

## GERMANY



Source: esri

### General

Germany - officially the Federal Republic of Germany - is located between the Baltic and North seas in the North, and the Alps in the South. It borders Denmark in the North, Poland and the Czech Republic in the East, Austria and Switzerland in the South, and France, Luxembourg, Belgium and the Netherlands in the West. The country has an area of 35.7 Mha (million hectares) with in 2020 a population of 83.8 million, or 2.35 persons per ha (Wikipedia and United Nations, 2019).

### Climate and geography

Elevation ranges from the mountains of the Alps in the South to the shores of the North Sea in the Northwest and the Baltic Sea in the Northeast. The forested uplands of central Germany and the lowlands of northern Germany (lowest point: Wilstermarsch at 3.54 m-MSL (mean sea level) are traversed by such major rivers as the Rhine, Danube and Elbe.

Most of Germany has a temperate seasonal climate dominated by humid westerly winds. The country is situated in between the oceanic Western European and the continental Eastern European climate. The climate is moderated by the North Atlantic Drift, the northern extension of the Gulf Stream. This warmer water affects the areas bordering the North Sea; consequently in the Northwest and the North the climate is oceanic. Germany gets an average precipitation of 789 mm/year. There is no consistent dry season. Winters are cool and summers tend to be warm: temperatures can exceed 30 °C. The East has a more continental climate: winters can be very cold and summers very warm, and longer dry periods can occur. Central and southern Germany are transition regions, which vary from moderately oceanic to continental. In addition to the maritime and continental climates that predominate over most of the country. Though the German climate is rarely extreme, there are occasional spikes of cold or heat. Winter temperatures can sometimes drop to two-digit negative temperatures for a few days in a row. Conversely, summer can see periods of very high temperatures for a week or two (Wikipedia).

The German name for polder is Koog, or in Eastfriesland Groden. These words can therefore be found in many names of polders.

Quast and Lukianas (1999) describe that beginning in 1740 under initiative of the Prussian king, Friedrich II, large polders systems based on Holland's land reclamation model were created on the lower courses of the Oder, Vistula and Nemunas rivers.

Kaup (2006) describes that in the second half of the 17<sup>th</sup> century large land reclamation works by Dutch settlers were implemented in Brandenburg. Each of them receiving 50 ha under certain conditions.

Eggelsmann (1983) describes the properties of peat polders in North-West Germany. He also presents formula's to describe the requirements for drainage and pumping as well as for subsidence and oxidation.

Liem (1999) describes a numerical optimisation for the functioning of the flood polder Kaldauer Feld along River Sieg, one of the tributaries of River Rhine. Leenders and Van der Meulen (2000) and Van der Meulen (2002) describe the POLDEVAC model with an application to the Maas and Waal- and Ooy-polder in the Netherlands and Germany. With this model required measures of an evacuation during flooding can be simulated.

Aten *et al.* (2009) describe that the Dutch polder expert Jan Adriaansz. Leeghwater in 1626 was involved in reclamation of two lakes in Schleswig-Holstein, and in 1634 in the endiking of the Dagebüllerbocht.

### Existing polders

Figure 1 shows, among others, the polders Wilster Marsch and Kremper Marsch in Schleswig Holstein.

Smit (1983) describes the Hinrich Lohse Plan of 1933 along the west coast of Schleswig-Holstein. In the framework of this plan several polders have been reclaimed as shown in Figure 2. Among these polders are the Adolf Hitler Koog later renamed as Dieksander Koog and the Hermann Göring Koog

later renamed as Tümlauer Koog (Figure 3). The reclamation and initial development of the Hermann Göring Koog are described in detail.

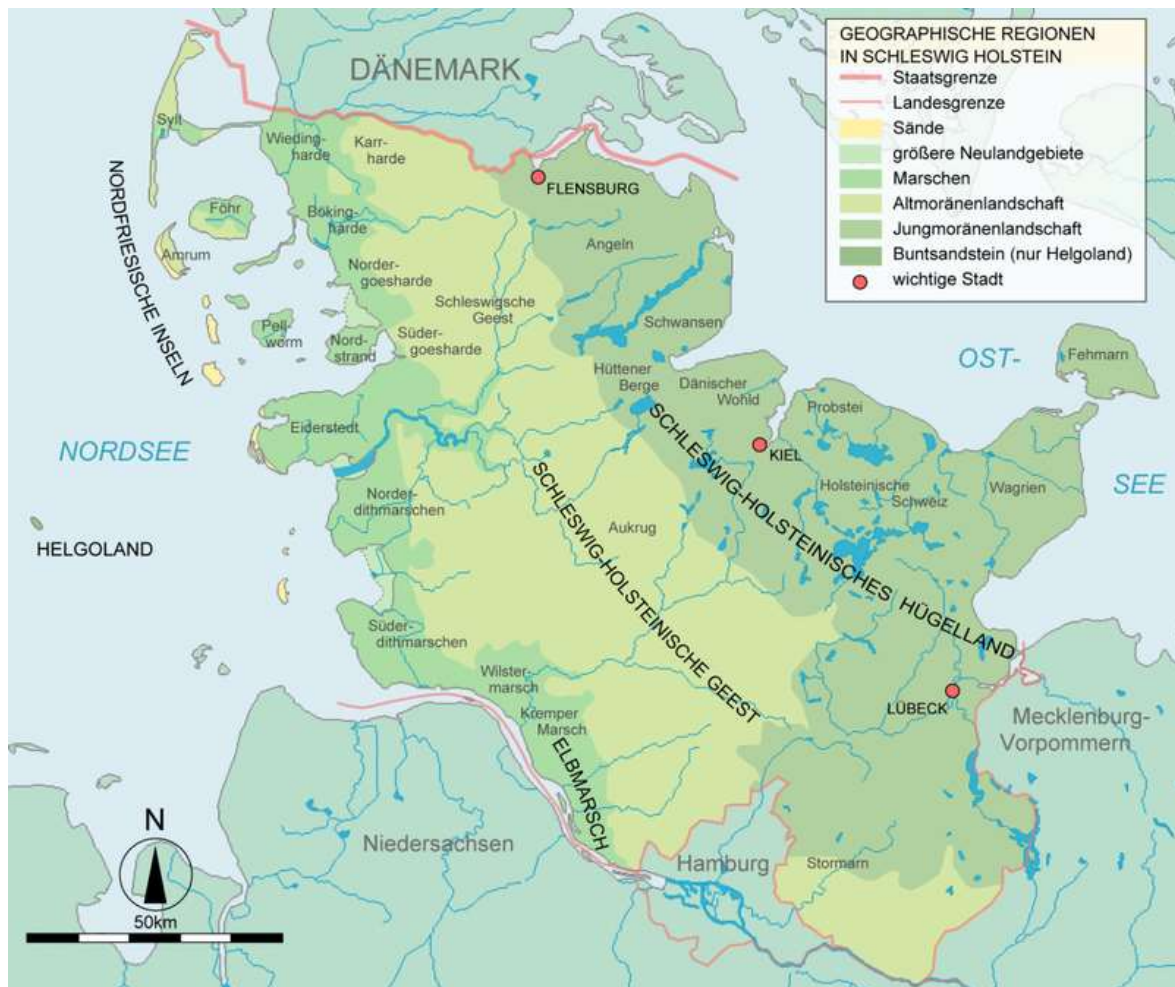


Figure 1. Geographical regions in Schleswig Holstein, including the polders Wilster Marsch and Kremper Marsch (source: de.wikipedia)

Several polders are located on the isles in front of the westcoast, like Isle of Pellworm and Isle of Nordstrand (Figure 4).

Several polders along the mouth of the Dollart, partly in Germany and partly in the Netherlands are shown in Figure 5. Among them the Landschafts Polder (1752) (source: Wikipedia).

Schreiber (undated) describes various polders in the Westermansch, like: Buscher Polder, Charlotten Polder, Leybucht polder, Lorenz Polder, Westermarscher Polder.

Figure 6 shows polders in the Harlebucht (source: Wikipedia).

General characteristics of the polders in Germany are shown in Table I.

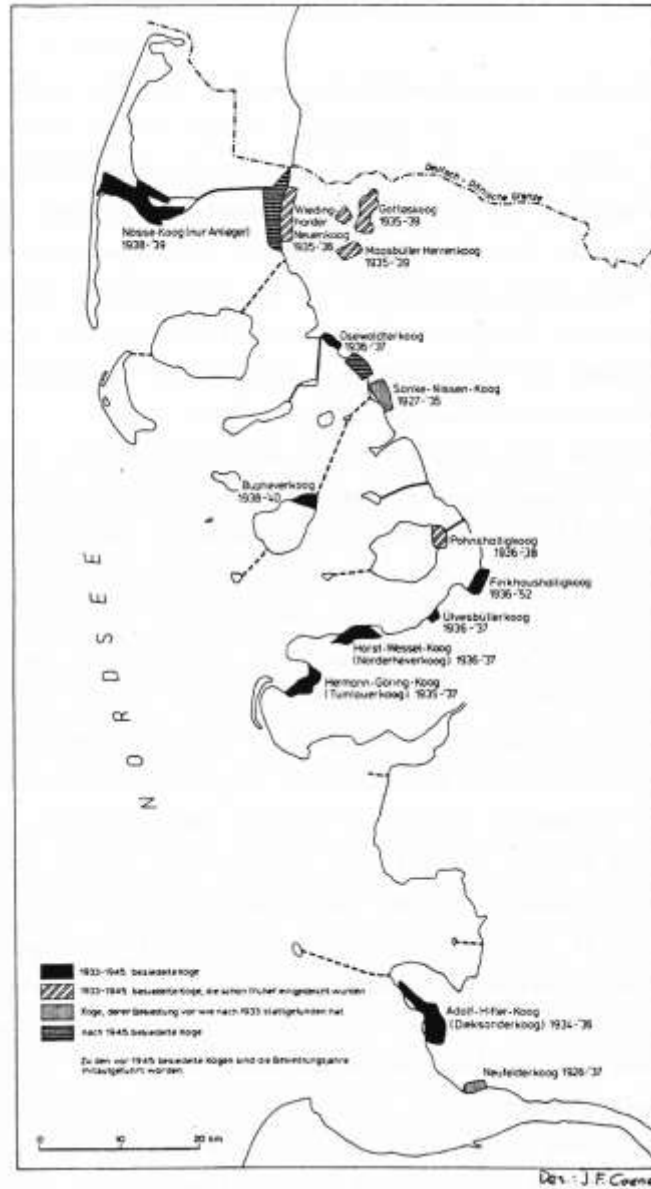


Figure 2. The Lohse Plan for reclamations along the west coast of Schleswig-Holstein



Figure 3. Herman Göring Koog in 1935 later renamed as Tümlauer Koog

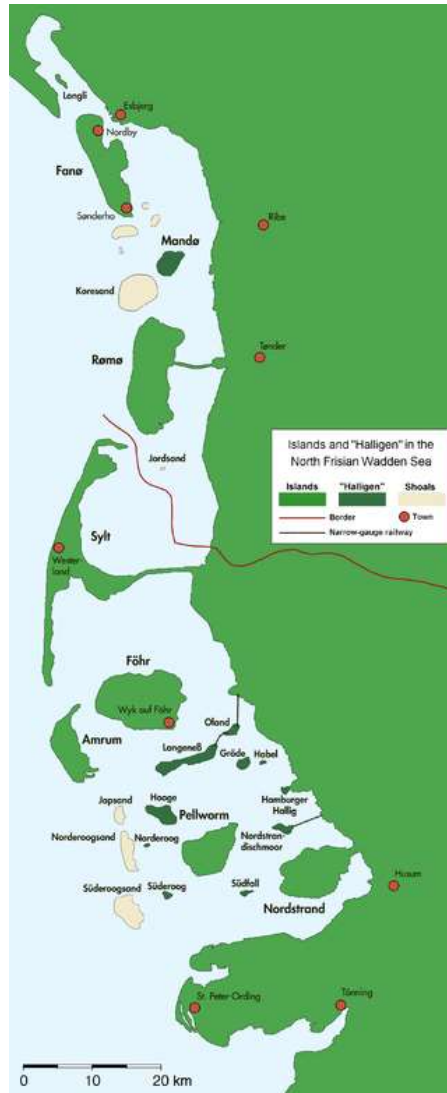


Figure 4. Several polders are located on the isles in front of the west coast, like Isle of Pellworm and Isle of Nordstrand

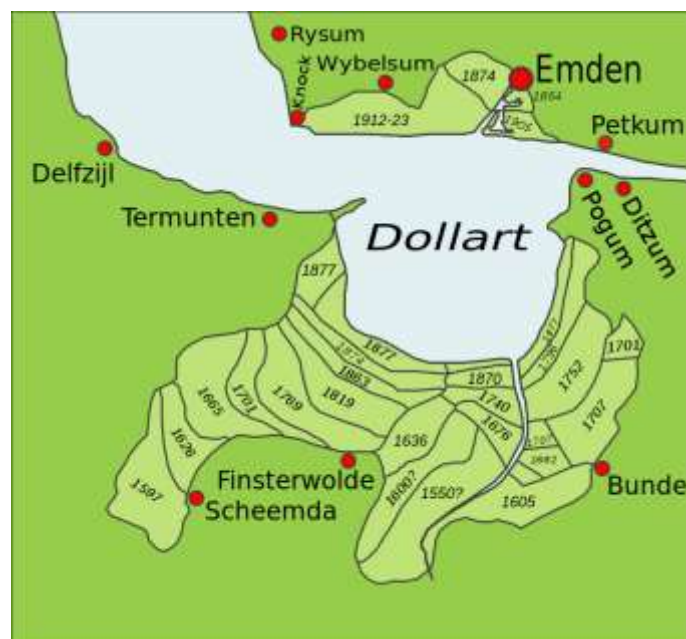


Figure 5. Several polders along the mouth of the Dollart. Among them the Landschafts Polder

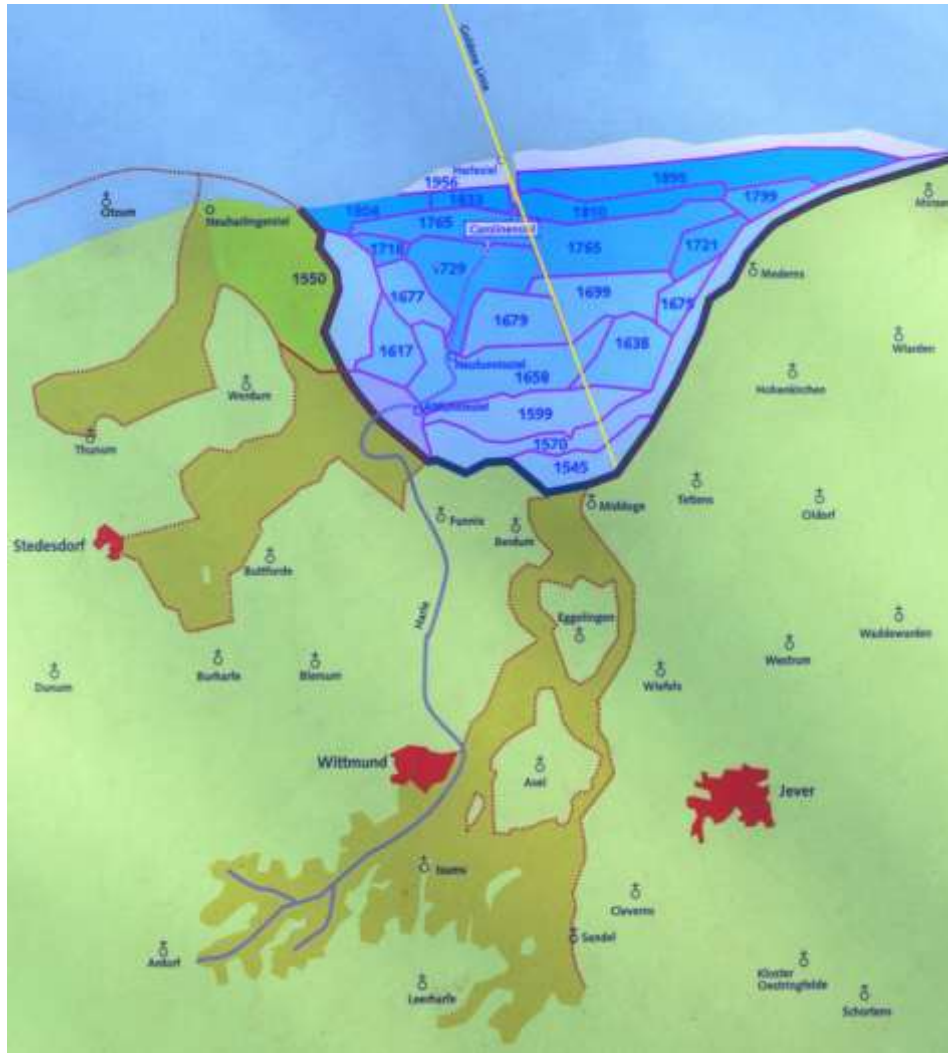


Figure 6. Polders in the Harlebucht

### Proposed polders

No proposed polders have been identified.

### Pictures of polders

The pictures by Prof. Bart Schultz are shown in Table II.

### References

- Aten, D., M. Joustra en H. van Zwet. 2009. *Leegwater en het Haarlemmermeer*. 26<sup>e</sup> uitgave van de Vrienden van de Hondsbosse, Kring voor Noord-Hollandseche Waterstaatsgeschiedenis (in Dutch).
- Eggelsmann, R., 1983. *Peatland polders of North-West Germany*. In: Proceedings International Symposium 'Polders of the World'. International Institute for Land Reclamation and Improvement, Wageningen, the Netherlands.
- Group Polder Development, Department of Civil Engineering, Delft University of Technology, 1982. *Polders of the World. Compendium of polder projects*. Delft, the Netherlands.
- Horlacher, H-B., D. Carstensen, T. Kop and J. Stamm, 2009. Untersuchungen zu gesteuerten Flutpoldern an der Elbe unter Berücksichtigung veränderter Klimabedingungen. DWA-KW-Korrespondenz Wasserwirtschaft, Vol. 2., No. 7. pp. 373-378.

- International Commission for the Protection of the Danube River, 2018. *A shared river. Managing the Danube River Basin*. Vienna, Austria.
- Kaup, Martina, 2006. *Niederlander in Norddeutschland, vor allem Brandenburg*. In: Danner, H.S., J. Renes, B. Toussaint, G.P. van de Ven and F.D. Zeiler. Polder pioneers. The influence of Dutch engineers on water management in Europe, 1600-2000. Nederlandse Geografische Studies nr. 338. Utrecht, the Netherlands.
- Kramer, J. and H. Rohde, 1992. *Historischer Küstenschutz. Deichbau, Insedshutz und Binnenentwässerung an Nord- und Ostsee*. Verlag Konrad Wittwer. Stuttgart Germany. (in German)
- Leenders, P.H.J.A. and G.G. van der Meulen, 2000. *Polder Evacuation and Emergency Provision Maas & Waal- and Ooy-polder in the Netherlands and Germany*. In: F. Toensmann and M. Koch (Eds.). River flood defence, Vol. 2. Kassel Reports of Hydraulic Engineering. No. 9/2000. Herkules-Verlag. Kassel, Germany. H-49 – H-64.
- Liem, R., 1999. *Numerical optimisation of a flood polder: a case study of the polder Kaldauer Feld, Germany*. In: Water 99 - Handbook and Proceedings. Hydrology & water resources; Brisbane, Australia, Jul, 1999, Institution of Engineers. Barton, Australia 119-122.
- Meulen, G.G. van der, 2002. *PoldEvac: An integrated cross-bordering approach to flood disaster and evacuation management in polder areas in the Netherlands and in Germany*. In: Modernization of water management – Technological and Institutional Improvements in Irrigation and Drainage. Proceedings Seventh Netherlands National ICID Symposium. Nijmegen, the Netherlands.
- Ohlig, C., 2005. *Ostfriesland und das land Oldenburg im Schutz der deiche*. Siegburg, Germany.
- Quast, J. and A. Lukianas, 1999. *Rehabilitation of polder systems on the floodplain regions of Oder River/Germany and the Nemudas River/Lithuania*. In: Proceedings 17<sup>th</sup> ICID Congress. New Delhi, India.
- Schreiber, G., undated. *Westermarsch I, Stadt Norden, Landkreis Aurich*
- Siepe, A., 1994. Regeneration of flood plain biotopes on the Upper Rhine - The "Polder Altenheim" case. *Water science and technology*. Vol. 29; No. 3, ; 281.
- Smit, J.G., 1983. *The origin and early stages of the Hermann-Göringpolder (Tümlauer Koog) in Schleswig-Holstein, Germany*. In: Proceedings International Symposium 'Polders of the World'. International Institute for Land Reclamation and Improvement, Wageningen, the Netherlands.
- Theunisz, J., 1943. *De Nederlandse Oostkolonisatie, meer in het bijzonder die in Brandenburg in de 17e eeuw tijdens de regering van den Groten Keurvorst*. Studiereeks der Germaanse Werkgemeenschap Nederland 1. Amsterdam, the Netherlands (in Dutch).
- United Nations, Department of Economic and Social Affairs, Population Division. 2019. *World Population Prospects, medium prognosis. The 2019 revision*. New York, USA.

Web sites:

- [https://commons.wikimedia.org/wiki/Category:Polders\\_in\\_Germany](https://commons.wikimedia.org/wiki/Category:Polders_in_Germany)
- [https://de.wikipedia.org/wiki/Liste\\_der\\_Eindeichungen\\_in\\_Ostfriesland](https://de.wikipedia.org/wiki/Liste_der_Eindeichungen_in_Ostfriesland)
- [https://de.wikipedia.org/wiki/Kremper\\_Marsch#/media/Datei:SLH.landscapes.png](https://de.wikipedia.org/wiki/Kremper_Marsch#/media/Datei:SLH.landscapes.png)

*Bart Schultz*

*Lelystad, May 2022*

Table I. General characteristics of existing polders in Germany

Name	Reclamation	Area in ha	Type *)	Latitudes	Longitudes	Elevation in m+MSL	Land use
Valley of the Weser near Bremen	Around 1110		RLL				
Bishorster-Hazeldorfer- and Wilster Marsch (Schleswig-Holstein)	1140-1164		RLL	53° 45' N	9° 30' E	0	Agriculture
Altes Land (various polders)	1140, 12 <sup>th</sup> and 15 <sup>th</sup> century	14,300	RLL	53° 33' N	9° 37' E	-1	Agriculture
Ladecop, Heringscop (mouth of Elbe)	12 <sup>th</sup> century		RLL	53° 40' N	9° 28' E	-1	Agriculture
Salzwedel, Stendal (east of Elbe)	Around 1157		RLL	52° 52' N	11° 11' E	18	Agriculture
Kremper Marsch	1230-1290		RLL	53° 51' N	9° 32' E	-1	Agriculture
Bucht von Campen	13 <sup>th</sup> century		RLL	53° 24' N	7° 4' E	-2	Agriculture
Bucht von Sielmönken	13 <sup>th</sup> century		RLL	53° 26' N	7° 9' E	-2	Agriculture
Hattstedter Marsch	1478	3152	RLL	54° 32' N	8° 59' E	-2	Agriculture
Altmark, Fleming, Thuringen, Saksen, Silezië. For example Dithmarschen, Stapelholm, Eiderstedt	15 <sup>th</sup> – 16 <sup>th</sup> century		RLL	54° 11' N	9° 7' E	0	Agriculture
Hattstedter Neuer Koog	1500	374	LGS	54° 33' N	8° 59' E	-1	Agriculture
Adenbüller Koog	1529	491	LGS	54° 22' N	8° 52' E	-2	Agriculture
Westermarscher Altes Neuland	1551	578	RLL	53° 34' N	7° 10' E	-2	Agriculture
Süderneuland	1556	633	RLL	53° 35' N	7° 12' E	-2	Rural area
Gottes Koog	1566	10,400	LGS	54° 53' N	8° 51' E	-2	Agriculture
Waygaarder Koog	1577	435	LGS	54° 42' N	8° 50' E	-3	Agriculture
Adolfs Koog	1579	431	LGS	54° 26' N	8° 58' E	-2	Agriculture
Westermarscher Neuland	1583	585	RLL	53° 34' N	7° 10' E	-2	Agriculture
Osteeler Neuland	1585	228	RLL	53° 33' N	7° 13' E	-2	Agriculture
Butsloot (Schleswig-Holstein)	1585-1648		RLL				
Addingaster Neuland	1589-1593	229	RLL	53° 35' N	7° 13' E	0	Urban
Blockland	1598	3030	RLL	53° 9' N	8° 48' E	1	Urban
Coastal reclamations in East-Friesland. Rolwagen	Early 17 <sup>th</sup> century		RLL				
Schoonorth	1603	418	RLL	53° 30' N	7° 11' E	-1	Agriculture
Bunder Neuland	1605		RLL	53° 10' N	7° 14' E	-4	Agriculture
Werdumer Altengroden	1617		RLL	53° 33' N	8° 6' E	3	Urban
6 polders along the Eider	1619-1623		RLL				

Drained lakes around Friedrichstadt (Schleswig-Holstein)	1627-1634		DL	54° 22' N	9° 5' E	-1	Agriculture
Drained Megger-, Börmer- and Bergenhusener lakes in Stapelholm	1630		DL	53° 23' N	9° 23' E	0	Agriculture
Blumen Koog	1652	180	RLL	54° 42' N	8° 49' E	-3	Agriculture
Coastal reclamations Isle of Pellworm (Schleswig-Holstein). Allerts. Coastal reclamation drowned Isle of Nordstrand (Schleswig-Holstein) Indervelde Neu-Holland near Oranienburg, Liebenwald and Cremmen (upstream of the Elbe)	1654-1691		LGS	54° 31' N	8° 39' E	-3	Agriculture
Enno-Ludwig Groden	1658		RLL	53° 40' N	7° 49' E	-2	Agriculture
Charlottenpolder	1677-1679	602	RLL	53° 11' N	7° 15' E	-2	Agriculture
Grothusen Koog	1693	327	LGS	54° 18' N	8° 45' E	-1	Agriculture
Hedwigen Koog	1696	1636	LGS	54° 11' N	8° 50' E	-1	Agriculture
Norderfriedrichs Koog	1696	531	LGS	54° 24' N	8° 54' E	0	Agriculture
Sophiengroden	1698		RLL	53° 41' N	7° 51' E	-1	Agriculture
Bunder Interessentenpolder mit Norder- und Süder-Christian-Eberhards-Polder	1707		RLL	53° 12' N	7° 13' E	-1	Agriculture
Friedrichsgabe Koog	1714	862	LGS	54° 09' N	8° 57' E	0	Agriculture
Kleiner Addinggaster Polder	1715	76					
Kleiseer Koog	1727	1265	LGS	54° 45' N	8° 47' E	-1	Agriculture
Carolinengroden	1729		RLL	53° 41' N	7° 48' E	-2	Agriculture
Elisabeth Sophien Koog	1739	529	LGS	54° 30' N	8° 53' E	-1	Agriculture
Sophien Magdalenen Koog	1743	608	LGS\	54° 37' N	8° 57' E	-1	Agriculture
Oderbruch (Brandenburg) Van Haerlem, Petri (Du)	1746-1758	85000	RLL	52° 42' N	14° 18' E	2	Agriculture
Landschafts Polder	1752	1119	RLL	53° 14' N	7° 15' E	-1	Agriculture
Friedrichsgroden	1765		RLL	53° 42' N	7° 47' E	-1	Agriculture
Friedrich-Augustengroden	1765		RLL	53° 42' N	7° 57' E	-2	Agriculture
Desmercieres Koog	1767	360	LGS	54° 34' N	8° 57' E	0	Agriculture
Magots Polder	1768	85	RLL	53° 30' N	7° 10' E	-2	Agriculture
Leysand Polder	1769	145	RLL	53° 33' N	7° 12' E	0	Agriculture
Hagen Polder	1770	133	RLL	53° 31' N	7° 11' E	-1	Rural area
Zucker Polder	1774	15	RLL	53° 35' N	7° 12' E	0	Urban
Buscher Polder	1775	48					
Juliane Marien Koog	1778	329	LGS	54° 44' N	8° 45' E	-1	Agriculture











Schulenburg Polder	1781	241	RLL	53° 31' N	7° 11' E	-1	Agriculture
Kronprinzen Koog	1787	2885	LGS	53° 58' N	8° 58' E	-1	Agriculture
Lorenz und Friederiken Polder	1789	60					
Heinitz Polder	1795	3086	RLL	53° 16' N	7° 15' E	-2	Agriculture
Louisen Koog	1799	409	LGS	54° 39' N	8° 52' E	-1	Agriculture
Angern Polder	1804	49	RLL	53° 29' N	7° 8' E	-2	Agriculture
Teltings Polder	1804	28	RLL	53° 34' N	7° 11' E	-1	Agriculture
Ernst August Polder	1804	218	RLL	53° 32' N	7° 11' E	-1	Agriculture
Schweringsgroden	1804-1833		RLL	53° 42' N	7° 48' E	-1	Agriculture and recreation
Neu-Augustengroden	1806-1810		RLL	53° 42' N	7° 52' E	-2	Agriculture
Kielgroden	1810		RLL	53° 28' N	7° 59' E	2	Agriculture
Königs Polder	1854						
Wesselburener Koog	1862	1306	LGS	54° 14' N	8° 53' E	0	Agriculture
Kaiser Wilhelm Koog	1874	22	LGS	53° 56' N	8° 56' E	0	Agriculture
Kanal Polder	1877	38	RLL	53° 15' N	7° 14' E	-1	Agriculture
Elisabethgroden	1894-1895	12,830	RLL	53° 42' N	7° 50' E	-1	Agriculture
Cecilien Koog	1905	400	LGS	54° 35' N	8° 55' E	0	Agriculture
Hafenpolder	1905		RLL	53° 20' N	7° 13' E	0	Urban and harbour
Larrelter and Wybelsumer Polder	1912-1923	630	RLL	53° 34' N	7° 14' E	-3	Rural area
Schoonother Polder	1913	377	RLL	53° 30' N	7° 12' E	-2	Agriculture
Pohnshallig Koog	1924	795	LGS	54° 30' N	8° 56' E	-1	Agriculture
Neufelder Koog	1925	976	LGS	53° 54' N	8° 59' E	2	Agriculture
Sönke Nissen Koog	1926	1200	LGS	54° 37' N	8° 53' E	-1	Agriculture
Grohde Polder	1926-1928	180	LGS	53° 42' N	7° 15' E	0	Agriculture
Cirksena Polder	1928	41					
Neuwesteel	1929	646	RLL	53° 32' N	7° 10' E	-1	Agriculture
Herren Koog	1930	1500	LGS	54° 44' N	8° 48' E	-2	Agriculture
Hermann Goringkoog later renamed as Tümlauer Koog	1935	580	LGS	54° 21' N	8° 41' E	-1	Agriculture
Adolf Hitler Koog later renamed as Dieksanderkoog	1935	1334	LGS	53° 58' N	8° 56' E	-1	Agriculture
Sommerdeich (Langeoog)	1934-1935	218	RLL	53° 56' N	8° 57' E	2	Agriculture
Nösse Koog	1936	178	LGS	54° 53' N	8° 35' E	0	Nature
Osewoldter Koog	1936	176	LGS	54° 43' N	8° 44' E	-1	Agriculture
Norderhever Koog	1937	650	LGS	53° 24' N	8° 47' E	1	Agriculture
Sudstrand Polder (Norderney)	1941	140					
Leybucht Polder	1950	1005	RLL	53° 31' N	7° 9' E	-1	Agriculture

Friedrich Wilhelm Lübke Koog	1954	1349	LGS	54° 52' N	8° 38' E	0	Agriculture
Groden westlich Harlesiel	1955-1959		RLL	53° 42' N	7° 47' E	-1	Agriculture
Hauke Haien Koog	1958 – 1960	1200	LGS	54° 42' N	8° 46' E	-1	Agriculture
Polder Neuensien (Rügen)	1972	40	RLL	54° 22' N	13° 40' E	6	Rural area
Speicher Koog Dithmarschen	1979	4640	LGS	54° 6' N	8° 58' E	-1	Nature
Rickelsbüller Koog	1981	534	LGS	54° 54' N	8° 39' E	0	Agriculture and nature
Beltringharder Koog	1987	3350	LGS	54° 34' N	8° 56' E	-1	Agriculture and nature
Fahretofter Wester Koog	1988	55	LGS	54° 43' N	8° 45' E	0	Nature
Polder Kaldauer Feld							
Total		172,768					




\*) RLL = reclaimed low-lying land; LGS = land gained on the sea; DL = drained lake

Table II. Pictures of polders and lowlands in Germany by Prof. Bart Schultz

			
<p>XV/3-1*) Plaque at the Statue of priest Heinrich in Steinkirchen, Germany. This priest has since 1106 guided the reclamation of swamps north-west of of Hamburg, July 2001</p>	<p>XV/3-2 Statue of priest Heinrich in Steinkirchen, July 2001</p>	<p>XV/4-1 Statue of priest Heinrich in Steinkirchen, July 2001</p>	<p>XV/4-2 Statue of priest Heinrich in Steinkirchen, July 2001</p>
			
<p>XV/4-3 Statue of priest Heinrich in Steinkirchen, July 2001</p>	<p>XV/4-4 Statue of priest Heinrich in Steinkirchen at the back Prof. Bart Schultz, July 2001</p>	<p>XV/5-1 Statue of priest Heinrich in Steinkirchen, July 2001</p>	<p>XV/5-2 Statue of priest Heinrich in Steinkirchen, July 2001</p>

\*) Batavialand/original

Table II. Pictures of polders and lowlands in Germany by Prof. Bart Schultz (continued)

			
<p>XV/6-1 Statue of priest Heinrichus in Steinkirchen, July 2001</p>	<p>XV/6-2 Statue of priest Heinrichus in Steinkirchen, July 2001</p>	<p>XV/6-3 Statue of priest Heinrichus in Steinkirchen, July 2001</p>	