

## Plant biomass - grassland

Responsible partner: FAUNS

Actuality: November 2021

### Interpretation

The indicator describes the usable ecosystem service of biomass yields obtained from pastures and meadows, taking into account site-specific conditions (yield potential, flooding regime) on grassland areas. It indicates the level of grassland yields to be expected in the floodplain segments or compartments with reference to their size. For this purpose, the proportion of grassland area in the reference area is multiplied by the respective yield potential, and the result is classified using the yield potential scale. Due to the reference to the grassland share, the minimum yield in a segment may take the value of 0 kStE/ha (River Ecosystem Service Index) or < 0.2 of max (IDES), even if the data on yield potential show a high soil fertility. In case no grasslands are existing in the respective segment/compartment, the evaluation class "0" should be assigned that was introduced in the Danube-wide assessment.

The input of operating resources is not taken into account here, only the natural site conditions are included.

### References

Stahl, H., Zacharias, S. & Röhrich, C. (2005). Veränderte Landnutzungssysteme in hochwassergefährdeten Gebieten. Schriftenreihe der Sächsischen Landesanstalt für Landwirtschaft, Heft 12, 10.Jg. Sächsische Landesanstalt für Landwirtschaft, Fachbereich Pflanzliche Erzeugung, Dresden

ZALF e.V. (2010). MinHorLam. Minderung von Hochwasserrisiken durch nicht-strukturelle Landnutzungsmaßnahmen in Abflussbildungs- und Überschwemmungsgebieten – eine transdisziplinäre Studie zur Effektivität solcher Maßnahmen – Ergebnisbericht

### ■ Original approach according to River Ecosystem Service Index (RESI) (Podschun et al., 2018)

Class	Abbr.	Description		Spatial reference	
Provisioning	PBI	Plant biomass used for agricultural purposes (yield of meadows and pastures)		Floodplain segment or compartment <input checked="" type="checkbox"/> former floodplain <input checked="" type="checkbox"/> active floodplain <input type="checkbox"/> river	
Variable	Abbr.	Unit	Variable description	Data basis	Comment
Reference areas (segment- or compartment)	$A_{Seg}$ $A_{Comp}$	ha	Calculation of the area	- Floodplain segment - Floodplain compartment	
Grassland in the floodplain segment (separated into active and former floodplain)	$GL_{act}$ $GL_{for}$	ha	Calculation of area: Grassland within the reference areas	- Corine Landcover Classification (CLC) - National Land Cover Model - Optionally aerial photographs	
Site-specific yield potential of meadows and pastures	$YP$	kStU/ha (kilo starch units /ha)	Weighting of grassland according to yield potential	- Agricultural site mapping (describing the value of the site for agricultural use, mainly depending on soil type)	Classification might differ between countries
Flood-induced yield loss (restrictions of use)	$YL_{Fl}$	constant	Risk of flooding and yield loss in the active floodplain	- Flood hazard maps HQ <sub>5</sub> , HQ <sub>10</sub> , HQ <sub>20</sub> - Water level data	Estimate

Calculation					
Calculation steps			Indicator		
<ol style="list-style-type: none"> <li>1. Determination of the reference area size for each segment or compartment j (GIS)</li> <li>2. Identification of all grassland i within the reference areas j from land use data (GIS) with differentiation according to location (active or former floodplain)</li> <li>3. Intersection of arable land with agricultural site mapping or with data on yield potential (GIS)</li> <li>4. Determination of the relevant flood probability for the active floodplain from water level records (tide gauge data) or flood hazard maps (simplified procedure)</li> <li>5. Calculation of the indicator for each reference area</li> <li>6. Classification of the resulting arable yield into 5 classes</li> </ol>			<p>Calculation of potential yields of meadows and pastures within the river-floodplain segments (for j =river-floodplain segments)</p> $PBI(j) = \sum_{i=1}^n (j) \frac{GL_{for i} * YP_i}{A_{seg j}} + \frac{GL_{act i} * YP_i}{A_{seg j}} * YL_{Fl}$ <p>j = 1, 2, ...m Floodplain segments/compartments i = 1, 2, ...n Partial area within segments/compartments</p>		
PBI	> 4300 kStU/ha	> 3700 – 4300 kStU/ha	> 3100 – 3700 kStU/ha	> 2500 – 3100 kStU/ha	< 2500 kStU/ha
Evaluation Class	5	4	3	2	1
Qualitative Evaluation	Very high yields	High yields	Average yields	Low yields	Very low yields

#### ■ Adaption for Danube-wide application

Class	Abbr.	Description		Spatial reference	
Provisioning	PBI	Plant biomass used for agricultural purposes (yield of meadows and pastures)		Floodplain segment or compartment <input checked="" type="checkbox"/> former floodplain <input checked="" type="checkbox"/> active floodplain <input type="checkbox"/> river	
Variable	Abbr.	Unit	Variable description	Data basis	Comment
Reference areas (segment- or compartment)	$A_{seg}$ $A_{comp}$	ha	Calculation of the area	- Floodplain segment - Floodplain compartment	
Grassland in the floodplain segment (separated into active and former floodplain)	$GL_{act}$ $GL_{for}$	ha	Calculation of area: Grassland within the reference areas	- Corine Landcover Classification (CLC)	
Site-specific yield potential of meadows and pastures	YP	Ordinal (1-5)	Weighting of grassland according to yield potential	- Agricultural site mapping (describing the value of the site for agricultural use, mainly depending on soil type)	Classification might differ between countries
Flood-induced yield loss (restrictions of use)	$YL_{Fl}$	constant	Risk of flooding and yield loss in the active floodplain	- Flood hazard maps HQ <sub>5</sub> , HQ <sub>10</sub> , HQ <sub>20</sub>	Estimate

Calculation						
Calculation steps				indicator		
<ol style="list-style-type: none"> <li>1. Determination of the reference area size for each segment or compartment j (GIS)</li> <li>2. Identification of all grassland i within the reference areas j from land use data (GIS) with differentiation according to location (active or former floodplain)</li> <li>3. Intersection of grassland with agricultural site mapping or with data on yield potential (GIS)</li> <li>4. Determination of the relevant flood probability for the active floodplain from flood hazard maps (simplified procedure) (GIS)</li> <li>5. Calculation of the indicator for each reference area</li> <li>6. Classification of the resulting production biomass index into 5 classes</li> </ol>				Calculation of potential yields of meadows and pastures within the river-floodplain segments (for j =river-floodplain segments) $PBI(j) = \sum_{i=1}^n (j) \frac{GL_{for i} * YP_i}{A_{seg j}} + \frac{GL_{act i} * YP_i}{A_{seg j}} * YL_{FI}$ j = 1, 2, ...m Floodplain segments/compartments i = 1, 2, ...n Partial area within segments/compartments		
PBI	> 0.8 of max (PBI)	0.8-0.6 of max(PBI)	0.6-0.4 of max(PBI)	0.4-0.2 of max(PBI)	< 0.2 of max (PBI)	0
Evaluation Class	5	4	3	2	1	0
Qualitative Evaluation	Very high yields	High yields	Average yields	Low yields	Very low yields	No grasslands

## ■ Data sources

Data set	Data type	Spatial reference	Spatial resolution	Source	Creation date	Comments
A <sub>Seg</sub> , A <sub>Comp</sub>	polygons			river-floodplain segments (1-10 km)	2021	
GL <sub>Act</sub> , GL <sub>For</sub>	polygons	International		CLC_2018		
YP classes	polygons			National soil datasets for Austria, Slovenia, and Serbia, SGDB for the other countries		YP is a relative value based on the official fertility classification of soils, which ranges from 1 = very low to 5 = very high Classification based on soil expert opinion and <a href="https://esdac.jrc.ec.europa.eu/public_path/shared_folder/datas-et/45_biomass_prod/SoilProd_model_soiltype_tables.xlsx">https://esdac.jrc.ec.europa.eu/public_path/shared_folder/datas-et/45_biomass_prod/SoilProd_model_soiltype_tables.xlsx</a>
YL <sub>FI</sub> classes	polygons			National datasets (Romania, Austria, Germany, Hungary, Slovenia), <a href="http://www.geo.u-szeged.hu/dfgis/">http://www.geo.u-szeged.hu/dfgis/</a> for Serbia		YL <sub>FI</sub> is defined as the averaged annual yield loss due to flooding. Calculation was not performed for AFP where is missing data about flooding probability (Croatia, Bulgaria, Slovenia (Sava))