Scale issues in the assessment of pesticide leaching vulnerability for loamy structured soils in Denmark

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> 3 - Coarse clayey sand 4 - Fine clayey sand 5 - Coarse sandy clay

6 - Fine sandy clay

8 - Heavy clay 9 - Very heavy clay

11 - Organic

Measured data

14 - 50

51 - 100

101 - 150

151 - 200

Estimated from

measured data

Kmatrix shp (cm/d) <all other values>

0 - 10

The marked

Clay (kg/m2)

Background

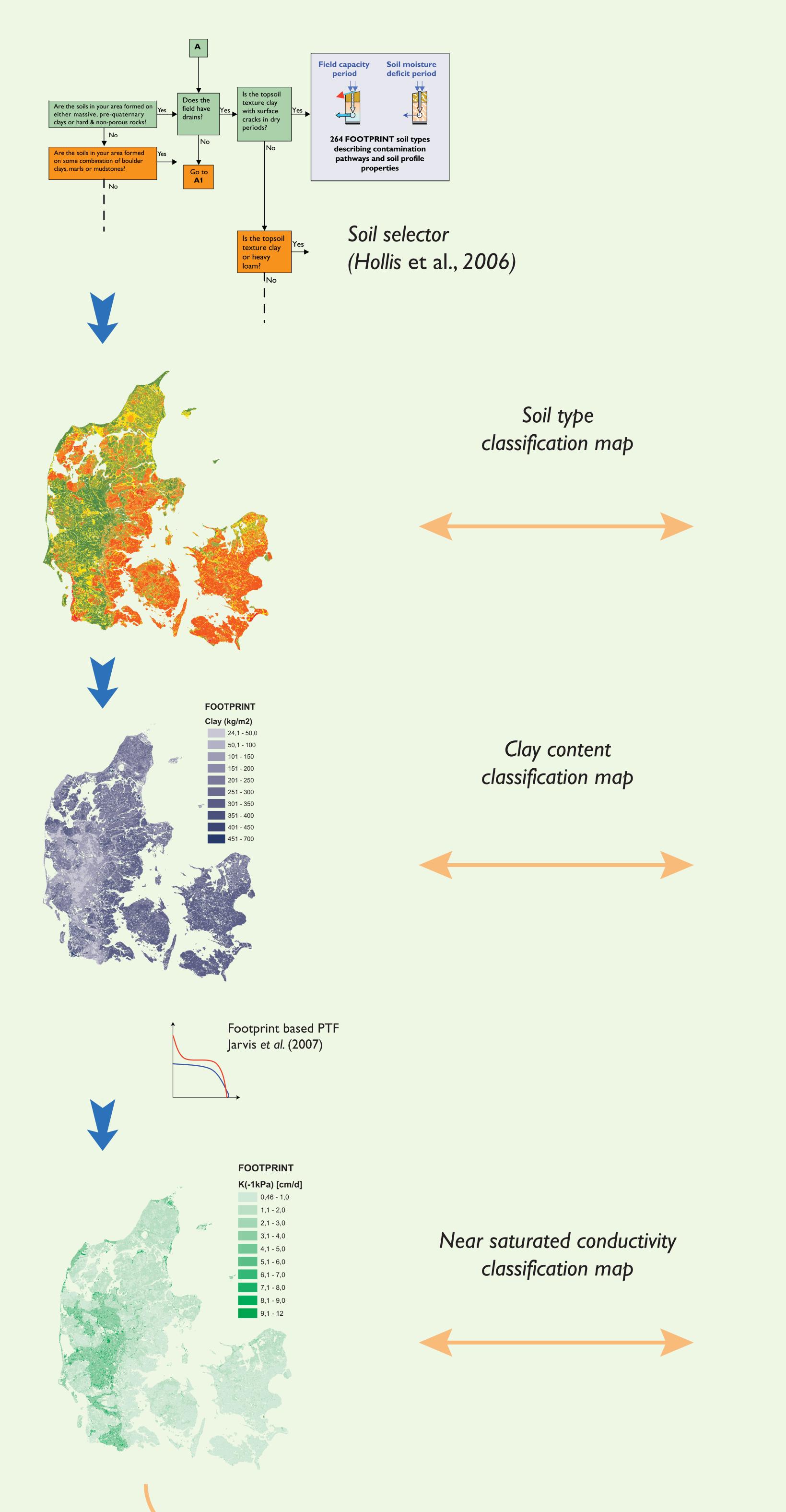
Vulnerability towards pollution of groundwater from pesticides needs to be assessed and mapped for legislative purposes at various spatial scales, national, regional and municipal. Mapping of vulnerability is a compromise between data availability and mapping requirements for legislation that complies with the EU Water Framework Directive. Rootzone leaching indicates where areas may be vulnerable, but only an integrated modeling approach can take account of all hydrologic interactions between groundwater and surface water. The integrated approach also can account for climate change effects for pesticide leaching to the aquatic environment. Examples of 3 different approaches are presented here for the case of Denmark.

Approach

Three approaches for vulnerability mapping of pesticide leaching for Denmark are considered. The first approach is based on an approach developed at the European spatial scale. The second approach relies on mapping soil hydraulic properties at a finer scale derived from a national soil property map. Both approaches rely on the findings that leaching of pesticides from well structured soils is sensitive to the occurrence of preferential flow. The near-saturated hydraulic conductivity (Kh) defined at a soil water potential of -1 kPa has been utilized as a threshold parameter to determine when preferential flow is likely to occur. Finally a third approach is considered in which an integrated catchment scale hydrological model is employed that allows taking into account implications on leaching due to change in climate and agricultural land management.

Discussion and conclusions

While it is clear that the spatial scale for pesticide leaching vulnerability mapping is dependent on the spatial scale of sampled data, the first approach that derived soil properties at the European scale captures the spatial distribution quite well as compared to data derived from soil property databases at the national scale. Nevertheless, within the context of WFD for small regions like Denmark detailed soil survey data is required. Mapping based on spatial distribution of near saturated hydraulic conductivity followed by 1-D root zone modeling has limited value as it does not take into account groundwater-surface water interactions, increasingly important for simulating ecological conditions. Combining mapping of sensitive hydraulic data and integrated hydrologic modeling is an appropriate way to account for such spatial interactions as well as effects of climate change.



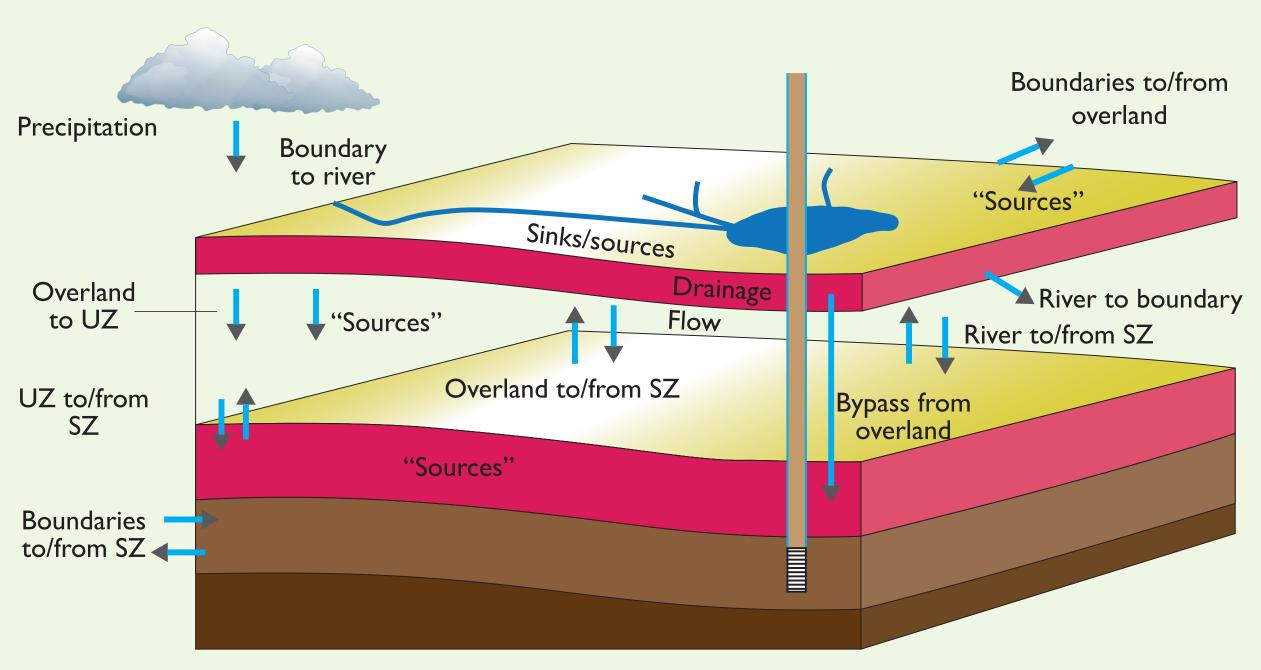
European Scale data

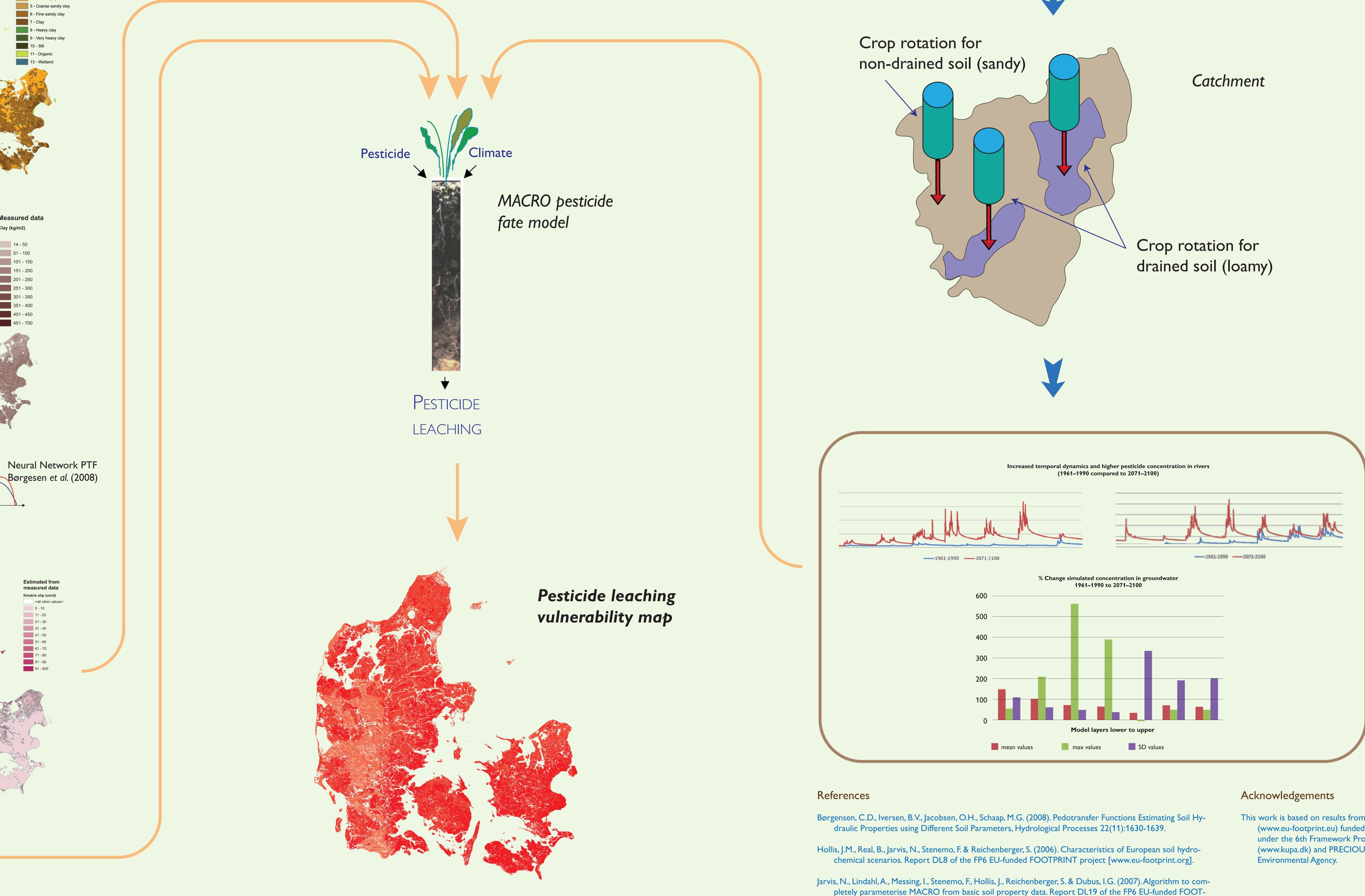
National (DK) Scale data

National texture database

>40.000 point in A-horizon >8.000 points in B-horizon >2.000 points in C-horizon

Regional and catchment scale modeling concept using MACRO-MIKE SHE

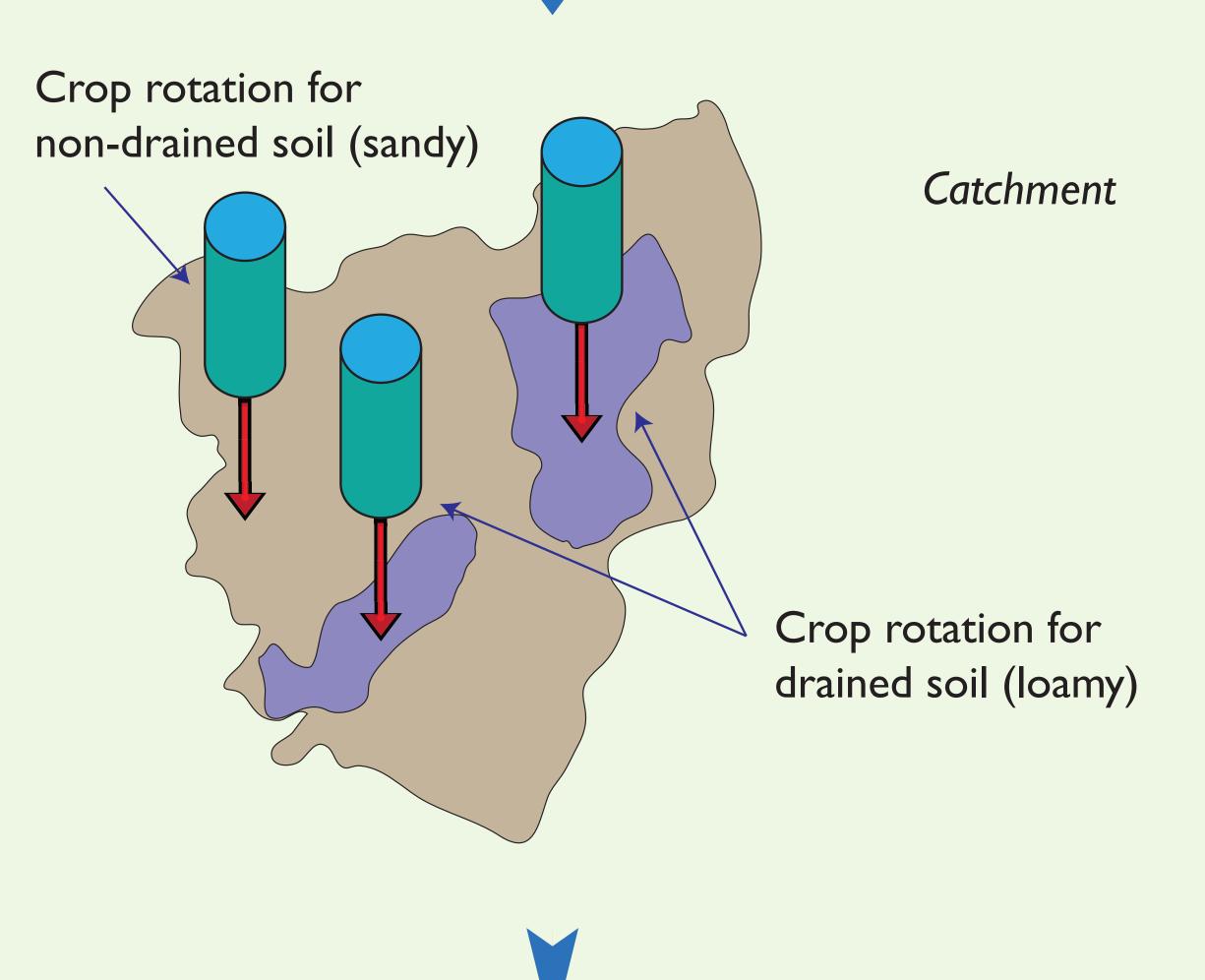




Regional/catchment scale data



Vejr, klima og hav



pletely parameterise MACRO from basic soil property data. Report DL19 of the FP6 EU-funded FOOT-PRINT project [www.eu-footprint.org], 18p.

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