



The Regional Association VI Working Group on Hydrology

WMO RA VI Hydrology Forum

2019

- RA VI Hydrological forum, 2-4 April 2019, Bratislava, Slovak Republic

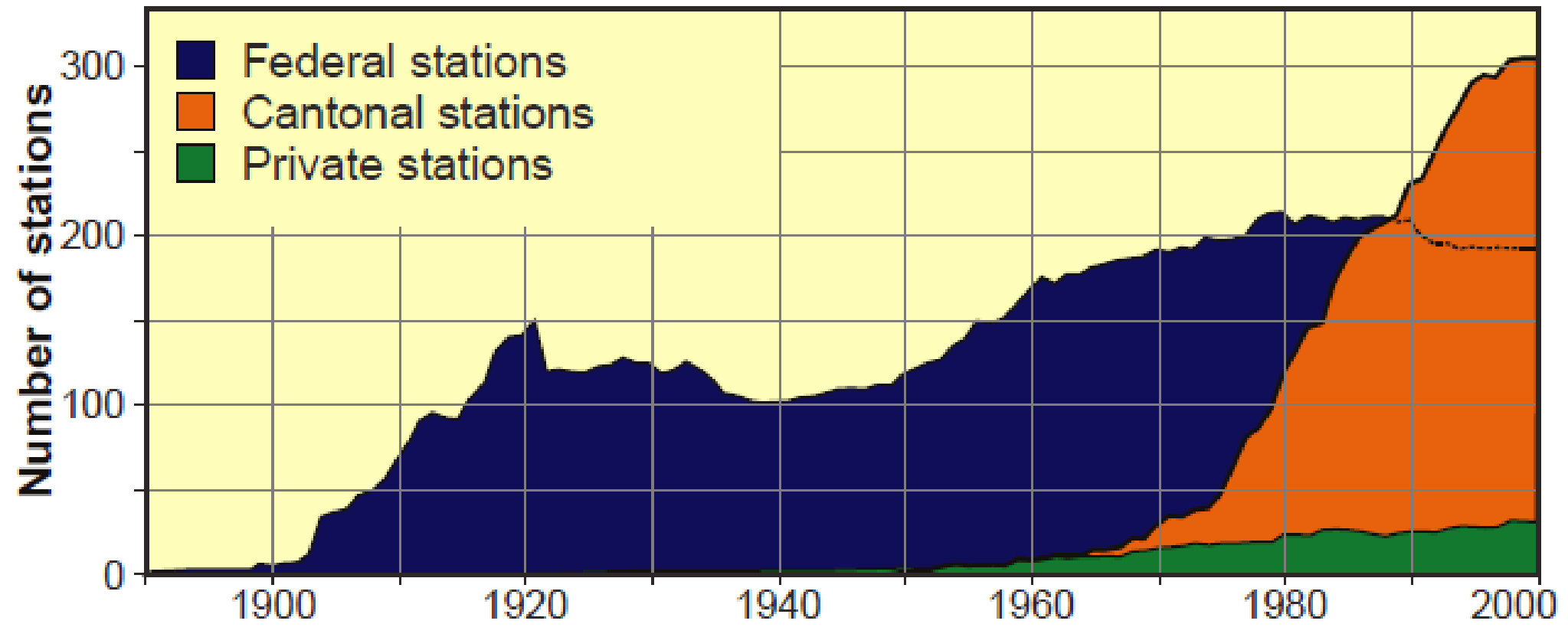
Session 1: Workshop part 2 – Country case studies

- **Switzerland** – Redesigning the station network - Martin Barben, Swiss Federal Office for the Environment

1. A new concept for the measuring network "*surface water quantity*"
 1. Introduction
 2. Tasks
 3. Modular structure

2. Renewal of technical installation

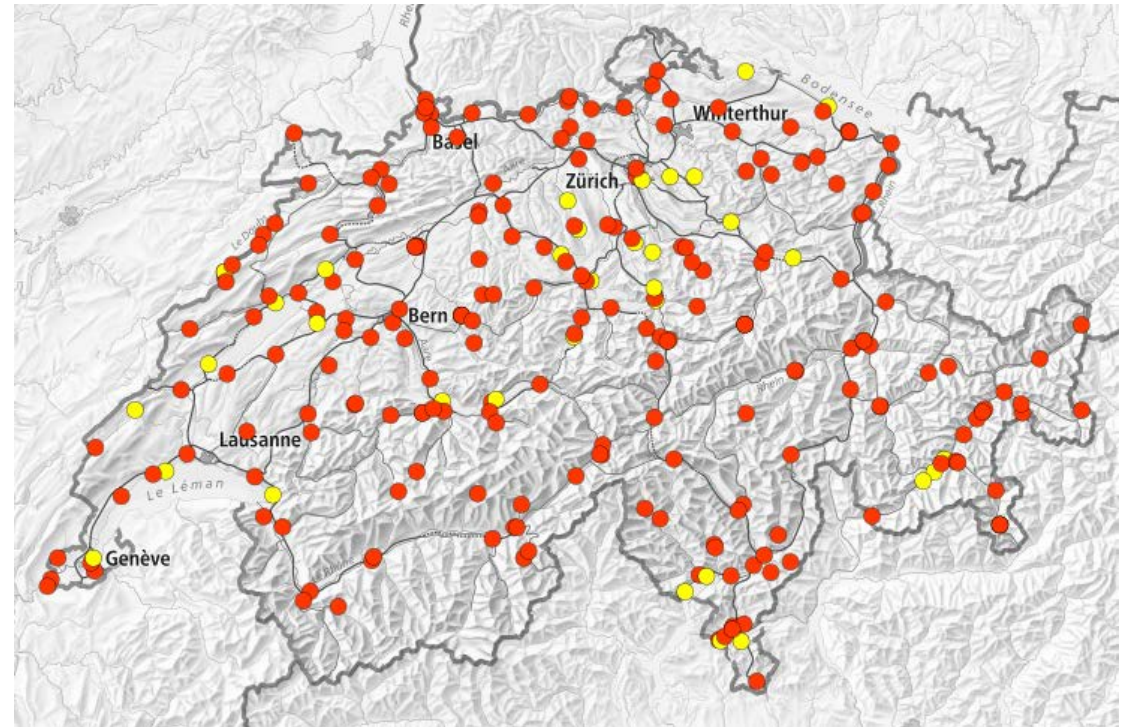
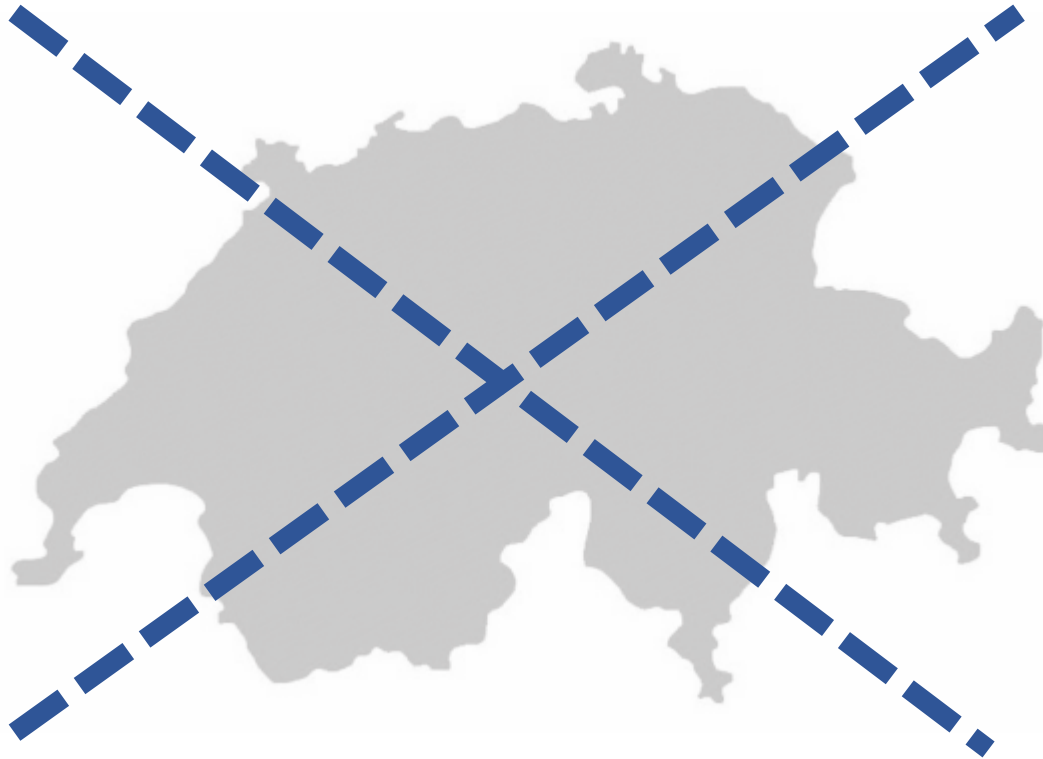
1.1 the new concept - Introduction



Expansion of the discharge measuring network including federal, cantonal and private stations up to 2000.

1.1 the new concept - Introduction

When redesigning a network, we can **not start from zero** because the existing network has to be taken into account.



1.1 the new concept - Introduction

In a first phase we had very **intense discussions**.

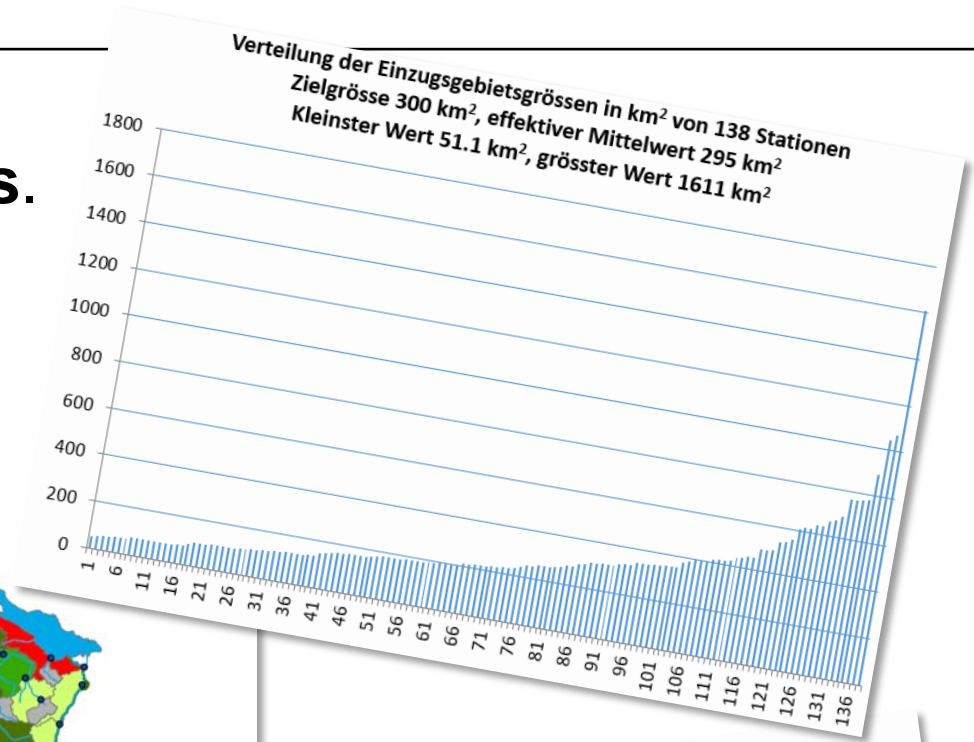
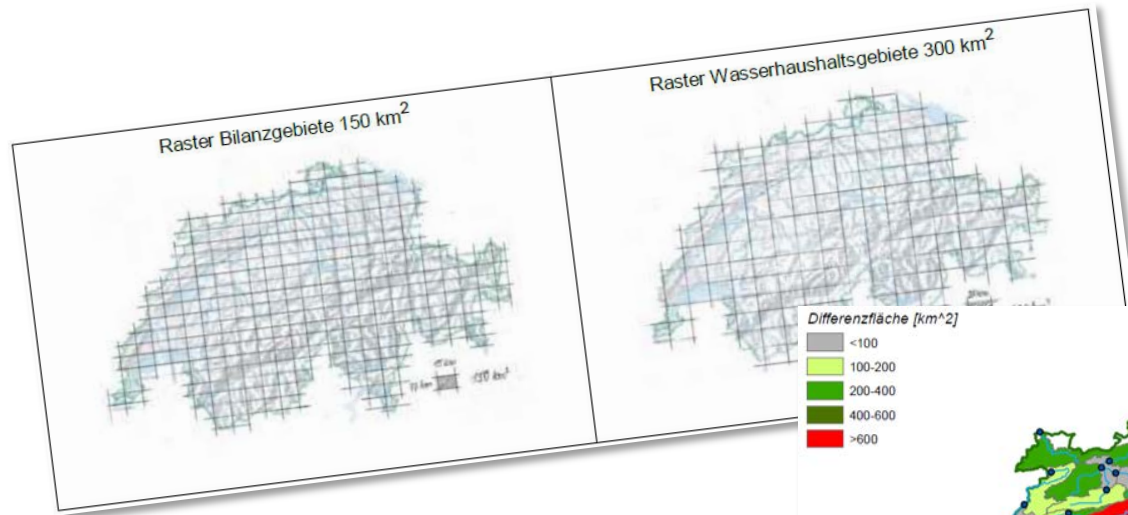
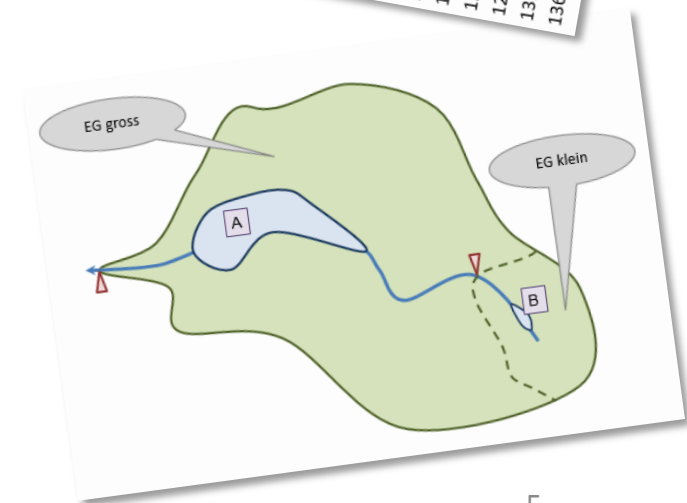
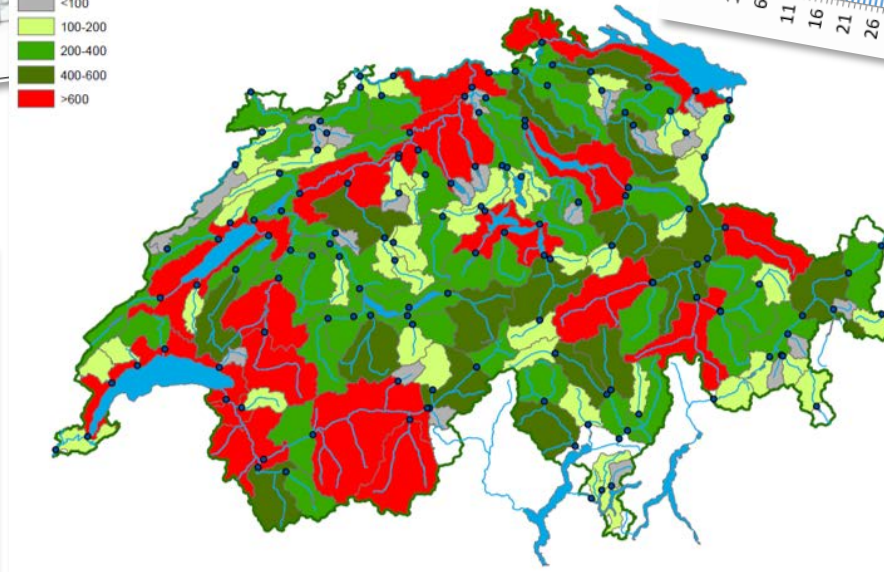


TABLE 20.3
Recommended minimum densities of streamflow stations

| <i>Physiographic unit</i> | <i>Minimum density per station (area in km² per station)</i> |
|---------------------------|---|
| Coastal | 2 750 |
| Mountainous | 1 000 |
| Interior plains | 1 875 |
| Hilly/undulating | 1 875 |
| Small islands | 300 |
| Polar/arid | 20 000 |

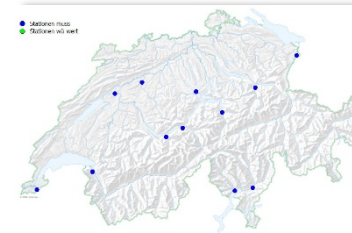


1.1 the new concept - Introduction

Two questions are the basis of the new concept:

1. Which **tasks** have to be done?
2. Which measuring **stations** are needed to complete these tasks?

- 1a) Erhebung der natürlichen Wasserressourcen und deren Veränderung
- 1b) Erhebung der natürlichen Gewässerqualität
- 1c) Bereitstellung der Datengrundlagen für die Wasserversorgung
- 1d) Überwachung der Nachhaltigkeit und ökologischen Verträglichkeit der Nutzung
- 2a) Hochwasser-Vorhersage
- 2b) Grundlagen für Seneguldrung
- 2c) Grundlagen für Hochwasserschutz (Bemessung, Abschätzung)
- 2d) Niedrigwasser Vorhersage
- 3a) Überwachung der Gewässerqualität



The result:

- ➔ A set of stations for each task.
- ➔ The measurement network is the superposition of these different sets.



1.2 the new concept - Tasks



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Federal Department
of the Environment,
Transport, Energy and
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«Organisationsverordnung DETEC»

Federal Office for the
Environment 1/7

Hydrology Division 1/14

Mandates for the Federal Office

Starting point: Legal basis

1.
Nachhaltige Ressourcen-
bewirtschaftung

2.
Schutz vor Naturgefahren

3.
Schutz vor schädlichen Stoffen
und Organismen

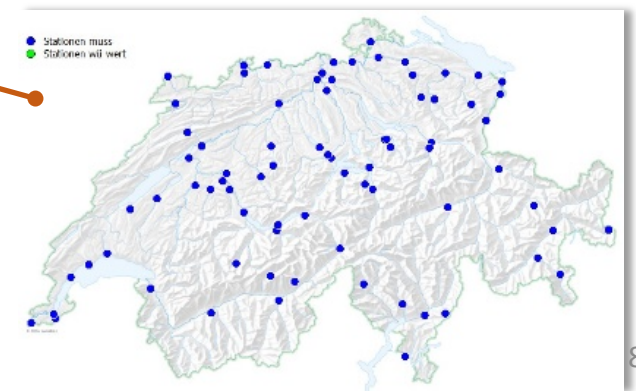
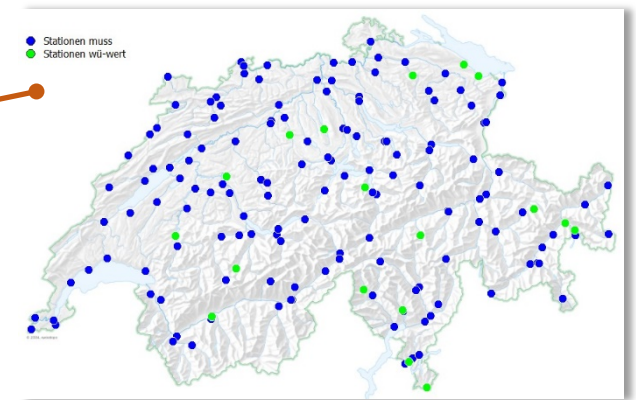
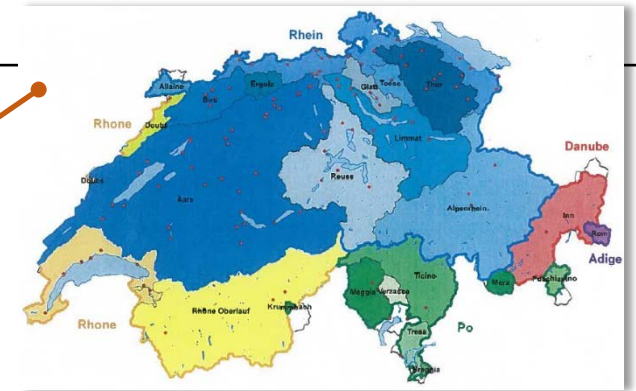
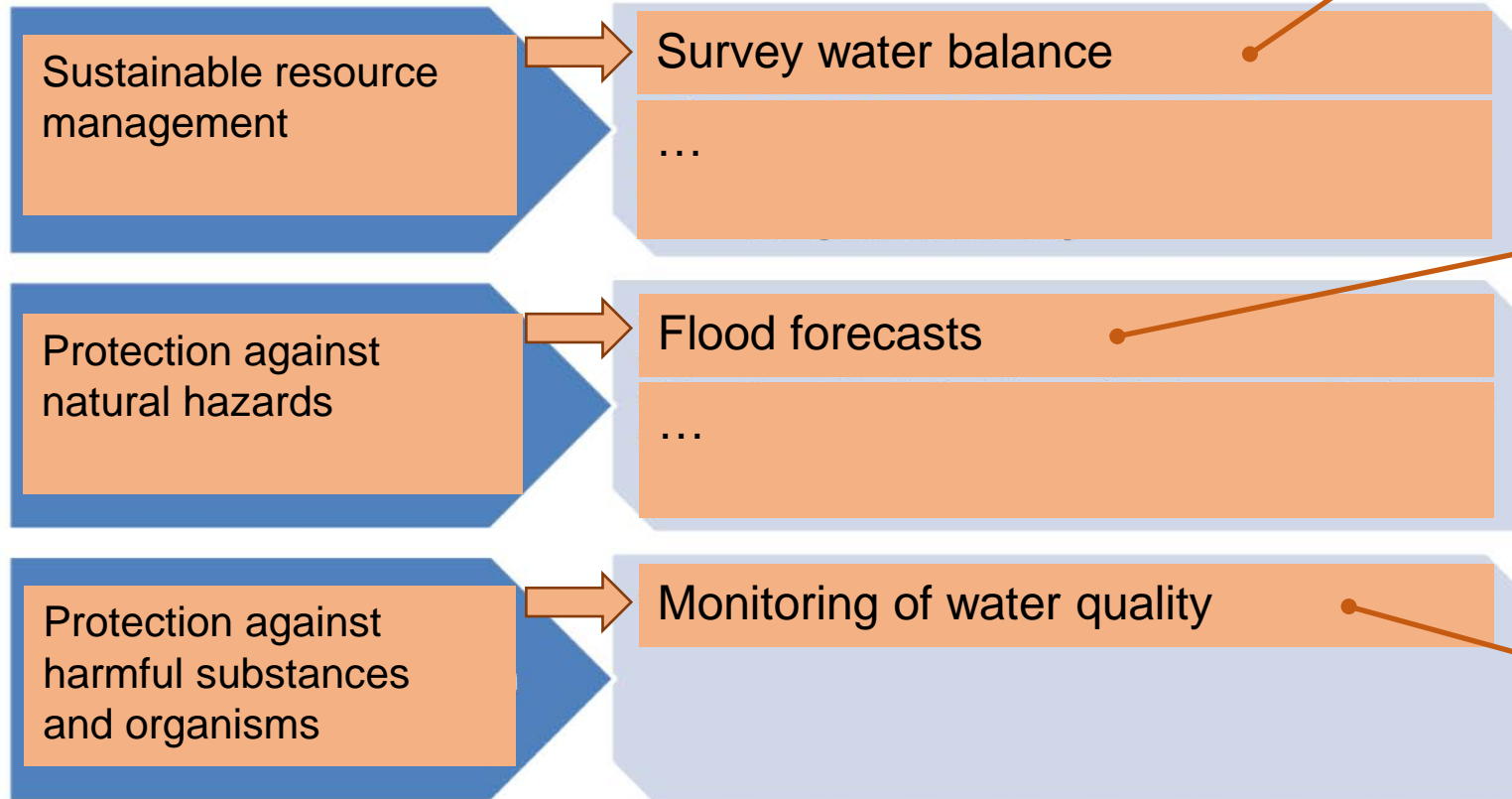
Tasks for the Hydrology Division

- 1a) Erhebung der natürlichen Wasserressourcen und deren Veränderung
- 1b) Erhebung der natürlichen Gewässerqualität
- 1c) Bereitstellung der Datengrundlagen für die Wasserwirtschaft
- 1d) Überwachung der Nachhaltigkeit und ökologischen Verträglichkeit der Nutzung

- 2a) Hochwasser-Vorhersage
- 2b) Grundlagen für Seeregulierung
- 2c) Grundlagen für Hochwasserschutz (Bemessung, Abschätzung)
- 2d) Niedrigwasser-Vorhersage

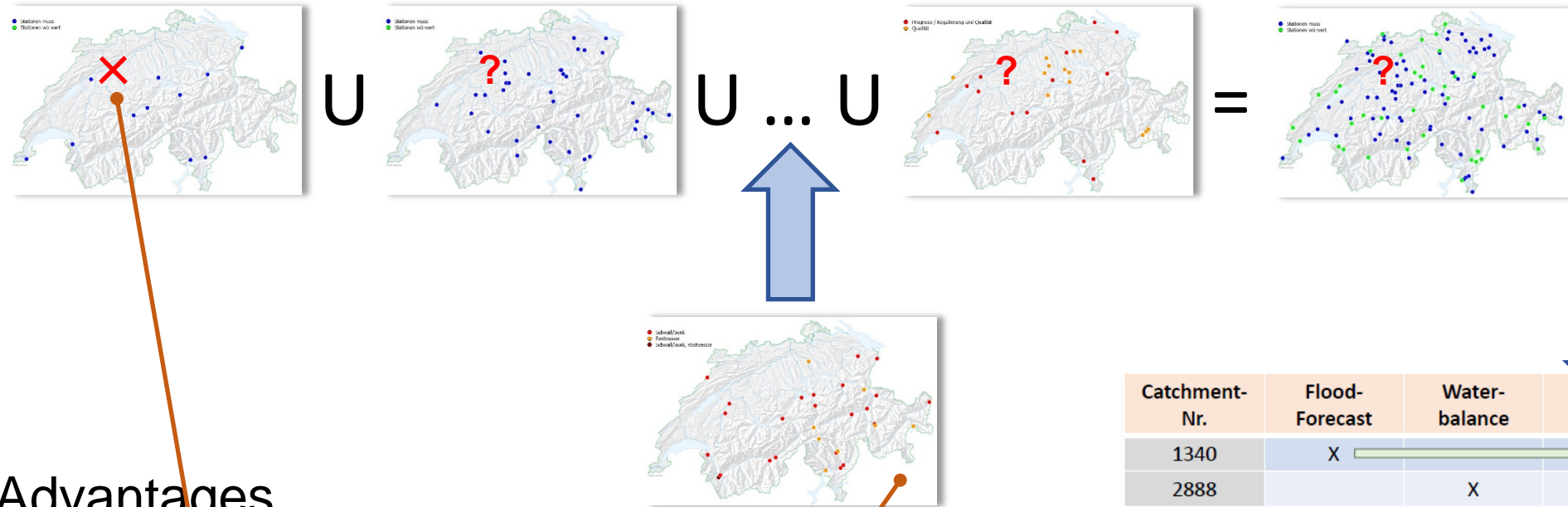
- 3a) Überwachung der Gewässerqualität

1.2 the new concept - Tasks



1.3 the new concept - Modular structure

The basis monitoring network is modular and consists of all the sub-networks.



Advantages

- **Updates** in the sub-networks.
- If tasks disappear or **new tasks** are added, the concept can be adapted very quickly.

| Catchment-Nr. | Flood-Forecast | Water-balance | Research | Monitoring Network |
|---------------|----------------|---------------|----------|--------------------|
| 1340 | X | | X | X |
| 2888 | | X | | X |
| 1011 | | | X | X |
| 3463 | | X | | X |
| 1078 | | | | --- |
| 2104 | X | | | X |
| 3803 | X | | | X |

1.3 the new concept - Modular structure

When assembling the sub-networks to the basis network, the goals are:

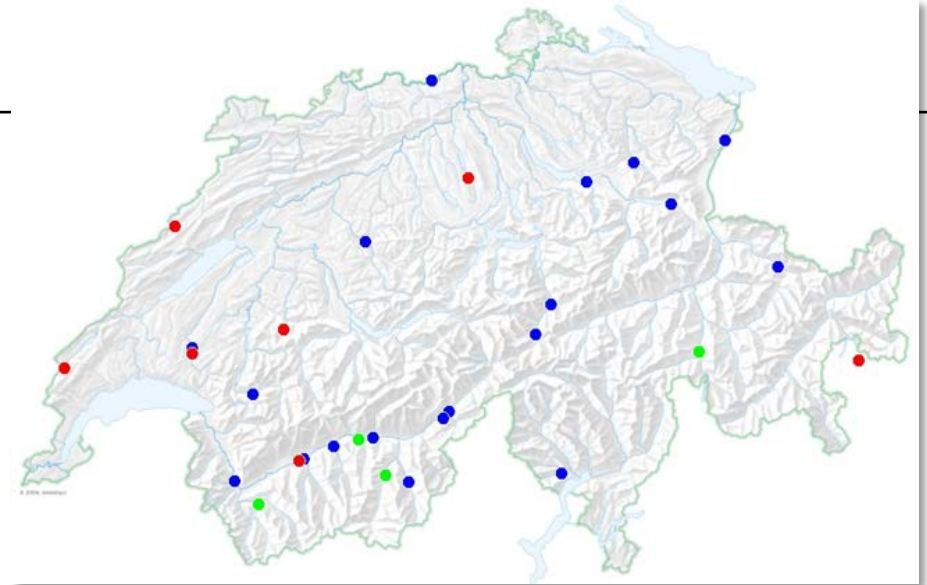
- Finding measurement stations that are **no longer needed**
- Identifying **gaps** that need to be closed

cancel

new station, priority 1
new station, priority 2

Consider economic aspects.

Once a year there is a workshop in the division with all persons, responsible for a measurement program.



2 Renewal of technical installation

Modernization and **standardization** of electronic equipment of the stations of the hydrological network.

The project costs around 4.5 million francs and will be completed in 2019.

| | |
|----------------|------------------|
| Surface water: | 240 stations |
| Groundwater: | 52 stations |
| Costs: | 15'000.-/station |



2 Renewal of technical installation - Examples of measuring stations



2 Renewal of technical installation - Measurement conditions



2 Renewal of technical installation - technical installation

old



- Special solutions
- Devices from the 80s
- Limited number of sensors
- End of life for spare parts

new



- Around 300 stations remote maintenance and monitoring
- Components meet **industrial standards** with increased requirements
- **Standardized** control cabinets with modular structure
- Redundant communication
- Autonomous power supply for 48h



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