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Decentralised Flood Protection: key step to natural flood management

Scientists have modelled the potential benefits of decentralised flood protection (DFP) in Central Europe and conclude that it could be a significant step towards natural flood management in the EU.

DFP describes a network of individual flood protection measures using small technical interventions distributed throughout an entire drainage area, rather than applying large technical measures, such as dams, at sites of peak flood risk.

The new study concentrated on measures that tackle flood discharge after excess water (i.e. stormwater runoff) has concentrated in river channels. These include construction of retention basins (small dams or artificial lakes lined with vegetation), renaturation of river channels by restoring meanders and vegetation, and afforestation of floodplains.

The researchers investigated all three approaches in the mountain catchment of the upper Flöha river on the Germany-Czech Republic border. The mountain regions of southeastern Germany experienced more than €1.2 billion worth of damage following a storm in 2002.

Using real storm data from the period 2002-2008, the researchers simulated a flood event with a recurrence interval of 100 years, then again following the introduction of 32 small (10-65,000 m^3 capacity) retention basins positioned either upstream of villages prone to flooding or in low gradient valleys with high water storage potential.

Locally, the retention basins solved the problem of storm runoff for some villages by reducing peak flows by up to 48% and delaying the flood peak by 6-10 hours. The exact efficiency was related to the available storage capacity in the valleys upstream of the settlements, resulting in a reduction in runoff of 10% over the whole catchment. The basins generally drained within 36 hours, minimising the ecological impact, i.e. the adverse effect of standing water on the surrounding vegetation.

Renaturation only had a low impact, which the researchers attributed to a limited number of suitable river sections and high slope gradients. However, renaturation (especially restoration of former meanders) should not be excluded as it could help offset the ecological impact of constructing retention basins.

Afforestation of floodplains reduced peak flows by up to 4% when applied to all unwooded floodplains rather than restricted to 5m riparian zones along river banks. Over the whole catchment, afforestation in combination with retention basins reduced flood peak by 12.8% and delayed it by 3 hours, providing earlier warning times for nearby settlements.

DFP could make an important contribution to flood protection strategies by shifting from flood defence to management of flood risk, as targeted under the integrated Flood[1] and Water Framework[2] Directives. This approach also extends flood protection to the watershed, not just to the receiving water. The researchers highlight that DFP should be used alongside, not necessarily instead of, traditional large-scale technical solutions, such as building dykes and dams.

1. EU Flood Directive. See: http://ec.europa.eu/environment/water/flood_risk/index.htm
2. EU Water Framework Directive (WFD). See: http://ec.europa.eu/environment/water/water-framework/index_en.html

Source: Reinhardt, C, Bölscher, J, Schulte, A & Wenzel, R (2011) Decentralised water retention along the river channels in a mesoscale catchment in south-eastern Germany. *Physics and Chemistry of the Earth*. **36**: 309-318.

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