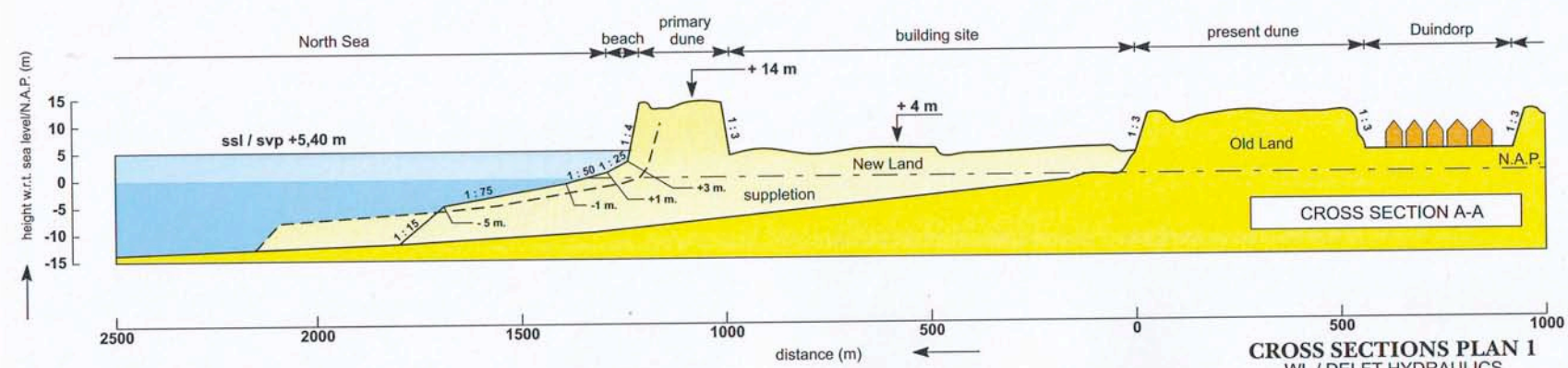
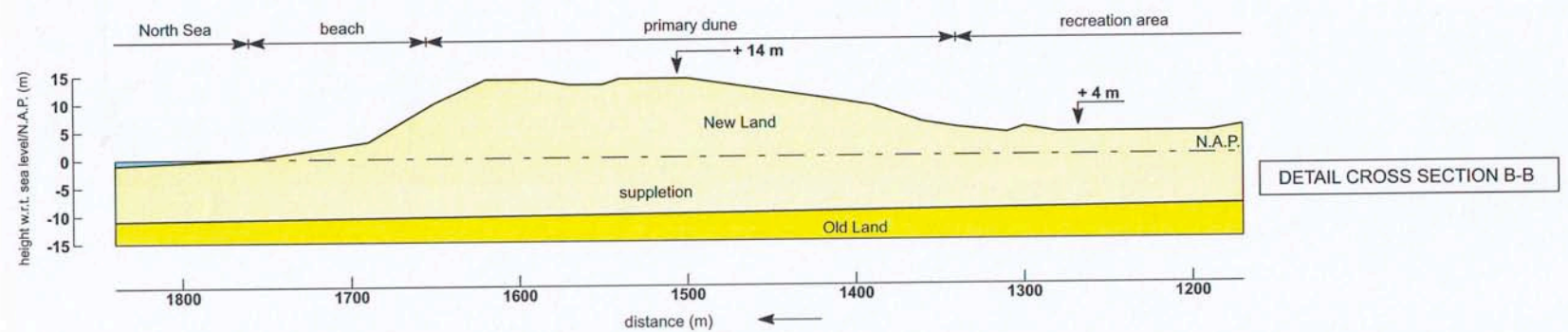
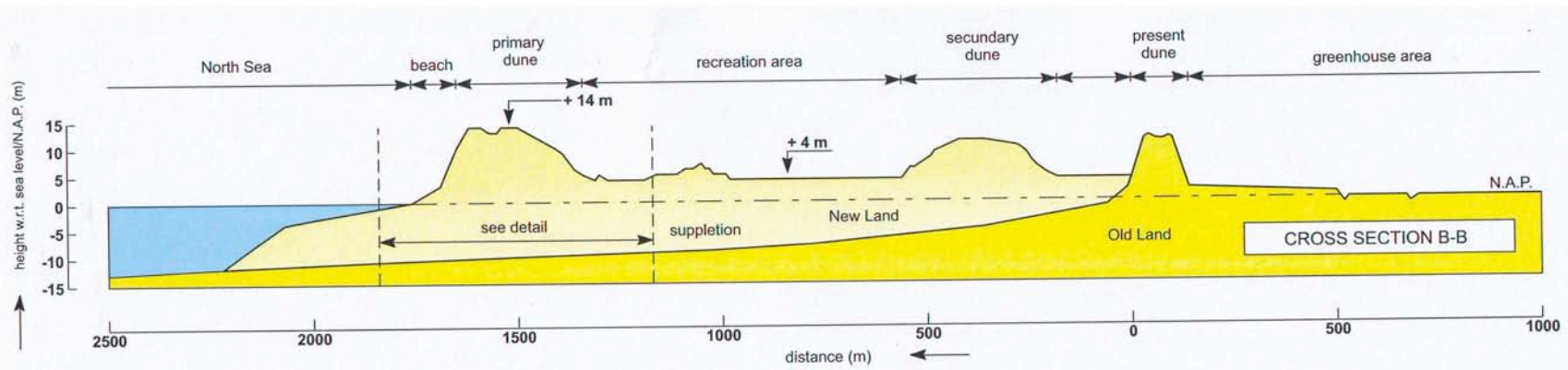
LEGEND

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|--|--|--|---------------------------------------|--|--|
| | PRIMARY ROAD WITH NUMBER | | CANAL WITH INLAND NAVIGATION FUNCTION | | WOODLAND, PARK, PUBLIC GREEN |
| | MAJOR HIGHWAY WITH NUMBER | | SOLID SEAWALL ELEMENT | | DUNES |
| | SECONDARY ROAD | | MUNICIPAL BOUNDARY | | BEACH |
| | LOCAL ROAD | | TOPOGRAPHIC ELEMENTS | | TIDAL FLAT |
| | RING ROAD | | FERRY | | LAKE |
| | FUTURE MAJOR HIGHWAY | | BUILDING AREA | | WATER DEPTHS |
| | FUTURE SECONDARY ROAD | | INDUSTRIAL AREA | | BATHYMETRIC CONTOUR |
| | RAILROAD WITH STATION | | POTENTIAL INDUSTRIAL AREA | | INTERESTING SITE IN THE COASTAL DEVELOPMENT AREA |
| | TRAMWAY IN COASTAL ZONE DEVELOPMENT AREA | | SILT DEPOT | | LIGHTHOUSE |
| | POTENTIAL METRO | | AGRICULTURAL & GREENLAND AREA | | PORT AND HARBOUR RELATED ACTIVITIES |
| | CANAL (> 6 m) | | GREENHOUSE AREA | | BUILDING |
| | | | | | RECREATION & TOURISM |



0 5 km 10 km





CROSS SECTIONS PLAN I
WL / DELFT HYDRAULICS

N.A.P. = New Amsterdam Zero Reference Level

Geologisch
jonge
Duinwiggen



Historische
kustlijn
Delfland



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BOUWEN MET DE NATUUR **PLAN 1**

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Muistromen
langs de
hoofden
veroorzaken
aflandig
zandtransport !

1985

DELFLANDSE KUST , MET 69 DELFLANDSE HOOFDEN

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ZUID-HOLLANDSE KUST OP ZIJN SMALST BIJ TER HEIJDE

16-3-1981

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BOUWEN MET DE NATUUR

PLAN 1



16-3-1981

EERSTE GEREALISEERDE SEGMENT VAN PLAN 1, BIJ HOEK VAN HOLLAND

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BOUWEN MET DE NATUUR

Plan 1



Toekomstige Ecodome in de nieuwe duinen bij Monster

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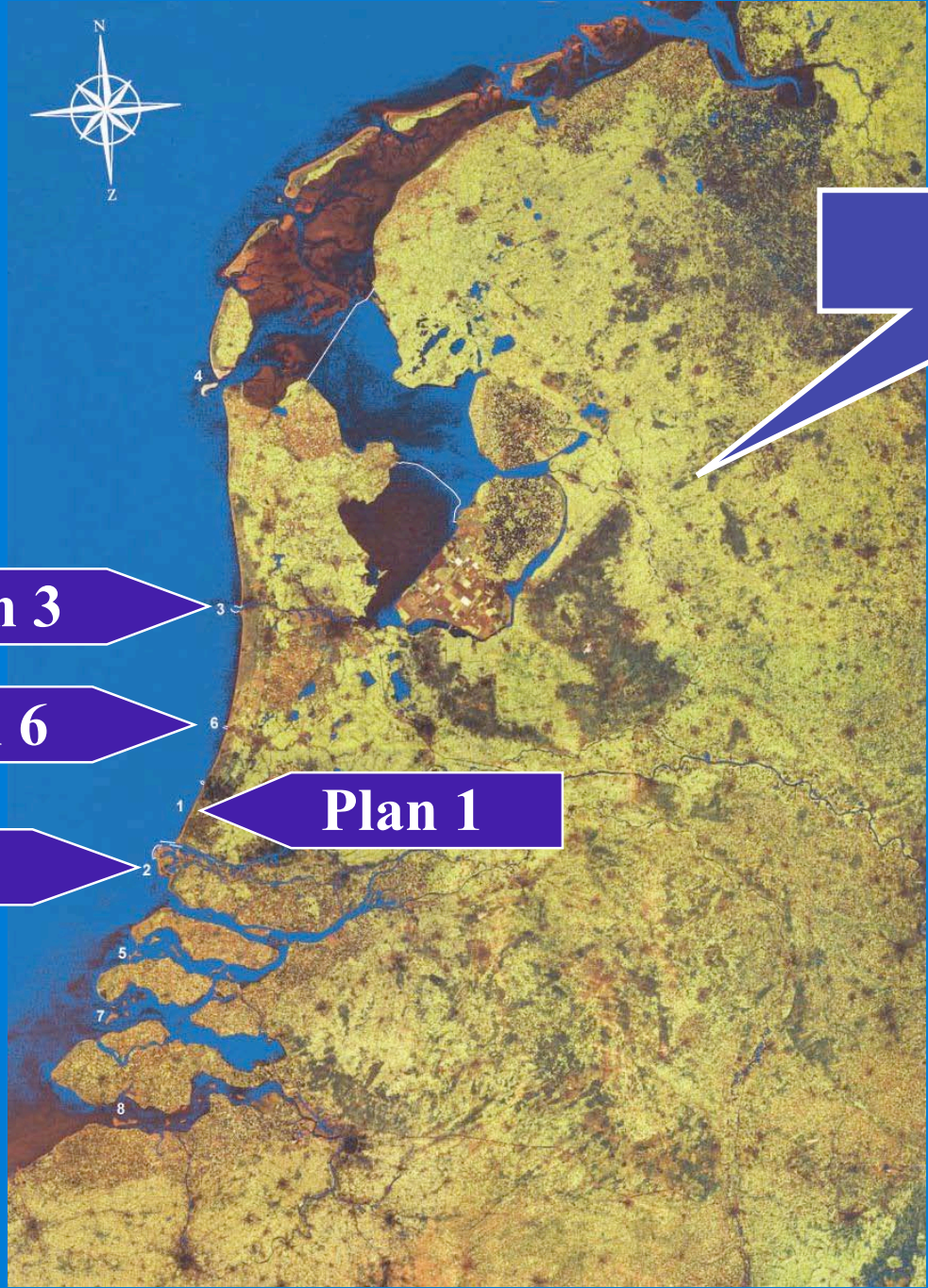
BOUWEN MET DE NATUUR

Plan 1



Toekomstige getijdenlagune bij Hoek van Holland

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Nederland

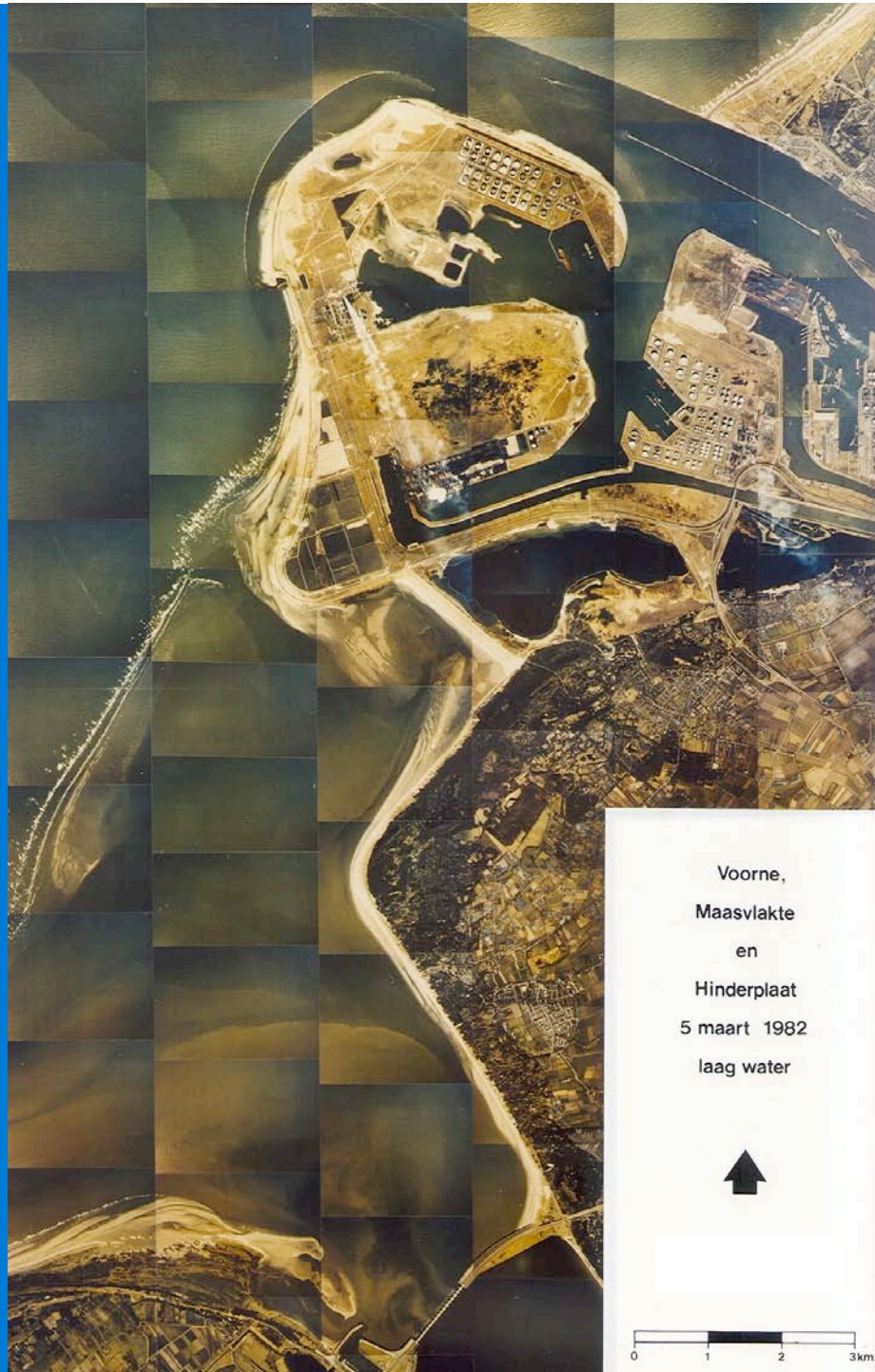
Plan 3

Plan 6

Plan 2

Plan 1



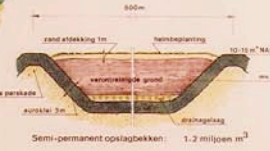
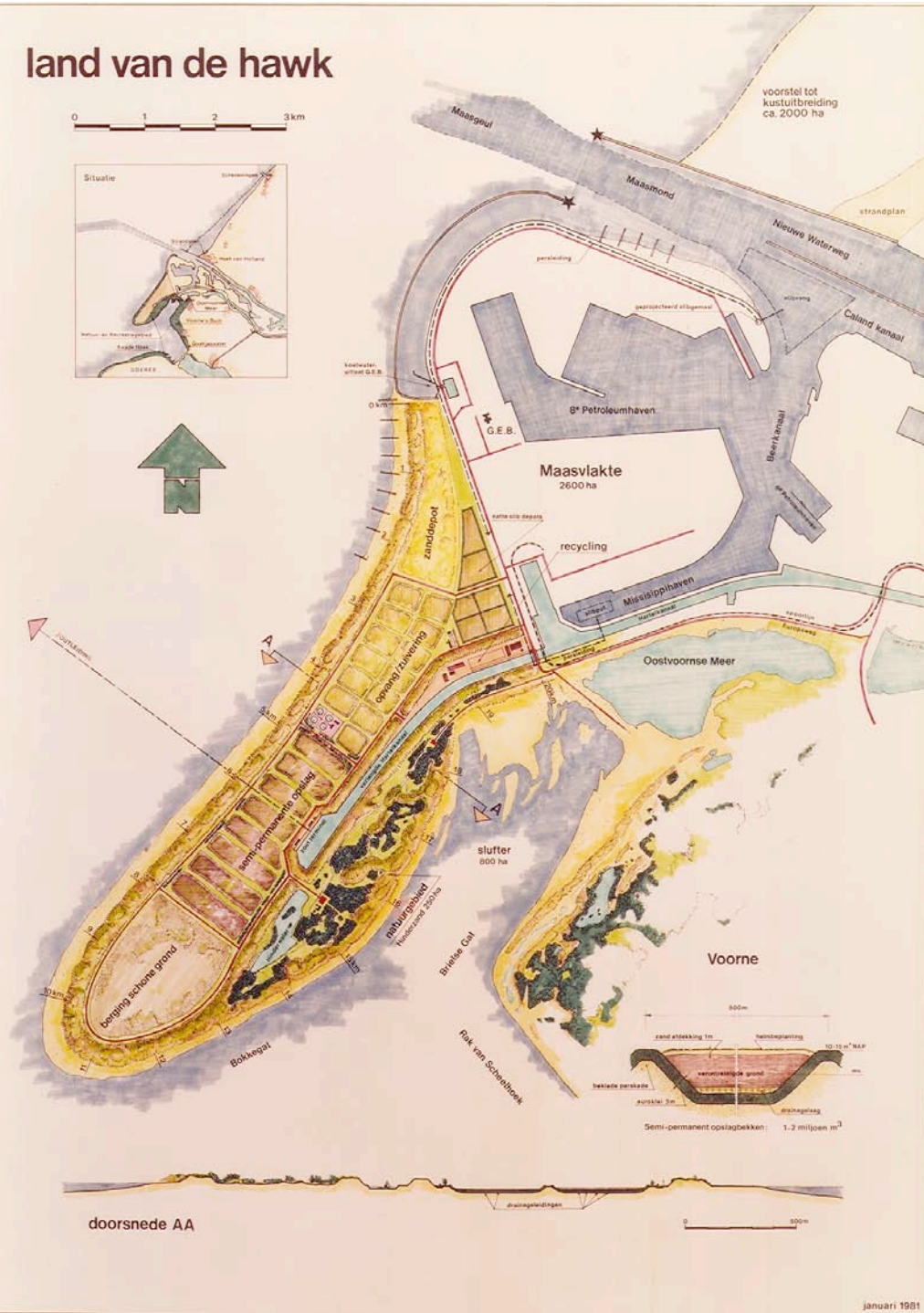


Voorne,
Maasvlakte
en
Hinderplaat
5 maart 1982
laag water

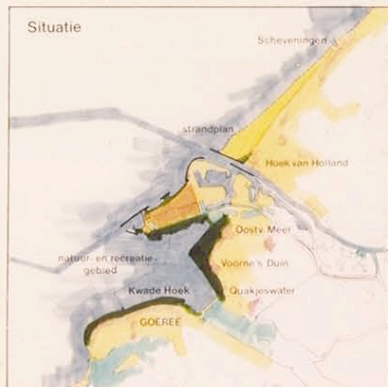
0 1 2 3km

land van de hawk

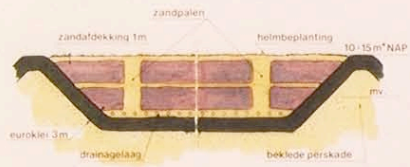
0 1 2 3 km



doorsnede AA



Noordzee



Semi-permanent opslagbekken

Deelplan 1
voorstel tot
kustuitbreiding
ca. 2350 ha



Naar een integraal kustbeleid voor Zuid-Holland
Deelplan 2

mei 1980 - maart 1982



TOWARDS AN INTEGRATED COASTAL POLICY FOR ZUID-HOLLAND

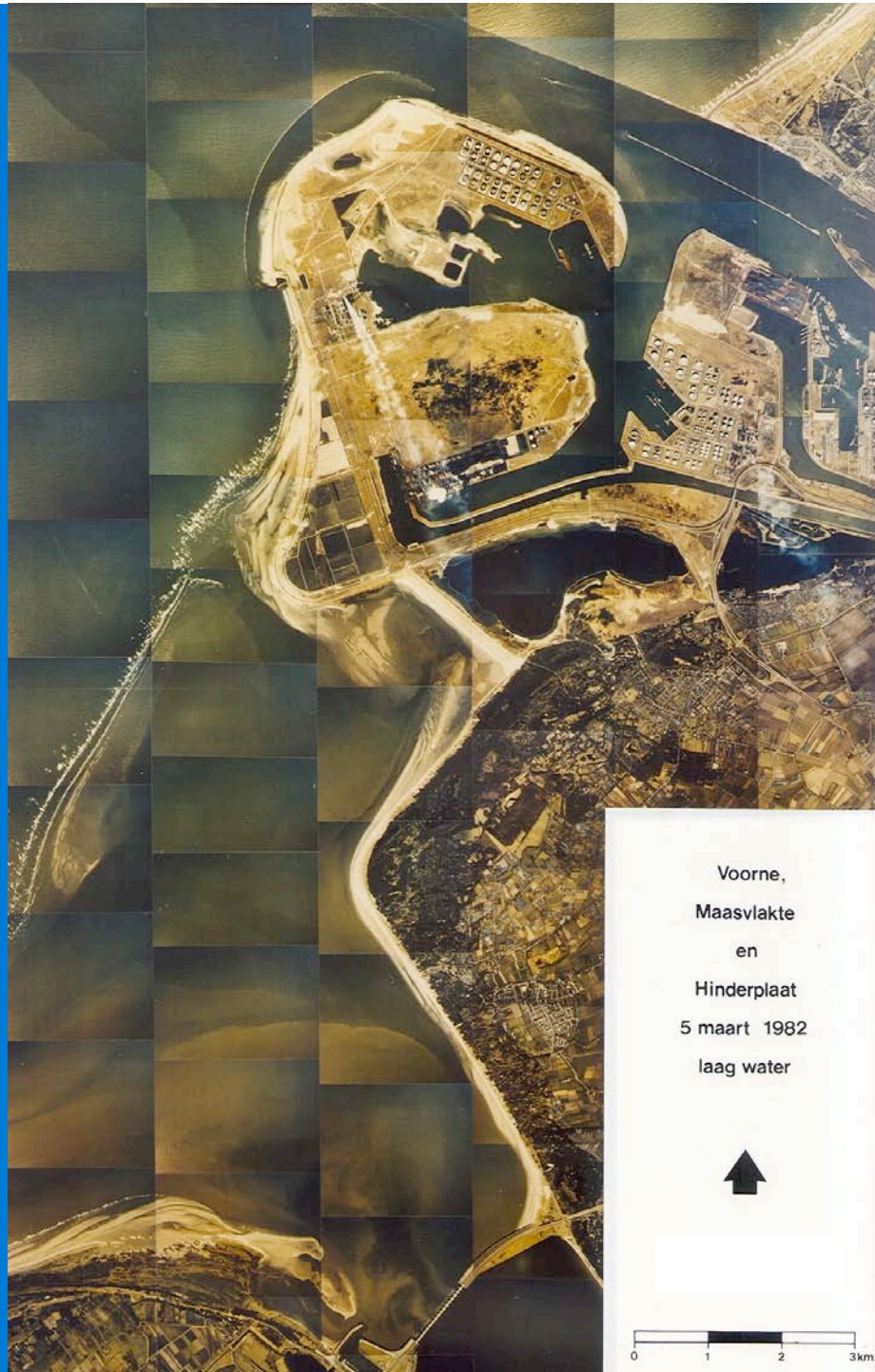
PLAN 2 © R.E. WATERMAN FIRST TWO SEGMENTS MAY 1980 - FEBRUARY 2002

LEGEND

MAJOR HIGHWAY WITH NUMBER	MUNICIPAL BOUNDARY	WOODLAND, PARC, PUBLIC GREEN
PRIMARY ROAD WITH NUMBER	BUILDING AREA	DUNES
SECONDARY ROAD	INDUSTRIAL AREA	BEACH, INNER DUNE AREA
LOCAL ROAD	POTENTIAL INDUSTRIAL AREA	TIDAL FLAT
RAILROAD WITH STATION	SILT DEPOT	LAKE
CANAL (> 6 m)	AGRICULTURAL & GREENLAND AREA	WATER DEPTHS
SOLID SEAWALL ELEMENT	GREENHOUSE AREA	-10 m BATHYMETRIC CONTOUR
		INTERESTING SITE IN THE COASTAL DEVELOPMENT AREA

Eerste gerealiseerde segmenten van Plan 2, aangelegd via *Bouwen met de Natuur*





Voorne,
Maasvlakte
en
Hinderplaat
5 maart 1982
laag water

0 1 2 3km

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BOUWEN MET DE NATUUR

PLAN 2



22-3-1991

EERSTE GEREALISEERDE SEGMENTEN VAN PLAN 2

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BOUWEN MET DE NATUUR

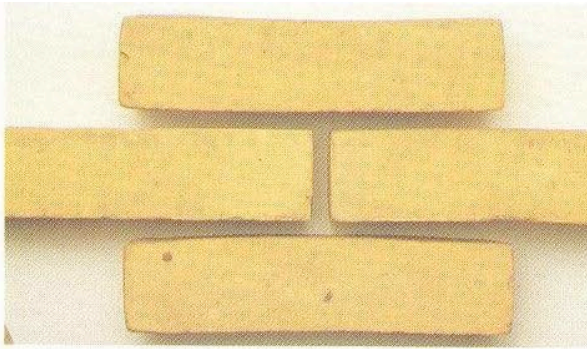
PLAN 2



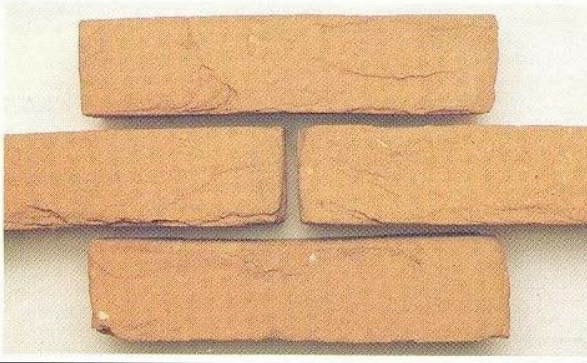
17-8-2000

EERSTE GEREALISEERDE SEGMENTEN VAN PLAN 2

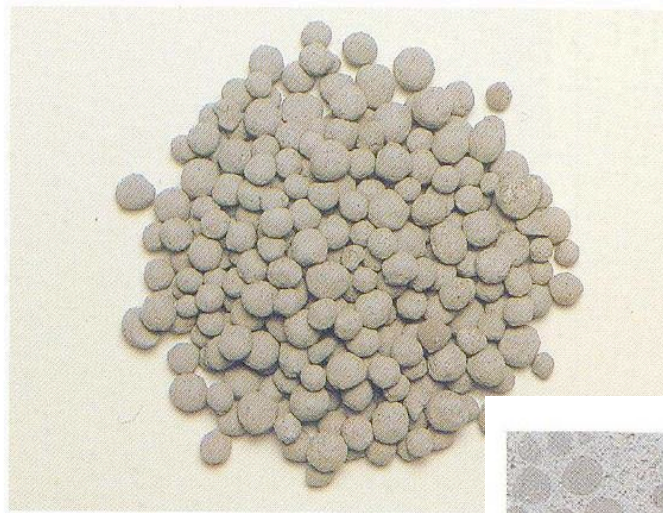
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Euroklei-bakstenen uit havenslib



Vliegas van kolengestookte elektriciteitscentrale

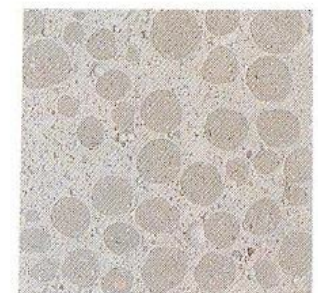


Vliegas en vuilverbrandingsinstallatie

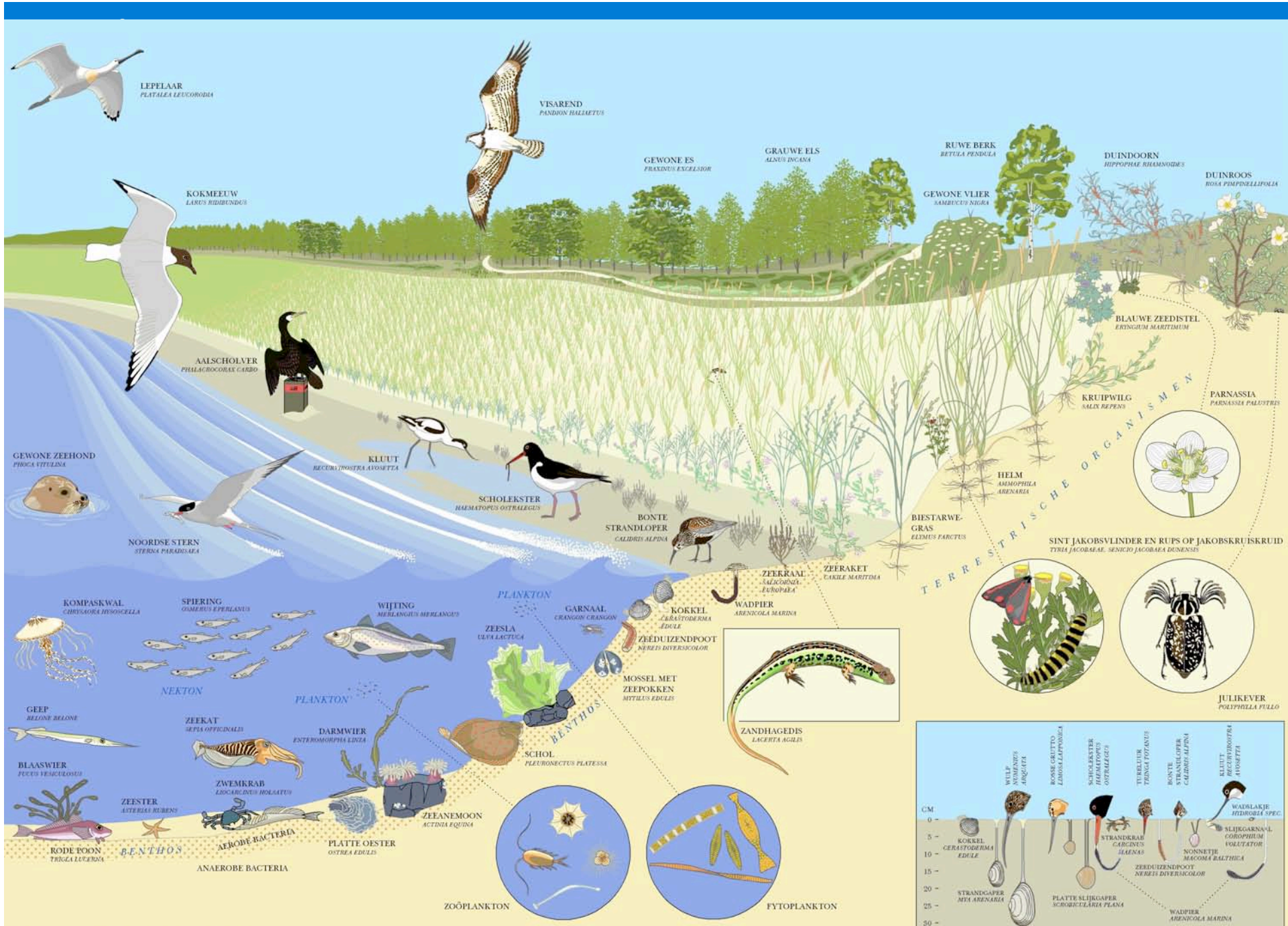


Aardelite©, kunstgrind

Eco-grind©, kunstgrind



Aardelite©, kunstgrind in betonprodukten

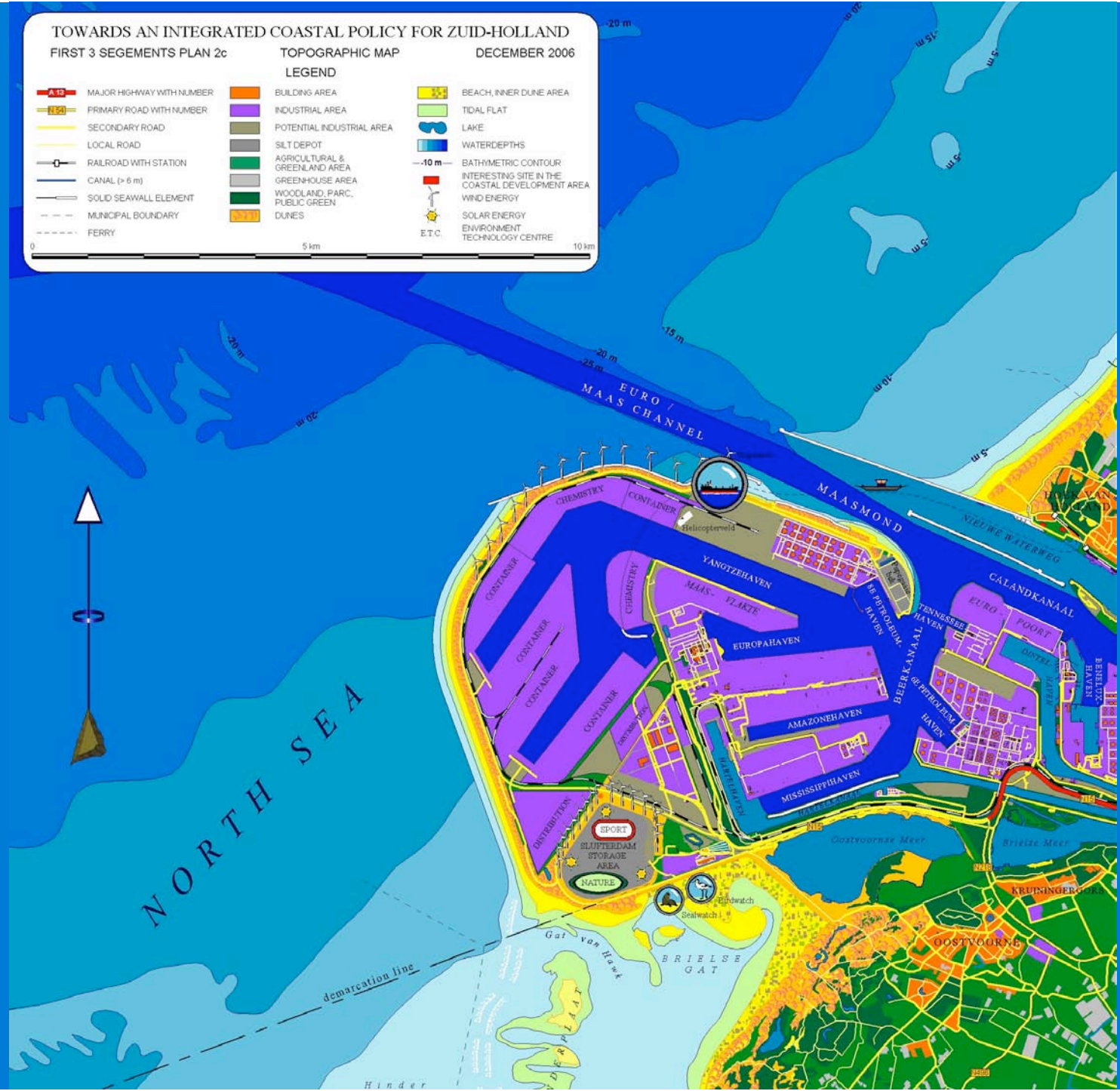


TOWARDS AN INTEGRATED COASTAL POLICY FOR ZUID-HOLLAND
FIRST 3 SEGEMENTS PLAN 2c **TOPOGRAPHIC MAP** **DECEMBER 2006**

LEGEND

	MAJOR HIGHWAY WITH NUMBER		BUILDING AREA		BEACH, INNER DUNE AREA
	PRIMARY ROAD WITH NUMBER		INDUSTRIAL AREA		TIDAL FLAT
	SECONDARY ROAD		POTENTIAL INDUSTRIAL AREA		LAKE
	LOCAL ROAD		SILT DEPOT		WATER DEPTHS
	RAILROAD WITH STATION		AGRICULTURAL & GREENLAND AREA		BATHYMETRIC CONTOUR
	CANAL (> 6 m)		GREENHOUSE AREA		INTERESTING SITE IN THE COASTAL DEVELOPMENT AREA
	SOLID SEAWALL ELEMENT		WOODLAND, PARC, PUBLIC GREEN		WIND ENERGY
	MUNICIPAL BOUNDARY		DUNES		SOLAR ENERGY
	FERRY				ENVIRONMENT TECHNOLOGY CENTRE
					E.T.C.

0 5 km 10 km



TOWARDS AN INTEGRATED COASTAL POLICY FOR ZUID-HOLLAND

PLAN 2c

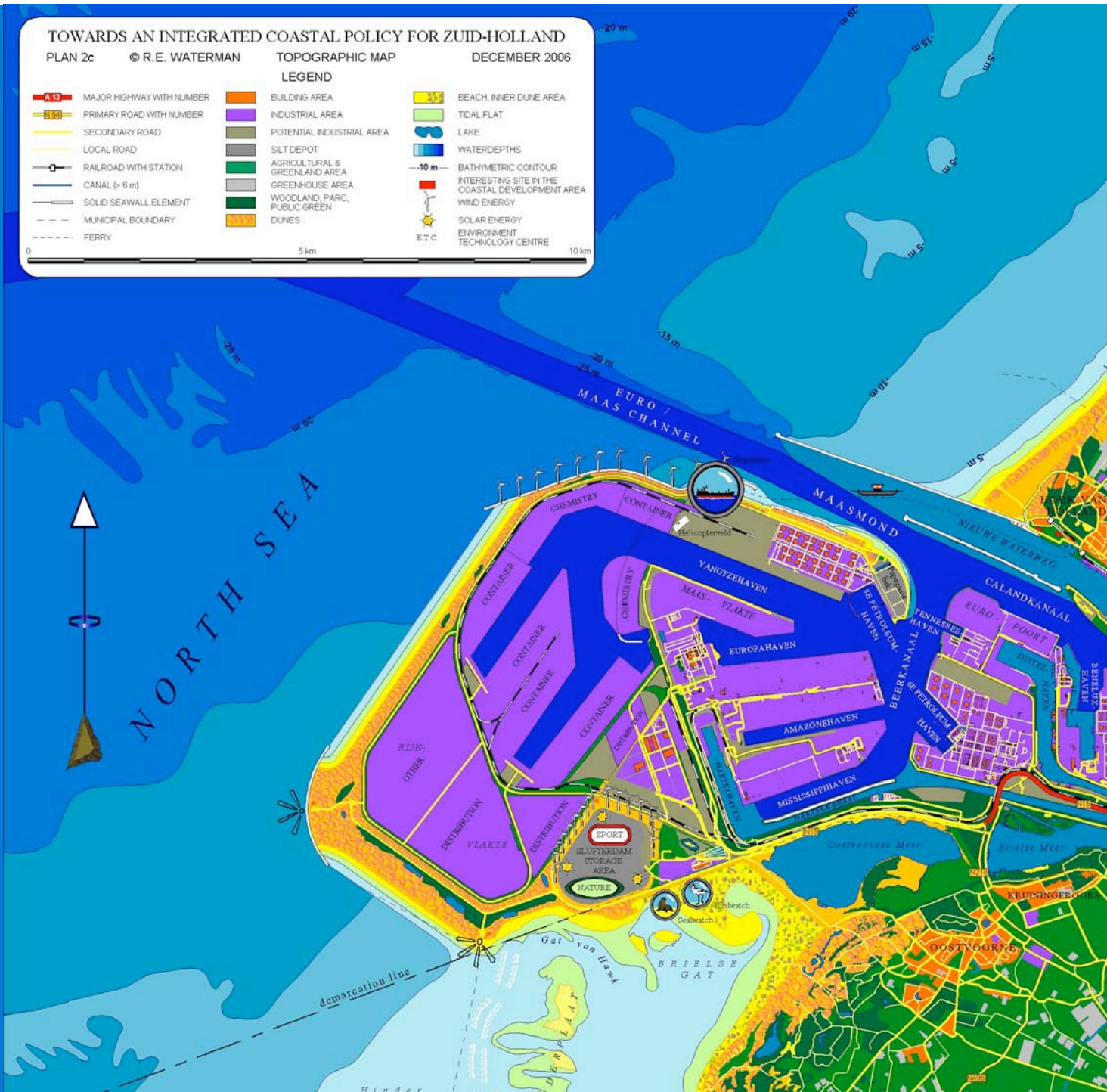
© R.E. WATERMAN

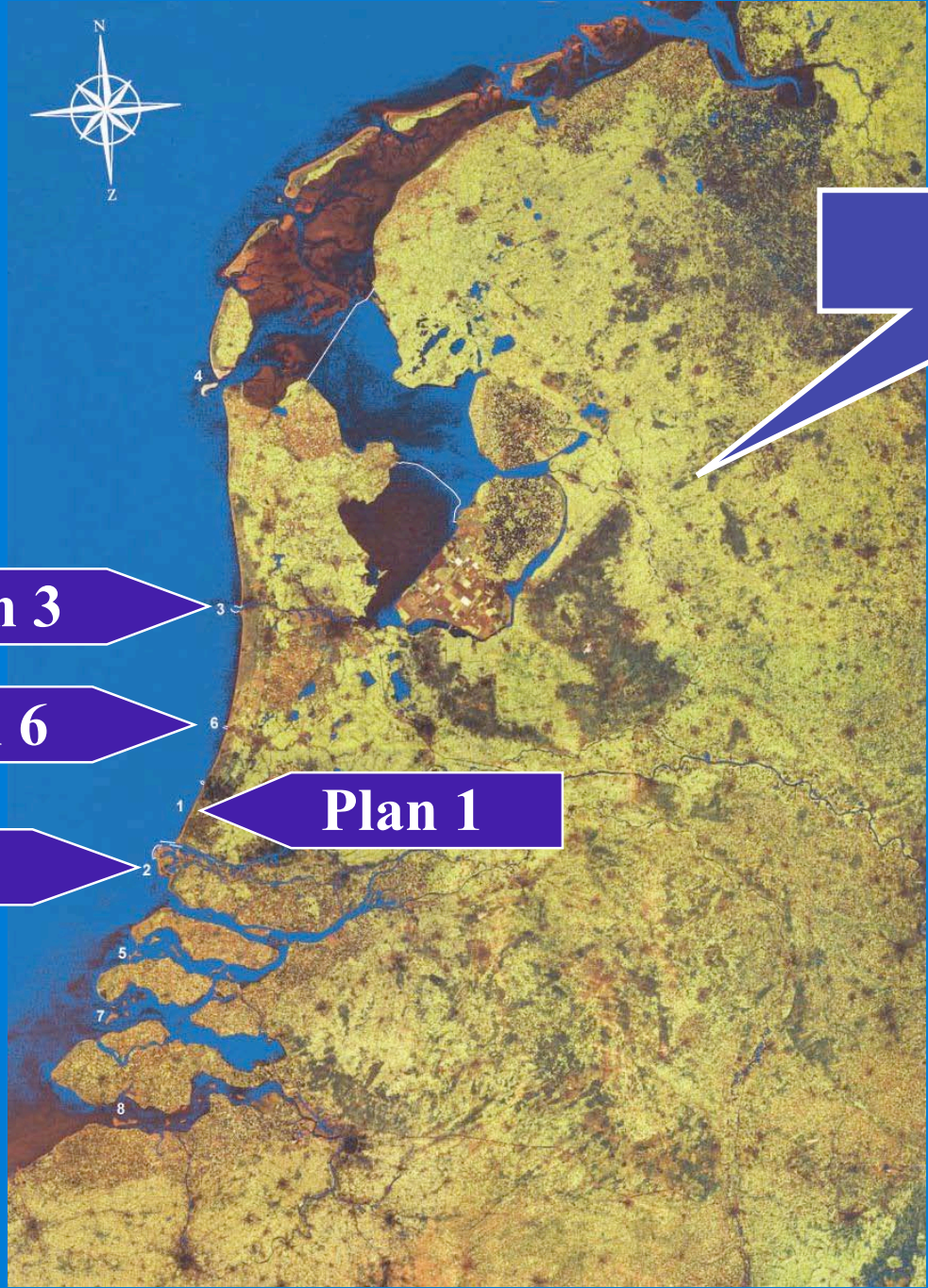
TOPOGRAPHIC MAP

DECEMBER 2006

LEGEND

	MAJOR HIGHWAY WITH NUMBER		BUILDING AREA		BEACH, INNER DUNE AREA
	PRIMARY ROAD WITH NUMBER		INDUSTRIAL AREA		TIDAL FLAT
	SECONDARY ROAD		POTENTIAL INDUSTRIAL AREA		LAKE
	LOCAL ROAD		SILT DEPOT		WATER DEPTHS
	RAILROAD WITH STATION		AGRICULTURAL & GREENLAND AREA		BATHYMETRIC CONTOUR
	CANAL (> 6 m)		GREENHOUSE AREA		INTERESTING SITE IN THE COASTAL DEVELOPMENT AREA
	SOLID SEAWALL ELEMENT		WOODLAND, PARK, PUBLIC GREEN		WIND ENERGY
	MUNICIPAL BOUNDARY		DUNES		SOLAR ENERGY
	FERRY				ENVIRONMENT TECHNOLOGY CENTRE
					E.T.C.





Nederland

Plan 3

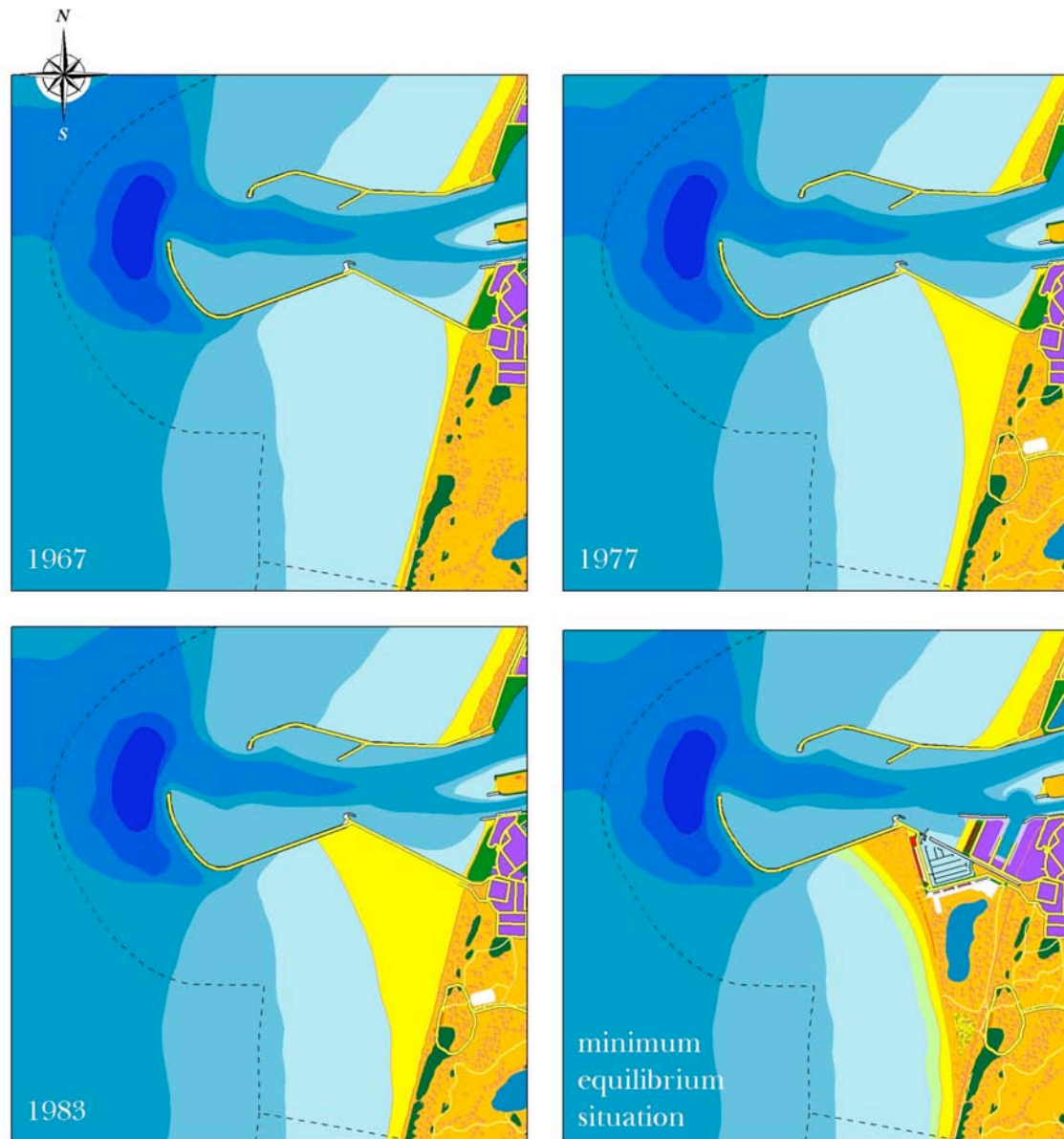
Plan 6

Plan 2

Plan 1



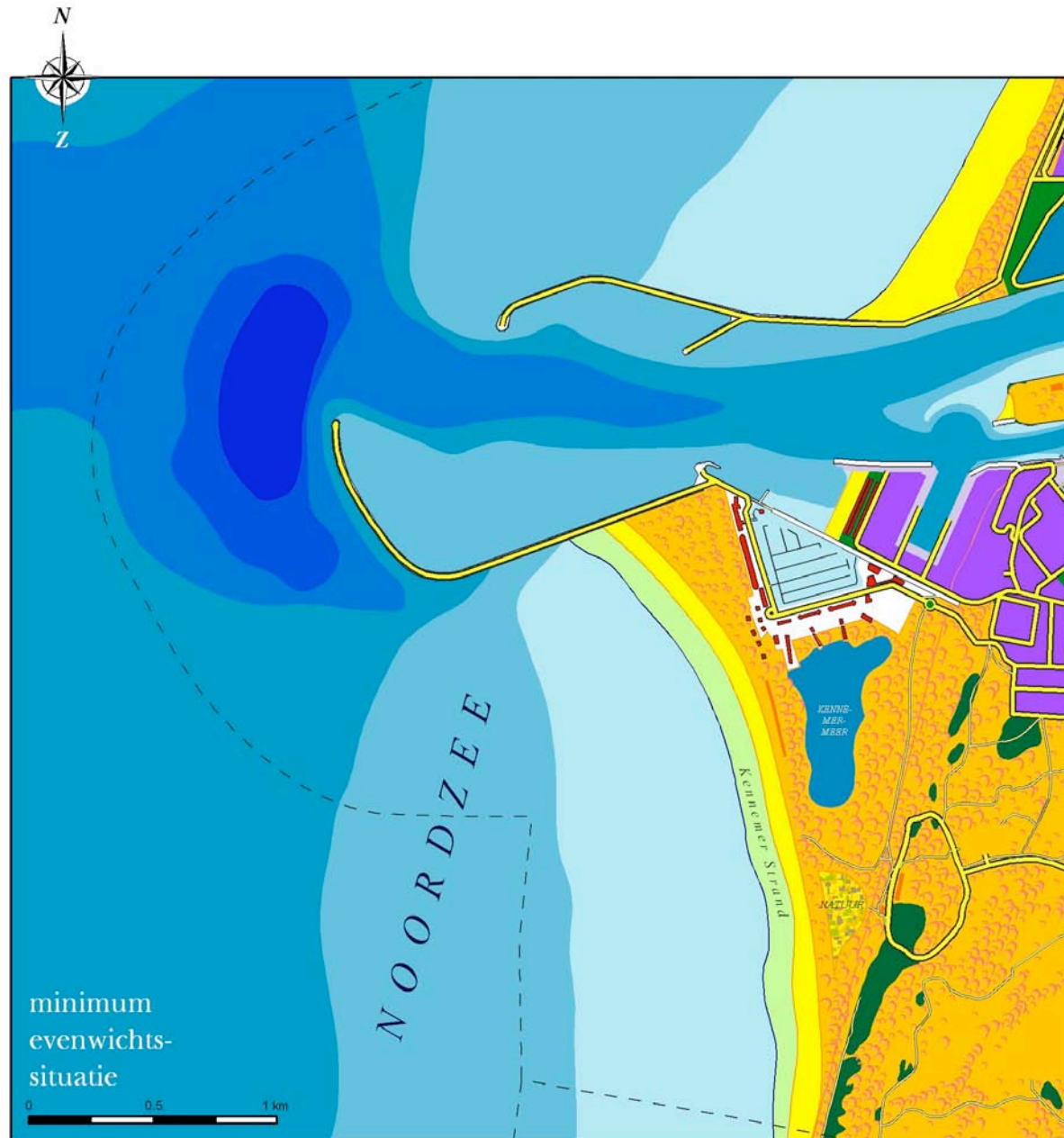
SEAPORT MARINA IJMUIDEN KENNEMER STRAND



De natuur is al bezig het nieuwe land ten zuiden van het zuiderhavenhoofd van IJmuiden, aan te leggen t.g.v. netto-zandtransport langs de kust in noordelijke richting.

Dit proces wordt versneld door externe en interne bagger werkzaamheden.

SEAPORT MARINA IJMUIDEN KENNEMER STRAND



Plan 3a is driehoekig en bestaat uit een zeewerend duin met een marina, dubbele boulevard, appartementen, restaurants & winkels, hotel, infrastructuur, recreatie en toerisme; overgangszone met meer & natuurgebied verbonden met het bestaande Nationaal Park Zuid - Kennemerland

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BOUWEN MET DE NATUUR

Plan 3a



10 -7-1997

Plan 3a. Compleet met zeeverend duin, stranden, marina, boulevard, appartementen, restaurants & winkels, hotel, infrastructuur, meer & natuurgebied.

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BOUWEN MET DE NATUUR

Plan 3a






























Juni 2000

Plan 3a. Compleet met zeeverend duin, stranden, marina, boulevard, appartementen, restaurants & winkels, hotel, infrastructuur, meer & natuurgebied.

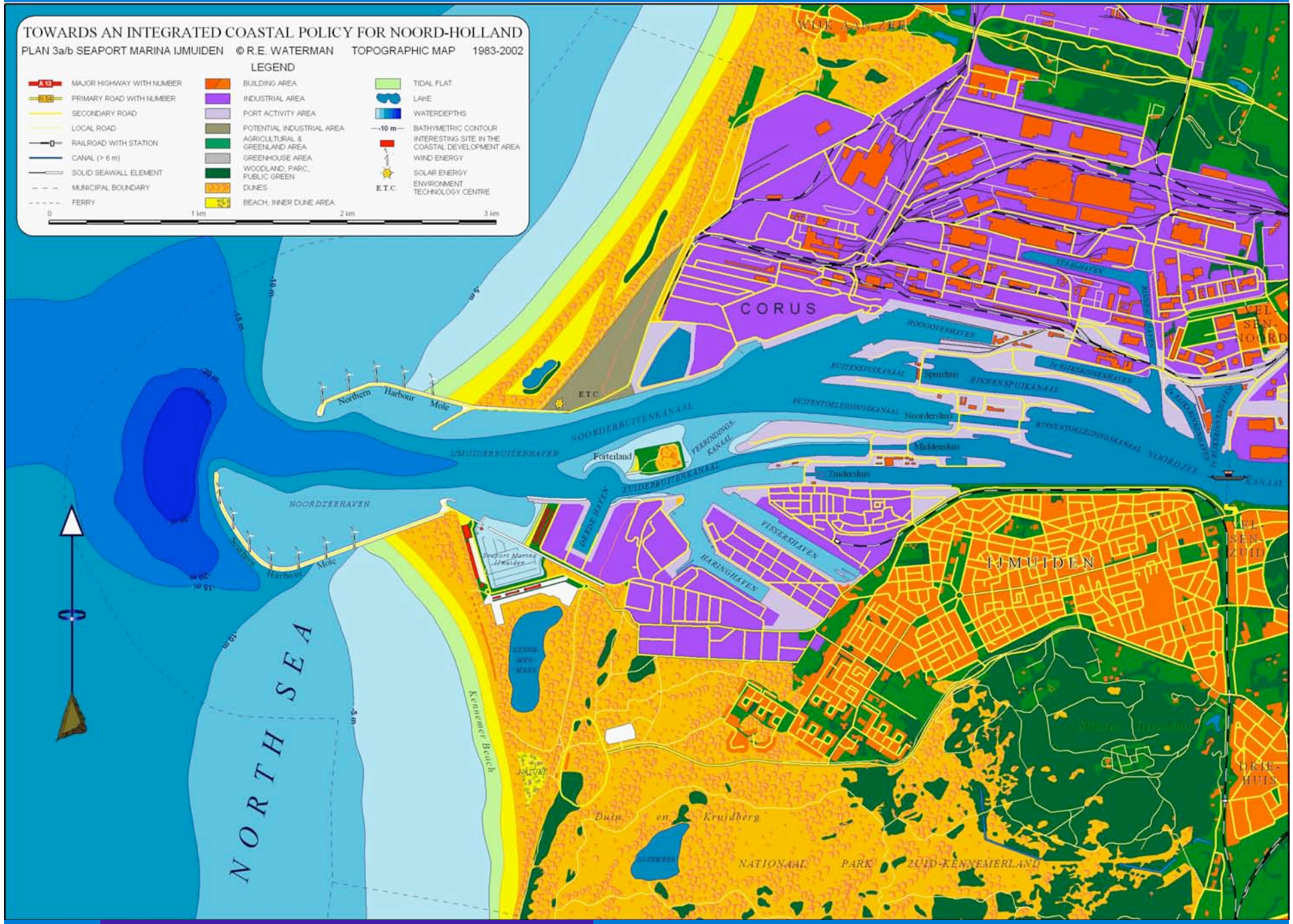
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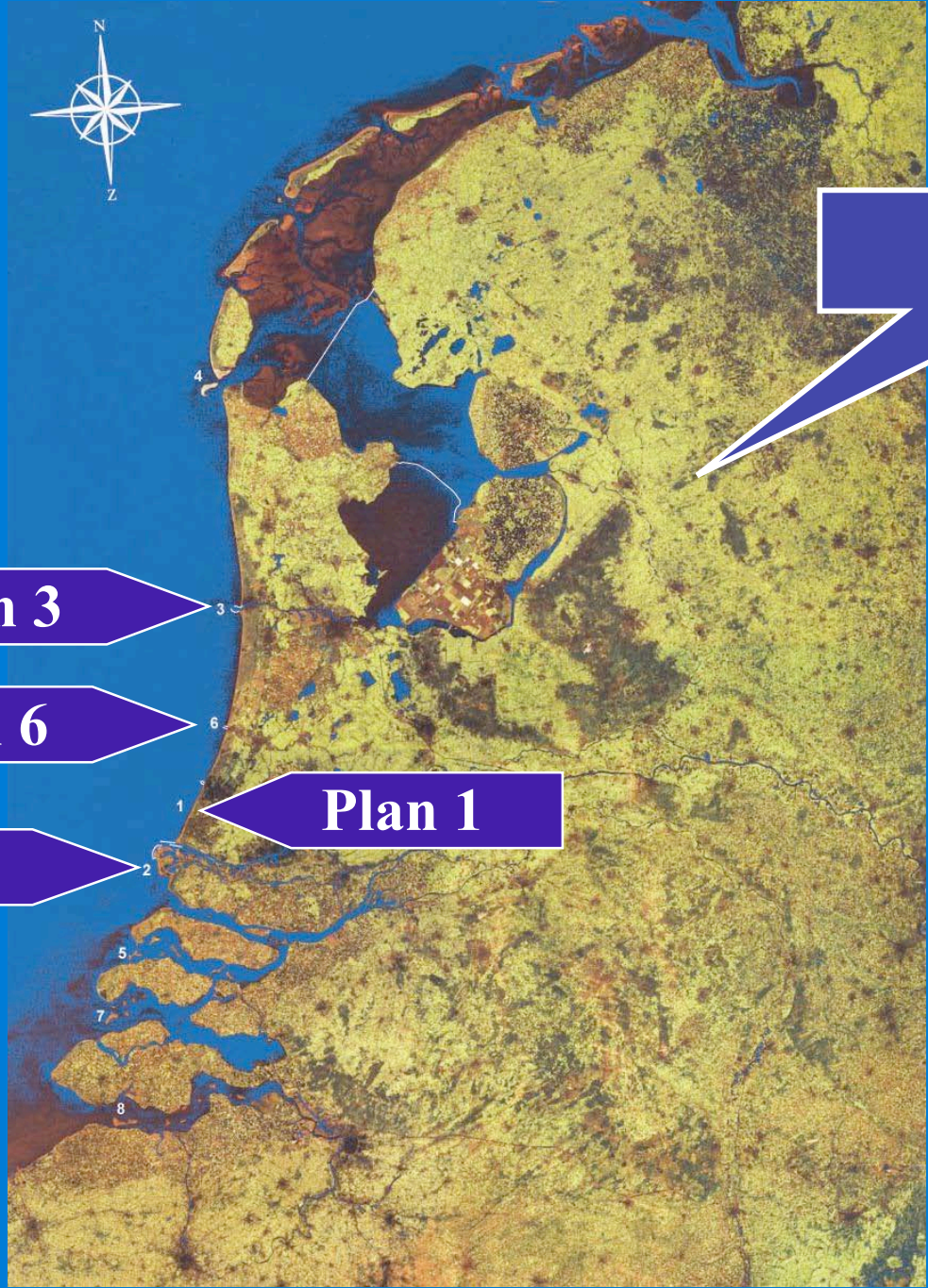
TOWARDS AN INTEGRATED COASTAL POLICY FOR NOORD-HOLLAND
 PLAN 3a/b SEAPORT MARINA IJMUIDEN © R.E. WATERMAN TOPOGRAPHIC MAP 1983-2002

LEGEND

	MAJOR HIGHWAY WITH NUMBER		BUILDING AREA		TIDAL FLAT
	PRIMARY ROAD WITH NUMBER		INDUSTRIAL AREA		LAKE
	SECONDARY ROAD		PORT ACTIVITY AREA		WATER DEPTHS
	LOCAL ROAD		POTENTIAL INDUSTRIAL AREA		BATHYMETRIC CONTOUR
	RAILROAD WITH STATION		AGRICULTURAL & GREENLAND AREA		INTERESTING SITE IN THE COASTAL DEVELOPMENT AREA
	CANAL (> 6 m)		GREENHOUSE AREA		WIND ENERGY
	SOLID SEAWALL ELEMENT		WOODLAND, PARC, PUBLIC GREEN		SOLAR ENERGY
	MUNICIPAL BOUNDARY		DUNES		ENVIRONMENT TECHNOLOGY CENTRE
	FERRY		BEACH, INNER DUNE AREA		E.T.C.

0 1 km 2 km 3 km





Nederland

Plan 3

Plan 6

Plan 2

Plan 1



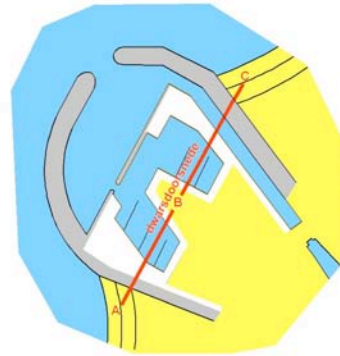


Plan 6. Katwijk aan Zee

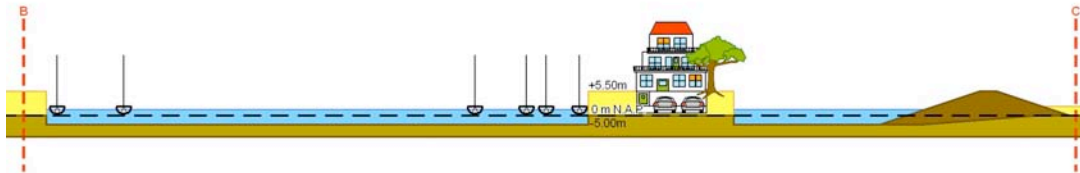
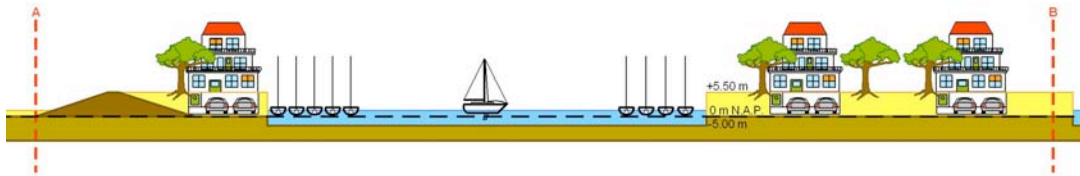
Zeejachthaven met
duinverbreding aan weerszijden
ten dienste van Katwijk en
Noordwijk

O.d.d. sluis of overtoom
verbinding met de Oude Rijn

Boulevard in Katwijk aan Zee



DWARSDOORSNEDE A-B-C



Plan 6. Katwijk aan Zee.





BUITEN- EN BINNENWAARTSE KUSTONTWIKKELING NOORD-HOLLAND

Noord-Holland

KUSTONTWIKKELING

IJmuiden

Petten

Noorderhaaks





Duinen met helmgras © Bert Peijs



Petten Marina
alleen te overwegen met zeewaartse
duinverbreding aan weerszijden





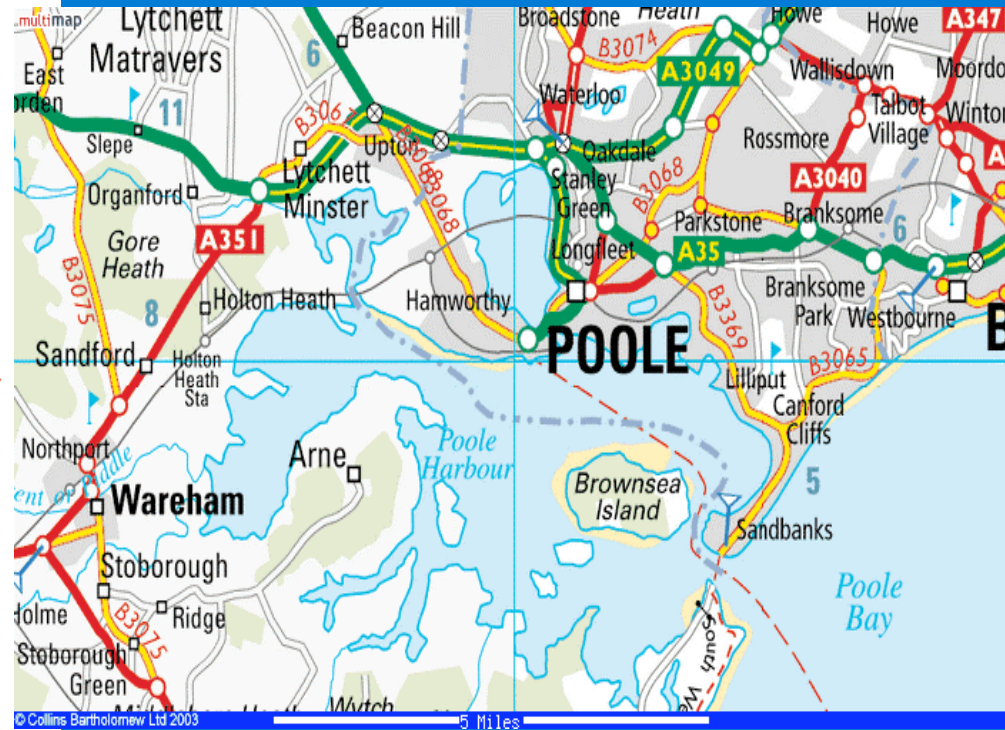
Westerschelde Container Terminal met natuurontwikkelingsgebieden aan



Sluis / Retranchement / Cadzand –Bad

Doorlopende waterverbinding van Sluis naar Cadzand-Bad met zeesluis Cadzand, jachthaven Sluis, een en ander tezamen met enkele natuurontwikkelingsgebieden

BOUWEN MET DE NATUUR



Engeland, Poole



Engeland, Poole

Vóór de landaanwinst





Engeland, Poole

Tijdens de landaanwinst

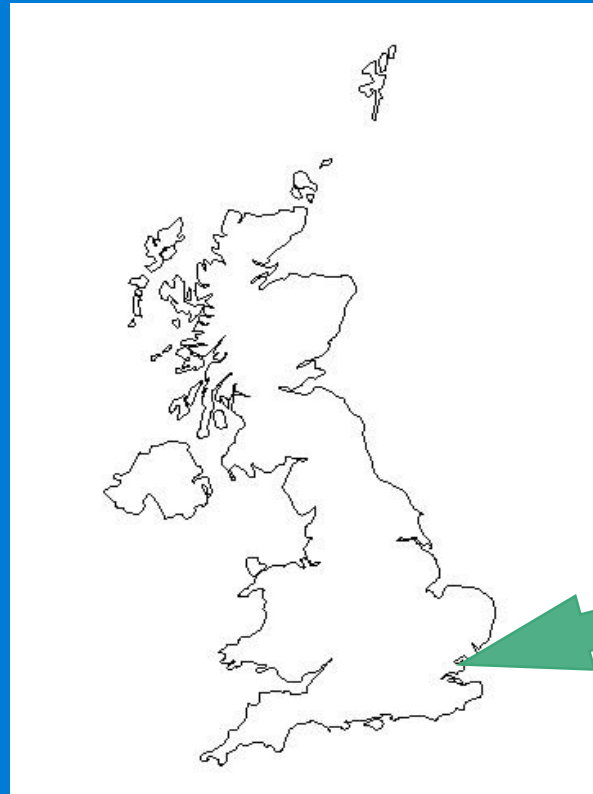


Engeland, Poole

Na voltooiing van de landaanwinst

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BOUWEN MET DE NATUUR



Engeland, Southend on Sea

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Engeland, Southend on Sea

Strand ophoging en verbreding, waarbij de wetlands intact worden gelaten



**Strandverbreding
en ophoging voor
toerisme &
recreatie en
kustverdediging,
met behoud van de
estuarine wetlands**

**Engeland,
Southend on Sea**



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BOUWEN MET DE NATUUR

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Engeland, Skegness



**Engeland, Lincshire, Skegness
Strandverbreding en ophoging**



**Engeland, Lincshire, Skegness
Strandverbredina en ophoaing**

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BOUWEN MET DE NATUUR



AFRIKA

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BOUWEN MET DE NATUUR



ZUID - AFRIKA

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BOUWEN MET DE NATUUR



Kaapstad

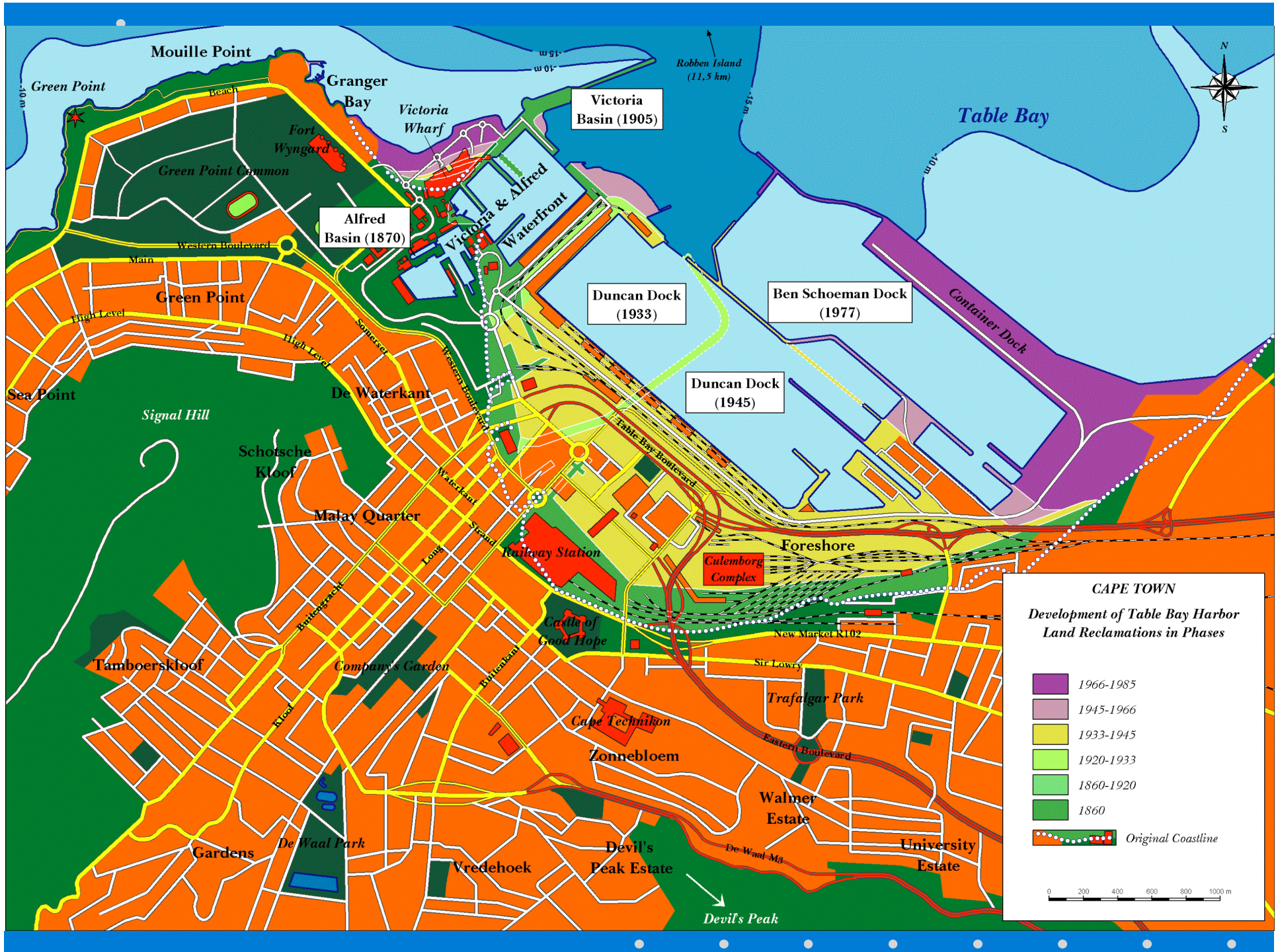
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BOUWEN MET DE NATUUR



Kaapstad

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BOUWEN MET DE NATUUR



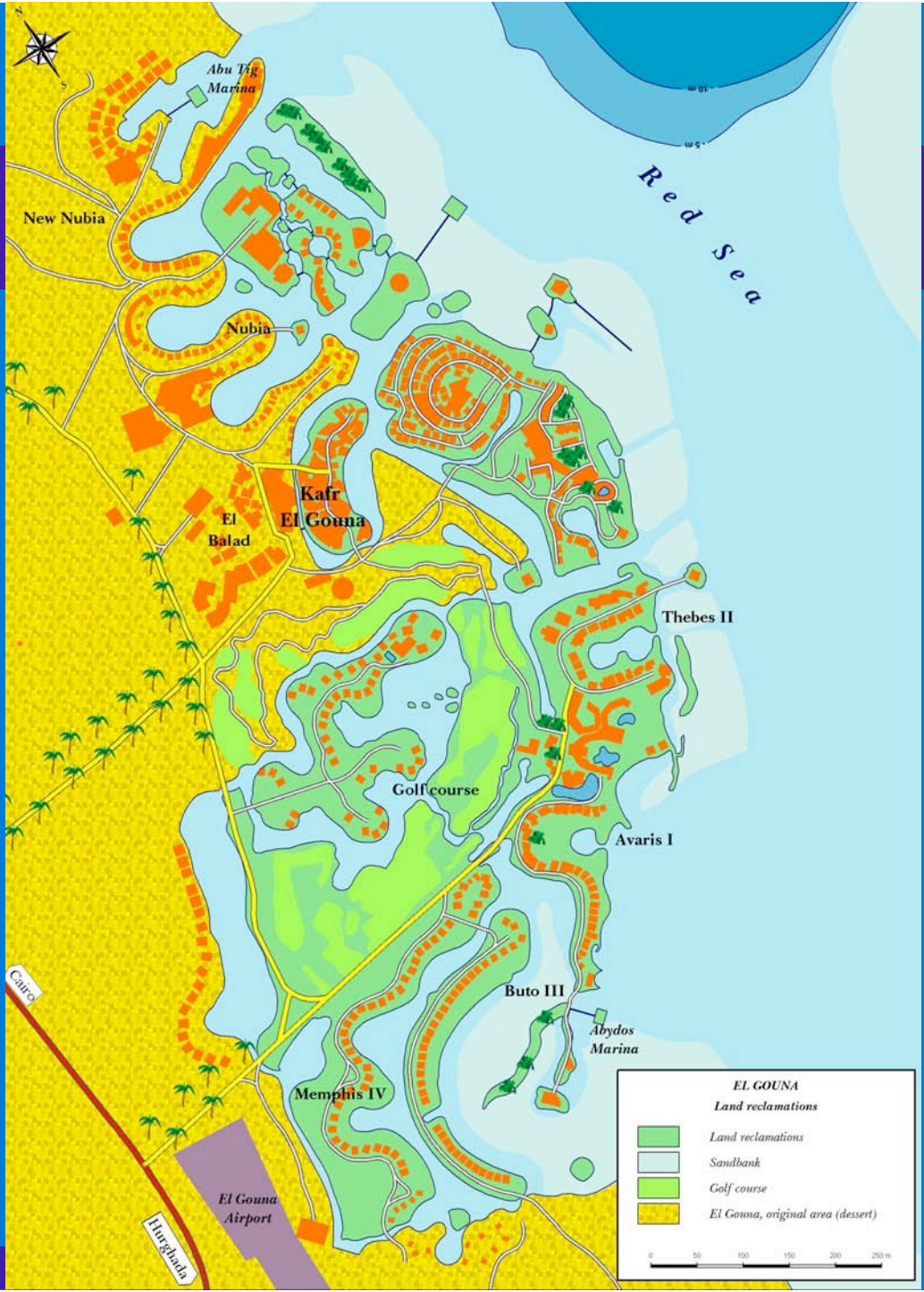
Kaapstad, ZUID - AFRIKA

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El Gouna





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El Gouna




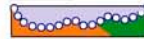
Tel Aviv - Jaffa





JAFFA

Marina / Ferry Port & Seashore development

-  Promenade / boulevard
-  Original Coastline

- ① terminal
- ② large yachts & tour boats & ferry
- ③ club / restaurant
- ④ bathing beach
- ⑤ yacht anchorage

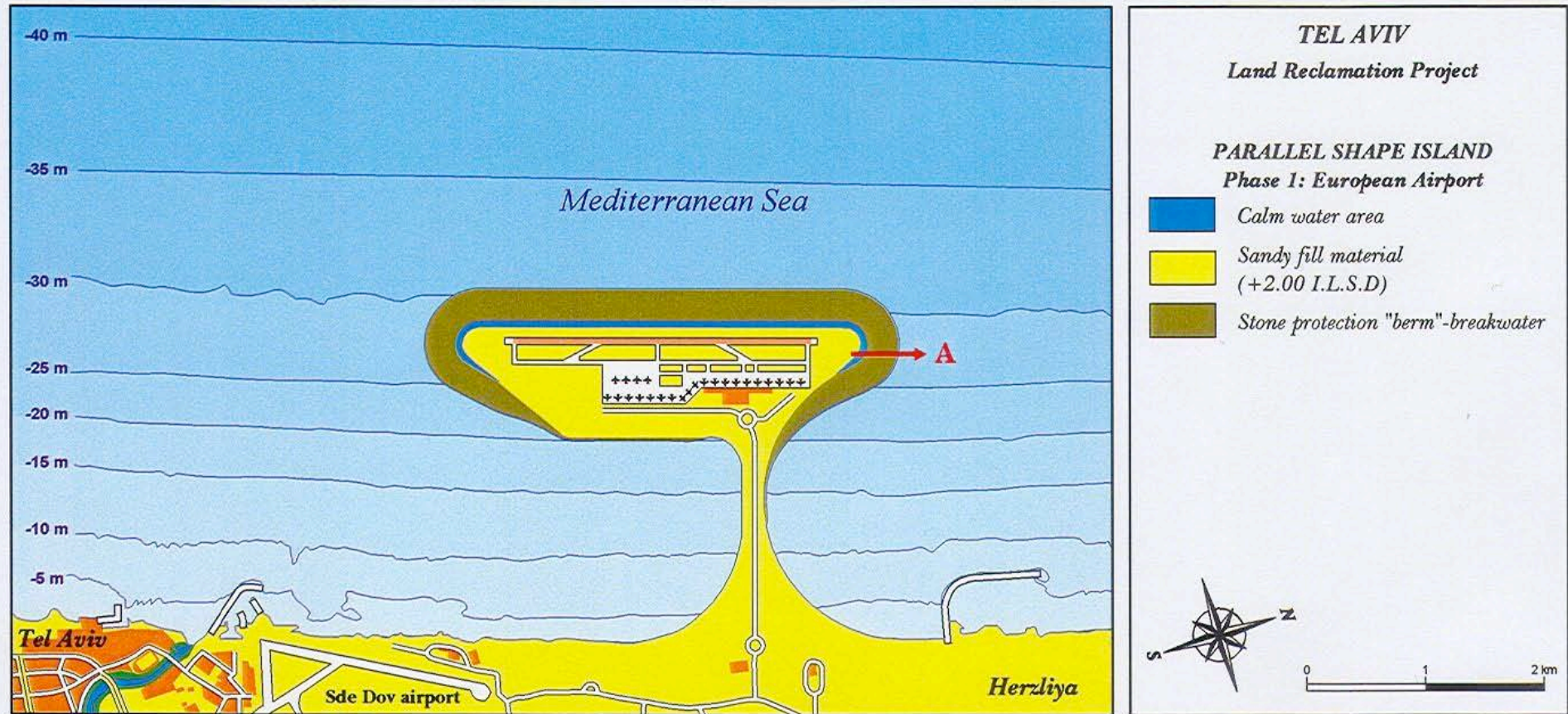
- ⑥ residential area
- ⑦ residential & hotel area
- ⑧ fishermen's store house
- ⑨ Jaffa shore park
- ⑩ marina services
- ⑪ marina dock yard
- ⑫ club house

- park, bathing beach & promenade (1500 ha)
- berthing capacity for 400-500 yachts
- ferry harbour & promenade
- residential area (450 units)
- hotel & residential area (350 units or hotels)
- existing Jaffa port area
- underground parking for 2300 cars

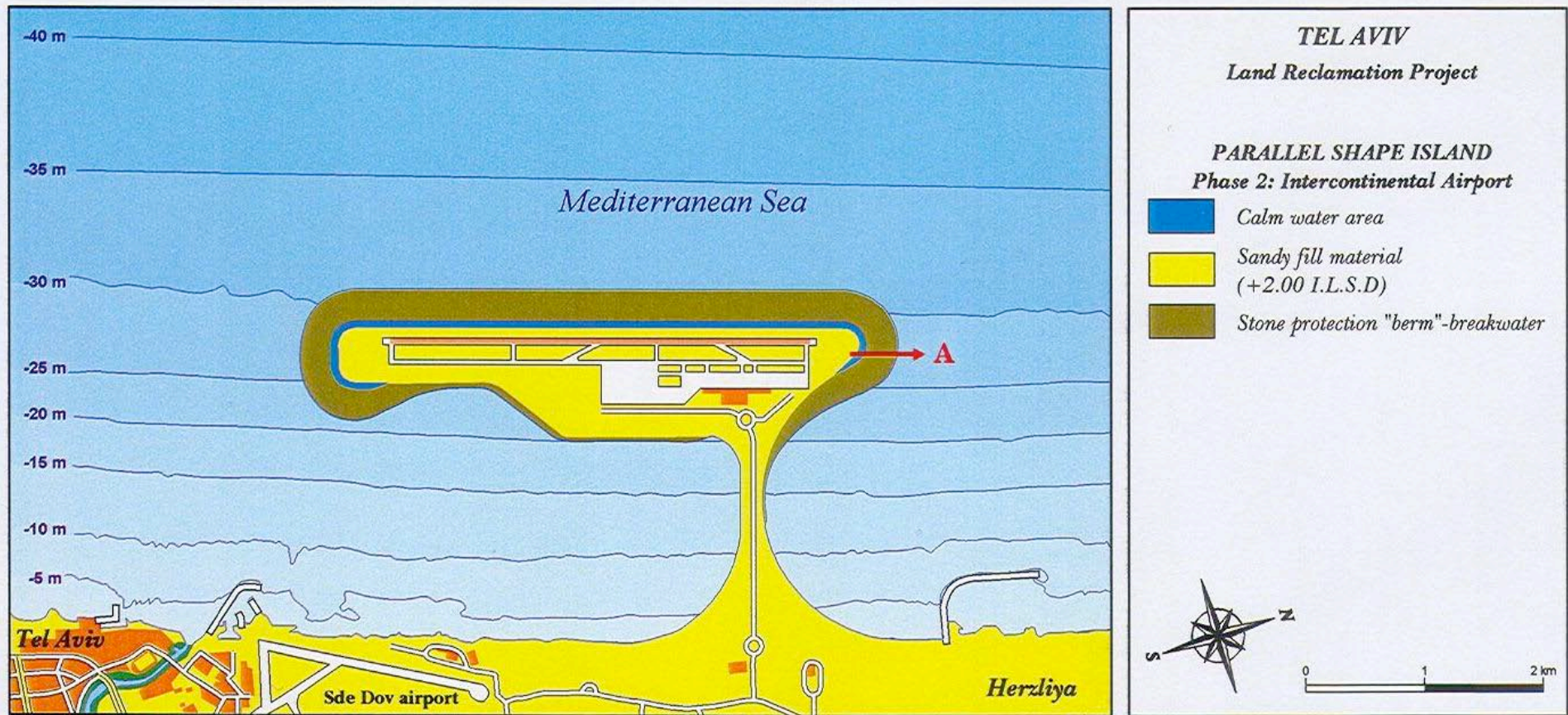
© Chaim Shapiro



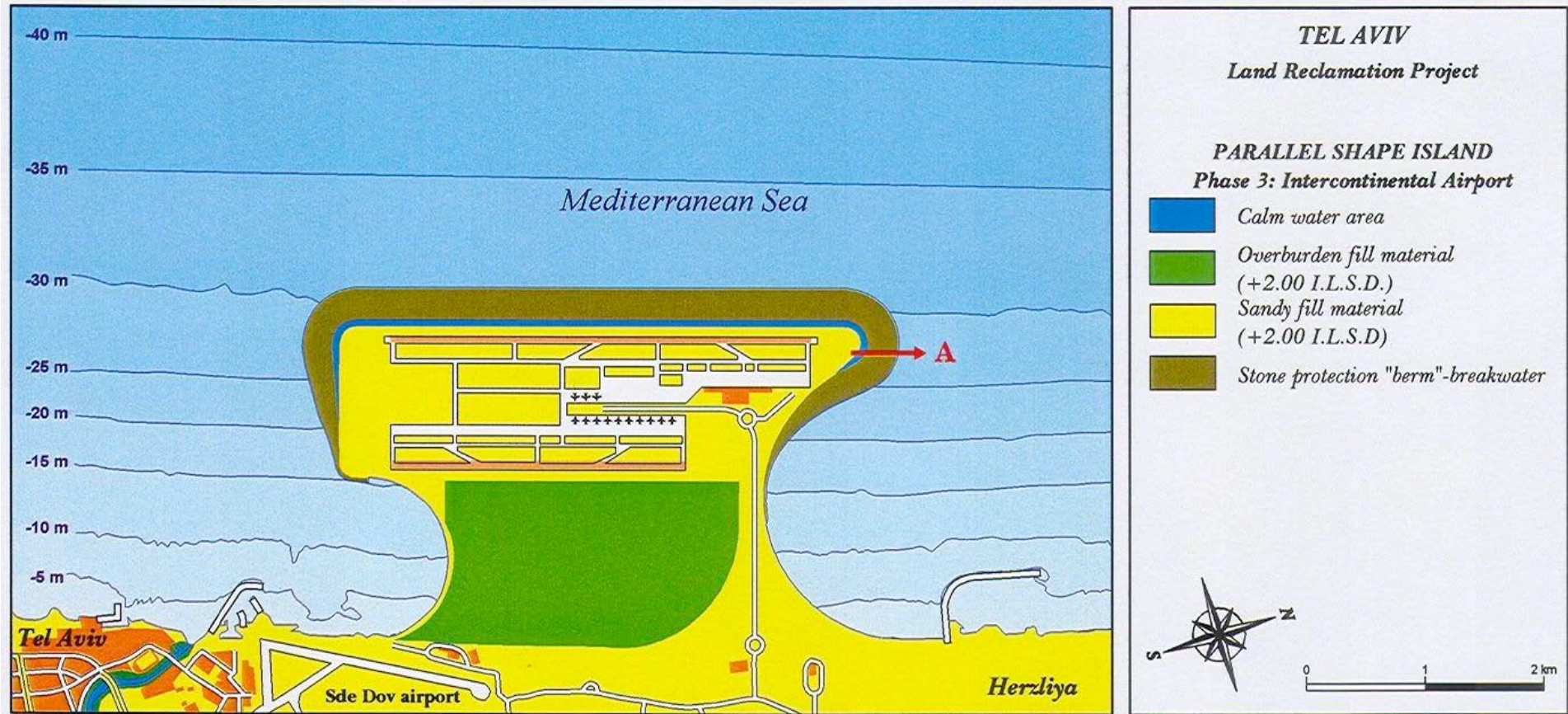
Tel Aviv - Jaffa



Tel Aviv - Jaffa

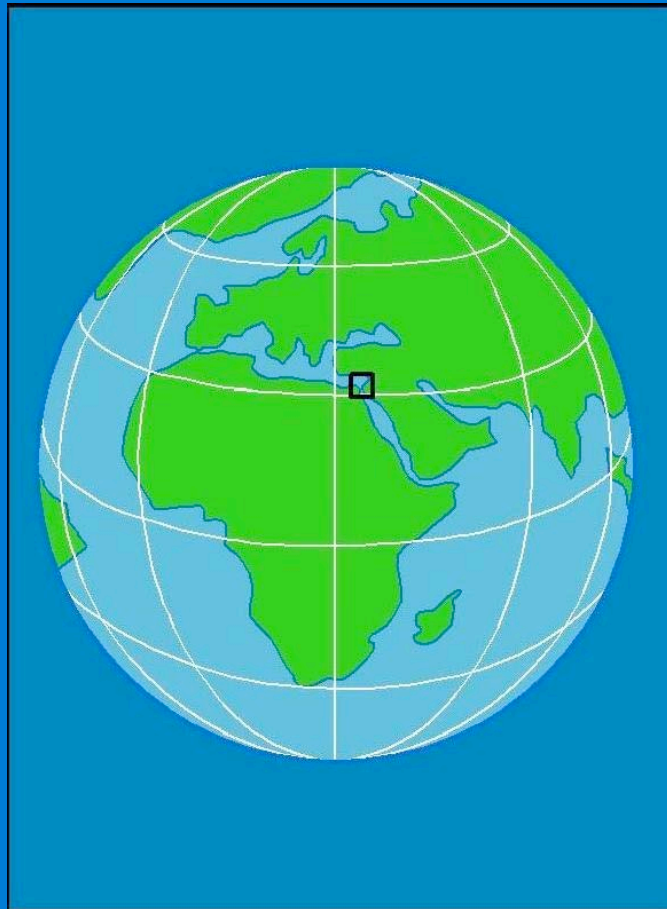


Tel Aviv - Jaffa



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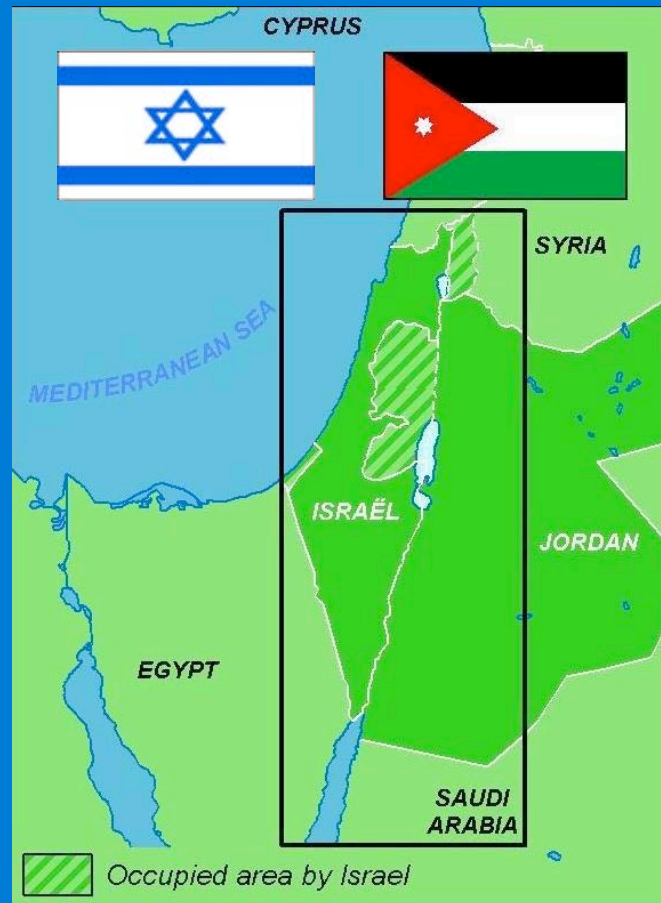
BUILDING WITH NATURE



AZIË

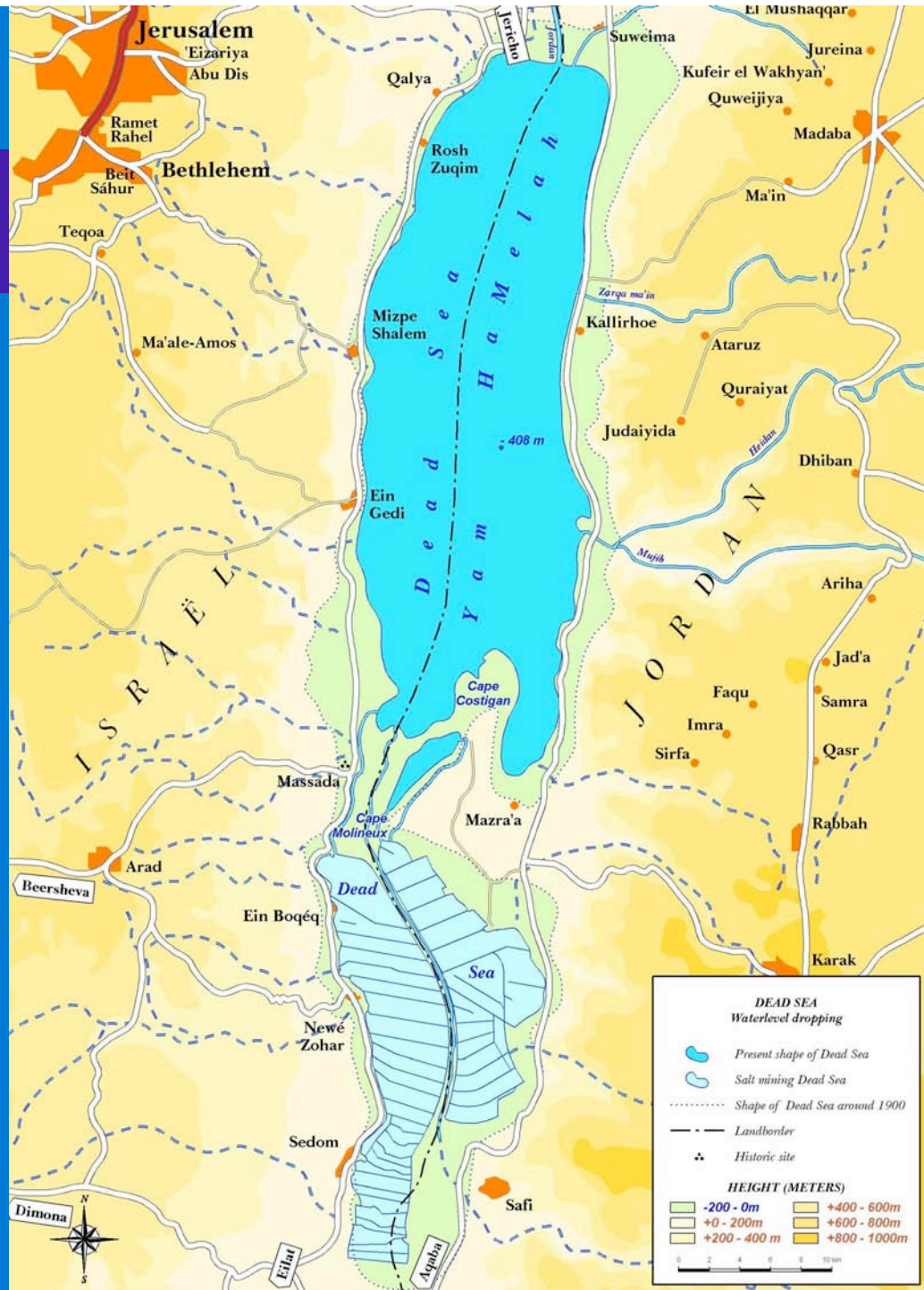
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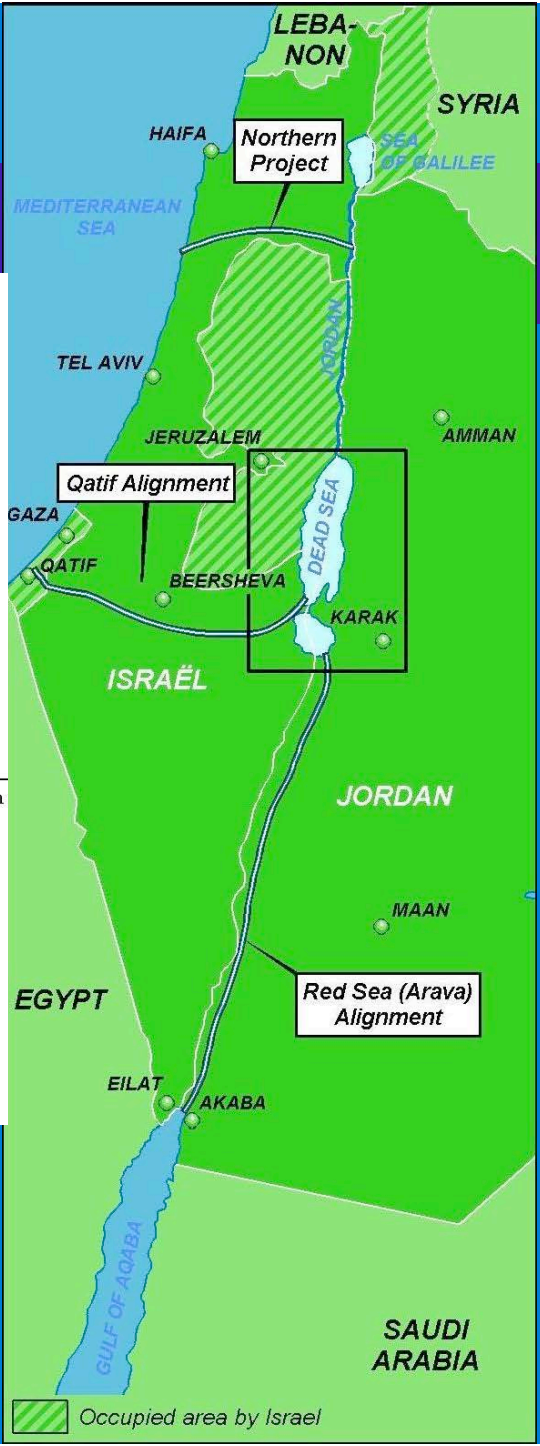
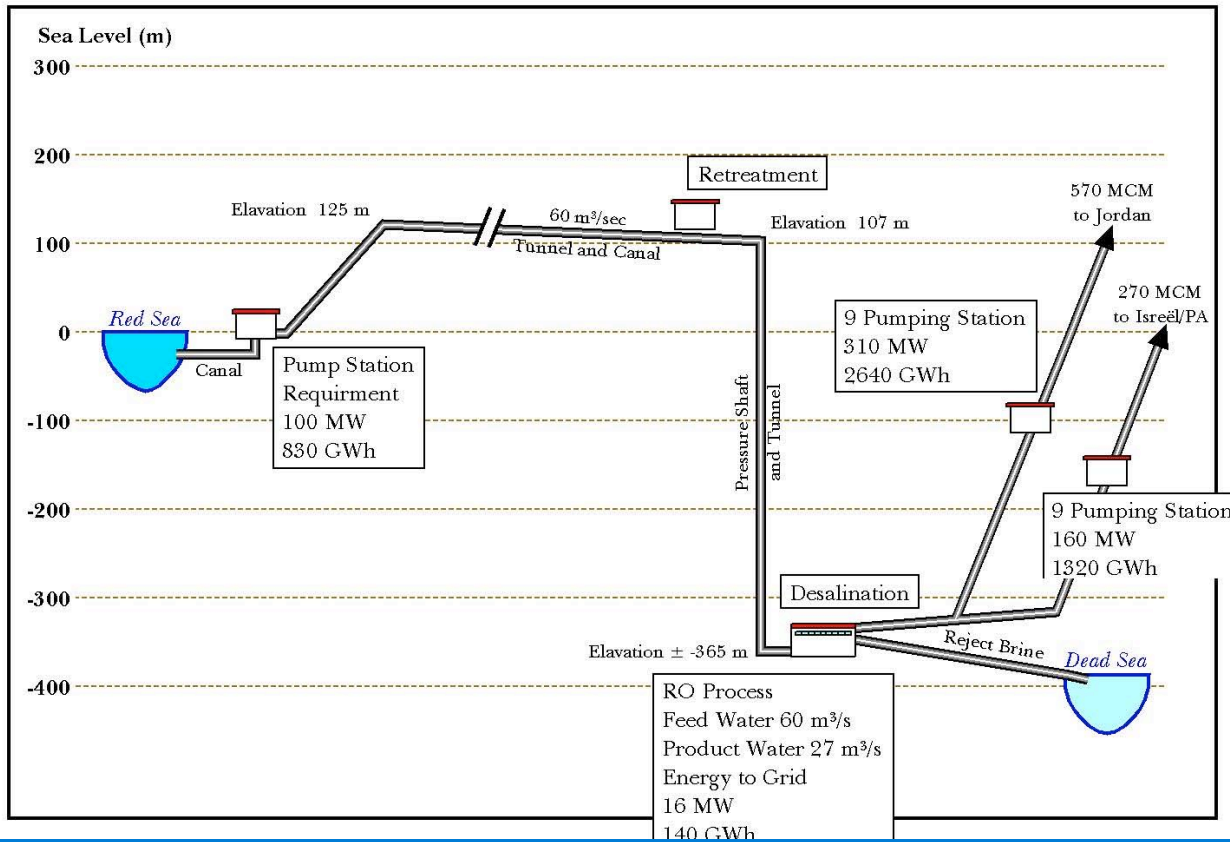
BUILDING WITH NATURE



Israël, Jordanië

Israël, Jordanië





Israël, Jordanië

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BOUWEN MET DE NATUUR

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AZIË

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BOUWEN MET DE NATUUR

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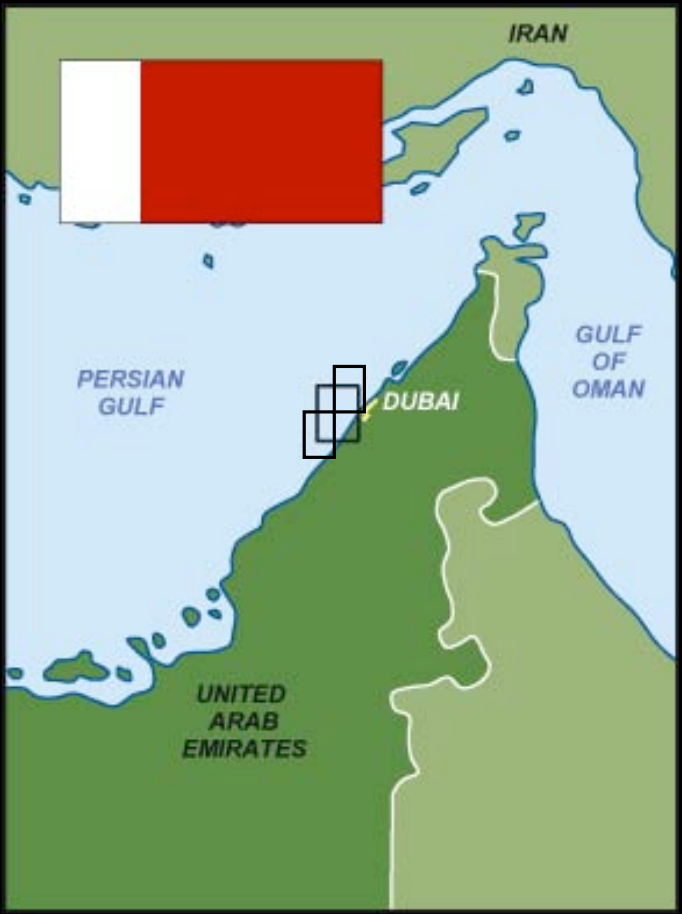
V.A.E.

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BOUWEN MET DE NATUUR

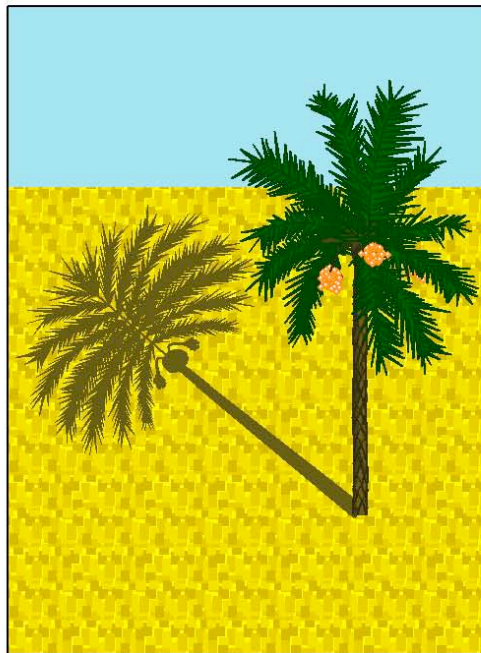
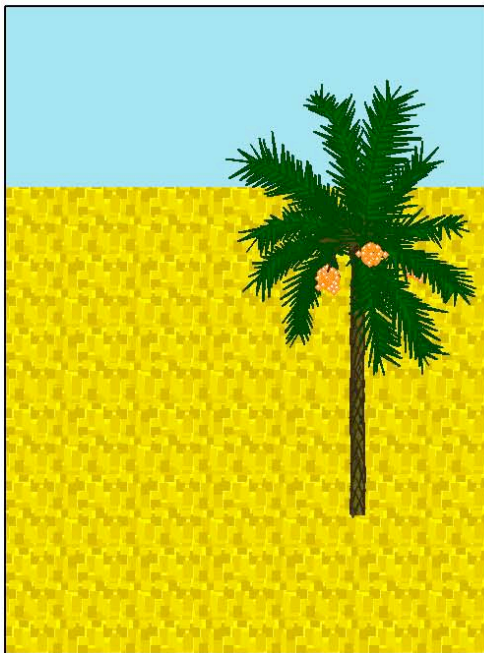
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V.A.E.
Dubai

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BOUWEN MET DE NATUUR

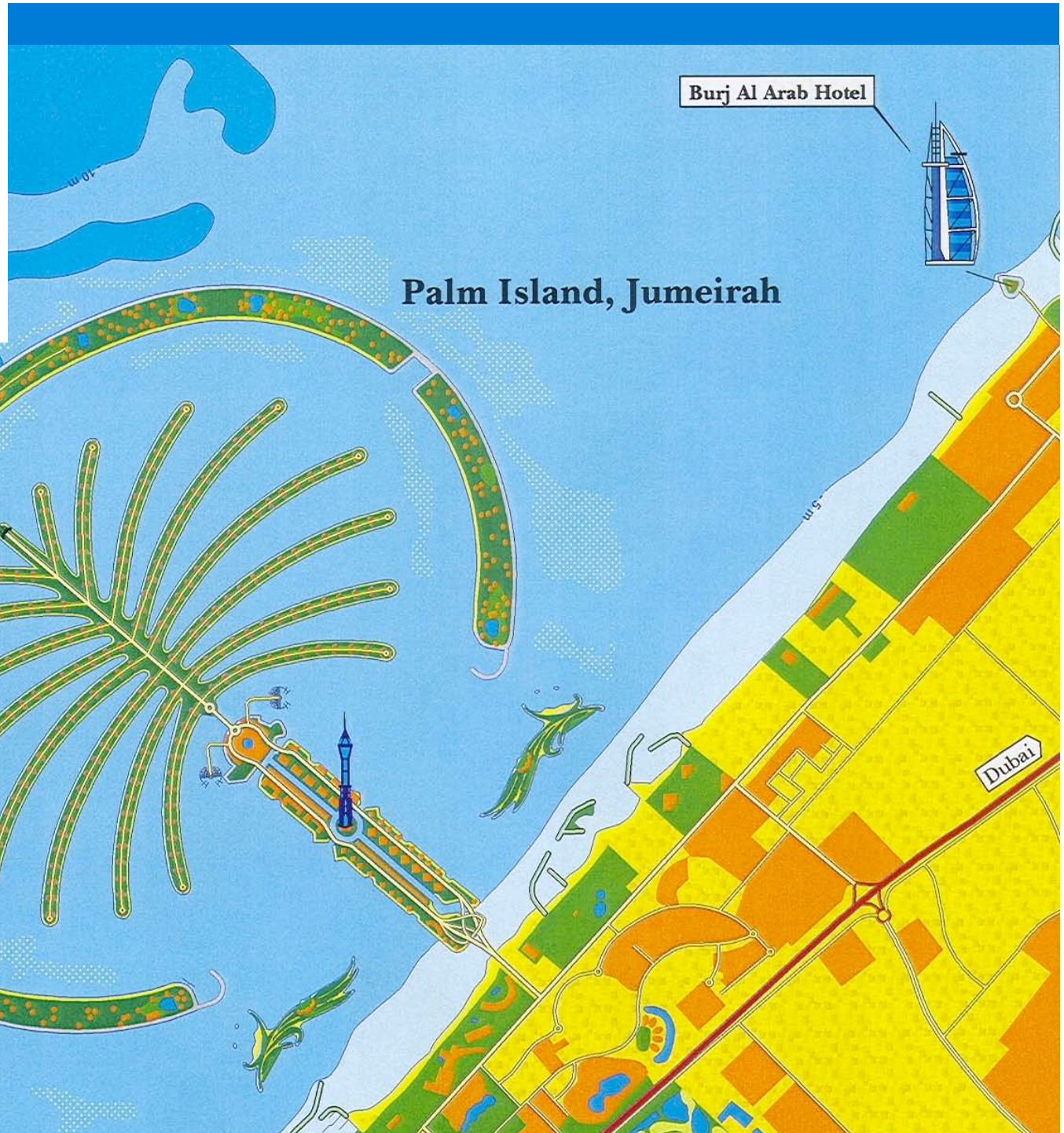


U.A.E.
Dubai

PALM ISLAND
Land reclamation project

- Housing purposes*
- Recreational purposes
(shops, clubs, amusements parks)*
- Parks and woods*
- Beach*
- Dessert*

0 200 400 600 800 1000 m

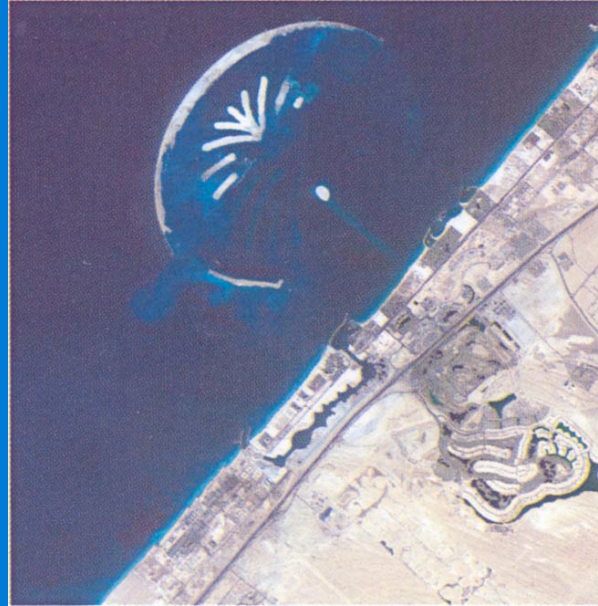


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Palm Eiland - Dubai



april 2002

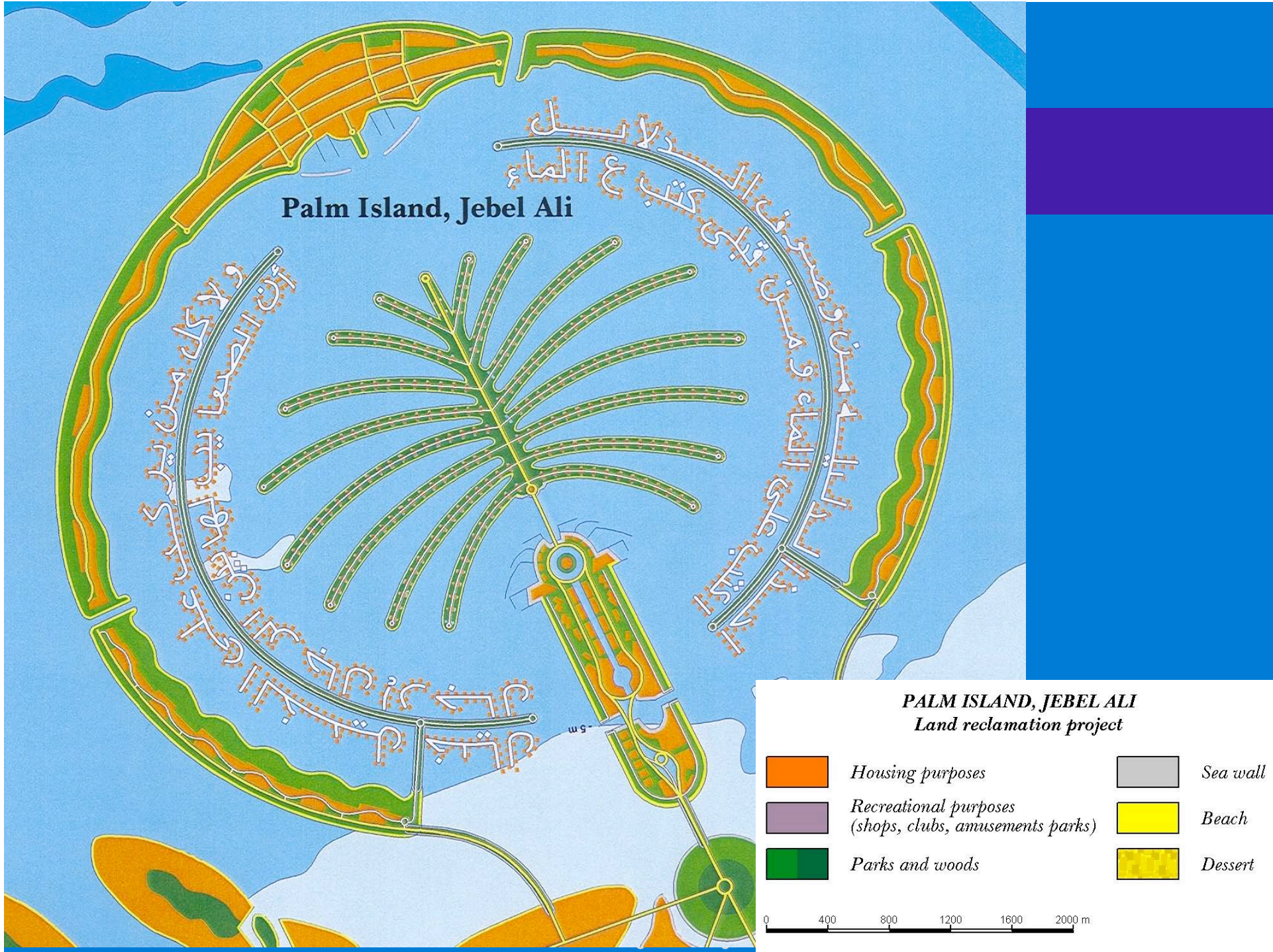


september 2002









mei 2003

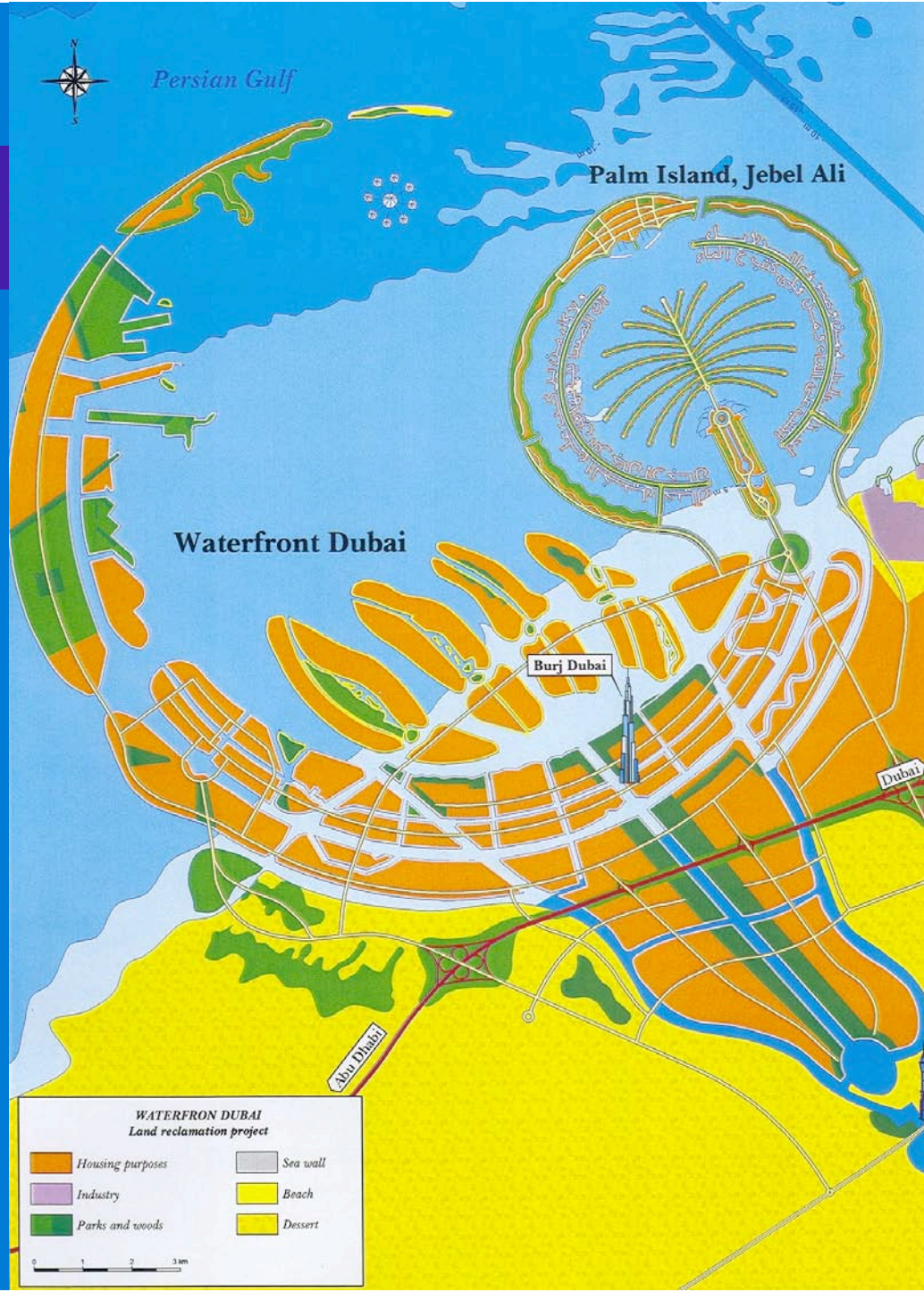
Palm Island, Jebel Ali



PALM ISLAND, JEBEL ALI
Land reclamation project

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|---|---|---|-----------------|
|  | <i>Housing purposes</i> |  | <i>Sea wall</i> |
|  | <i>Recreational purposes
(shops, clubs, amusements parks)</i> |  | <i>Beach</i> |
|  | <i>Parks and woods</i> |  | <i>Dessert</i> |





Persian Gulf

Palm Island, Jebel Ali







Waterfront Dubai

Burj Dubai

Dubai

Abu Dhabi

WATERFRON DUBAI
Land reclamation project

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|--|--|
|  Housing purposes |  Sea wall |
|  Industry |  Beach |
|  Parks and woods |  Desert |











Persian Gulf

The World



THE WORLD
Land reclamation project

 Housing purposes	 Sea wall
 Recreational purposes (shops, clubs, amusements parks)	 Beach
 Parks and woods	 Desert

0 400 800 1200 1600 2000 m

Um al-Suqaym 1 Harbour

Jumayrah

Dubai









PALM ISLAND, DEIRA
Land reclamation project

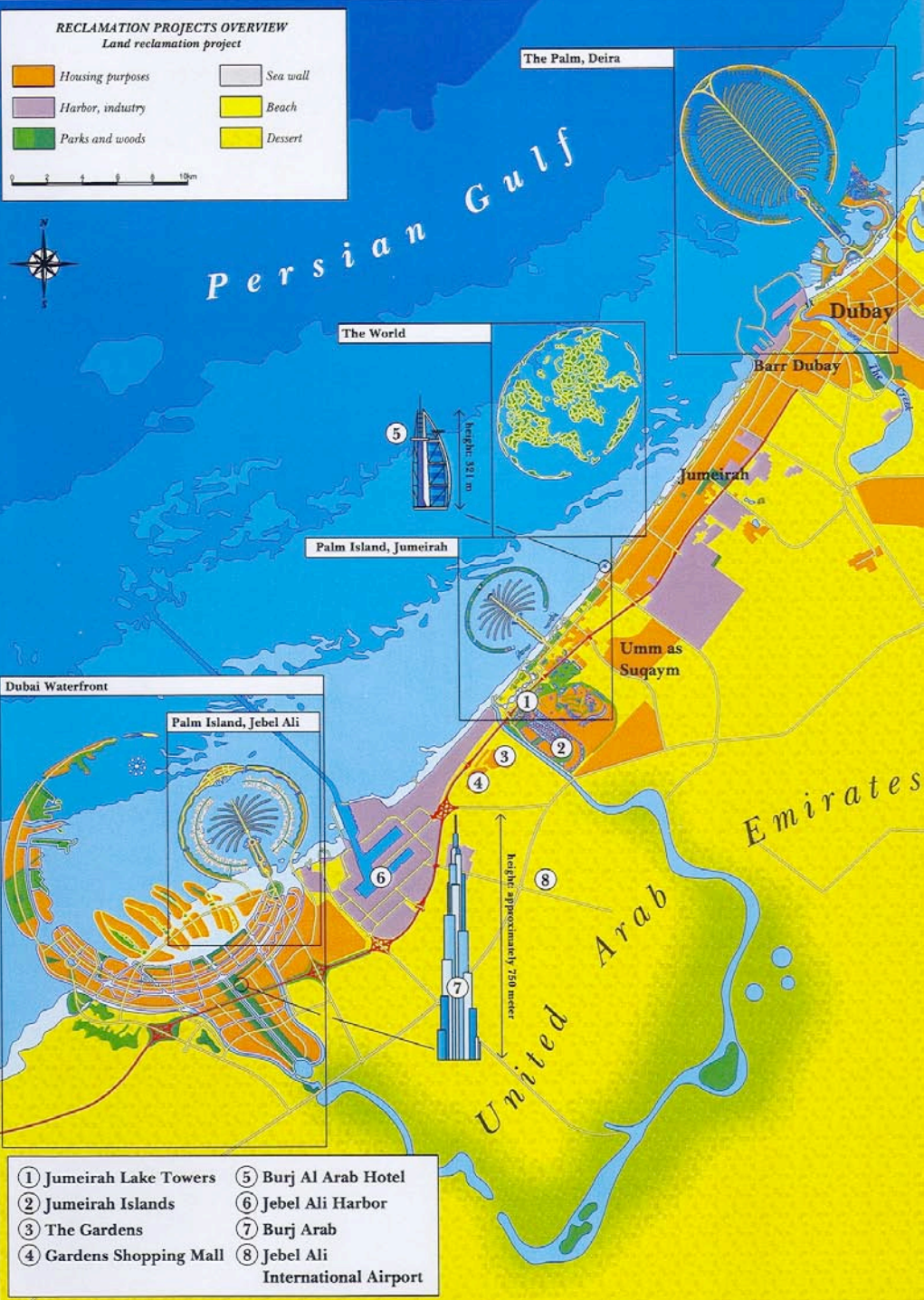
Housing purposes	Sea wall
Harbor, industry	Beach
Parks and woods	Desert

0 400 800 1200 1600 2000 m

RECLAMATION PROJECTS OVERVIEW
Land reclamation project

 Housing purposes	 Sea wall
 Harbor, industry	 Beach
 Parks and woods	 Desert

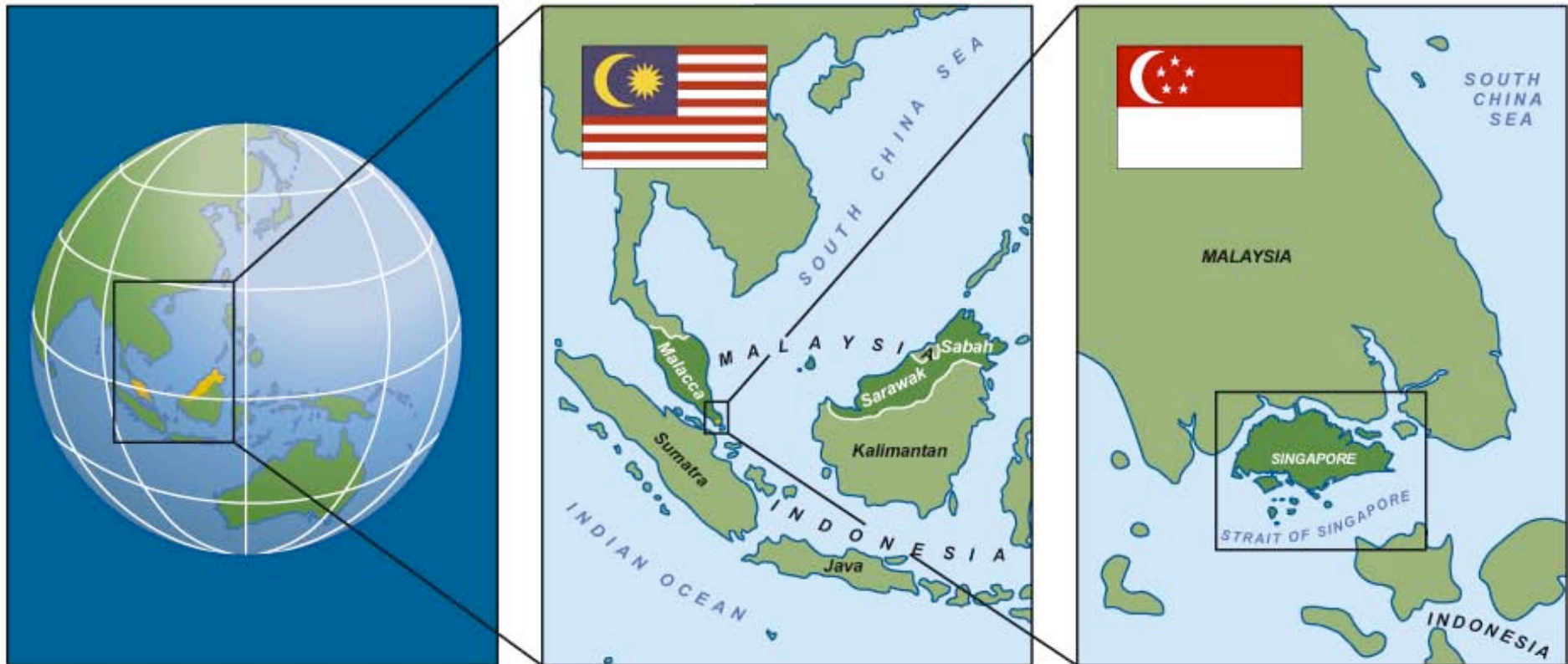
0 2 4 6 8 10 km



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|-------------------------|-----------------------------------|
| ① Jumeirah Lake Towers | ⑤ Burj Al Arab Hotel |
| ② Jumeirah Islands | ⑥ Jebel Ali Harbor |
| ③ The Gardens | ⑦ Burj Arab |
| ④ Gardens Shopping Mall | ⑧ Jebel Ali International Airport |

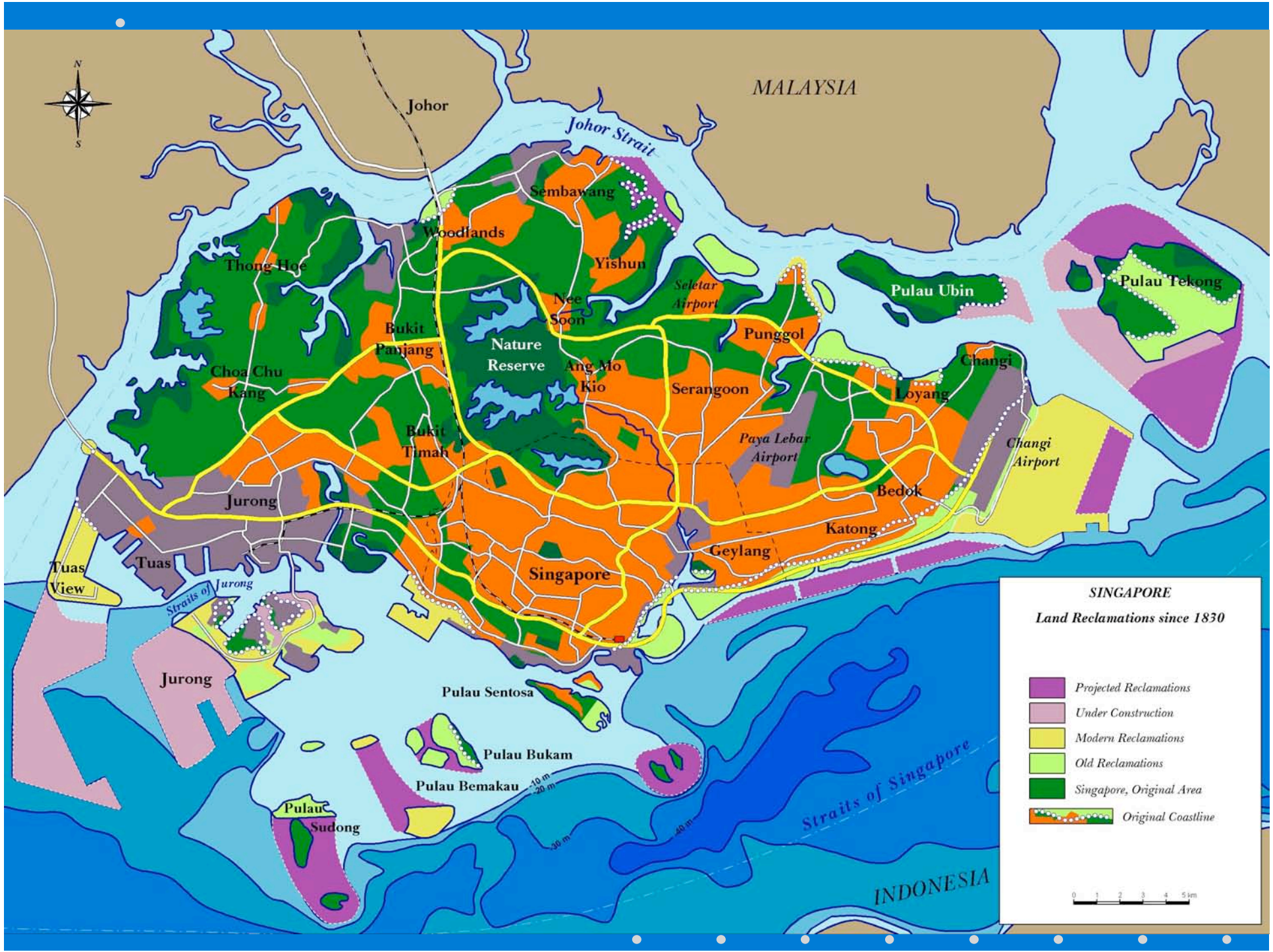
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Singapore



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SINGAPORE
Land Reclamations since 1830

- Projected Reclamations
- Under Construction
- Modern Reclamations
- Old Reclamations
- Singapore, Original Area
- Original Coastline

0 1 2 3 4 5 km

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Singapore



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BUILDING WITH NATURE

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ASIA

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BUILDING WITH NATURE

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China
Hong Kong



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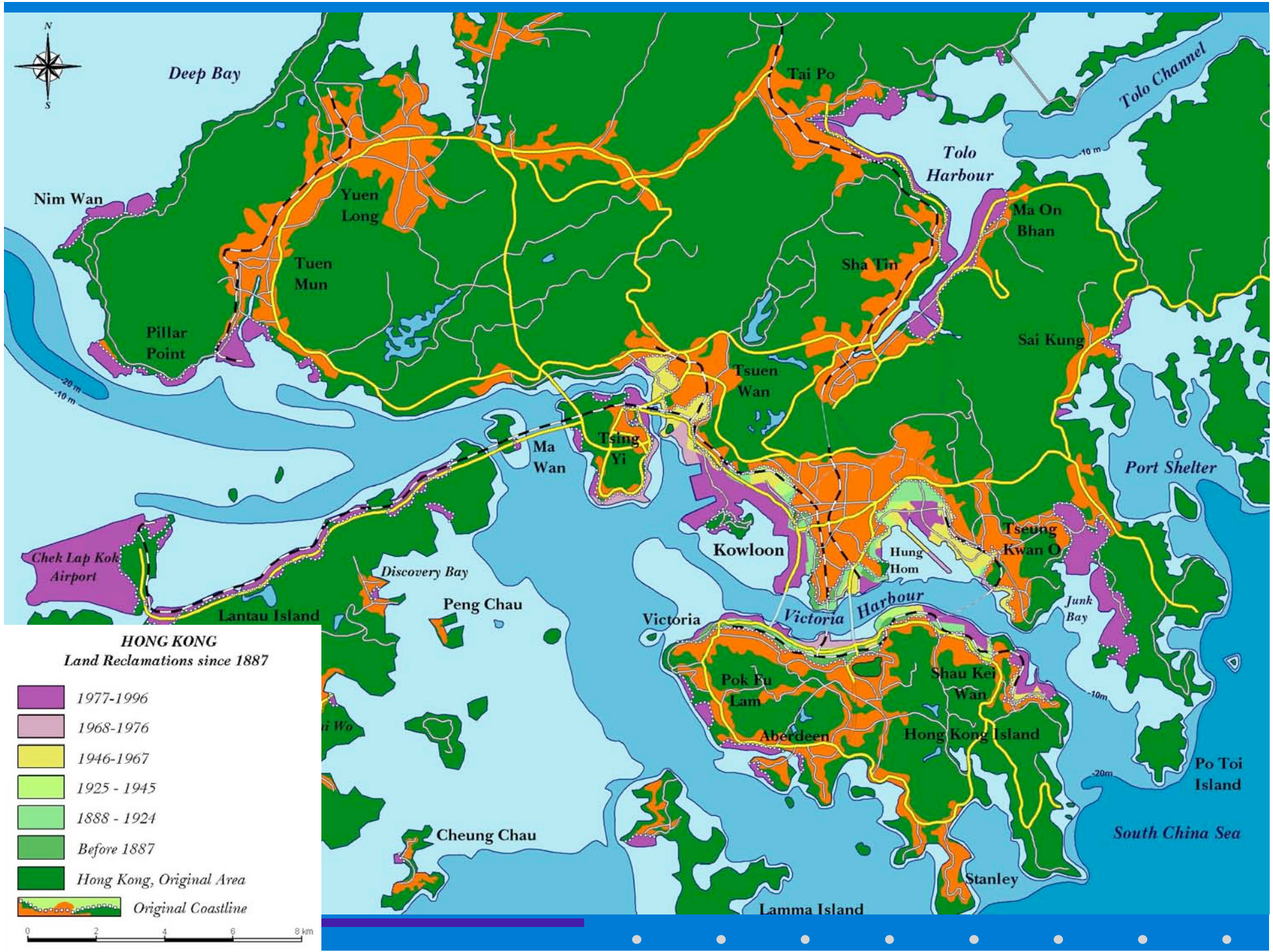
BUILDING WITH NATURE

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Hong Kong

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HONG KONG
Land Reclamations since 1887

- 1977-1996
- 1968-1976
- 1946-1967
- 1925 - 1945
- 1888 - 1924
- Before 1887
- Hong Kong, Original Area
- Original Coastline





HONG KONG

CENTRAL WATERFRONT DEVELOPMENT CONCEPT PLAN

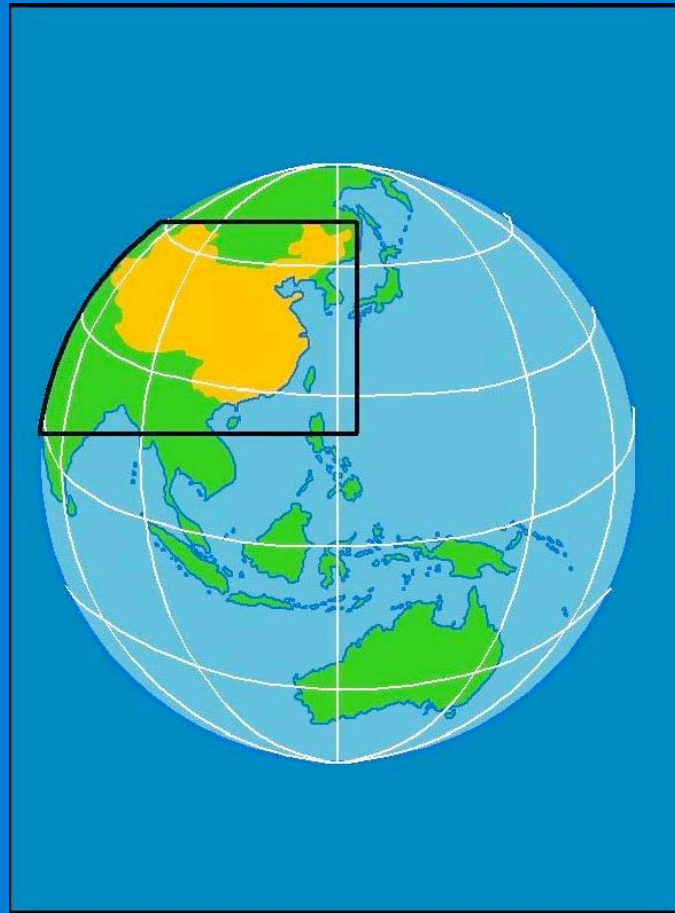
1999 Swire Properties Ltd. All Rights Reserved



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BUILDING WITH NATURE

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ASIA

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BUILDING WITH NATURE

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China
Shanghai

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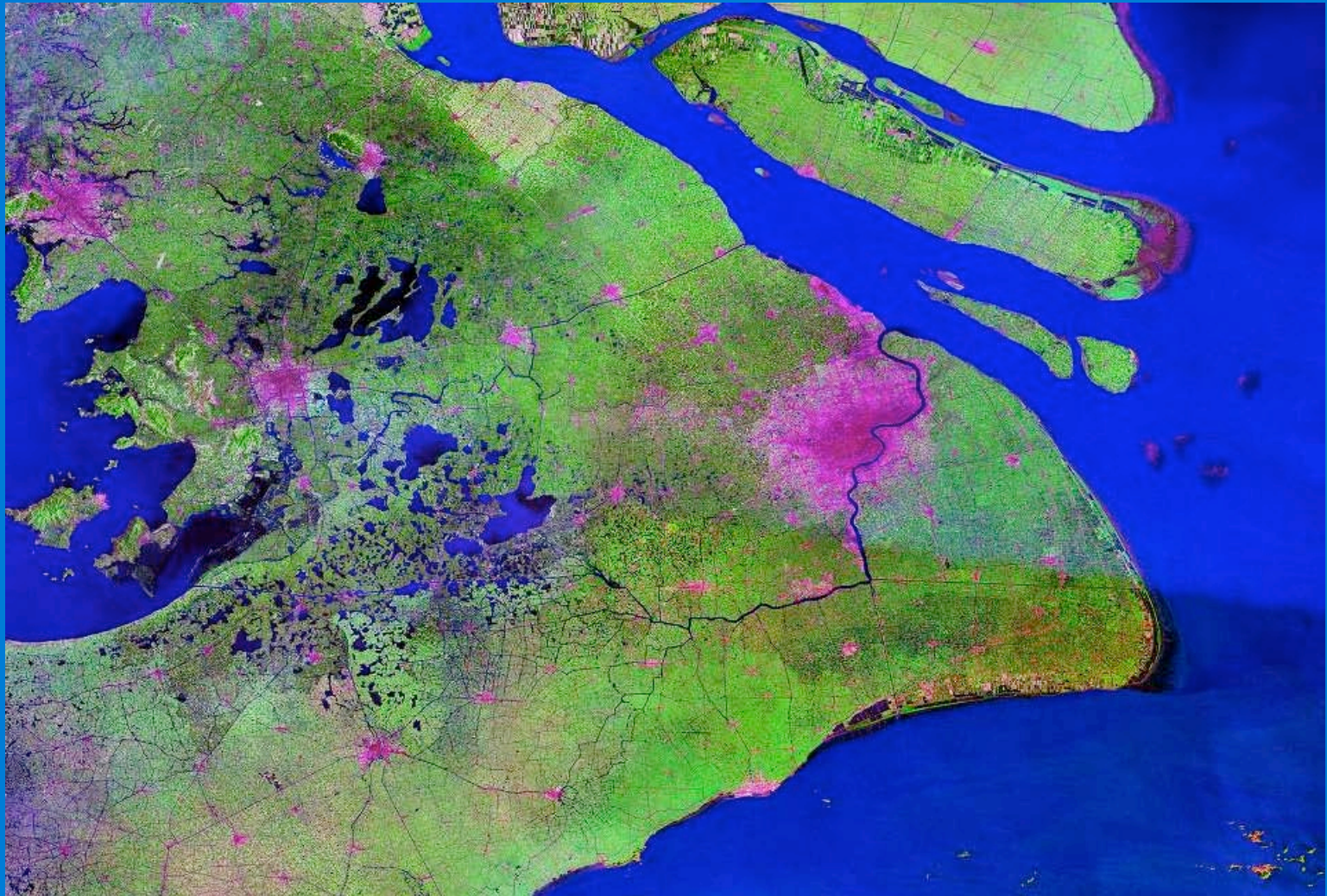
BUILDING WITH NATURE



Shanghai

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BUILDING WITH NATURE



Shanghai

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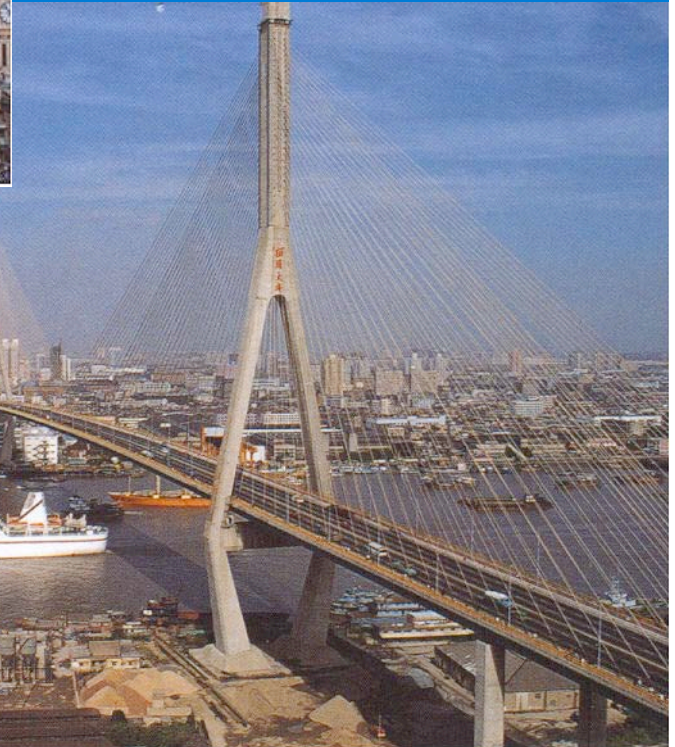
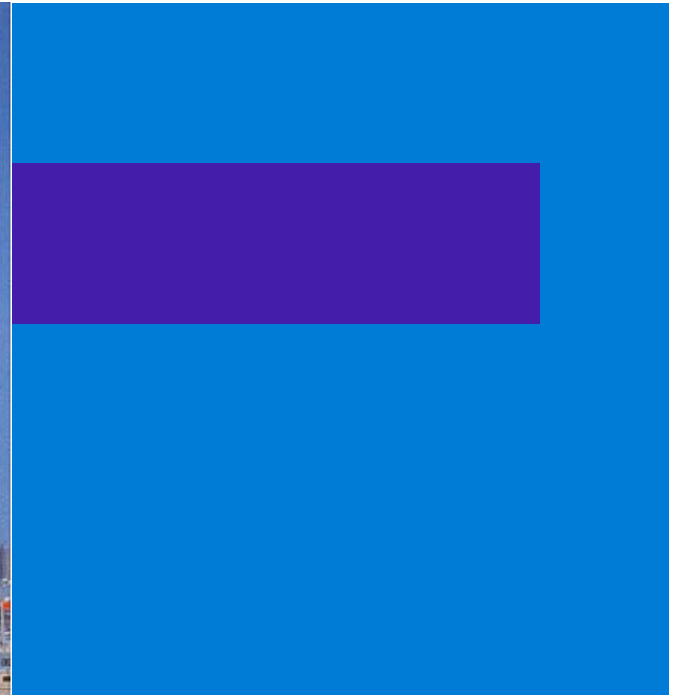
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Shanghai



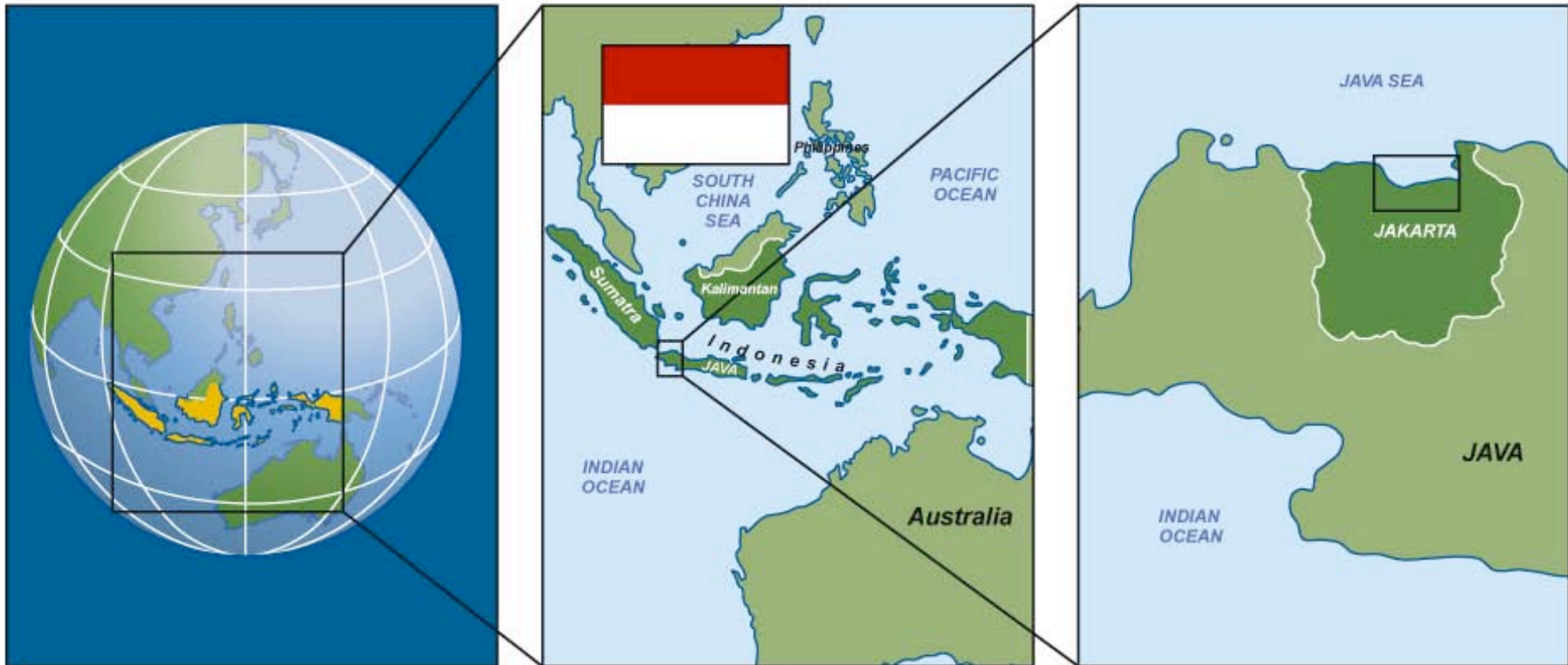
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Shanghai

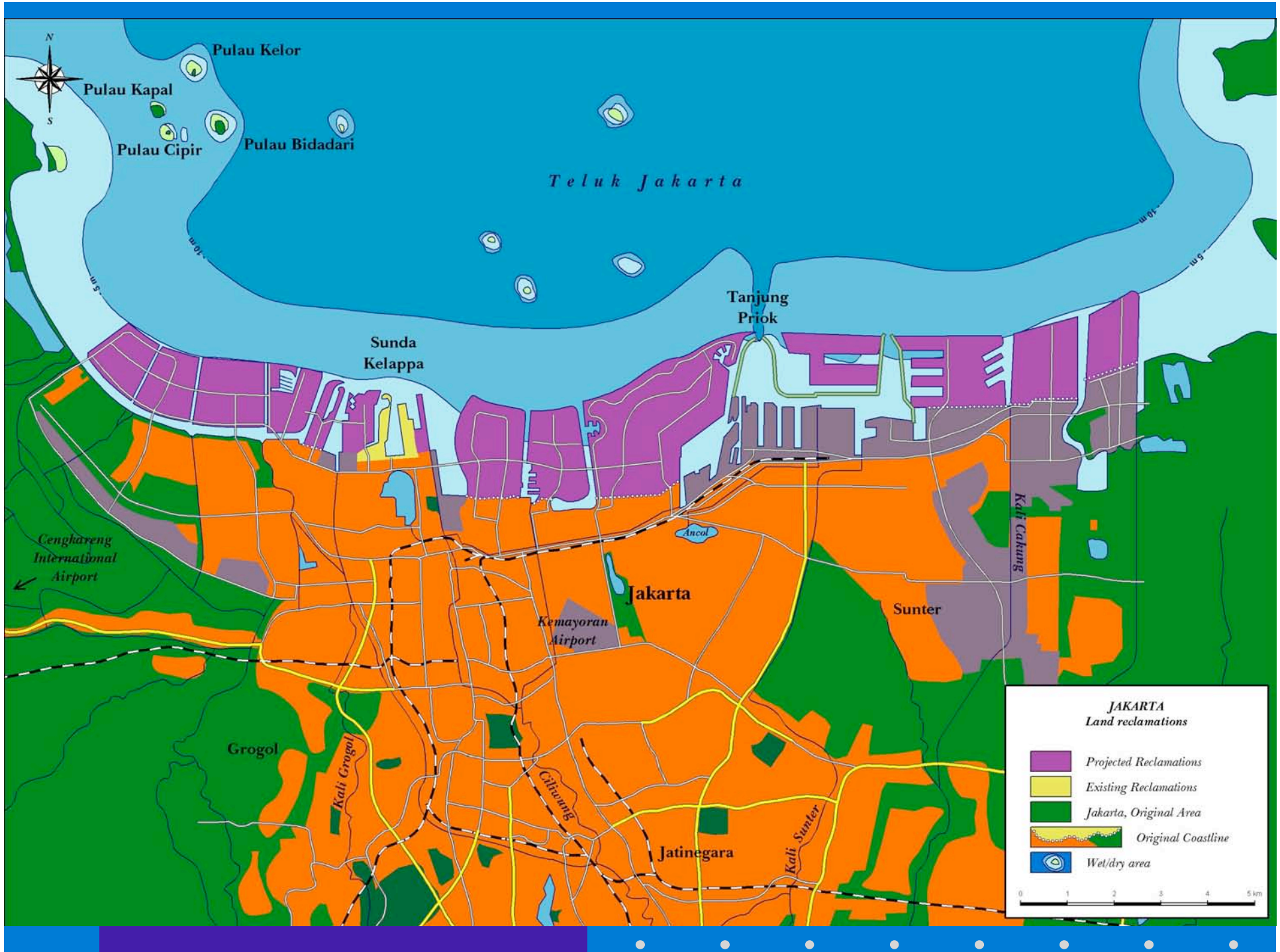
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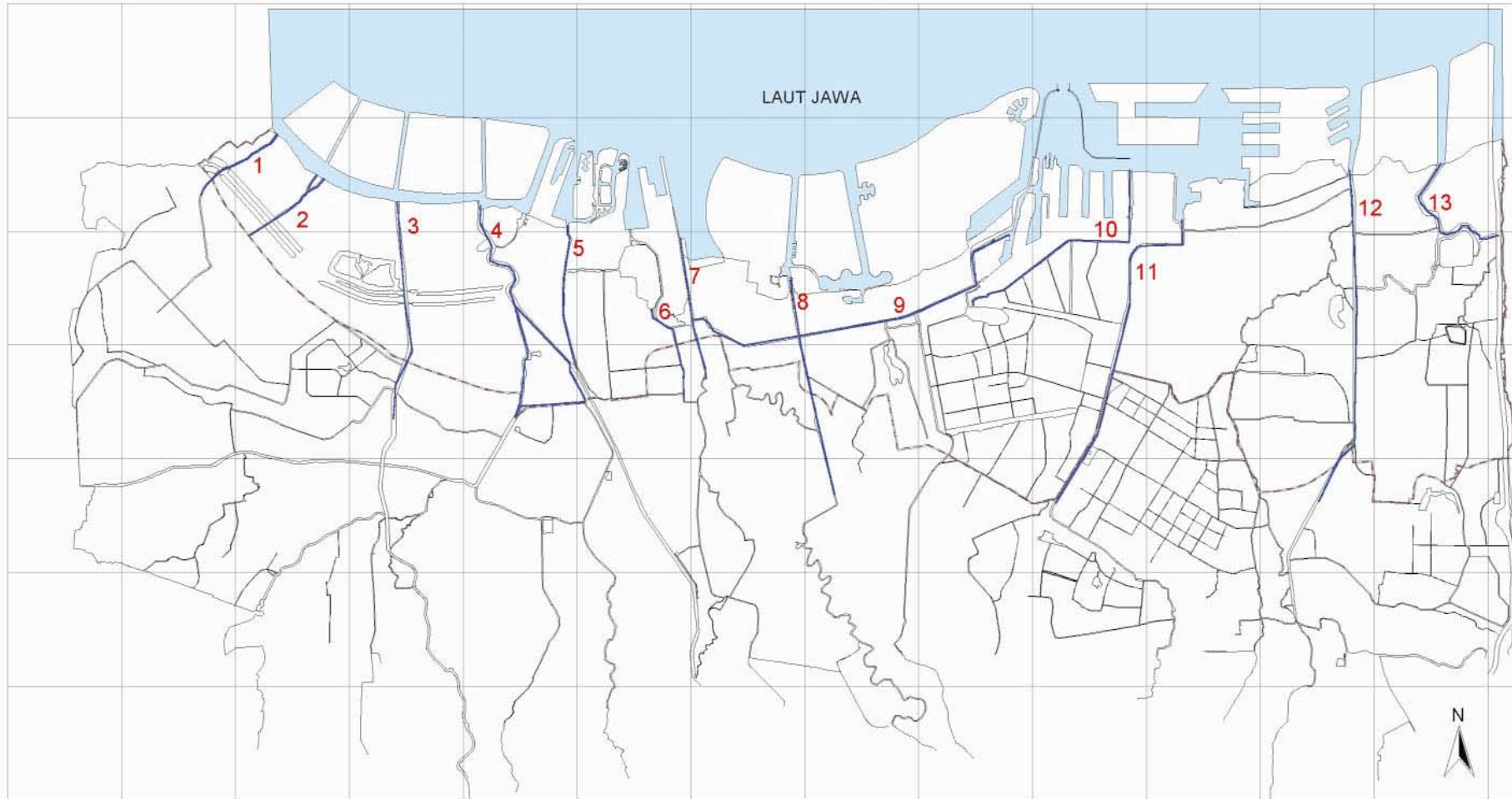
Indonesia Jakarta



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PETA LOKASI 13 SUNGAI DI KAWASAN PANTURA JAKARTA

KETERANGAN :

- | | | | |
|---------------------|-------------------------|------------------|-------------------|
| 1. KALI KAMAL | 5. KALI DURI LEDENG | 9. KALI ANCOL | 13. KALI BLENCONG |
| 2. KALI TUNJUNGAN | 6. KALI OPAK | 10. KALI LAGOA | |
| 3. CENGKARENG DRAIN | 7. KALI ANAK CILIWUNG I | 11. KALI SUNTER | |
| 4. KALI MUARA ANGKE | 8. KALI CILIWUNG/MARINA | 12. CAKUNG DRAIN | |



PEMERINTAH DAERAH KHUSUS IBUKOTA JAKARTA
**BADAN PELAKSANA REKLAMASI
 PANTAI UTARA JAKARTA**
 JAKARTA WATERFRONT DEVELOPMENT

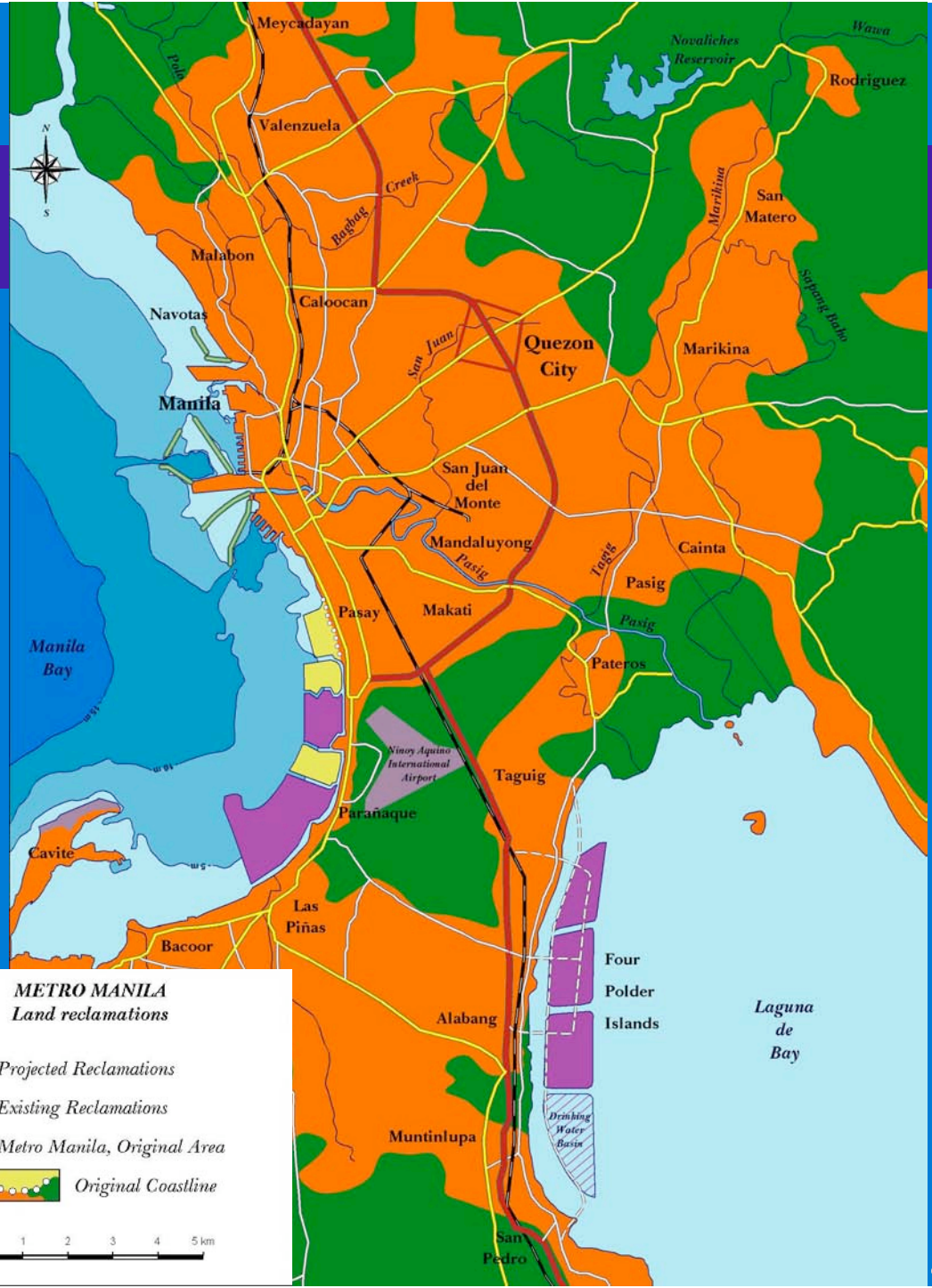


Jakarta



Philippines Manila *Laguna de Bay*





METRO MANILA
Land reclamations

- Projected Reclamations*
- Existing Reclamations*
- Metro Manila, Original Area*
- Original Coastline*

0 1 2 3 4 5 km





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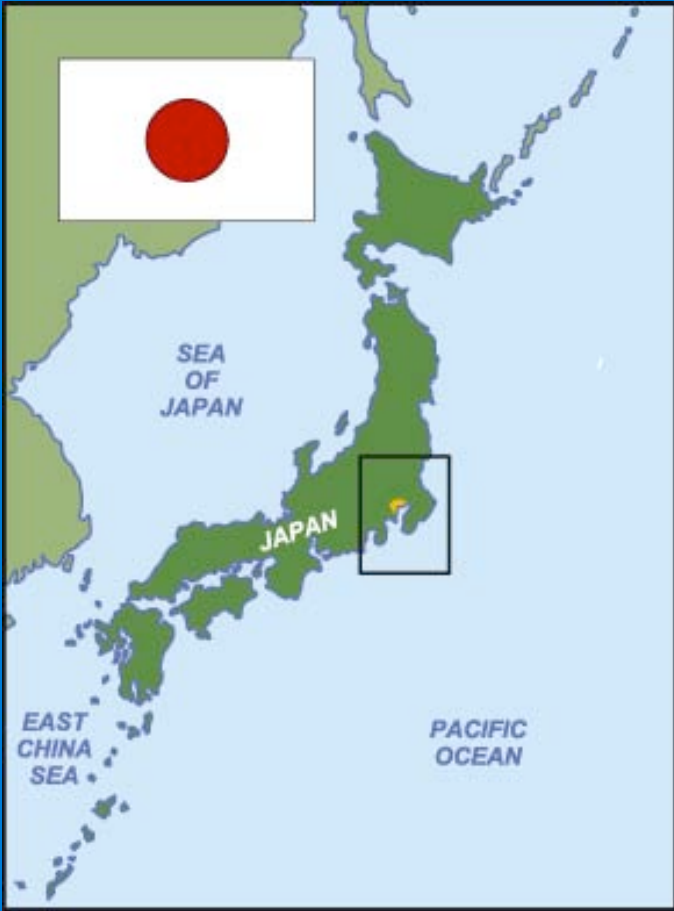


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Japan
Tokyo

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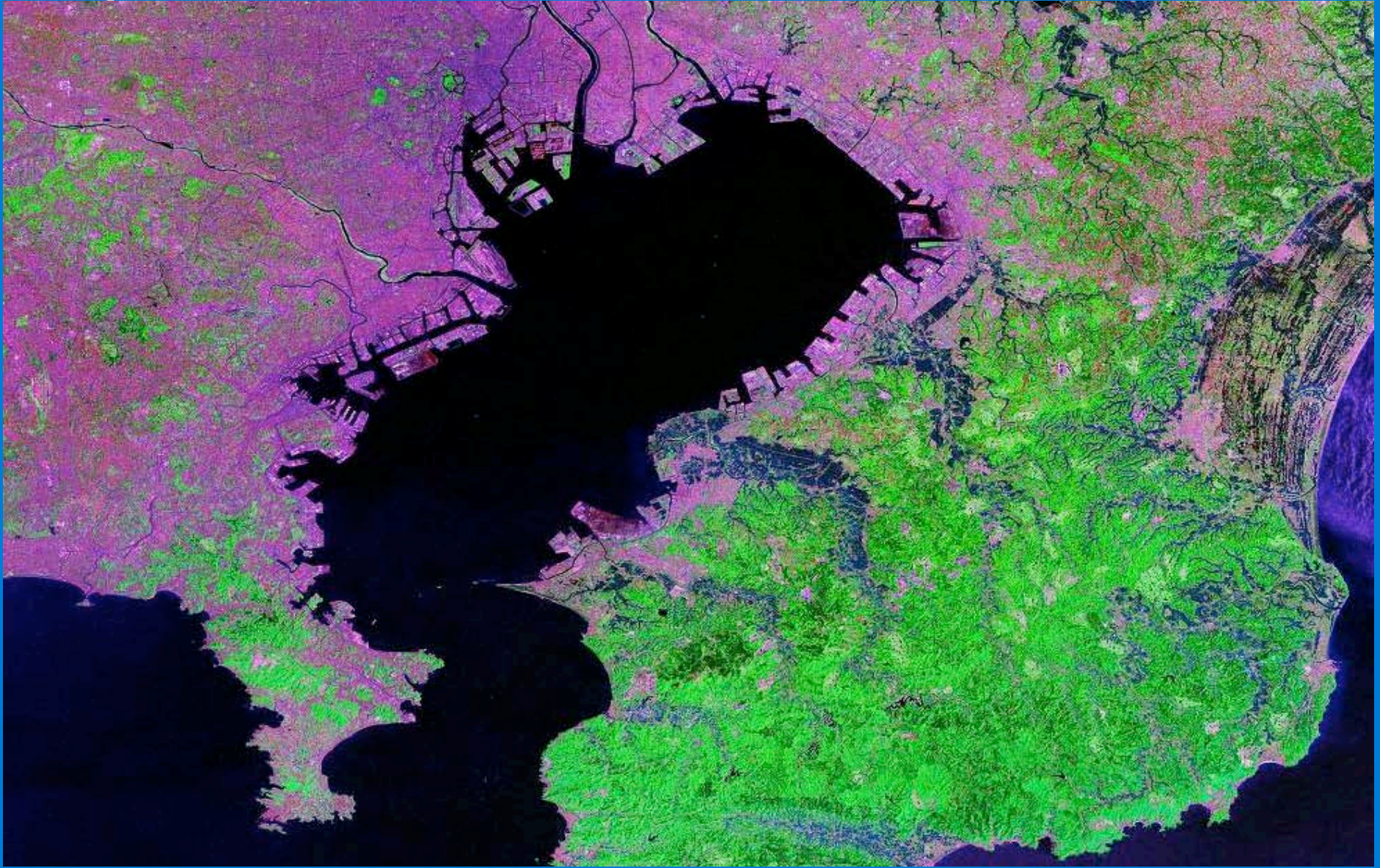
BOUWEN MET DE NATUUR

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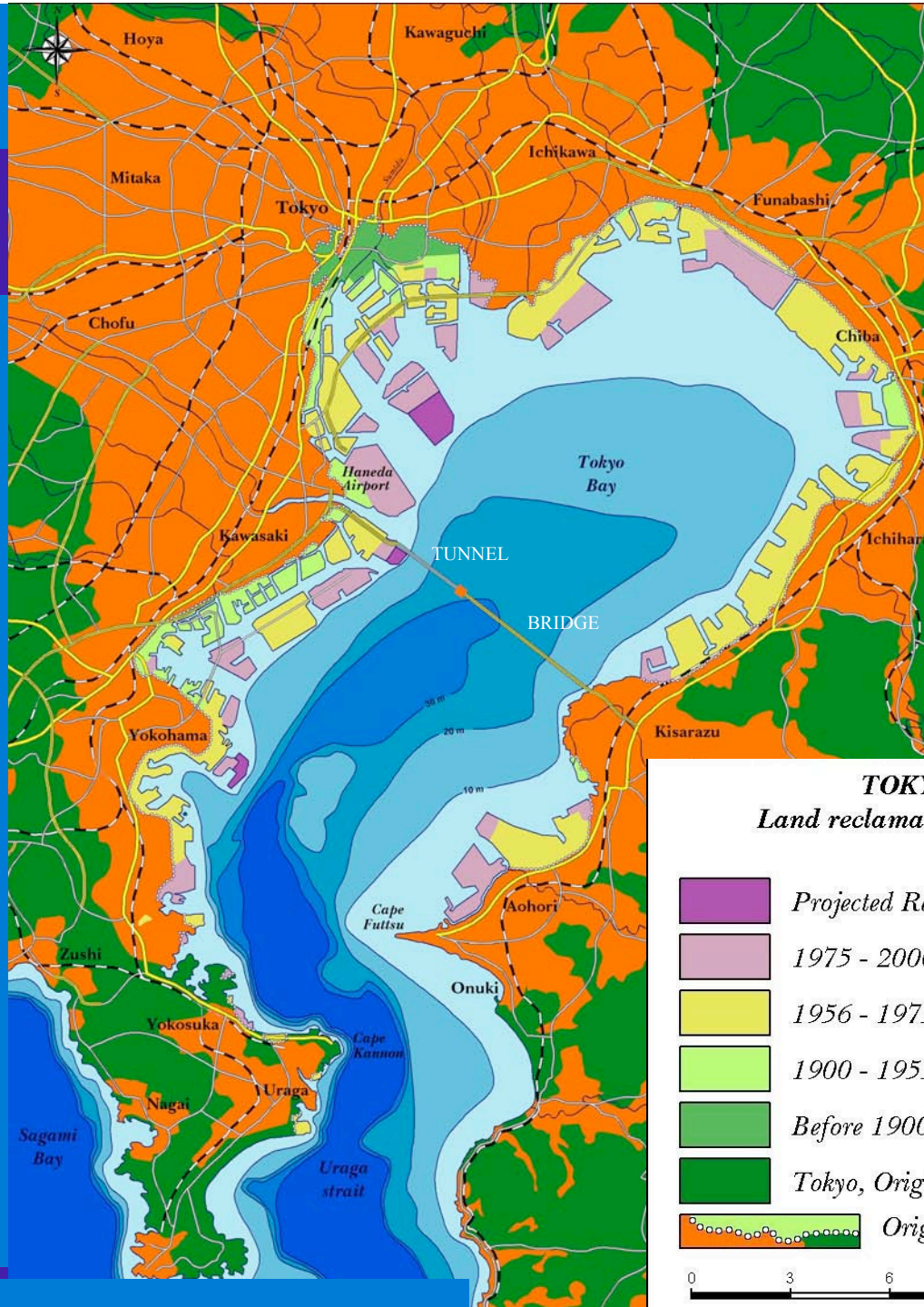
Tokyo

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Tokyo

Tokyo



TOKYO BAY
Land reclamations since 1500

-  *Projected Reclamations*
-  *1975 - 2000*
-  *1956 - 1975*
-  *1900 - 1955*
-  *Before 1900*
-  *Tokyo, Original Area*
-  *Original Coastline*

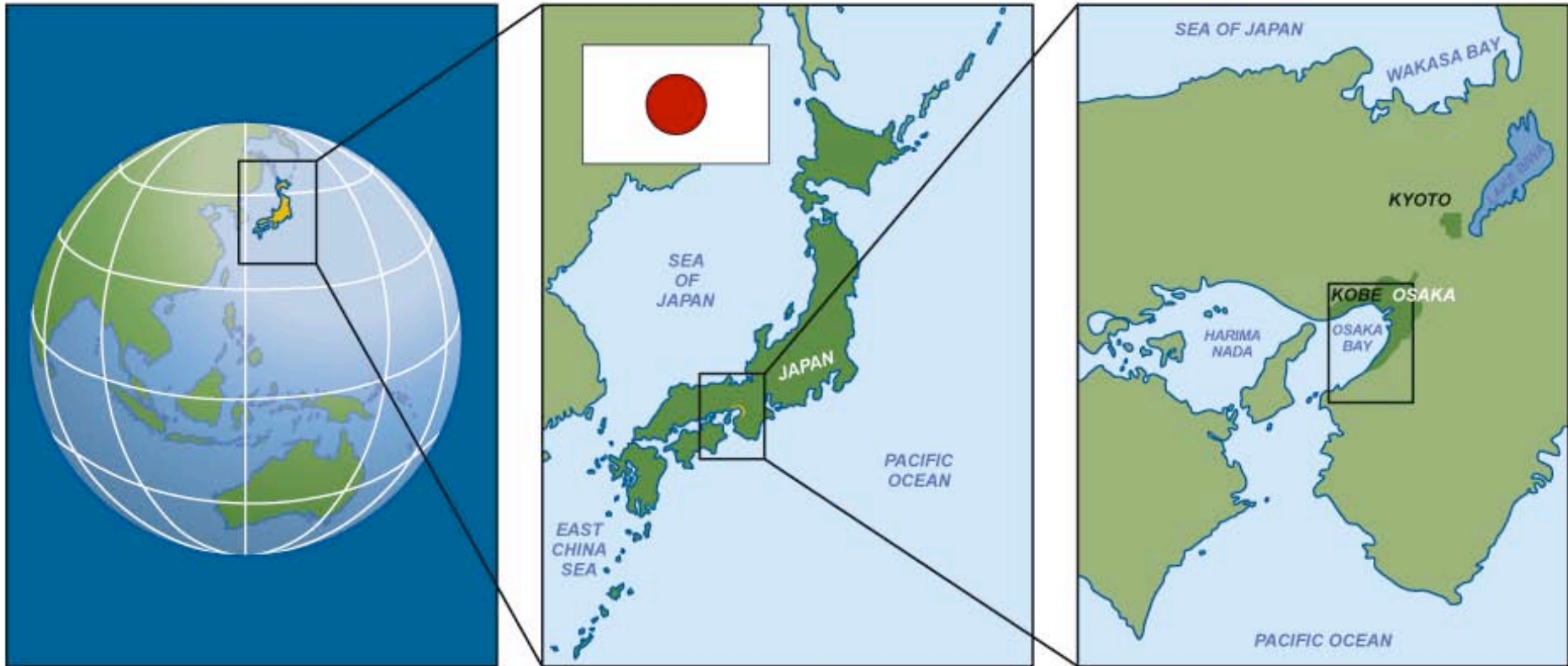


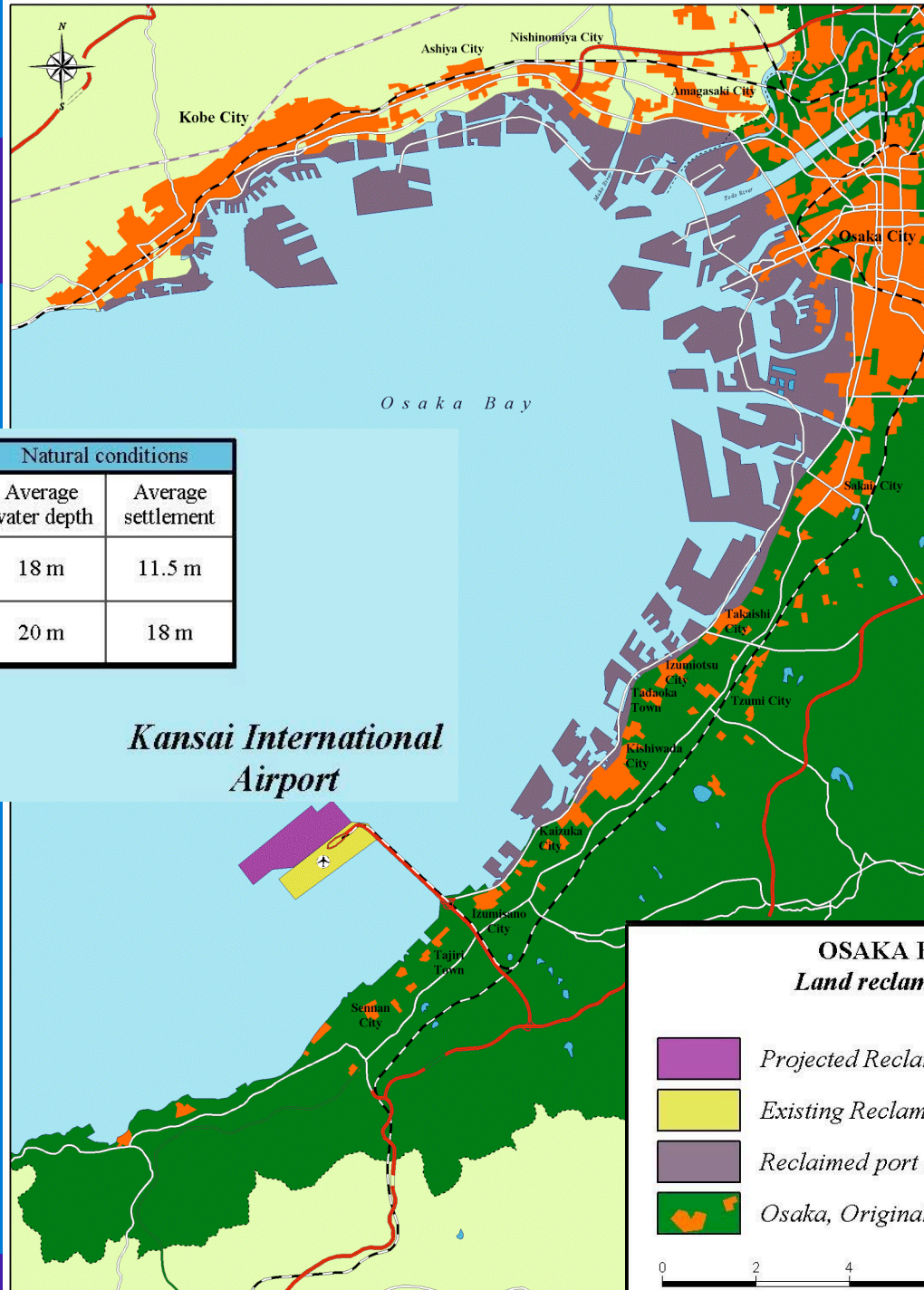
Outline of Tokyo Bay




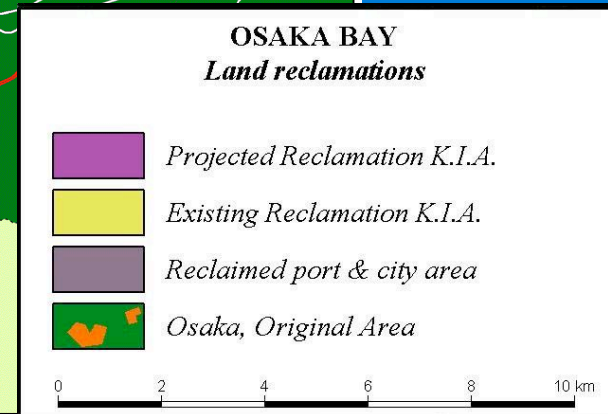
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Osaka - Kobe





	Scale			Natural conditions	
	Landfill dimension	Seawall extension	Amount of landfill soil	Average water depth	Average settlement
Phase I of Island	510 ha	11.2 km	1.8 million m ³	18 m	11.5 m
Phase II of Island	545 ha	13 km	2.5 million m ³	20 m	18 m



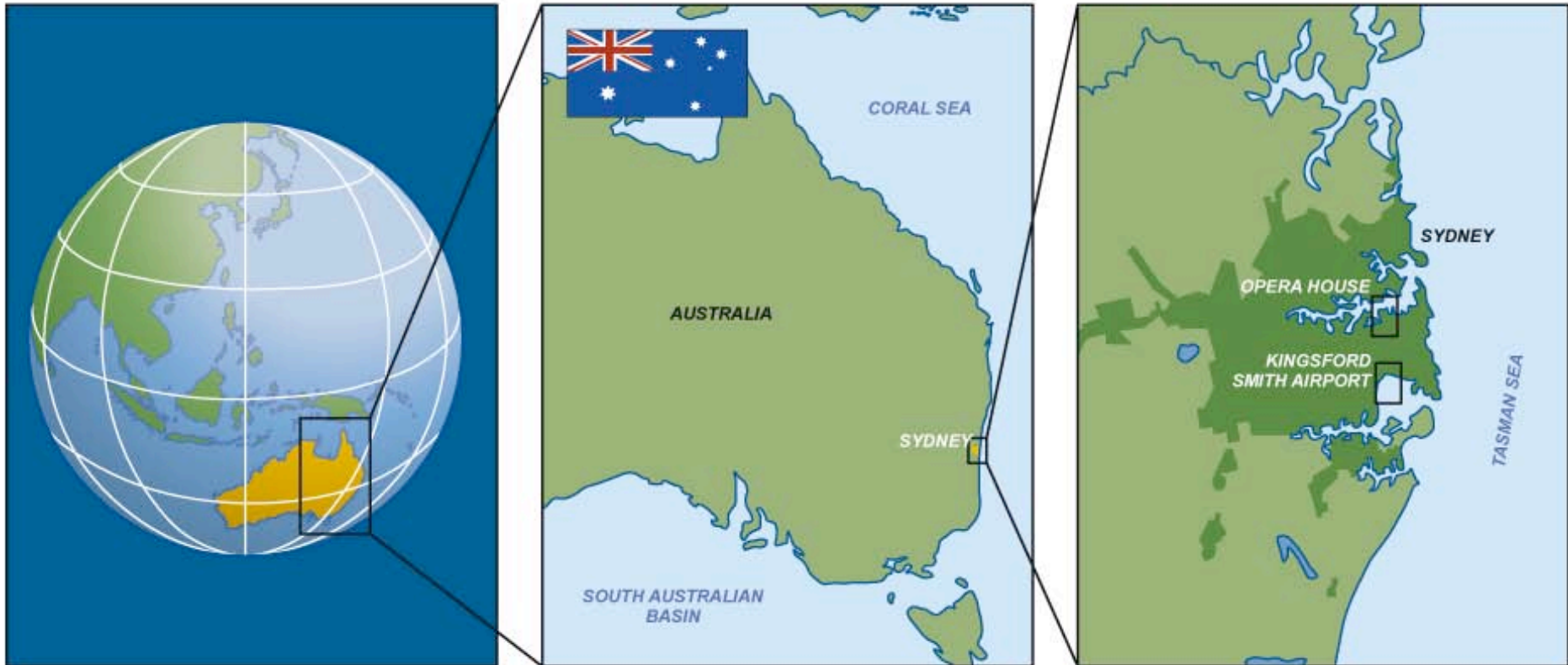
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Osaka – Kobe *Kansai Int. Airport*



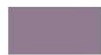
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Australia - Sydney

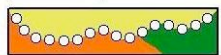




SYDNEY
Land reclamations



Harbor area

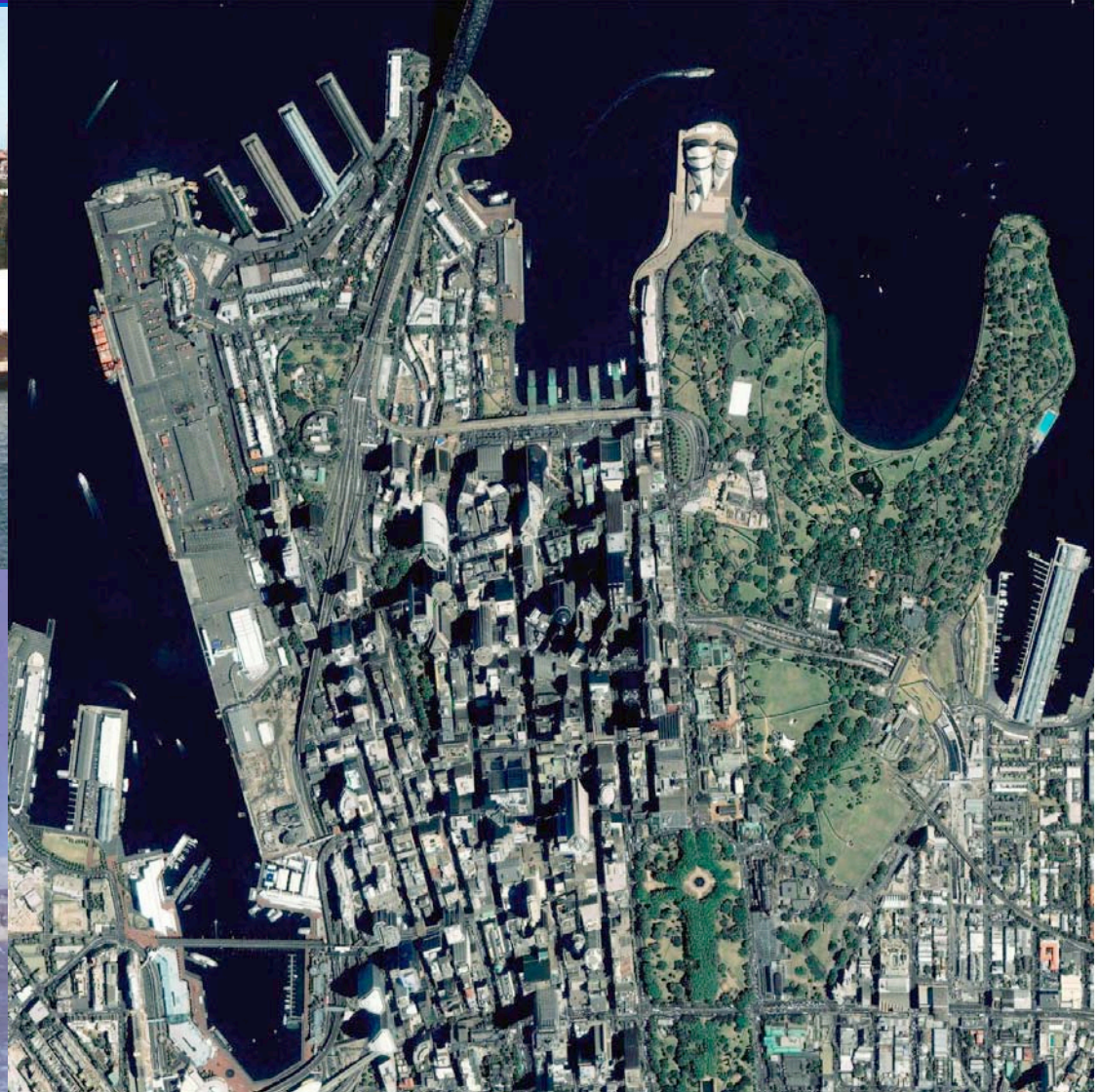


Original Coastline



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Sydney *Opera House*





*Airport Kingsford Smith
Land reclamations*



Airport Kingsford Smith



Reclamation



Original Coastline

0 200 400 600 800 1000 m

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Sydney Kingsford Smith Airport



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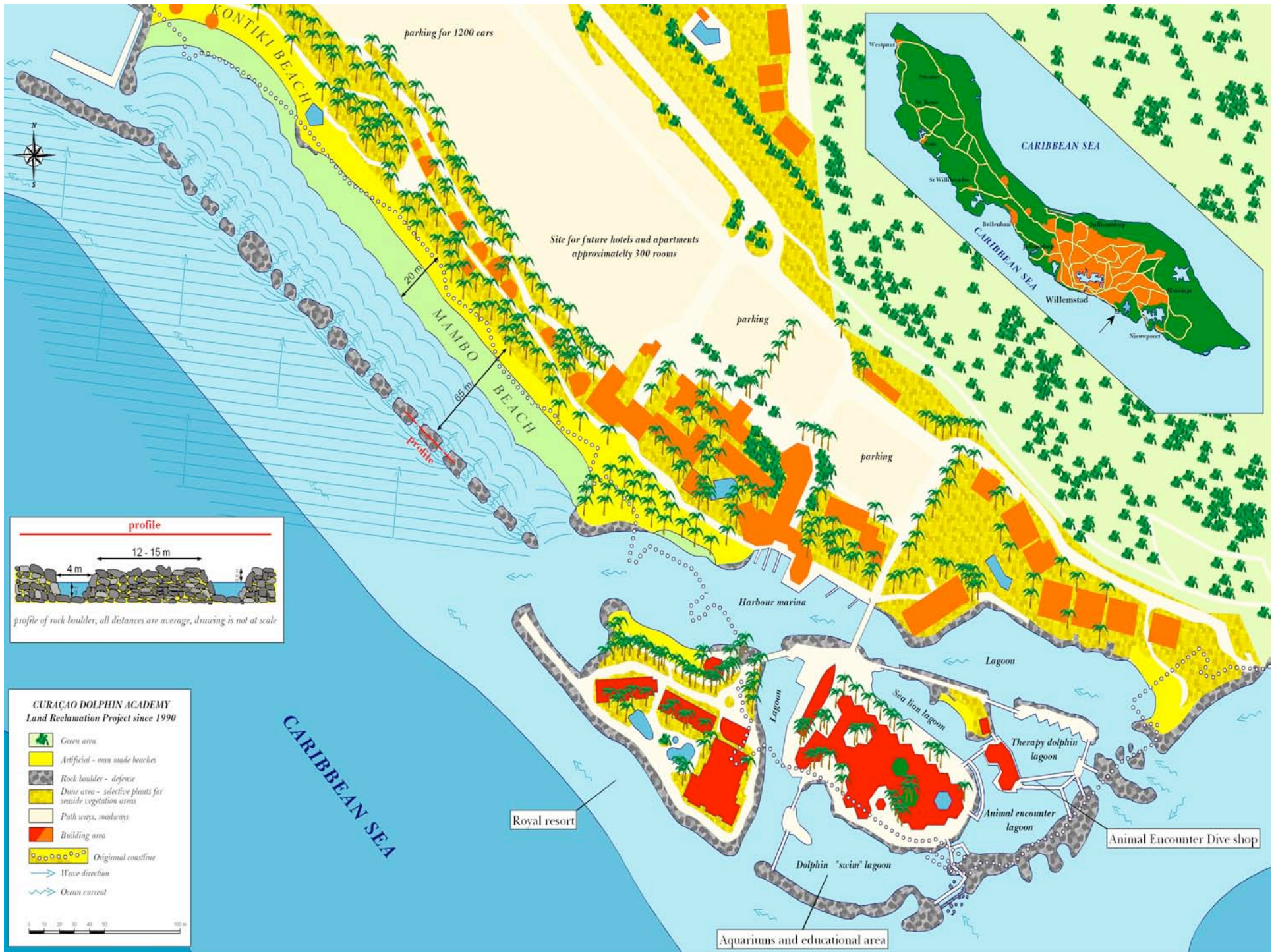


Sydney

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Curaçao





parking for 1200 cars

Site for future hotels and apartments approximately 300 rooms

parking

parking

Harbour marina

Lagoon

Sea lion lagoon

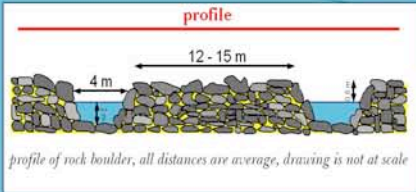
Therapy dolphin lagoon

Animal encounter lagoon

Animal Encounter Dive shop

Royal resort

Aquariums and educational area



CURAÇAO DOLPHIN ACADEMY
Land Reclamation Project since 1990

- Green area
- Artificial - man made beaches
- Rock boulder - defense
- Dune area - selective plants for seaside vegetation areas
- Path ways, roadways
- Building area
- Original coastline
- Wave direction
- Ocean current



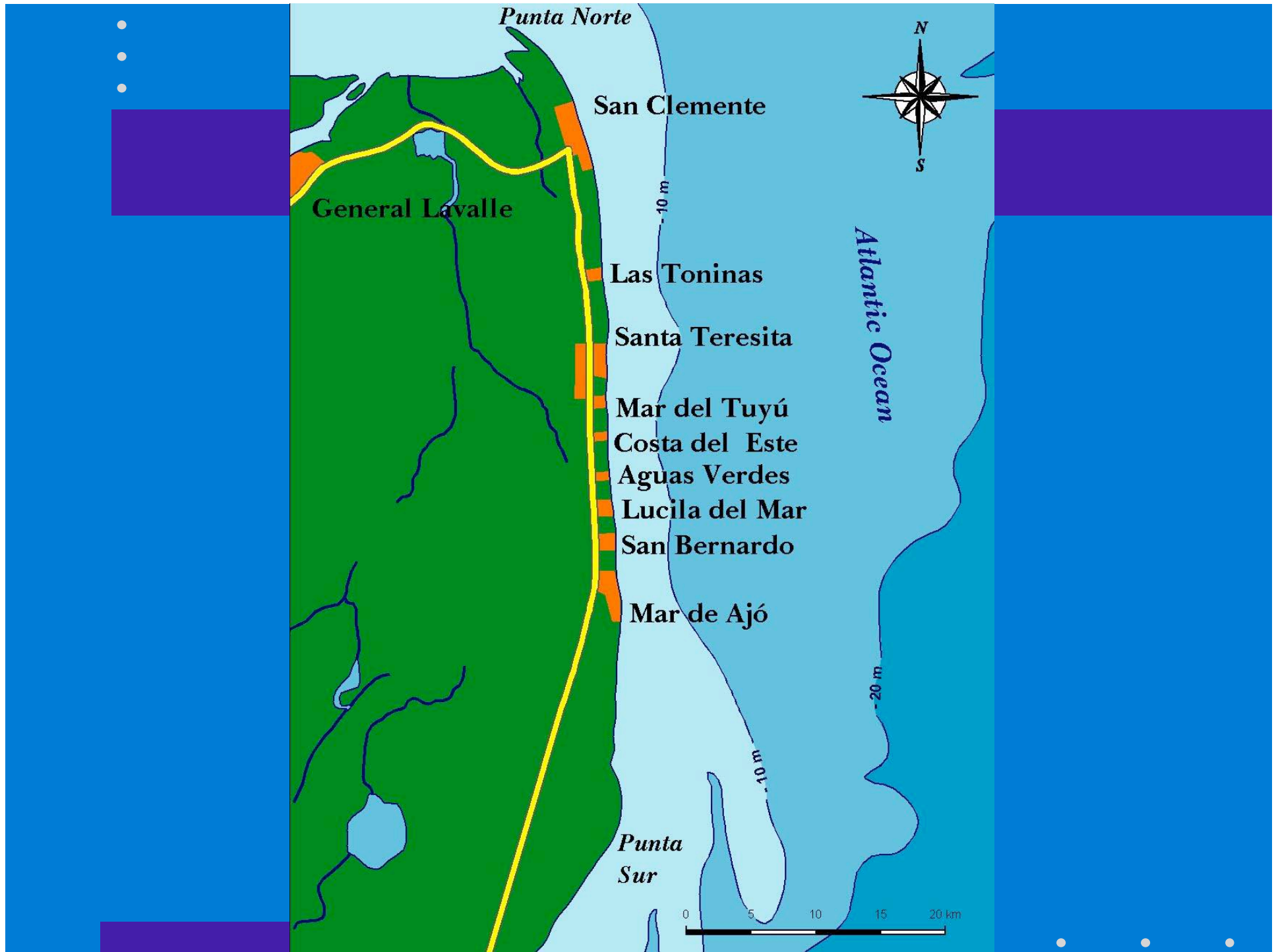


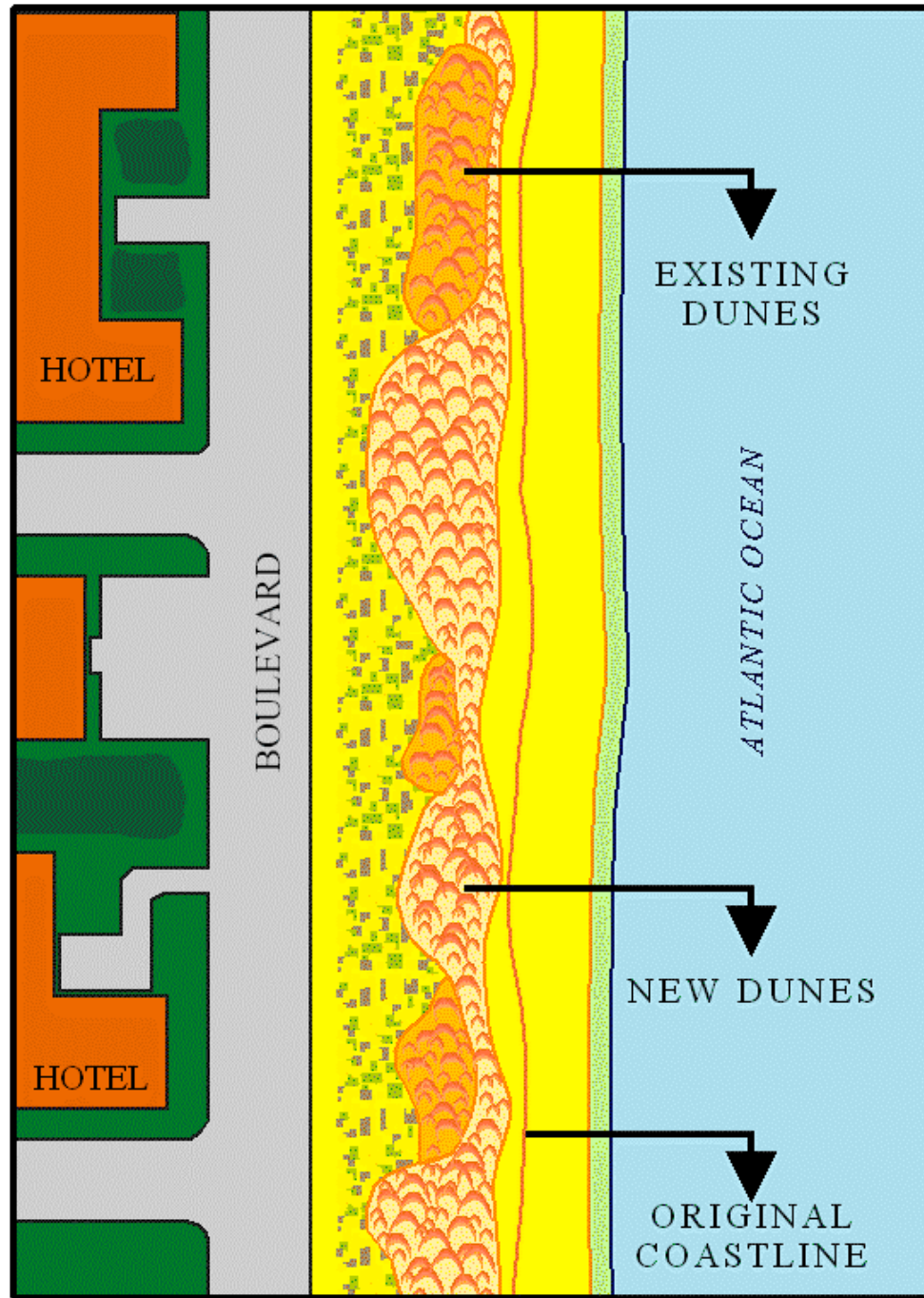




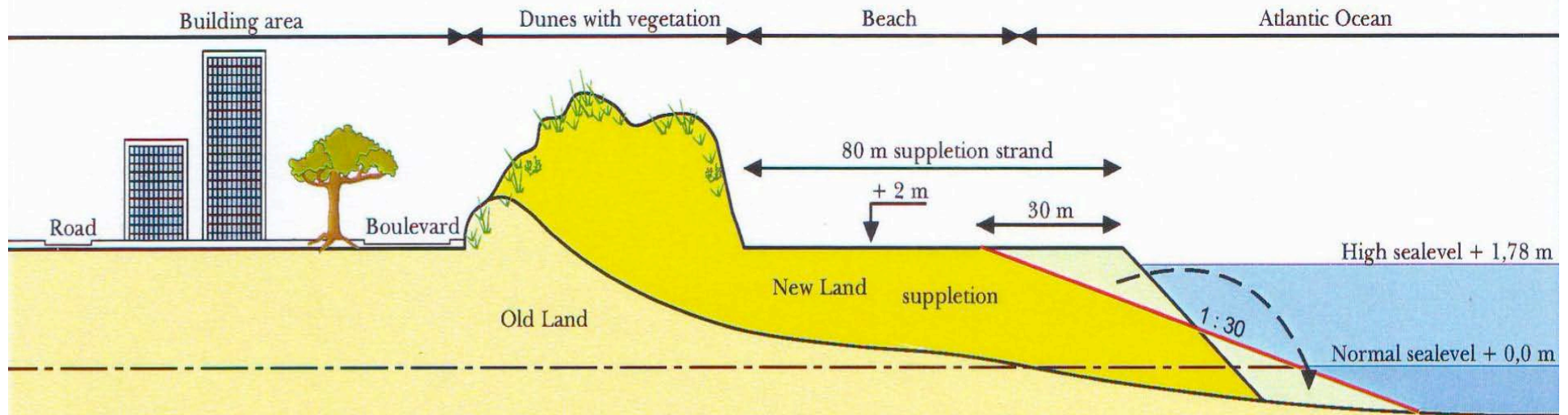
Argentina – *Municipalidad de la Costa*







Argentina – *Municipalidad de la Costa*



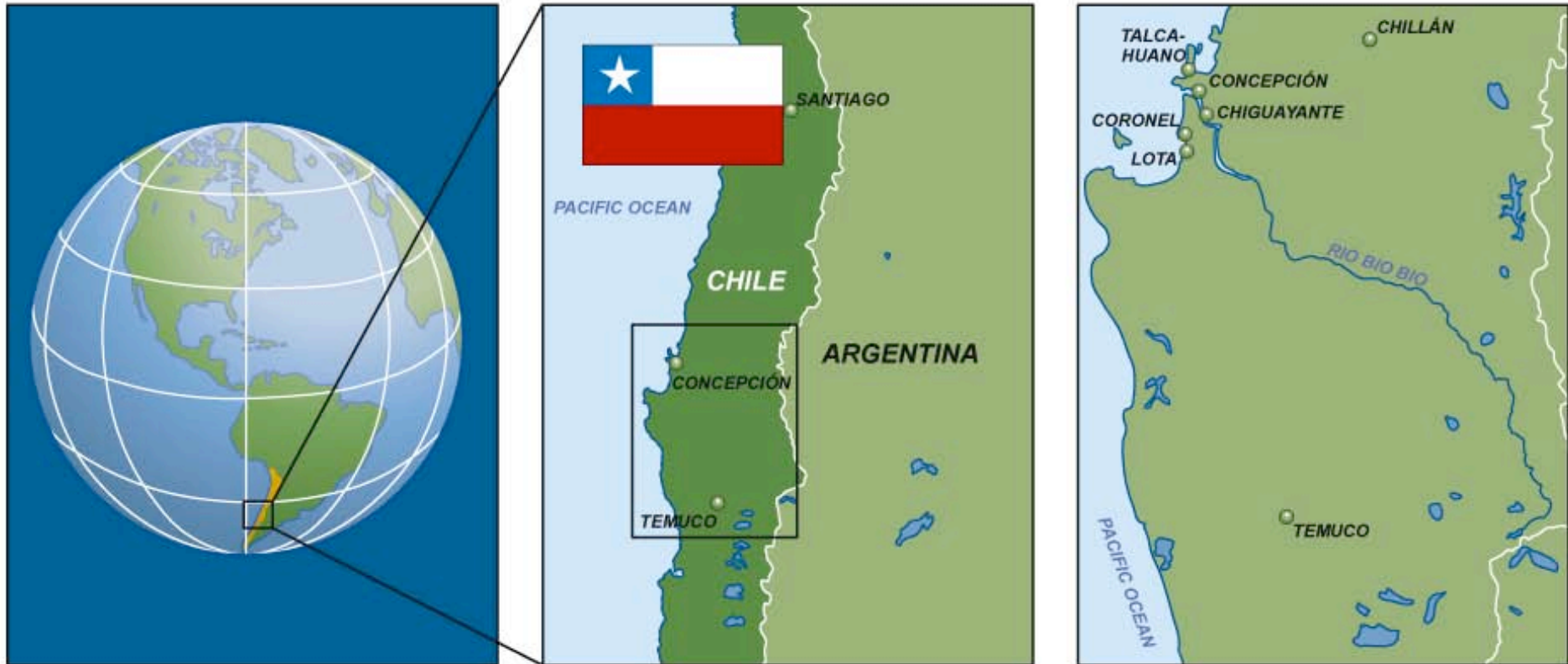
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Argentina

Santa Teresita



Chile



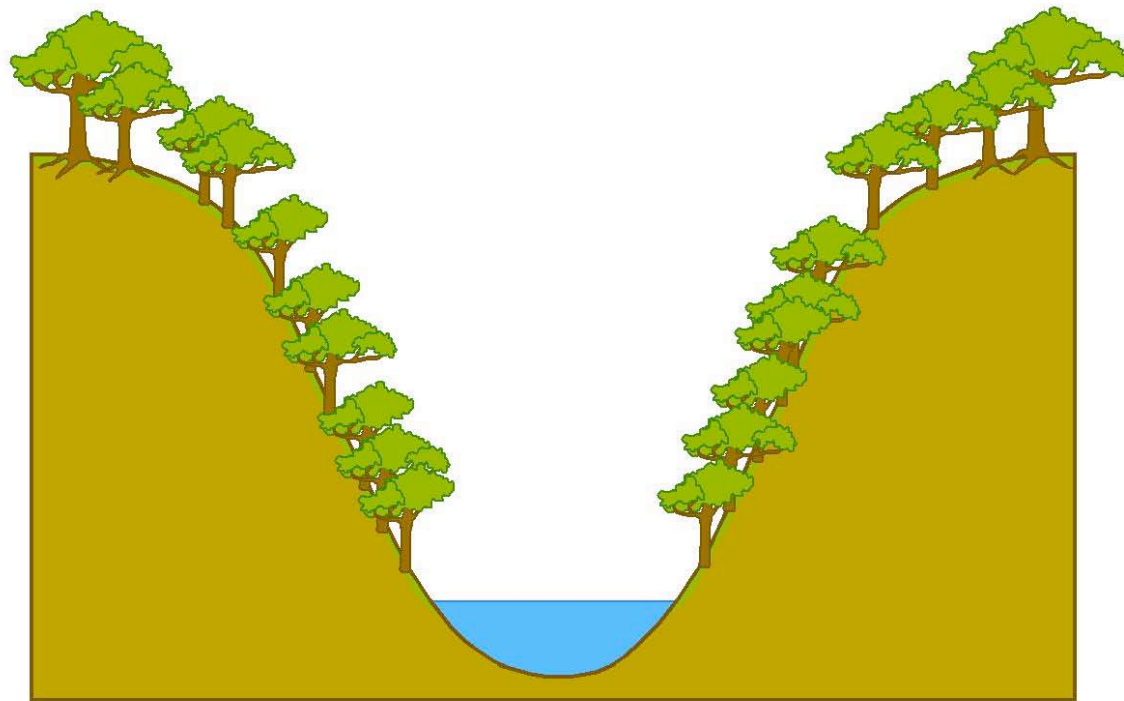
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Chile

Rio Bio Bio

RIO BIO BIO IN CHILE

Cross section in original situation of riverbanks with trees, shrubs and a navigable river.

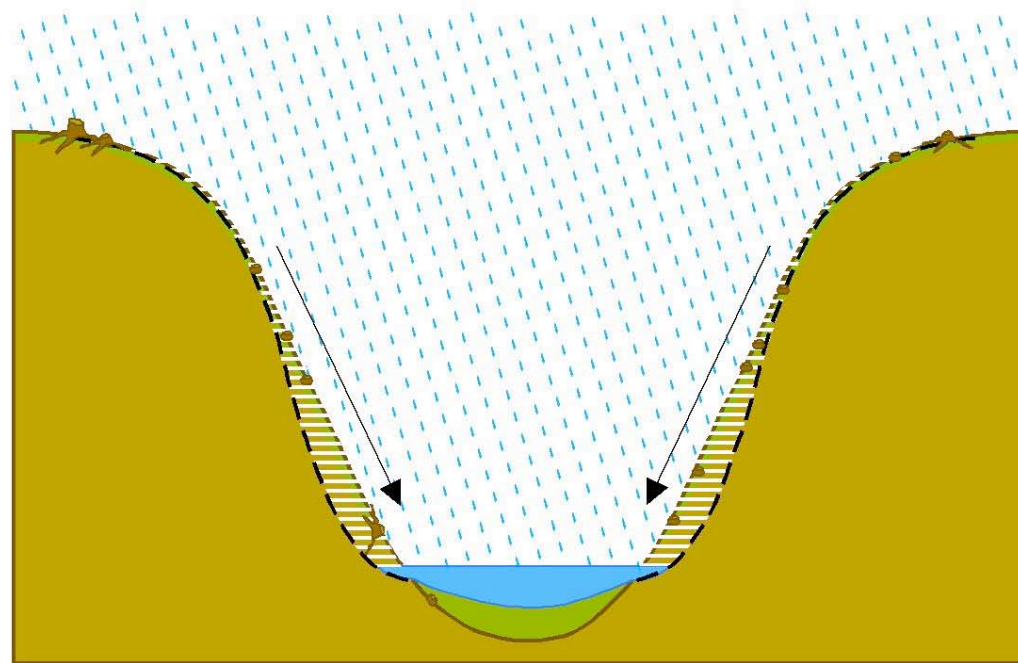


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Chile

Rio Bio Bio

Cross section with man-induced erosion by tree logging leading to a wider but less deep riverbed which in turn causes reduced navigability and reduction of fertile land.

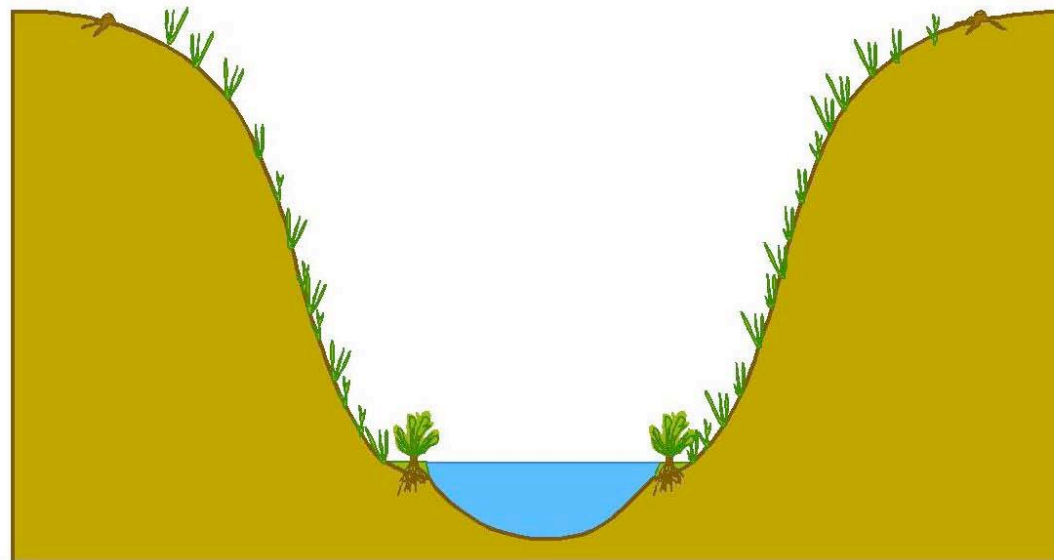


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Chile

Rio Bio Bio

Cross section with river bank restoration by tree planting and planting of tree saplings in the river causing local sedimentation and land reclamation, which in turn forces the river in a narrower and deeper riverbed, thereby restoring the original river depth.





Chile *Rio Bio Bio*

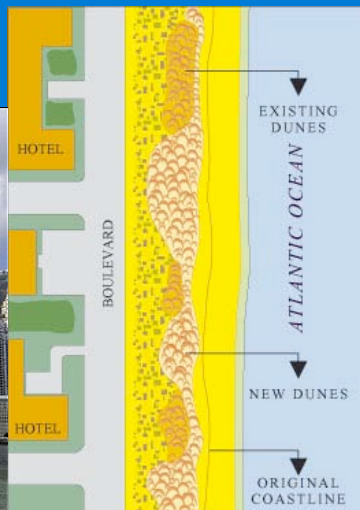


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Question Time



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BOUWEN MET DE NATUUR

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Bedankt voor uw aandacht

Ronald E. Waterman

&

Paul T.A. Liesting: Cartografie

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