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The Hydromorphological Index of Diversity HMID - an objective tool to assess, compare and improve aquatic habitat diversity of streams

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Hydromorphological conditions of streams are critical to the ecological integrity of freshwaters. Thus, it is necessary that methods to evaluate hydromorphological conditions of streams at an ecologically relevant scale are available.

The Hydromorphological Index of diversity HMID has been developed by means of extensive field works, hydrodynamic numerical modelling and statistical analysis. Its formulation is based on the coefficient of variation (CV = standard deviation / mean) of water depth and flow velocity and allows appraising habitat heterogeneity at a reach scale. Thus, the HMID is not subject to observer bias which might be the case in applying visual assessment methods.

The HMID of a reach is calculated by multiplying the partial diversity of the hydraulic variables flow velocity (v) and water depth (d), by:

$HMID = (1+CVv)^2 * (1+CVd)^2$

The HMID can be applied for different purposes:
• By means of field work where water depth and flow velocity are recorded, it is possible to determine habitat heterogeneity for the flow during the field campaign and, by comparison with a reference condition, to assess habitat heterogeneity of a stream reach;
• Hydrodynamic modelling of a stream reach for different discharges allows to determine HMID for the modelled discharges and therefore to evaluate temporal variability of habitat heterogeneity. Thus, threshold discharges where habitat heterogeneity becomes can be defined.
• Comparing the HMID between different stream reaches with varying morphological characteristics, a ranking of reaches with respect to habitat heterogeneity can be conducted and gaps to a reference conditions established.
• In river restoration projects where habitat enhancement is the goal, calculation of HMID allows to quantify the improvement of habitat heterogeneity for different project alternatives under discussion. Thus, being an objective comparative tool, the HMID delivers a decision support to the project designer.

In the presentation the development stages of the HMID will be described. Different examples for application by means of case studies will be shown. Advantages and drawbacks in comparison to alternative methods will be enlightened.