PlasticFreeDanube

MAP OF PLASTIC ACCUMULATION ZONES

Report

DOCUMENT INFORMATION	
Work Package	3 Material Flow and Transport Modelling
Activity	3.5 Identification of potential plastic accumulation zones
Detailoutput	3.5.1 Map of plastic accumulation zones

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1. Introduction

One of the objectives of the project „PlasticFreeDanube“ is an analysis of the main sources, inputs and pathways of plastic waste in the Danube and on its river banks. Therefore, a general GIS-based analysis was performed serving as a basis for the development of a material flow and transport model for (macro-)plastic waste in and along the Danube. The resulting description of the project area located between Vienna and the hydropower plant Gabcikovo regarding economy, population, land use, hydrology and waste management system as well as a depiction of potential pollution sources and input pathways in the project area is given in the deliverable D.3.1.1 GIS analysis of the project area.

In activity 3.5 a map of plastic accumulation zones in and along the project-reach of the Danube is comprised. Within this activity typical plastic accumulation zones were selected and evaluated according to hydromorphological aspects. This investigation is a prerequisite to define sections in the project area (groyne fields, river outer bends, backwater zones), which will be hydrodynamically modelled within the scope of this work package. This approach strengthens process understanding of plastic debris flows in streams and holds opportunities for the removal of these pollutants.

2. Methodology

Within the context of project „PlasticFreeDanube“ accumulation zones were defined as areas in the waterbody or at river banks where plastic waste accumulates regularly in higher amounts. By identifying these zones, waste can be systematically removed and eventually measures can be taken in order to prevent further transport. Examples for accumulation zones are e.g. grates at hydropower plants, groynes fields, gravel bars, zones with riparian vegetation, side channels as well as woody debris. In order to evaluate and define accumulation zones in the project reach various approaches were considered:

- Available data and expertise from the National Park Donau-Auen
- Site visits and collection campaigns within the scope of the project „PlasticFreeDanube“
- GIS- and orthophoto-based analysis of engineering structures along the Danube River

2.1. Data and expertise from Nationalpark Donau-Auen

Figure 1 shows a map of designated accumulation zones provided by the Nationalpark Donau-Auen. The areas shown in red represent locations of repeated sampling campaigns due to high accumulation tendencies. All designated zones are located on the right river bank covering river banks, side channels, woody debris, anabranch systems and gravel bars with related riparian vegetation.

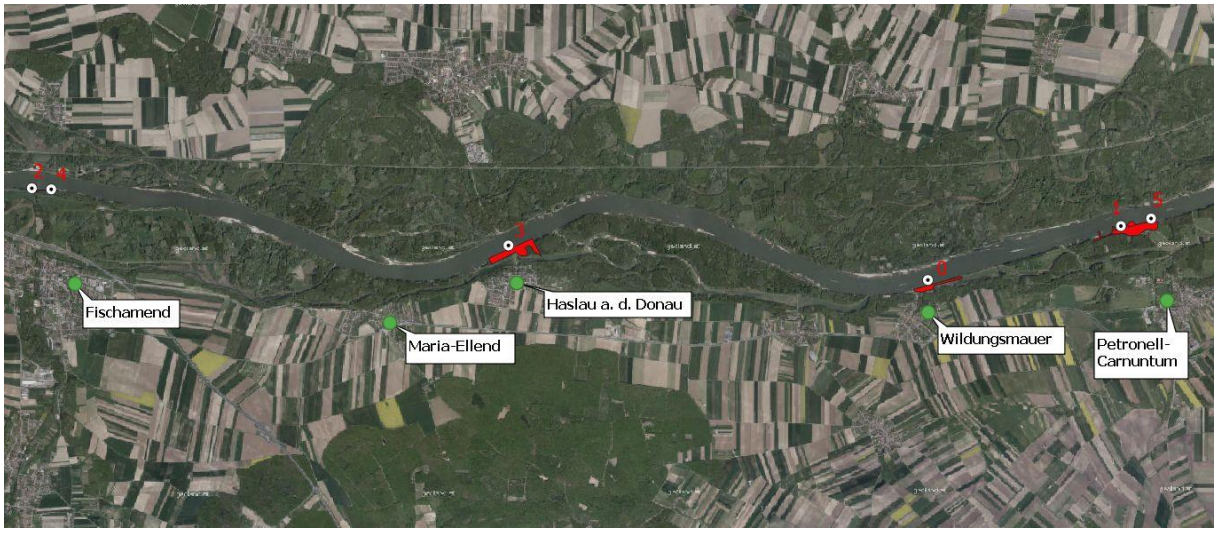


Figure 1 Accumulation zones most sampled by Nationalpark Donau-Auen

2.2. Site visits and collection campaigns

During site visits and collection campaigns within the frame of the current activity mainly identifying accumulation spots and their characteristic towards hydromorphology was focussed. Based on expertise from rangers of the National Park Donau-Auen several known accumulation areas were investigated on site. Typical items and their locations were recorded via GPS and documented. Figure 2 shows macro plastic accumulations detected during a site visit and sampling campaign in a dried-out anabranch near Fischamend mainly consisting of PET bottles and EPS (expandable polystyrene) parts. Figure 3 gives an impression of accumulation zones in groyne fields and related woody debris detected during a site visit and sampling campaign near Petronell-Carnuntum representing a different characteristic towards hydromorphology. An example of bank near accumulations is given in Figure 4.



Figure 2 Macro plastic accumulations detected during a site visit and sampling campaign in a dried-out anabranch near Fischamend



Figure 3 Macro plastic accumulations detected during a site visit and sampling campaign in groyne fields and woody debris near Petronell-Carnuntum



Figure 4 Macro plastic accumulations detected during a site visit and sampling campaign along the river bank near Haslau-Regelsbrunn

2.3. GIS and orthophoto based analysis of engineering structures along the Danube River

Along with site visits and collection campaigns a systematic GIS and orthophoto based analysis of engineering structures along the Danube River was performed. Figure 5 depicts transverse (groynes) and longitudinal (bank protection & guiding walls) hydraulic structures along the Danube River near Haslau-Regelsbrunn exemplarily. Also, presence of gravel bars, vegetation, inner/outer bend situation are considered in the evaluation. By characterizing hydromorphological structures and referring it to accumulations found in the field it is aimed to delineate different zones of plastic deposition as well as zones for frequent long-term sampling spots in bank-near and floodplain areas.

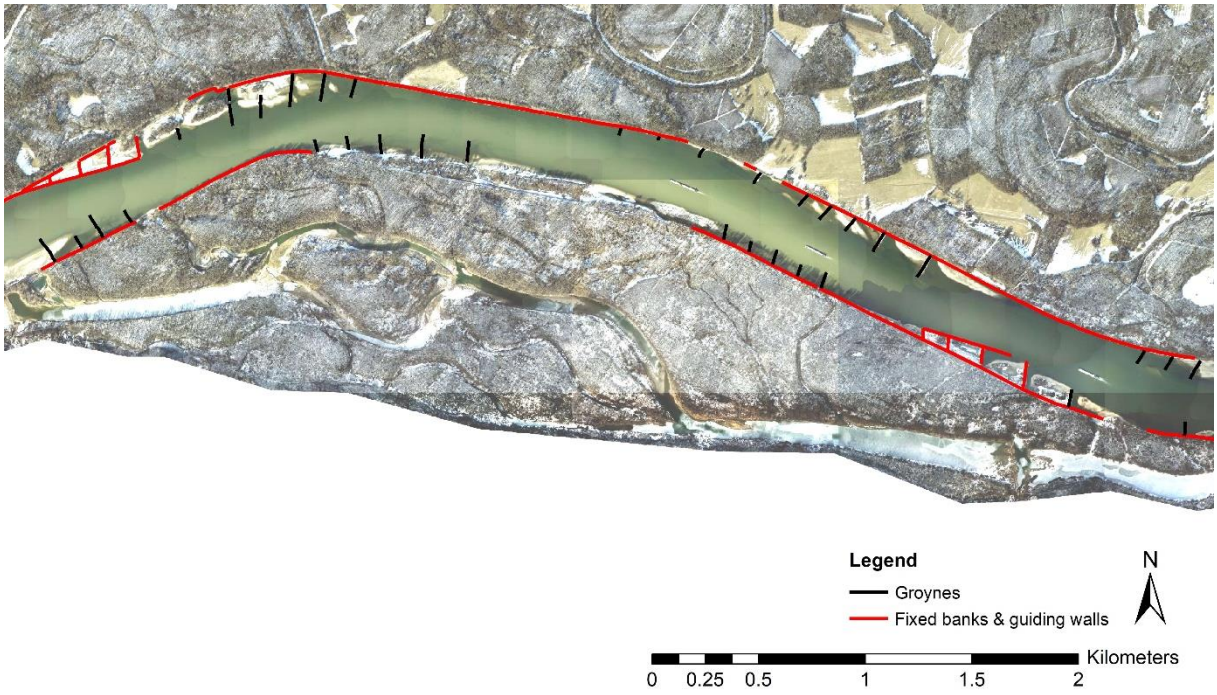


Figure 5 Map of transverse (groynes) and longitudinal (bank protection & guiding walls) hydraulic structures along the Danube River near Haslau-Regelsbrunn

3. Results

Several approaches were applied to identify and characterize plastic accumulations zones with a focus on hydromorphological aspects including data analysis as well as site visits. The resulting maps of plastic accumulation zones are depicted in the following in separate layers.

Figure 6 refers to accumulation zones visited and investigated during a site visit near Fischamend (green), Haslau-Regelsbrunn (red) and Petronell-Carnuntum (blue). All 3 sites are located on the right river bank of the Danube River.

Based on the derived findings from site visits, available data from experts of the Nationalpark Donau-Auen and a GIS-based hydromorphological analysis reaches for 2D and 3D numerical simulation were defined as depicted in Figure 7. The modelling reaches cover:

- 3D model Haslau-Regelsbrunn: river-kilometer 1901 - 1903,5
- 3D model Haslau-Wildungsmauer-Witzelsdorf: river-kilometer 1903,5 1891,7 - 1895,2
- 2D model Vienna-Bratislava: river-kilometer 1907 - 1881,3

The current task also contributed to define sampling points for repeated bank near and Hinterland sampling of macro plastic (Figure 8) in order to cross-validate numerical simulations. Special focus was given to this section due to its change from inner to outer band, the associated side channel system, natural as well as confined river banks, groyne fields, alluvial vegetation and is therefore considered as a representative section for the Danube River east of Vienna.

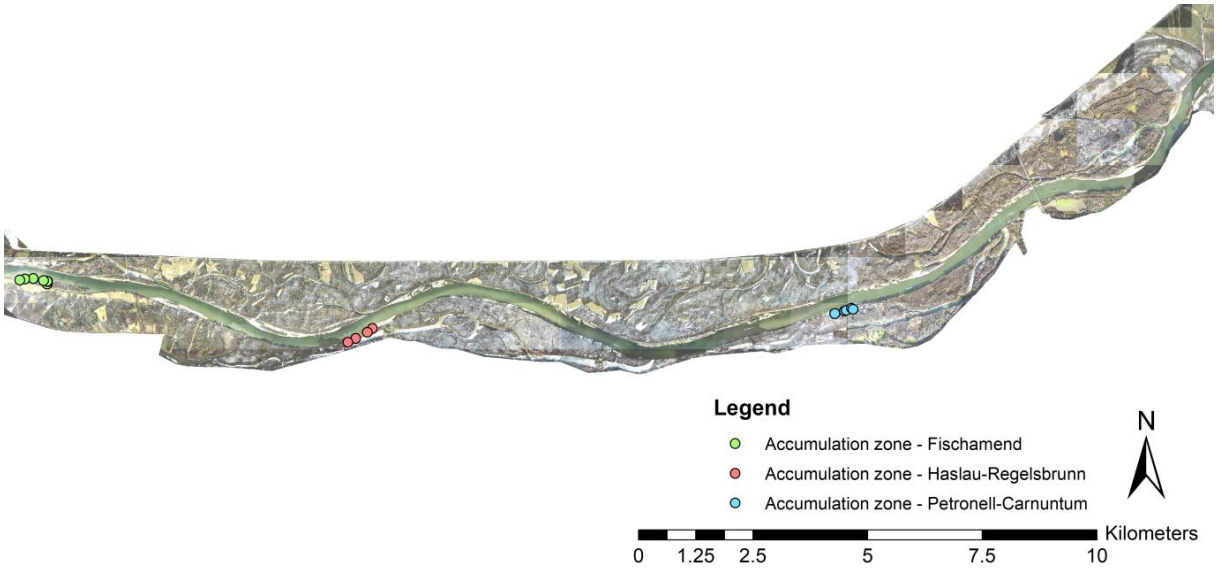


Figure 6 Accumulation zones detected during a site visit

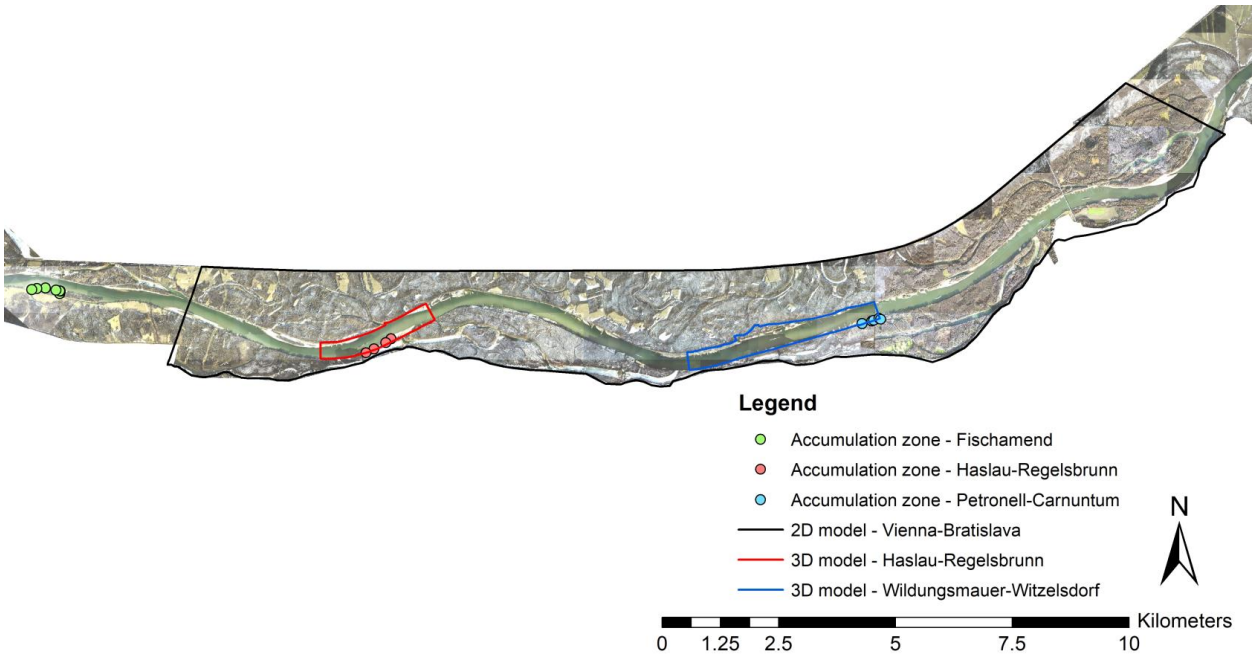


Figure 7 Defined modelling reaches for 2D and 3D numerical simulation based on accumulation zones detected during site visits, expertise from Nationalpark Donau-Auen and GIs-bases analysis of the hydraulic structures of the Danube River

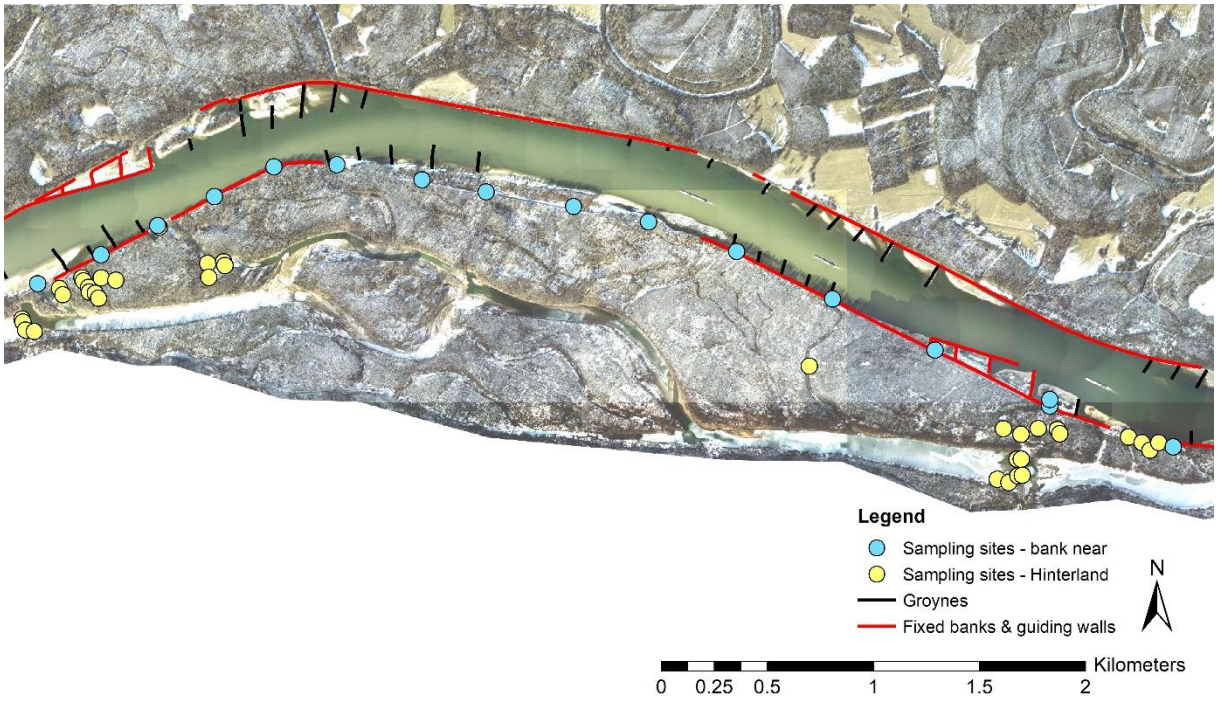


Figure 8 Defined sampling points for repeated bank near and Hinterland sampling of macro plastic

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