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100 years of mapping the Holocene Rhine-Meuse delta plain: combining research and teaching

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The history of modern soil, geomorphological and shallow geological mapping in the Holocene Rhine-Meuse delta plain goes back about 100 years. The delta plain is of very heterogeneous build up, with clayey and peaty flood basins, dissected by sandy fluvial distributary channel belts with fine textured levees grading into tidal-influenced rivers and estuaries. Several generations of precursor rivers occur as alluvial ridges and buried ribbon sands. They form an intricate network originating from repeated avulsions, back to 8000 years ago. Present rivers have been embanked since ca. 1250 AD and the delta plain ($\sim$ 3000 km2) has been reclaimed for agriculture. Soils are young and subject to oxidation and compaction.
The first detailed field map of channel belts and floodbasins was made in 1926 by Vink, a geography teacher from Amsterdam. Soil mapping and Holocene geology gained interest after WW-II, with Wageningen soil scientists Edelman, Hoeksema and Pons taking lead. Utrecht University started teaching and research on the subject in 1959, launching an undergraduate mapping field course based on hand augering and field observation. An archive of borehole logs and local maps started to build up. Initially focused on soil mapping, from 1973 the course shifted to a geomorphological-geological focus. Berendsen took over supervision, introduced standard description protocols and legends and increased coring depth. This resulted in 1982 in his influential PhD thesis on the Rhine delta's genesis. New coring and sampling methods came and extensive 14C dating campaigns began. With steadily increasing numbers of students, accumulation of data speeded up, and increasingly larger parts of the delta were mapped. The academic mapping ran in parallel with soil survey and geological survey mapping campaigns. The computer was introduced in the field course and digital data archiving began in 1989. A series of PhD studies on thematic aspects of delta evolution and an increasing number of scientific papers since 1990s made the Rhine-Meuse delta mapping internationally known. In 2001, Berendsen and Stouthamer published the first overview on the palaeo-geographical development of the whole delta. In the decade that followed mapping continued as part of staff and PhD research and undergraduate teaching activities, as well as large applied-mapping projects. Since 2008 the activities are synchronised with those at the geological survey in the Netherlands. The database now comprises over 200,000 borehole descriptions of which the majority is digital, a well as different series of digital palaeo-geographical and lithological maps.
As time proceeded, methods and approaches have changed. The introduction of high-resolution Lidar elevation data allowed to re-evaluate earlier collected borehole data and to develop more efficient field data collection strategies. While in the 1960-1990s we taught students 'how to map a data-sparse area', we now train students 'to critically evaluate heaps of existing data and maps to improve mapping'. This also raises the awareness of the distinction between observation and interpretation, when different types of information are combined in mapping. This attitude change and maturity also echoes through current research in soil, geomorphology and geology in the delta.