



# Recent advances in smart water technology of drainage systems in China

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# CONTENTS

1

Research background

2

Development status of data perception,  
storage and analysis

3

Smart Water Application Cases

4

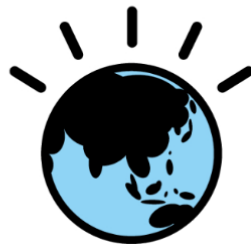
Problems and Suggestions



# 1. Research background

## Policies promote development

智慧地球赢在中国



IBM  
IBM商业价值研究院

ICS 35.240.01  
CCS L 70



中华人民共和国国家标准

GB/T 33356—2022  
代替 GB/T 33356—2016

新型智慧城市评价指标

Evaluation indicators for new-type smart cities



首页 > 信息公开 > 通知公告

### 关于大力推进智慧水利建设的指导意见

2021-11-29 10:28  

为践行习近平总书记“节水优先、空间均衡、系统治理、两手发力”的治水思路，贯彻习近平总书记关于网络强国的重要思想，落实《中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要》提出的“构建智慧水利体系，以流域为单元提升水情测报和智能调度能力”要求，以及水利部党组把智慧水利建设作为推动新阶段水利高质量发展六条实施路径之一的决策部署，现就推进当前和今后一段时期智慧水利建设提出以下指导意见。

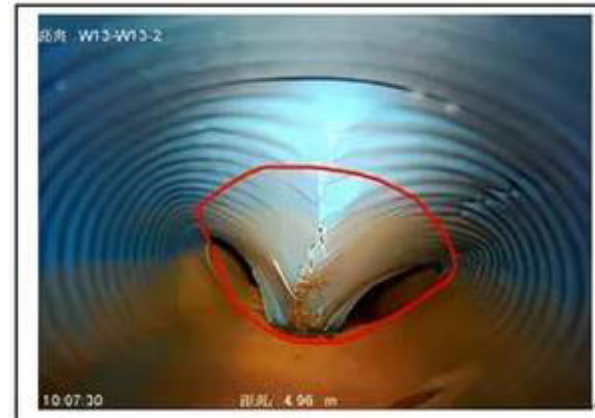


# 1. Research background

## Urban drainage problems



Urbanization rate at the end of 2022 is **65.2%**  
(National Bureau of Statistics)



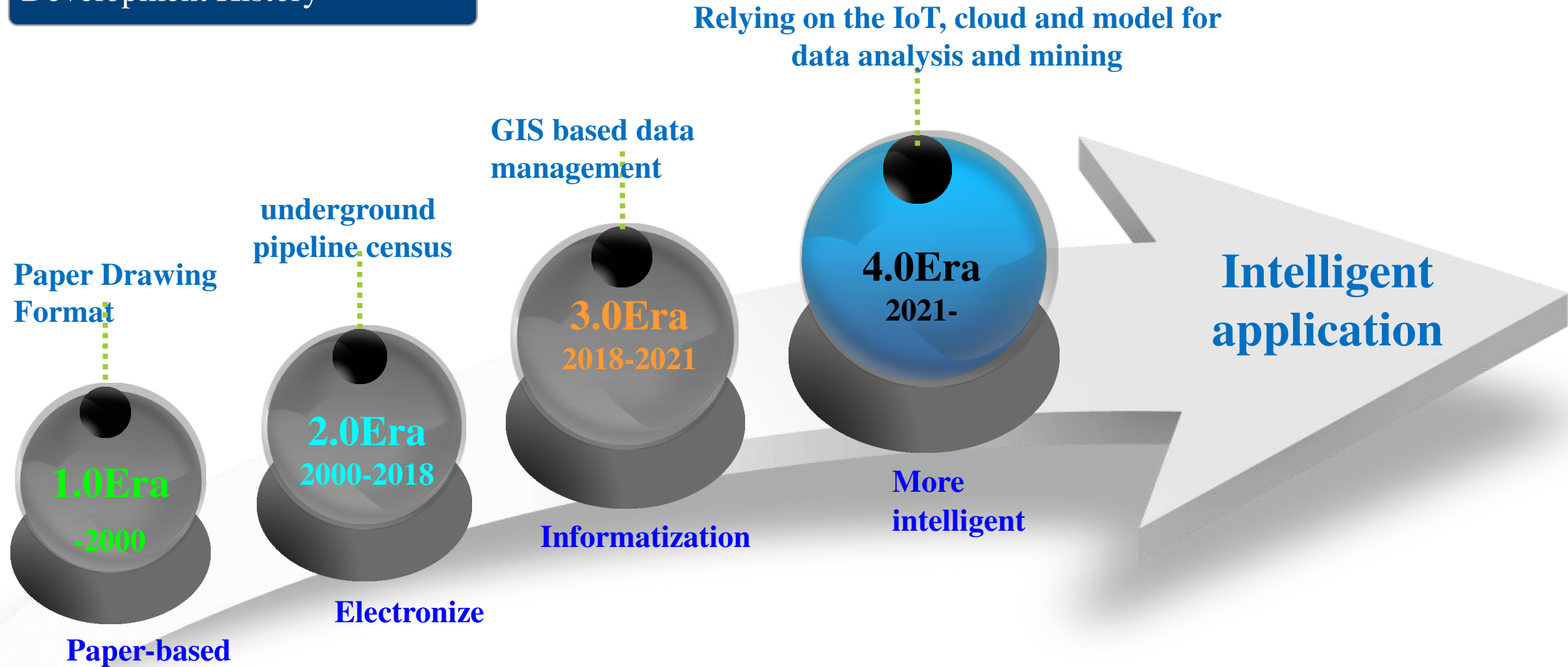
## Urban drainage problems



**Establishing an effective intelligent water management system is necessary**

## 2. Development status of data perception, storage and analysis

### Development History



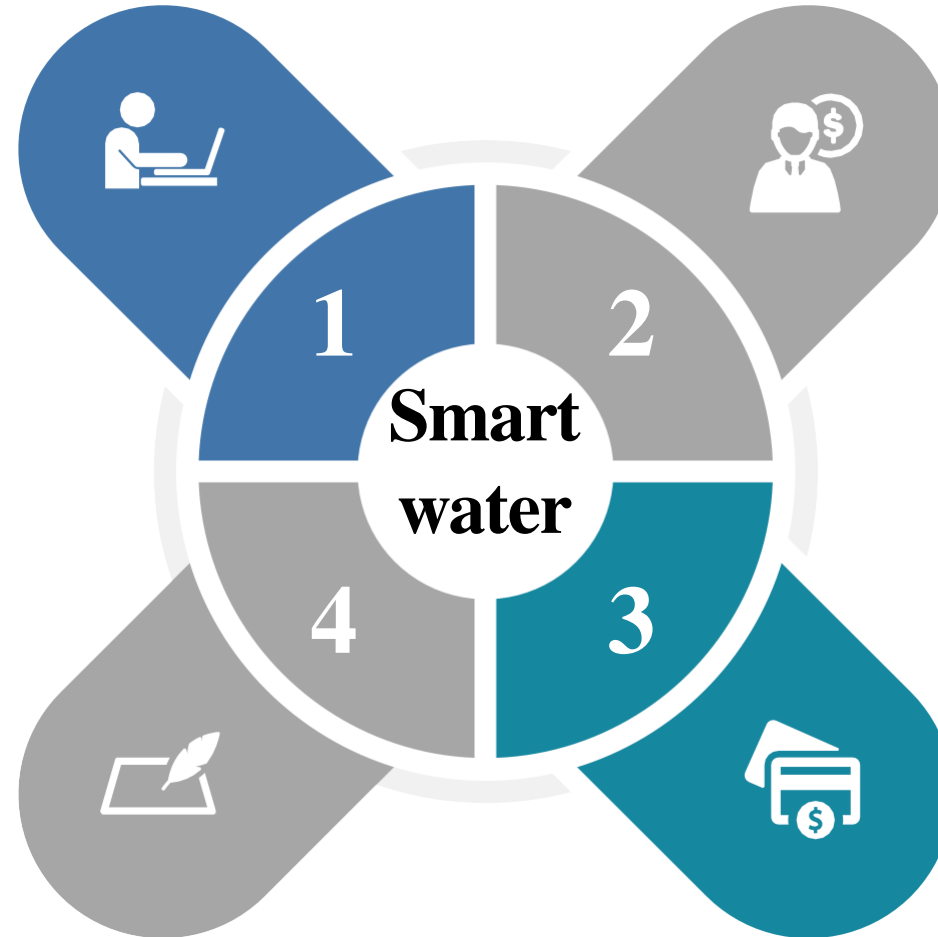
### Content of Construction

#### Perception Layer

Applying sensors to achieve data monitoring

#### Decision Layer

Analyze the results to achieve decision making



#### Data Layer

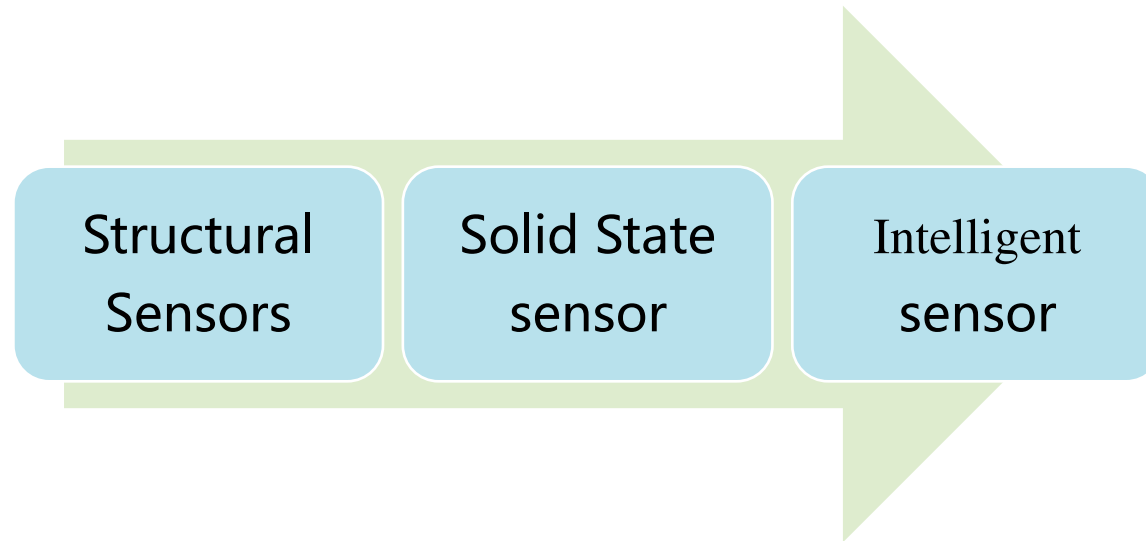
Data transmission and storage

#### Application Layer

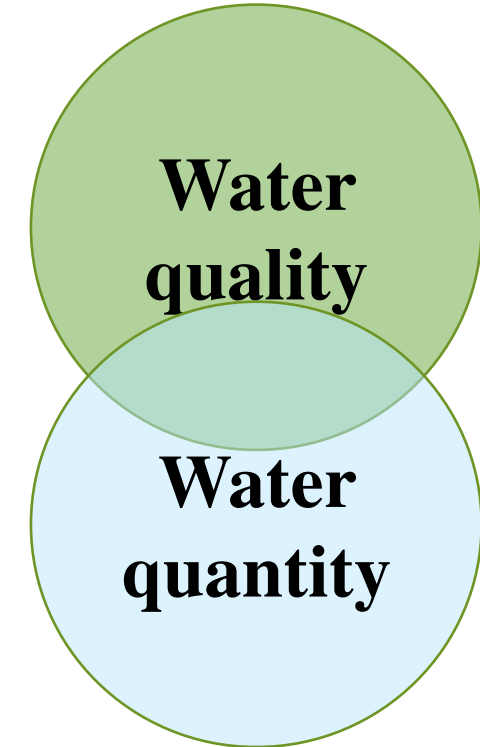
analysis data by model

## 2. Development status of data perception, storage and analysis

### Data Perception: Sensor Development



Reduced size, rich functionality, and lower price



## 2. Development status of data perception, storage and analysis

### Data perception: sensor optimization layout

#### statistical principles

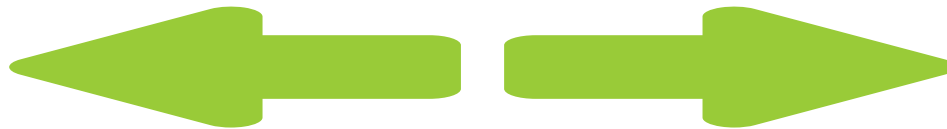
- Analyze the correlation of nodes, and nodes with strong correlation can be reduced in layout

#### operations research principles

- multi-objective model to optimize the layout of monitoring points in drainage system

#### Remote sensing technology

Transformation from point data to surface data

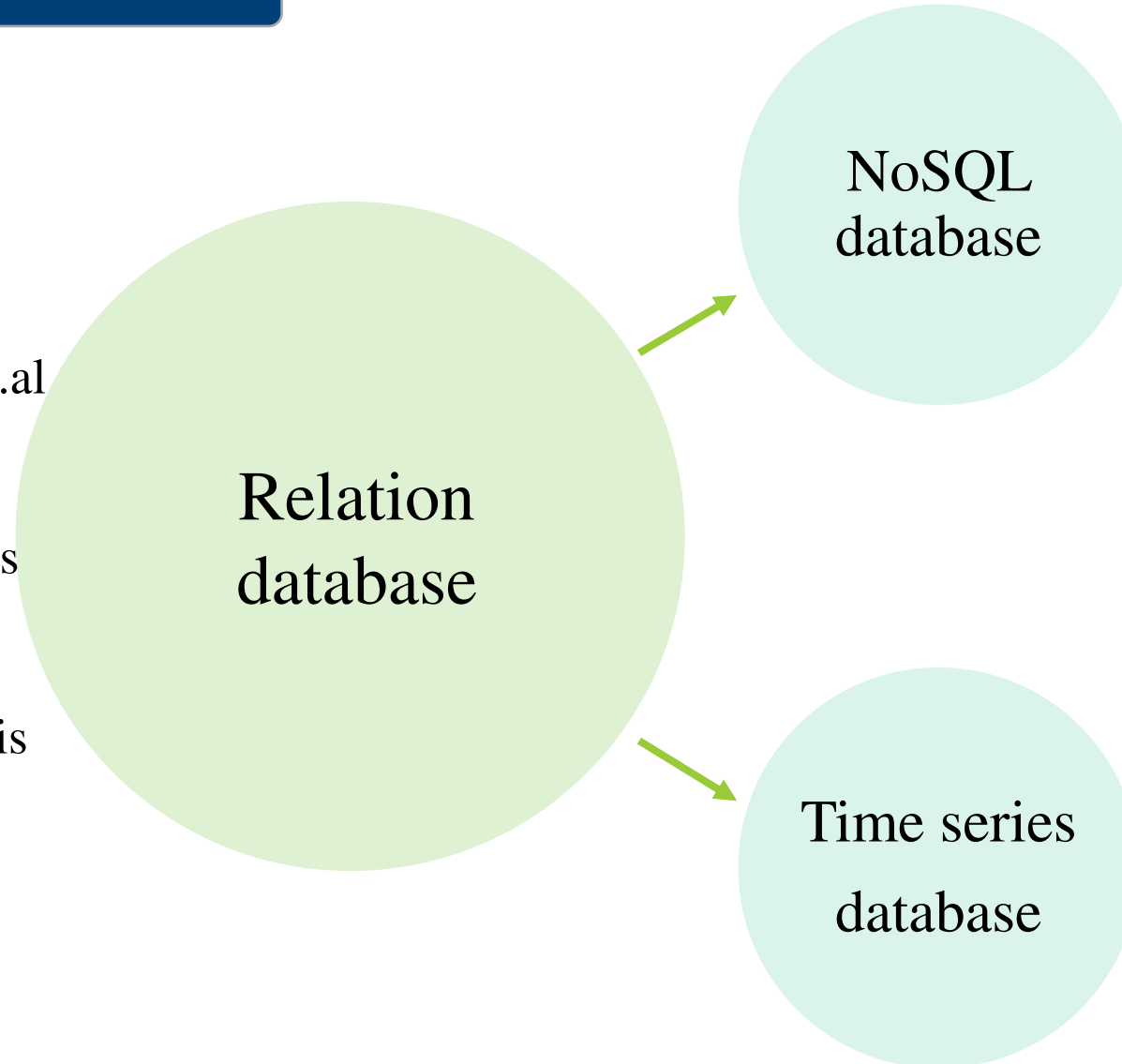


A large number of sensors have been deployed in areas such as Beijing, Shenzhen, and Fuzhou



### Data storage

- ❑ Oracle、MySQL et.al
- ❑ Unable to store and query heterogeneous data
- ❑ When the data size is large, the search is slower



- HBase、Redis et.al
- Using distributed retrieval services to improve large-scale retrieval time for scattered data
- TDengine, InfluxDB et.al
- The power system is widely used, and in the smart water, its till needs to be explored



## 2. Development status of data perception, storage and analysis

Data analysis: data cleansing

**Analyze the mean and variance of data to eliminate outliers**

simple

high subjectivity



**Set a threshold to eliminate unreasonable data**

simple

high subjectivity



**Using machine learning methods for cleaning**

based on predicted results

Need much data for training data

Data cleaning  
rules ensure  
the quality of  
data

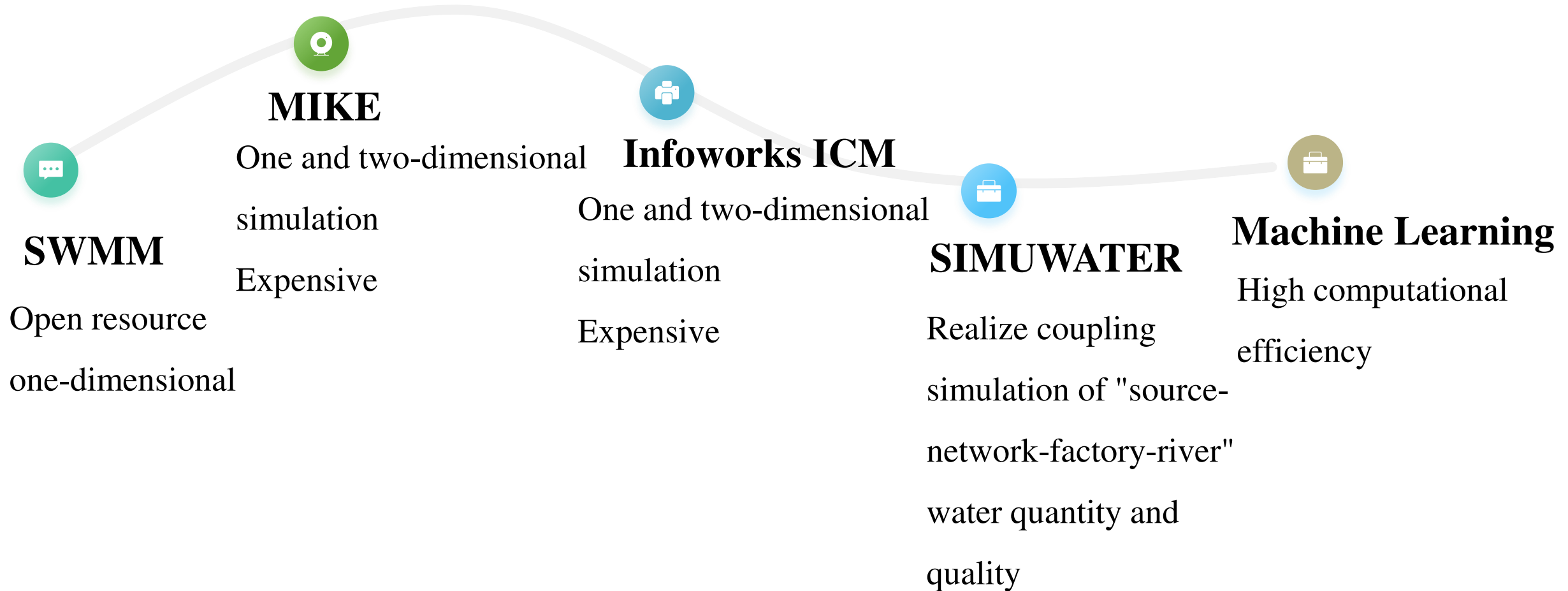
Commercial software :Google

Refine、DataWrangler、 SAS、

SPSS et.al

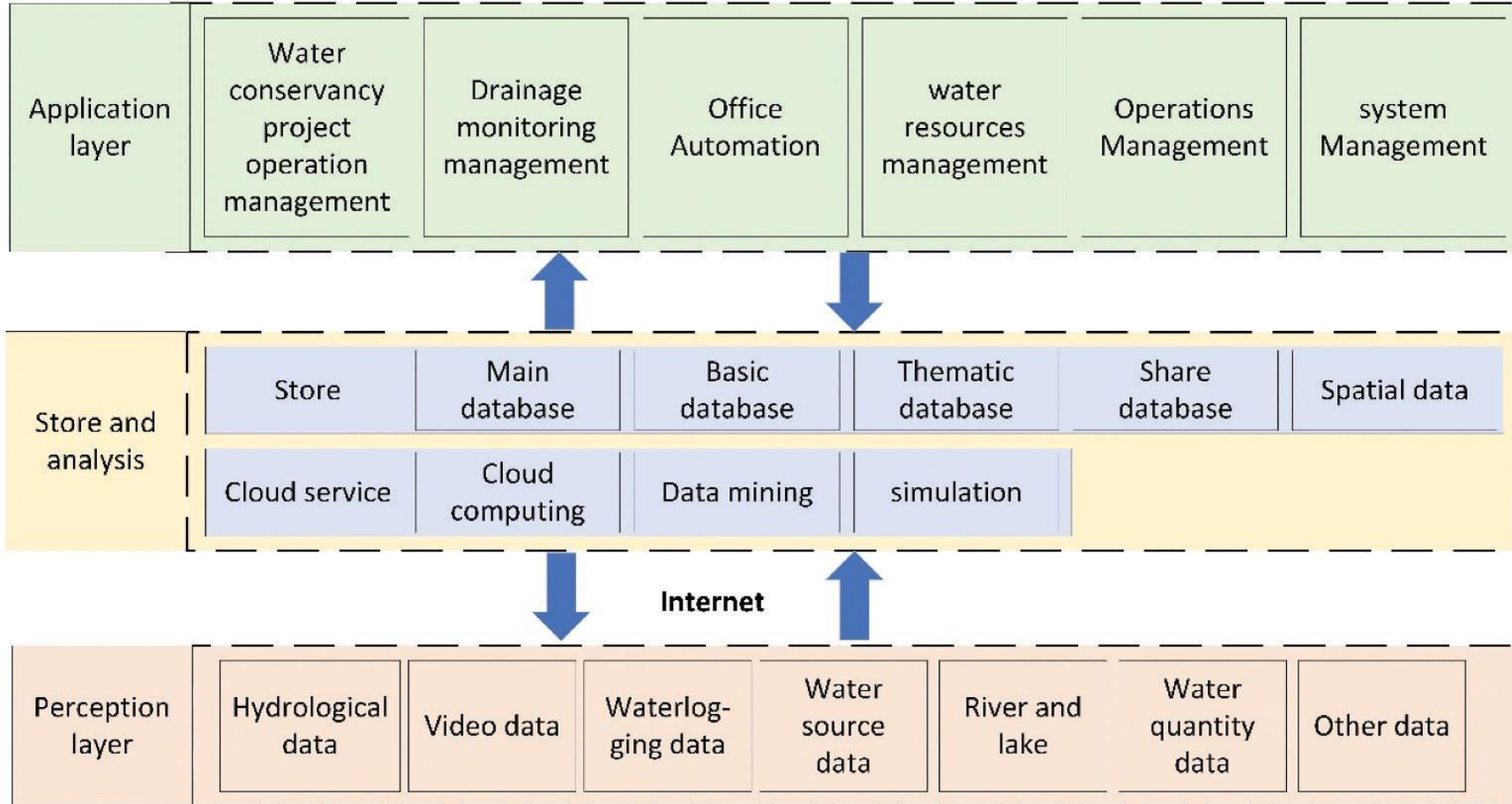
## 2. Development status of data perception, storage and analysis

### Data Analysis: Model Simulation



# 3. Smart Water Application Cases

## Suzhou Smart Water Development



- Severe leakage
- Frequent waterlogging
- Low efficiency of sewage treatment



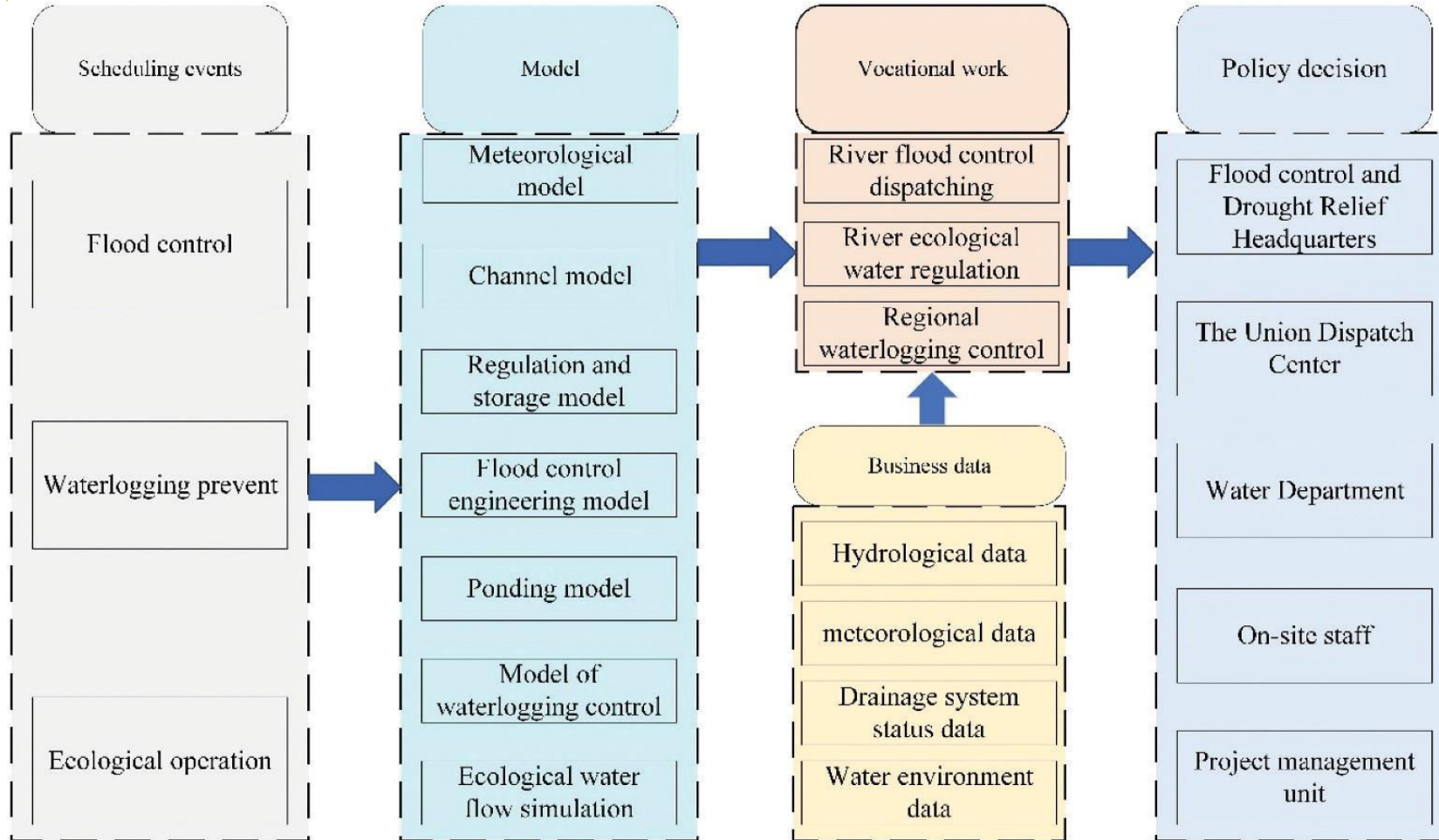
- Identify areas of leakage
- Establish regulation measures
- Optimize sewage treatment process



- ✓ Reduce groundwater intrusion
- ✓ Reduce the risk of waterlogging
- ✓ Improve the treatment efficiency of waste water

# 3. Smart Water Application Cases

## Fuzhou Smart Water Development



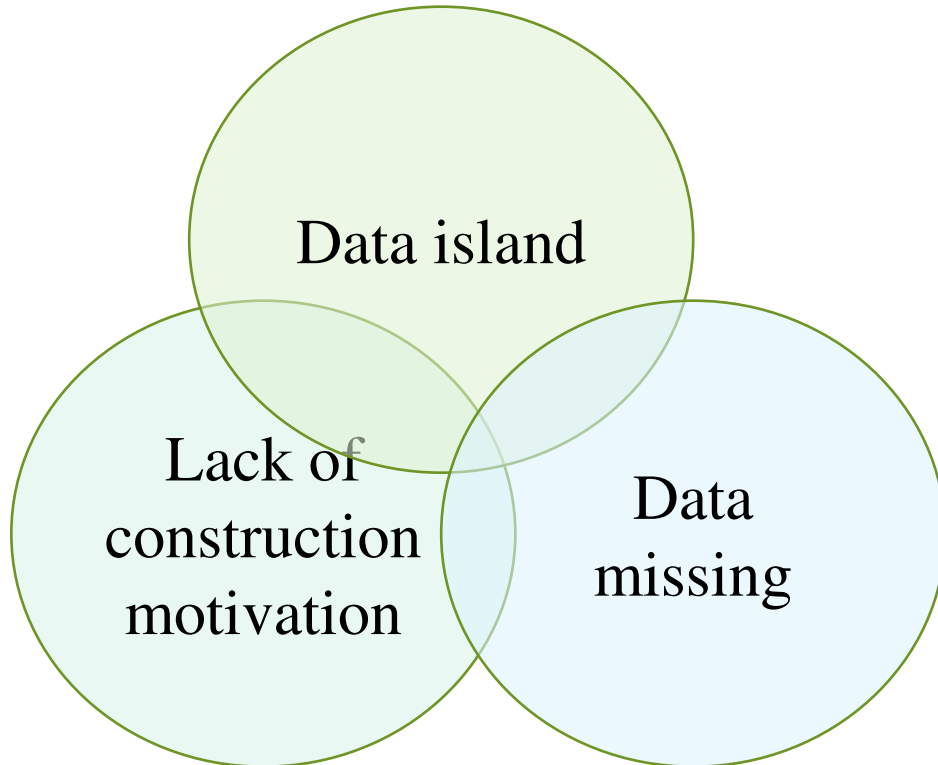
- Serious waterlogging problem
- 86% of rivers have deteriorated water quality

- Joint scheduling of gate and pump
- Minjiang River diverts water into inland rivers

- ✓ Increase storage capacity by 30%
- ✓ Achieve the goal of heavy rain without waterlogging
- ✓ Increase the water level of inland rivers by more than 1.2m

## 4. Problems and Suggestions

### Problems



Lack of construction motivation

- The drainage system is complex and requires high investment
- difficult to generate direct benefits

Data island

- Lack of data sharing mechanism among different departments

Data missing

- Data transmission efficiency is low and may be incomplete
- The data may not be representative

## 4. Problems and Suggestions

### Suggestions



**Exploring new  
benefit growth  
methods**



**Integrating industry,  
university, and  
research institution**



**Establishing a  
data centre**



Thanks for your  
listening!

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