OP-PEIL

Assessment criteria for the development of the controlled drainage suitability map

Use and Purpose of This Map

With this map, we aim to provide an initial assessment of the potential for controlled drainage in a given area, based on available map information about soil type, slope, and groundwater supply. However, there is a lot of specific information about a plot that cannot be derived from map data. Characteristics such as the heterogeneity of the plot or the presence of heavier soil layers just above or below the drainage pipes can have a major impact on the success of controlled drainage. These characteristics are, in most cases, only known by the owner or user of the plot or can only be determined in the field. Therefore, we see this map primarily as a first step in evaluating the opportunities for converting conventional drainage to controlled drainage, indicating which areas or plots are worth examining further. The final decision on conversion can only be made on-site.

Controlled drainage (CD) is a drainage technique at the plot level, which is drained with a network of permeable pipes underground. In contrast to classic drainage, the pipes end in a collection drain that can be controlled in a regulating well. Figure 1 schematically shows the distinction between a plot with classical drainage and a CD plot.

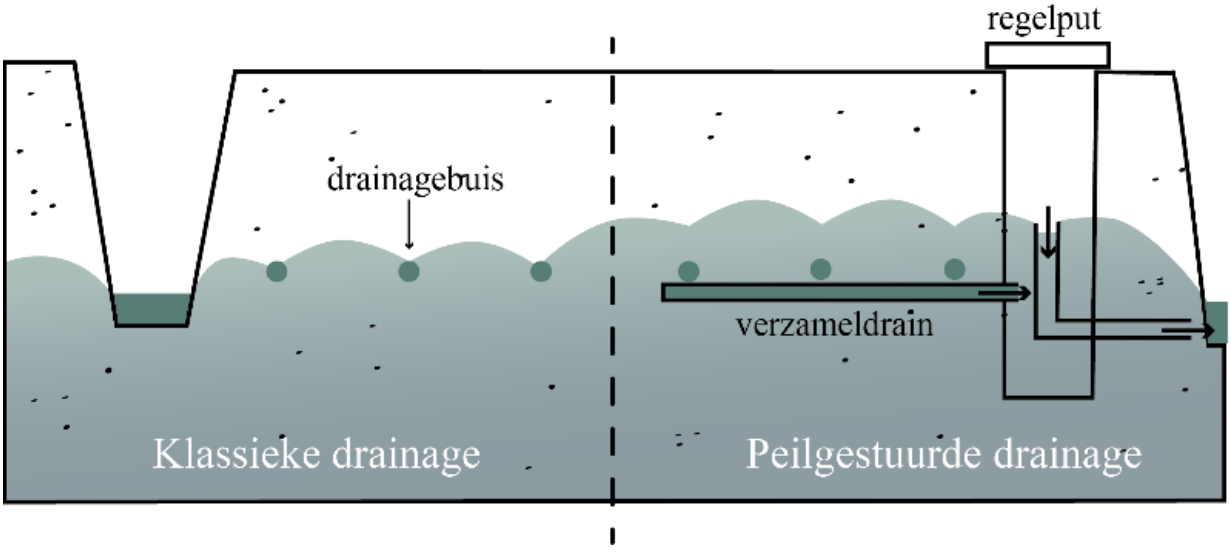

Figure 1: Schematic sketch of a classically drained plot and a plot equipped with controlled drainage.

The suitability for CD is evaluated based on three factors: 1) water permeability of the soil, 2) groundwater supply and 3) slope. Each factor is assessed with a score ranging from 0 (poor) to 3 (good). The factors together determine the CD suitability via a decision model.

The assessment of the three factors is briefly explained below. For more information, the handbook on PGD can be consulted at https://www.boerennatuur.be/peiloverzicht-drainage-het-handboek/ (Coussement et al., 2023).

The information used for the assessment of the factors is slightly different for the polder areas (Kustpolders, Meetjesland and Antwerp port) than for the other areas of the Flemish Region (Inner Flanders). The location of these zones is shown on the map below.

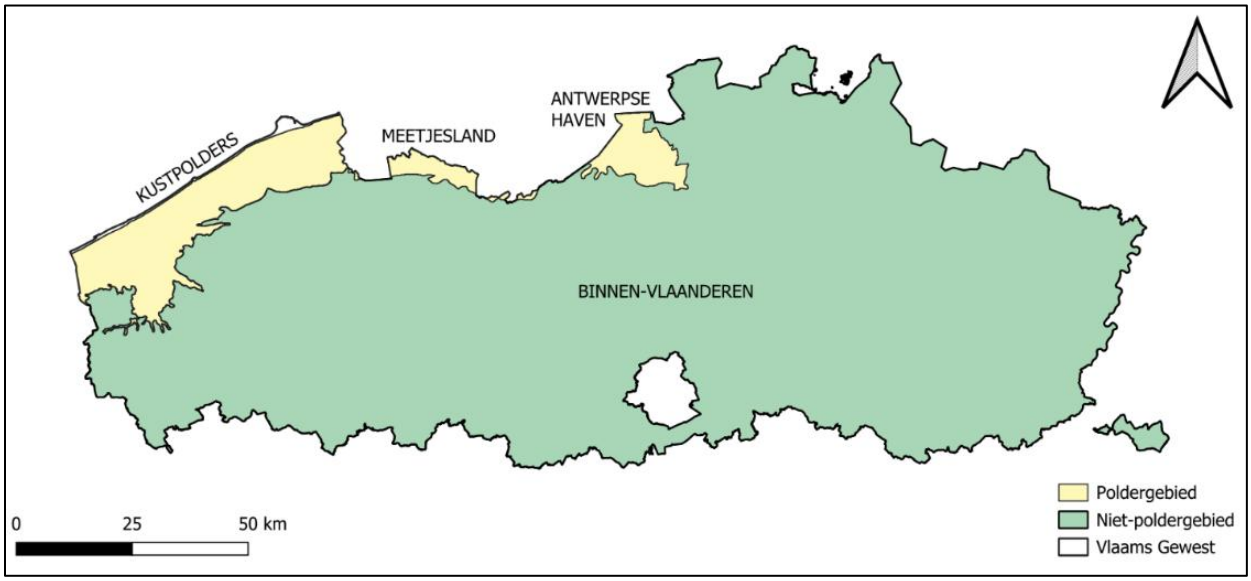

Figure 2: Zones in the Flemish Region that are taken into account when building the CD suitability map.

In the suitability map, areas whose soil profile has been completely changed or destroyed by human intervention according to the Soil Map of Belgium (category of anthropogenic soils) are not taken into account. For these areas, information about the texture class is lacking, which means that the water permeability of the soil cannot be assessed.

1 Assessment of factors Binnen-Vlaanderen (niet-poldergebied)

1.1 Water permeability of the soil

The water permeability of the soil is assessed based on the texture class specified by the Belgian Soil Map (Databank Subsurface Flanders, 2017). Table 1 shows the assessment of the different texture classes. Lighter textured soils receive a better rating than heavy textured soils, since for a successful application of level control the upper soil layers generally need to be well permeable

Table 1: Assessment table of the water permeability factor of the soil for Binnen-Vlaanderen.

Category	**Assessment (score)**
Sandy soils	Good (3)
Loamy soils	sufficient (2)
Clay soils	Moderate (1)
Not applicable	Bad (0)

1.2 Groundwater

The groundwater supply of the soil is assessed based on the drainage class specified by the Soil Map of Belgium (Databank Subsurface Flanders, 2017). Table 2 shows the assessment of the different drainage classes. The potential for CD is greater for zones where the groundwater is fed by seepage (seepage is the natural supply of groundwater from a nearby, often higher zone). Therefore, the naturally wetter soils receive a better assessment.

Table 2: Assessment table of the groundwater supply factors for Binnen-Vlaanderen.

Category	**assessment (score)**
(Very/extremely) wet soils	Good (3)
(Very) wet soils with a relatively high elevation, moderately wet soils	sufficient (2)
Moderately dry soils	Moderate (1)
(Very) dry soils	Bad (0)

1.3 Slope

The slope is calculated from the terrain model of the Digital Height Model Flanders II (Digital Flanders Agency, 2014). Table 3 shows the slope rating. In an almost flat landscape it is possible to manage the groundwater level over a large area using one control well. Therefore, areas with no or weak slope receive a better rating.

Table 3: Assessment table of the slope for Binnen-Vlaanderen.

Category	**Assessment (score)**
0 – 0.5 %	Good (3)
0.5 – 1 %	sufficient (2)
1 – 2 %	Moderate (1)
>2%	Bad (0)

2 Assessment factors for poldergebied

2.1 Water permeability of the soil

The water permeability of the soil is assessed based on the map layers for the polder areas that express the presence of sand, clay or peat in the upper part of the soil profile (De Louw et al., 2019). Table 4 shows the assessment of the different categories. Soils with a shallow presence of clay or peat are assessed less well, as for successful application of level control the upper soil layers generally need to be well permeable

Tabel 4: Assessment table of the groundwater supply factor for poldergebieden.

Category	Assessment (score)
Predominantly sand in the top meter of the soil profile	Good (3)
Possible presence of clay or peat in the top meter of the soil profile	sufficient (2)
Certain presence of clay or peat in the top meter of the soil profile	Moderate (1)
N/A	Bad (0)

2.2 Groundwater

The groundwater supply from the soil is assessed based on a map layer that specifies the seepage and erosion areas for the polder areas (De Louw et al., 2019). Table 5 shows the assessment of the different categories. The potential for CD is greater for zones where the groundwater is fed by seepage (seepage is the natural supply of groundwater from a nearby, often higher zone). That is why seepage areas receive a better assessment.

Table 5: Assessment table of the groundwater supply factors for poldergebieden.

Categorie	Assessment (score)
seepage	Good (3)
N.v.t.	sufficient (2)
Wegzijging	Moderate (1)
N.v.t	Bad (0)

2.3 Slope

The slope is calculated from the terrain model of the Digital Height Model Flanders II (Digital Flanders Agency, 2014). Table 6 shows the slope rating. In an almost flat landscape, it is possible to manage the groundwater level over a large area using one control well. Therefore, areas with no or weak slope receive a better rating

Tabel 6: Assessment table of the slope for poldergebieden.

Category	Assessment (score)
0 – 0.5 %	Good (3)
0.5 – 1 %	sufficient (2)
1 – 2 %	Moderate (1)
>2%	Bad (0)

3 Combined score for controlled drainage suitability

Thee three factors together determine the ultimate suitability or likelihood for CD. This led to the final suitability map for CD shown in Figure 3. The degree of suitibility is divided into four categories ranging from 'little promising' to 'very promising'. The decision rules for determining the category are shown in Table 7.

The suitability map for CD is intended as a tool for an initial assessment of the potential for level management. A conclusive assessment of the usefulness and feasibility of CD must also always be assessed on the ground

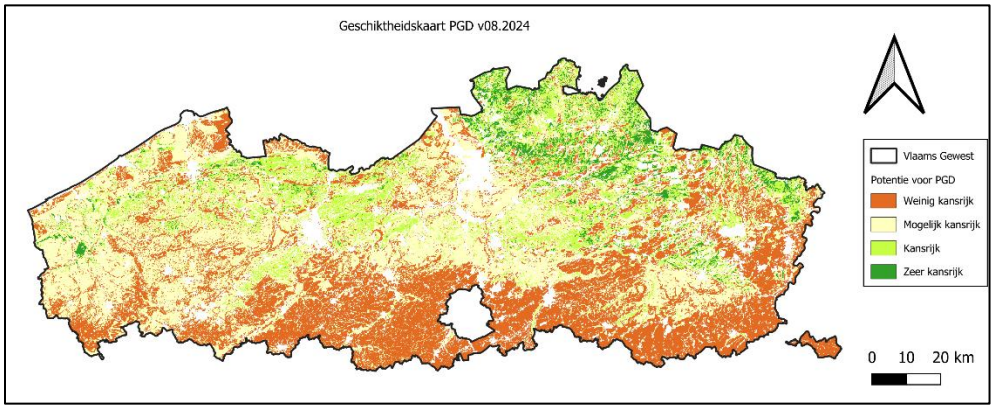

Figure 3: Suitability map controlled drainage.

Tabel 7: Decision table to assess the degree of probability for controlled drainage.

SUITABILITY	DECISION RULE
VERY SUITABLE (SCORE 4)	All factors rated as good (score 3)
PROMISING (SCORE 3)	Twee factoren beoordeeld als goed (score 3), en één factor beoordeeld als voldoende (score 2)
POSSIBLY SUITABLE (SCORE 2)	Two factors rated as good (score 3), and one factor rated as sufficient (score 2)
LITTLE SUITABLE (SCORE 1)	At least two factors rated as moderate (score 1); or at least one factor rated as poor (score 0)

References

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- Coussement, T., Meuris, S., Elsen, F. (2022). Peilgestuurde drainage – het handboek. Project uitgevoerd door Bodemkundige Dienst van België en Boerennatuur Vlaanderen. Eindrapport, 9/11/2022. 32 pp.
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- De Louw, P., van Baaren, E., Kaandorp, V., Galvis Rodriguez, S., Dupon, E., Huits, D., van Camp, M., Walraevens, K., Vandenbohede, A. (2019). TOPSOIL – GO FRESH Vlaanderen: Potenties om de zoetwaterbeschikbaarheid te verbeteren.

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