



Decision-support System: Sustainable Flood Retention Basins (SFRB) as Adaptive Measures to Control Flooding

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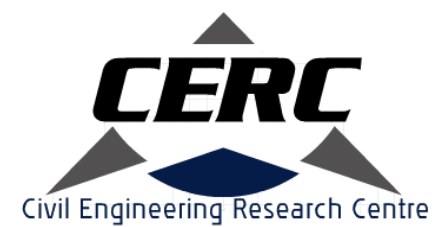


Investing in the future by working together for a sustainable and competitive region





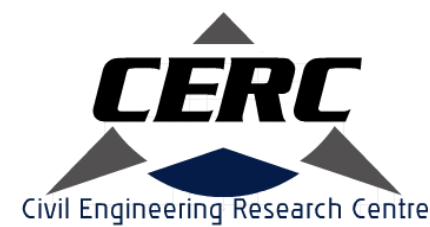
Outline



1. Wetland Systems
2. **Guidance** Manual
3. German **Classification**
4. Scottish Classification
5. Multi-label Classification
6. Feature Selection
7. **Geostatistics**
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9. Dam Failure **Risk**
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1 Wetland Systems

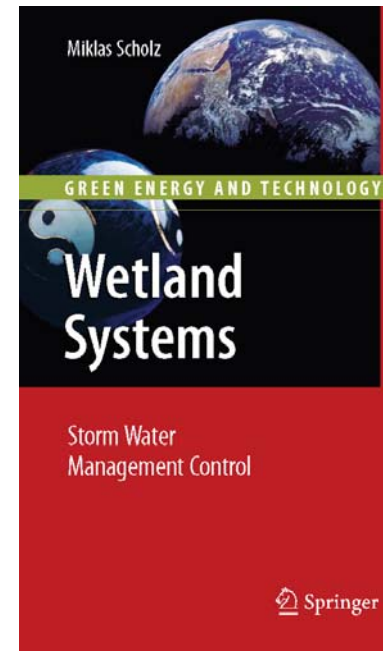


A **Sustainable Flood Retention Basin (SFRB)** is defined as an **impoundment** or integrated wetland, which has a pre-defined or potential role in **flood defence** and **diffuse pollution control** that can be accomplished cost effectively through best management practice, achieving **sustainable flood risk management** and enhancing sustainable drainage, pollution reduction, biodiversity, green space and recreational opportunities for society.

(McMinn, Scholz and Yang, 2009)

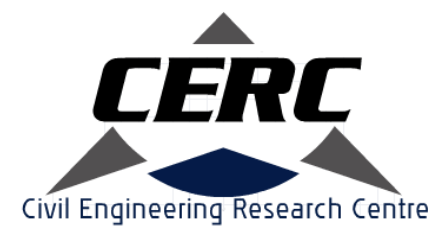
1 Wetland Systems

- Current best practice in wetland management has been critically reviewed.
- Sustainable Flood Retention Basins (SFRB) control flooding and diffuse pollution.
- Scholz M. (2010), *Wetland Systems – Storm Water Management Control*. Springer Verlag, Berlin, Germany.
- A text book highlighting SAWA findings has been published for the benefit of practitioners.





2 Guidance Manual



- Case study information on how to characterise water bodies has been collected.
- Guidance manual versions for practitioners and academics have been published.
- Scholz M. and Yang Q. (2010), **Guidance on Variables Characterising Water Bodies including Sustainable Flood Retention Basins**. *Landscape and Urban Planning*, 98 (3-4), 190-199.
- SAWA benefits from a guidance manual that define SFRB types, which are a novel and timely adaptive measures.

- Six different SFRB types have been characterised.
- Scholz M. (2008), **Classification of Flood Retention Basins: The Kaiserstuhl Case Study.** *Environmental & Engineering Geoscience*, 24 (2), 61-80.
- Scholz M. and Sadowski A. J. (2009), **Conceptual Classification Model for Sustainable Flood Retention Basins.** *Journal of Environmental Management*, 90 (1), 624-633.
- Practitioners benefit from the novel SFRB classification methodology, which provides guidance on management issues.

- The German classification methodology has been improved by widening the data base and by introducing **new variables**.
- Novel **dam failure risk**-related variables have been identified.
- Scottish water bodies have been classified, and **significant differences** between **German** and **Scottish SFRB** have become apparent.
- Robinson M., Scholz M., Bastien N. and Carfrae J. (2010), **Classification of Different Sustainable Flood Retention Basin Types**. *Journal of Environmental Sciences - China*, 22 (6), 898-903.



4 Scottish Classification

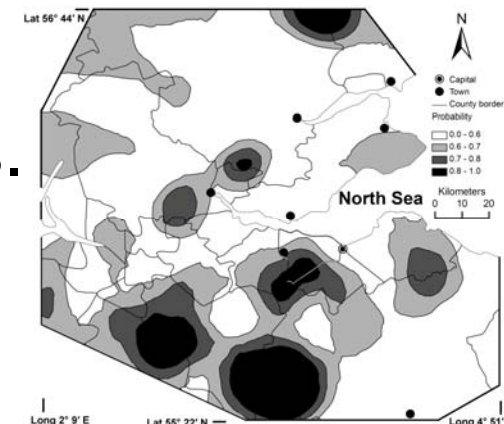


- McMinn W. R., Yang Q. and Scholz M. (2010), Classification and Assessment of Water Bodies as Adaptive Structural Measures for Flood Risk Management Planning. *Journal of Environmental Management*, 91 (9), 1855-1863.
- A revised and significantly improved SFRB classification methodology has been provided to SAWA and practitioners.
- The new methodology is applicable across temperate and oceanic climates.

- The **traditional SFRB classification** methodology is **biased towards particular SFRB usages**.
- A **new methodology** has been developed recognizing the **multi-functional use of SFRB**.
- Yang Q., Shao J., Scholz M., Boehm C., Plant C. and Tumula P. D., **Multi-label Classification Model for Sustainable Flood Retention Basins** (submitted to a journal).
- SAWA members obtained a fit-for-purpose tool suitable for **conflict resolution** regarding SFRB management.

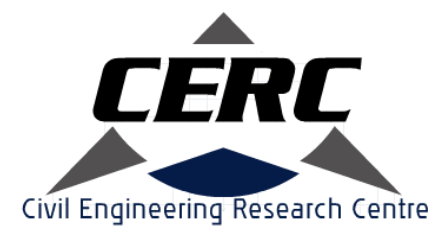
- The most suitable variables for various management tasks were identified with an unbiased methodology.
- The SFRB **feature selection** tool helps to **minimise variables** and therefore **costs and effort**.
- Yang Q., Shao J., Scholz M. and Plant C. (2010), **Feature selection methods for characterizing and classifying adaptive Sustainable Flood Retention Basins**. *Water Research*, 45 (3), 993-1004.
- The novel tool will help practitioners to reduce costs when managing water bodies by reducing sampling effort.

- **Spatial statistics** have been used to **identify sites optimal** for capital **flood control investment**.
- Yang Q., Scholz M. and Shao Y., **Application of Spatial Statistics as a Screening Tool for Sustainable Flood Retention Basin Management**. *Water and Environment Journal* (in press).
- Findings indicate the applicability for management and planning decisions.
- Practitioners benefit from a planning tool for **flood risk management**.





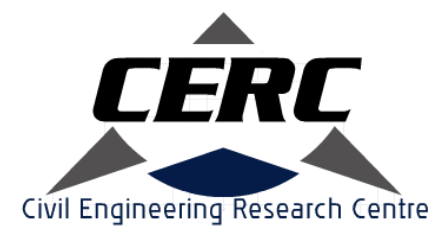
8 Self-organizing Map



- The idea is to **determine costly** and **difficult** to collect **variables with variables** that are **inexpensive** and **easy** to determine.
- Results show that flood control variables can be estimated even without a site visit.
- Yang Q., Shao J. and Scholz M., **Using Self-organizing Map Model to Predict Sustainable Flood Retention Basin Types and Characteristics** (submitted to a journal).
- Practitioners benefit from **cost savings** in **sampling and data analysis**.



9 Dam Failure Risk



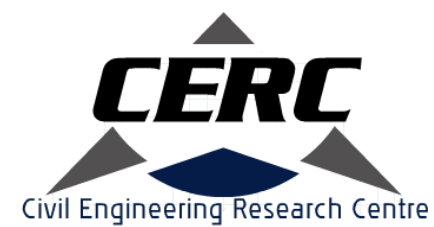
- The risk of dam failure is difficult to determine cost-effectively.
- A **timely methodology** has been developed to **assess hotspots of risk** requiring attention.
- Results indicate a revolution in **characterizing risk cost-effectively without high errors**.
- Scholz M., Yang Q. and Shao J., **Risk Assessment for Sustainable Flood Retention Basins in Central Scotland and Baden** (submitted to a journal).

- Scholz M. and Yang Q., **Novel Method to Assess the Risk of Dam Failure**. *Sustainability* (in press).
- Danso-Amoako E., Hartley W., Curwell T., Nickolas Kalimeris, Piotr Grabowiecki and Miklas Scholz, **Predicting Dam Failure Risk for Sustainable Flood Retention Basins: a Generic Case Study for the Wider Greater Manchester Area** (submitted to a journal).
- The new methodology is a useful tool in **flood risk management**.

- EU-funded research on land management has been assessed for the United Nations.
- Findings indicate the usefulness of the SFRB toolbox (part of SAWA output) for planners.
- Scholz M., Hedmark Å. and Hartley W., Recent Advances in Sustainable Multifunctional Land and Urban Management in Europe: a Review. *Journal of Environmental Planning and Management* (in press).
- SAWA's contribution to knowledge in terms of SFRB has been highlighted.



10 Statements



- Development of a **SFRB guidance manual**.
- Production of international and **generic SFRB classification tools** for different user groups.
- Creation of a **prioritisation tool** for SFRB **variables**.
- Development of a **spatial statistics tool** useful in **flood asset management planning**.
- Delivering of an unbiased **model to optimise sampling** and decision-making.
- Provision of a **dam assessment tool** that can be used in **flood risk management** practice.



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