Petra van Dam

The history of the NAP; continuity and change

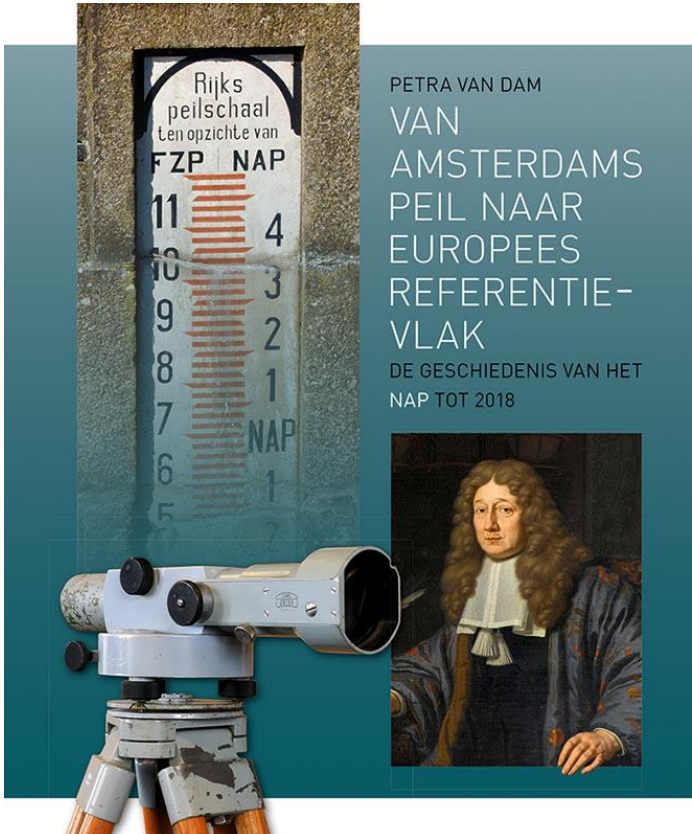
Presentation on

Environmental Humanities Center symposium

Water & the city:

how citizens respond to flooding

March 23, 2018



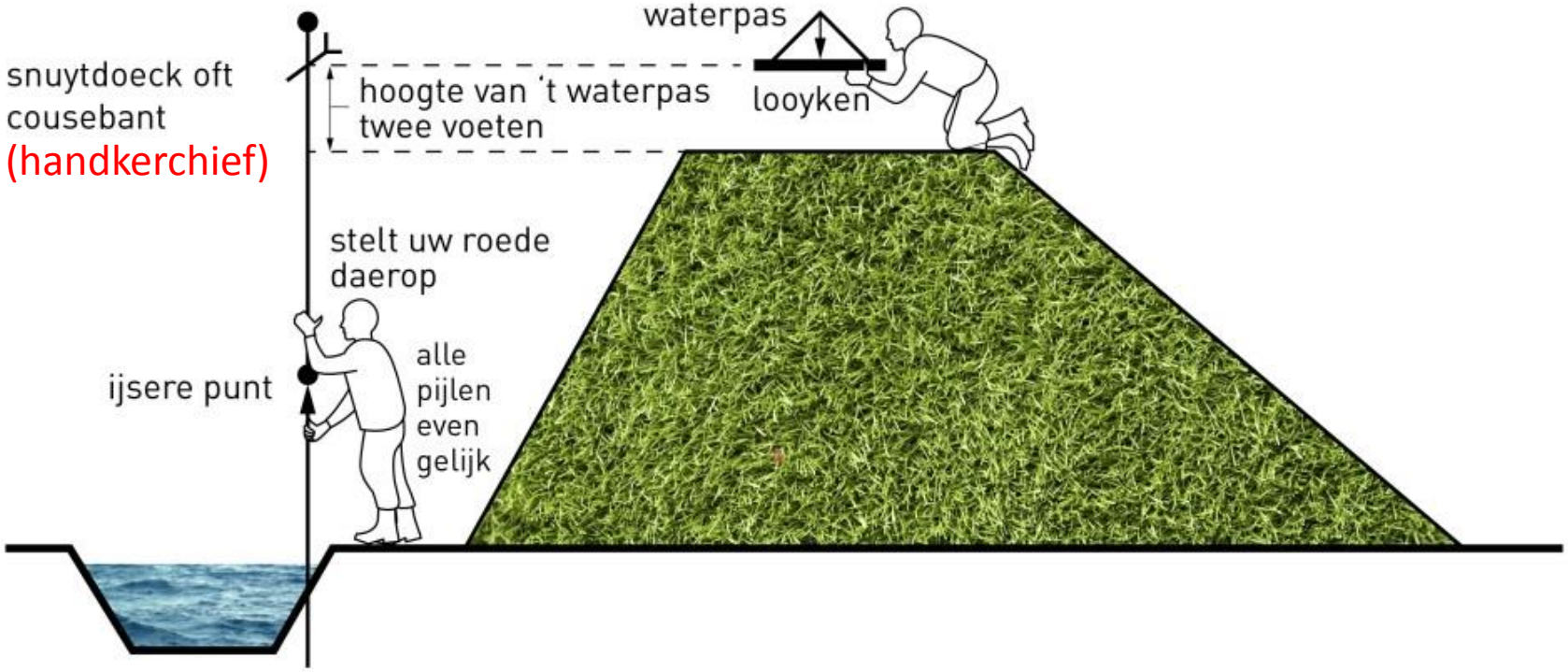
NAP

Normaal Amsterdams Peil =

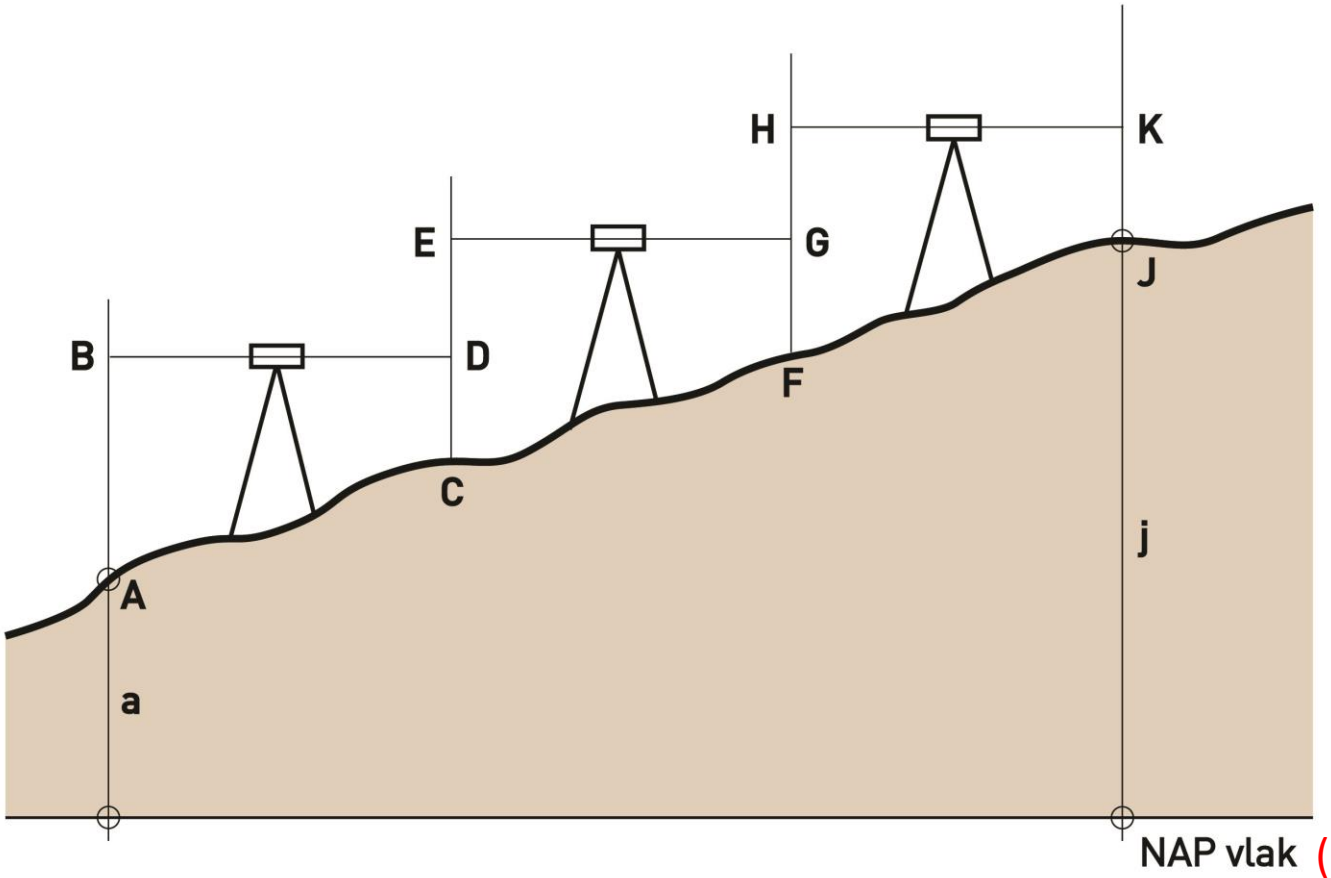
Amsterdam Ordnance Level/

Dutch Vertical Reference

Middle Ages:
measuring height with a water body as reference (zero)



After 1818:
measuring height with the AP as reference (zero)



(NAP-level)

Our questions

- How did AP start?
- How does it relate to flooding and climate change?
- How did AP become NAP (become national)?

History of the NAP in 3 steps

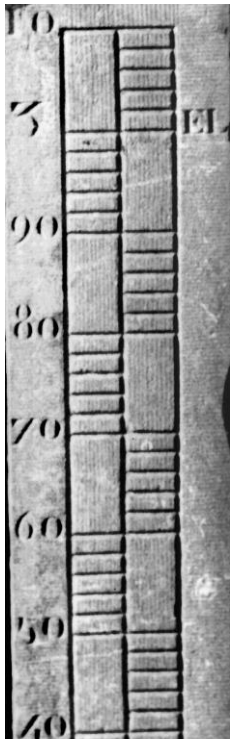
1400-1700: - AP as one of many regional water levels
- origin due to series of floods

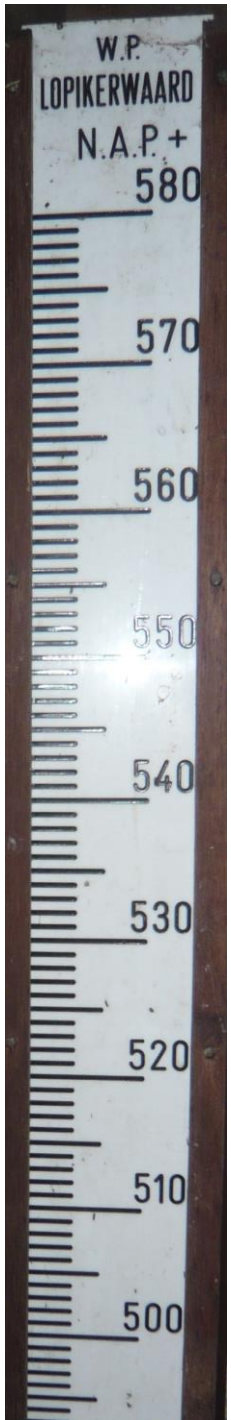
1700-1900: - spreading of the AP
- new name: NAP

after 1900: - more scientific
- NAP goes global

1400-1700

local and regional references for measuring water levels





Local level: AP

In Amsterdam, at the end of the 17th century strong need for more precise 0 water-mark, to improve the control of water management

- Water safety (floods)
- Water quality (smelly canals)

<- new methods developed during the Scientific Revolution (Chr. Huygens, I. Newton)

Flooding of Amsterdam

Dike breach of the southern IJ dike, east of Amsterdam, March 5, 1651

Jan Asselijn, Rijksmuseum

Flooding of Amsterdam
Broken dikes in November and December 1675

Why so many and ever higher flooding?

- Longterm: geological change

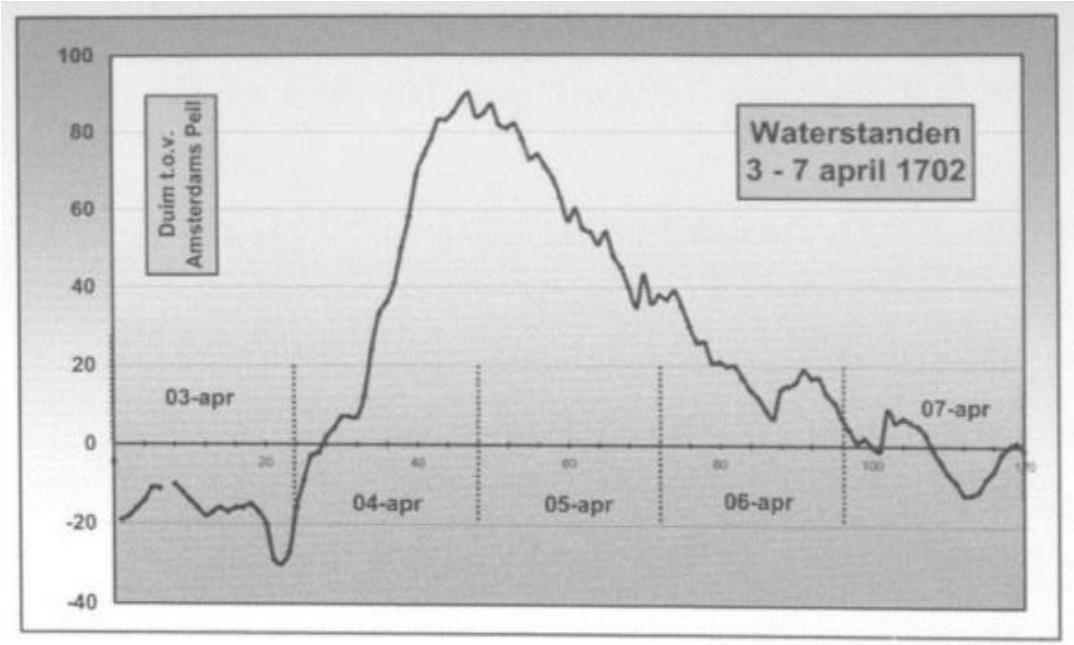
  Increase of the high tide sea level in de Zuiderzee

  <- increase of Zuiderzee & widening of the gullies between the Wadden isles (since 1200)

- Short term: Maunder minimum ca. 1662-1718
  - Greater storminess (< shipping logbooks)
  - Higher frequency of easterly winds (< shipping logbooks)
  - More precipitation in Spring & Autumn
  - Cooler winter temperatures

Typical Zuiderzee storm surge: wind turning from Southwest to North

- More easterlies
- More rain



High water levels in the IJ during the Maunder Minimum ca. 1662-1718

Column headings:

Date, Water level above AP, Remarks

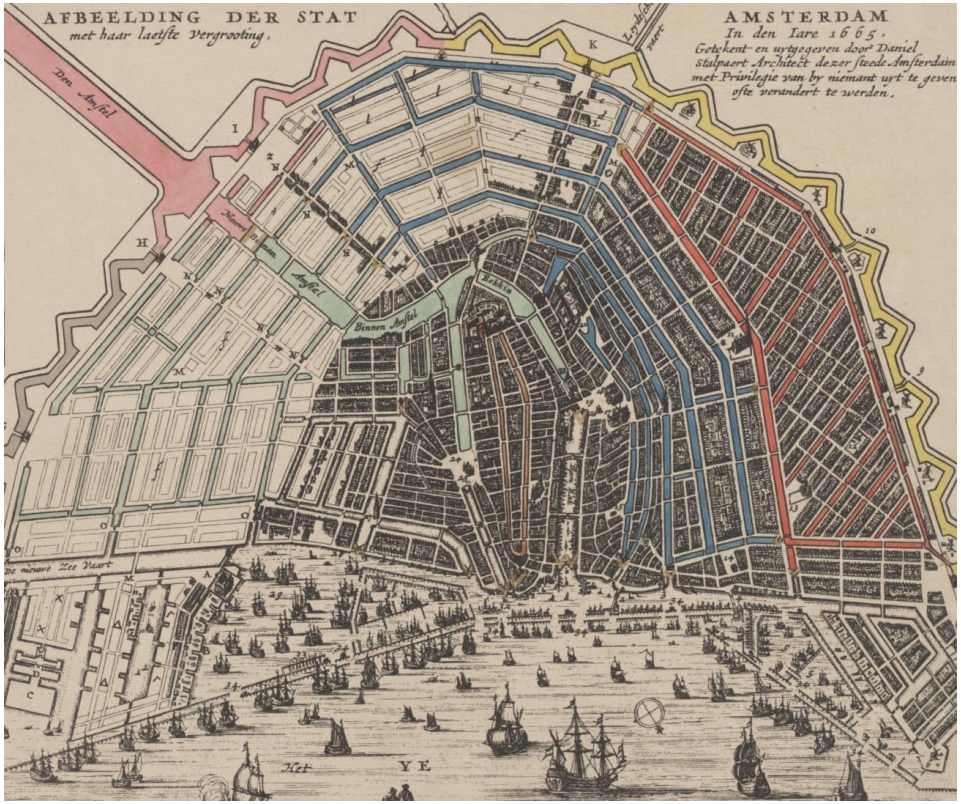
Source: Fransen, *Dijk onder spanning* (2011)
[PhD thesis VU 2009]

Datum	Waterhoogte boven AP	Bijzonderheden	Datum	Waterhoogte boven AP	Bijzonderheden
05-11-1675	+ 90 duim	Enige duimen hoger dan 1570	27-02-1714	+ 56 duim	
26-01-1682	+ 80 duim		03-03-1714	+ 84 duim	
08-01-1683	+ 5 voet	5 voet	07-03-1714	+ 71 duim	75 duim
28-01-1683	+ 55 duim		08-10-1714	+ 76 duim	
18-02-1683	+ 84 duim	7 voet	04-03-1715	+ 77 duim	84 duim
16-11-1683	+ 72 duim		05-11-1715	+ 69 duim	
17-11-1683	+ 63 duim		06-12-1716	+ 72 duim	
23-11-1686	+ 57 duim		05-01-1717	+ 81 duim	
25-11-1686	+ 75 duim		24-12-1717	+ 47 duim	47 Amsterdamse duimen (1,21 m) of 47 Rijnlandse duimen (1,23 m)
27-11-1687	+ 69 duim		25-12-1717	+ 97 duim	(ook 96 Rijnlandse duimen: 2,52 m)
01-01-1688	+ 61 duim		14-12-1718	+ 56 duim	
16-10-1688	+ 55 duim		22-12-1718	+ 53 duim	
19-12-1690	+ 77 duim		20-10-1720	+ 63 duim	
25-03-1699	+ 75 duim		02-12-1720	+ 61 duim	
16-10-1701	+ 65 duim		01-01-1721	+ 82 duim	
01-03-1702	+ 84 duim		30-03-1722	+ 55 duim	
05-04-1702	+ 8 voet, 2 duim	Andere mededeling 90 duim	09-11-1722	+ 55 duim	
06-04-1702	+ 90 duim		03-01-1723	+ 57 duim	
08-11-1702	+ 57 duim		17-10-1726	+ 59 duim	
08-12-1703	+ 57 duim		11-11-1727	+ 72 duim	
10-12-1703	+ 57 duim		26-12-1731	+ 80 duim	
27-11-1707	+ 75 duim	Andere meting: 78 duim			

Bron: Buisman, *Duizend jaar* en Gottschalk, *Stormvloeden*; zie ook: Van Malde, *Historische stormvloeden*; Conrad, *Rhijnlandschen Slaperdijk*; Febrand 'Doorbraken'.

Bad water quality in Amsterdam also led to desires for better water control

Compartments for flushing the canals, 1662-65



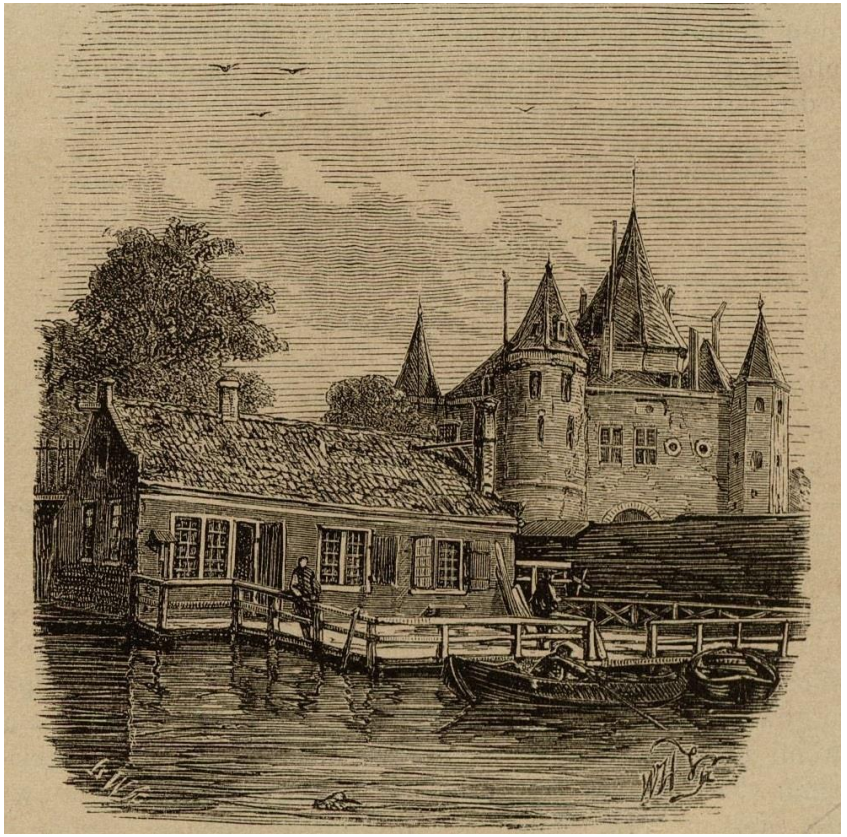
City waste water mill Nieuwervaart, 1765

Origin of AP:
the water measuring project 1683-84

Johannes Hudde

Mayor of Amsterdam

City water office at the Nieuwmarkt



8 water-mark stones of 1684

zeedykshooghte zynde negen voet vijf duim boven het stadspeyl (268 cm)

sea dike heigth being 9 feet 5 inches above city water-level

Water-mark stone in the Eenhoornsluis, corner Korte Prinsengracht/IJ

how the AP became NAP 1700-1800

slow (economic recession)

- initiatives of Regional Water Authorities
- scientific experiments by Bolstra & Lulofs

Spreading the AP:

ir. Kraijenhoff at work 1797-1812 building a network of fixed water-marks

stone in Schreierstoren, 1812

The event of 1818: the men

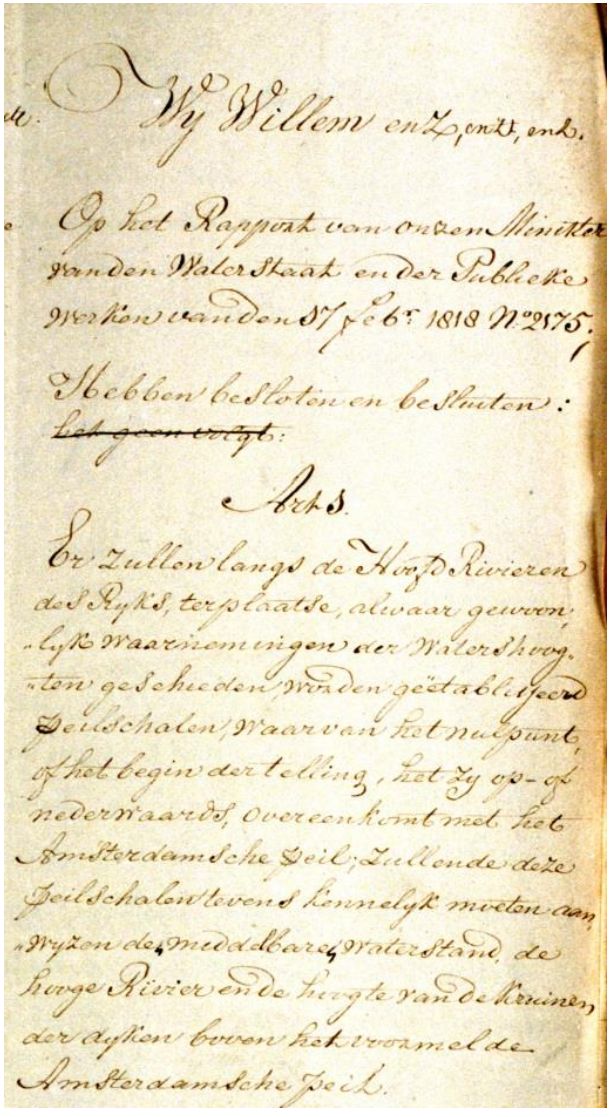
C.R.Th. Kraijenhoff

inspector of the rivers

King William I

the Canal King

The event of 1818: the Royal Degree of February 18, AP becoming the national standard



Wy Willem en Z. enz. enz.

Op het Rapport van onzen Minister van den Waterstaat en der Publieke Werken van den 8/ste 6r 1818 N.o 2175.

Hebben besloten en besluiten:

~~Het gene volgt~~:

Art. 1.

Er zullen langs de Hoofd Rivieren des Rijks, ter plaatse, alwaar gewoonlijk Waarnemingen der Watershoog. ten geschieden, worden geëtablisseerd Peilschalen, waarvan het nulpunt, of het begin der telling, hetzij op- of nederwaards, overeenkomt met het Amsterdamsche Peil; Zullende deze Peilschalen tevens kennelijk moeten aanwijzen de middelbare Waterstand, de hoogte Rivier en de hoogte van de kruinen der dijken boven het vermelde Amsterdamsche Peil.

Art. 1 Er zullen langs de Hoofdrivieren des Rijks, ter plaatse alwaar gewoonlijk waarnemingen der watershoogten geschieden, worden geëtablisseerd peilschalen, waarvan het nulpunt, of het begin der telling, hetzij op- of nederwaards, overeenkomt met het Amsterdamsche peil […]

Placing gauges along the main rivers, for measuring water levels, using the Amsterdam peil as zero-level.

how the AP became NAP 1800-1900

fast (supported by law and economic prosperity)

- systematic expedition by Kraijenhoff 1797-1812
- 1818 Royal Degree
- canals:
    - Noord-Hollands Kanaal 1819-1824
    - Zuid-Willemsvaart 1823-1826
    - Noordzeekanaal 1863-76
- railways:
    - Rijnspoorweg Amsterdam-Arnhem 1838-1847
    - Spoorlijn Amsterdam-Rotterdam 1839-47


W.P. =
0.62+
N.A.
0.7
0.6
0.50
0.40
0.30
0.20
0.10


DELFLAND

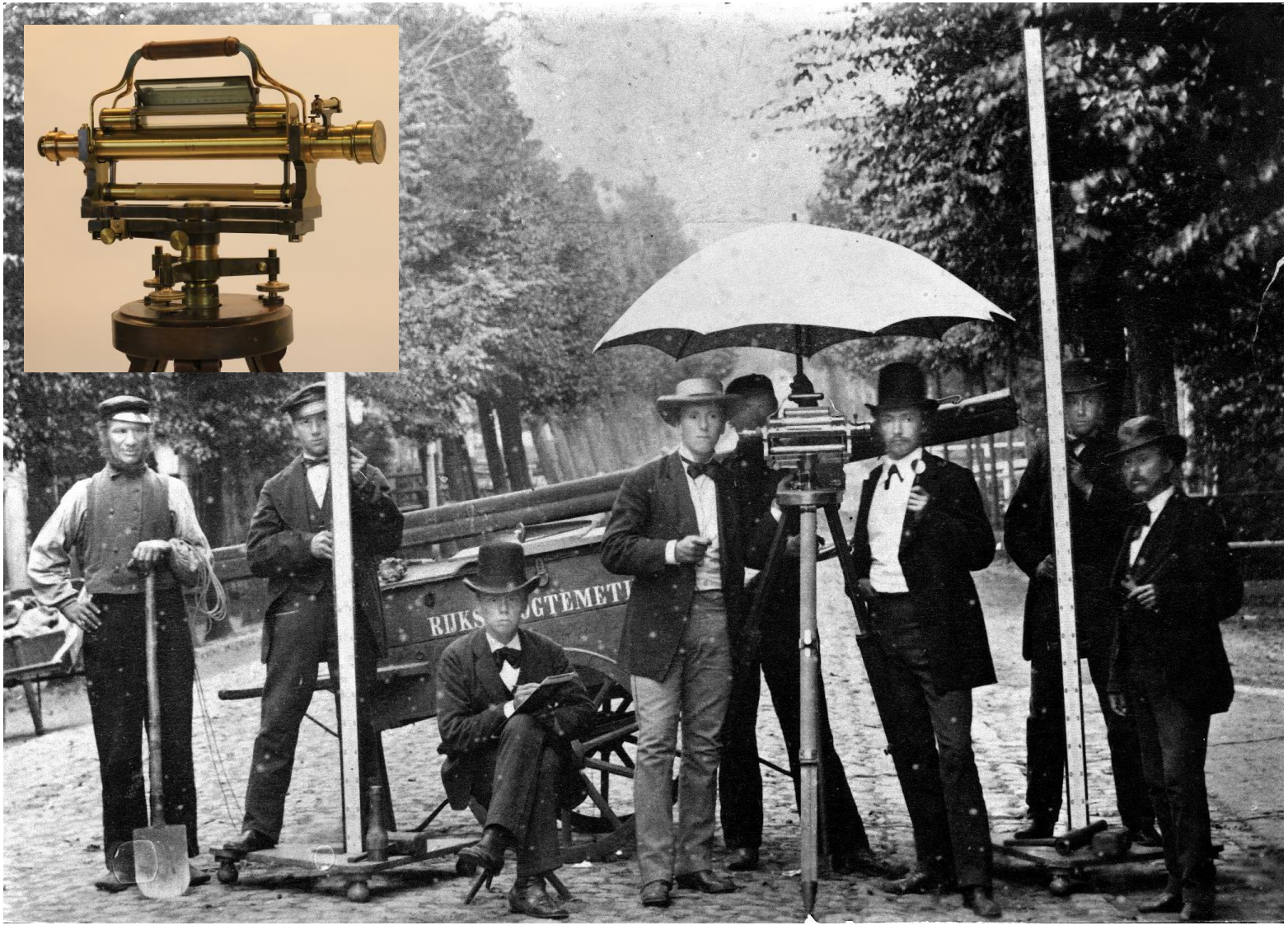

Rijks
peilschaal
ten opzichte van
FZP NAP
11


W.P.
LOPIKERWAARD
N.A.P.+
580
570
560
550
540
530
520
510


1891
NAP


60

1900-2018: more scientific and more global: Five measuring expeditions with ever more advanced instruments. Here Cornelis Lely at work



Extending and checking the network of water-marks

- 1931: 4.000
- 1960: 25.000
- 1986: 35.200
- 2017: 35.000

Globalisation: NAP travelling around the world

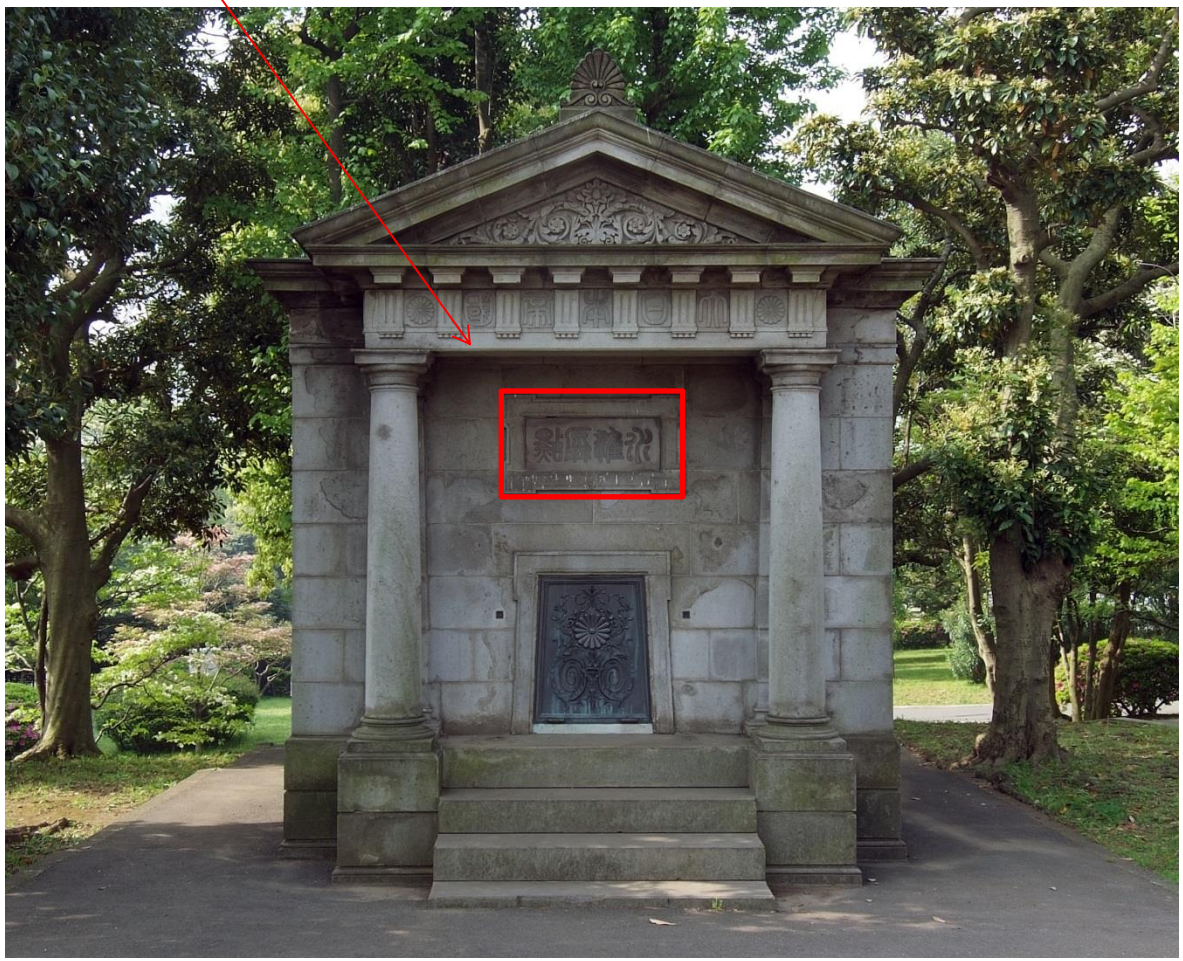
1872-1891
Japan

1986-93
Sumatra ,
Indonesia

1975 Okanvangodelta, Botswana

‘NAP-monument’ in Tokyo, 1891

chiyoda-ku: water, basis, norm, point



Summary

1400-1700 local and regional water-marks

- Amsterdams Peil 1684, after severe floods

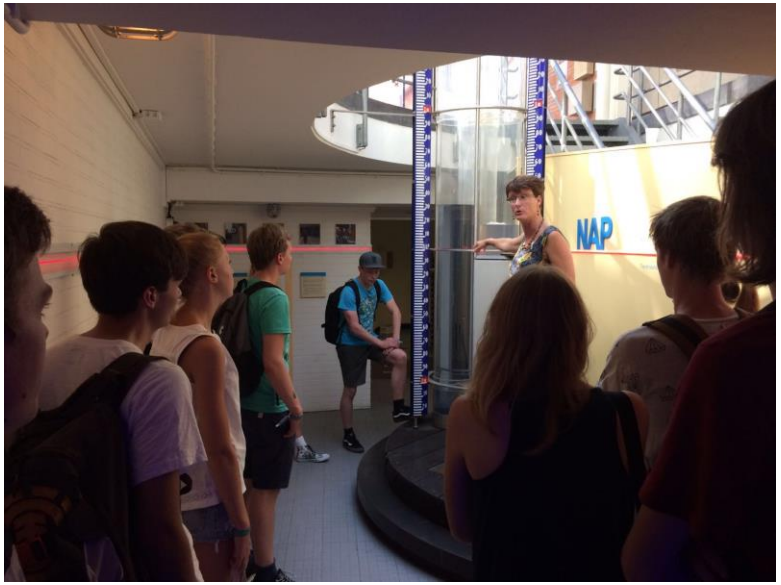
1700-1900 spreading AP

- great rivers (Lulofs, Bolstra, Kraijenhoff)
- AP goes national , Royal Degree of 1818
- AP get new name NAP 1891

After 1900 more scientific and more global

- Five measurement expeditions
- NAP goes global

NAP monument in city hall



Stopera 1988
Louis van Gasteren