

# 水利行业的信息与决策现状以及智能化展望

Informatization & Decision-making Status & Outlook for Intelligence in Water  
Resources Industry

胡时伟/Shiwei Hu

迅腾科技首席数字化转型顾问 & 第四范式联合创始人兼首席架构师

Xi'an Centn Technology Chief Digital Transformation Advisor & 4Paradigm Co-founder, Chief Architect

Sep 2023

# 第四范式简介

## Introduction to 4Paradigm



The headquarter is currently located in Beijing, China, with branches in Shanghai, Shenzhen, Hong Kong, Singapore.

## A trusted partner for enterprise digital transformation

---

Founded in September 2014, 4Paradigm is the industry pioneer and leader of enterprise artificial intelligence, and the largest player in China's platform-centric decision-making AI market. With the brand concept of "AI decision-making, a new paradigm for enterprise transformation", the company provides platform-centric artificial intelligence solutions, enabling enterprises to realize the rapid and large-scale implementation of artificial intelligence, discover the hidden laws of data and comprehensively enhance the decision-making ability of enterprises.

The industries served by the company include but are not limited to finance, retail, manufacturing, energy and electricity, telecommunications and medical care. As of 2022, it has provided services to 75 Fortune Global 500 companies and listed companies.

## Empower enterprises become leaders in the digital and intelligent era Achieve AI For Everyone

---

Corporate Mission And Vision:

**Mission:** Empower enterprises become leaders in the digital and intelligent era

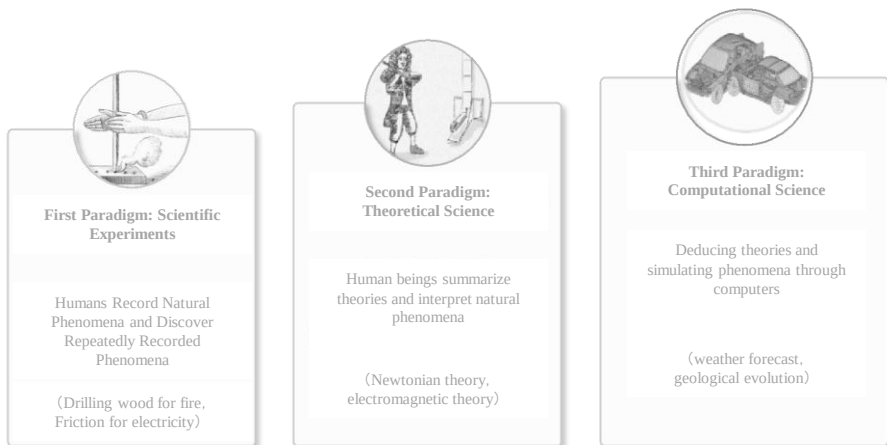
**Vision:** AI For Everyone, Let everyone enjoy the dividends of AI

Core Values:

Value-Oriented; Goal-Oriented; Be Bold To Explore & Be Innovative

# 科学发展的四个范式

Four paradigms of scientific development



## 第四范式：数据科学 Fourth Paradigm: Data Science

Computers discover patterns from massive data, form theories to explain natural phenomena  
( Epidemic Simulation、 Disease Prediction)

Drive scientific development by **Data and Computing Resources**

Massive Data

Massive Rules

Massive Fields

科学规律数量井喷

The number of scientific laws blows out

Machines Find Massive Rules



产业全面进入科学时代

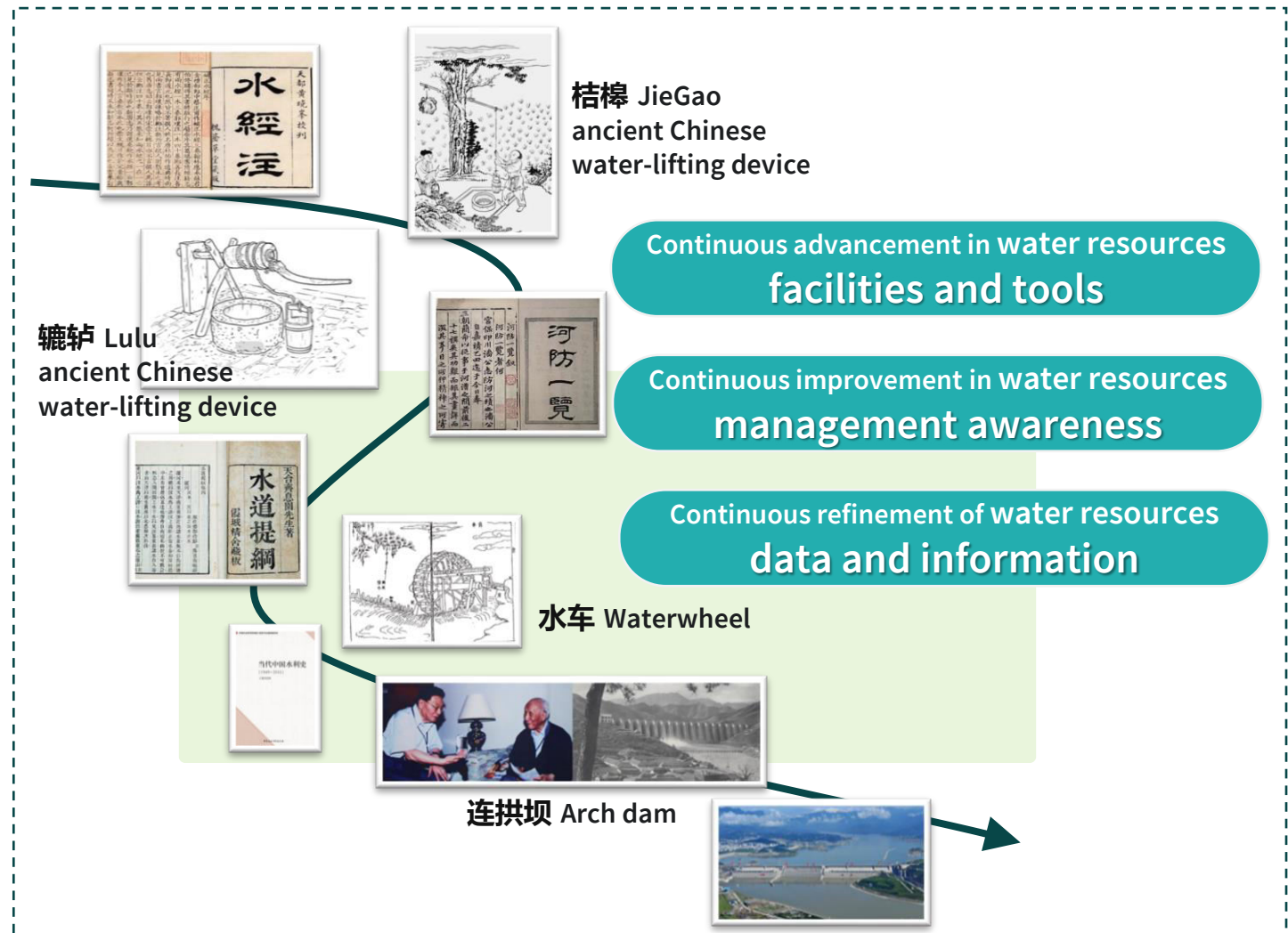
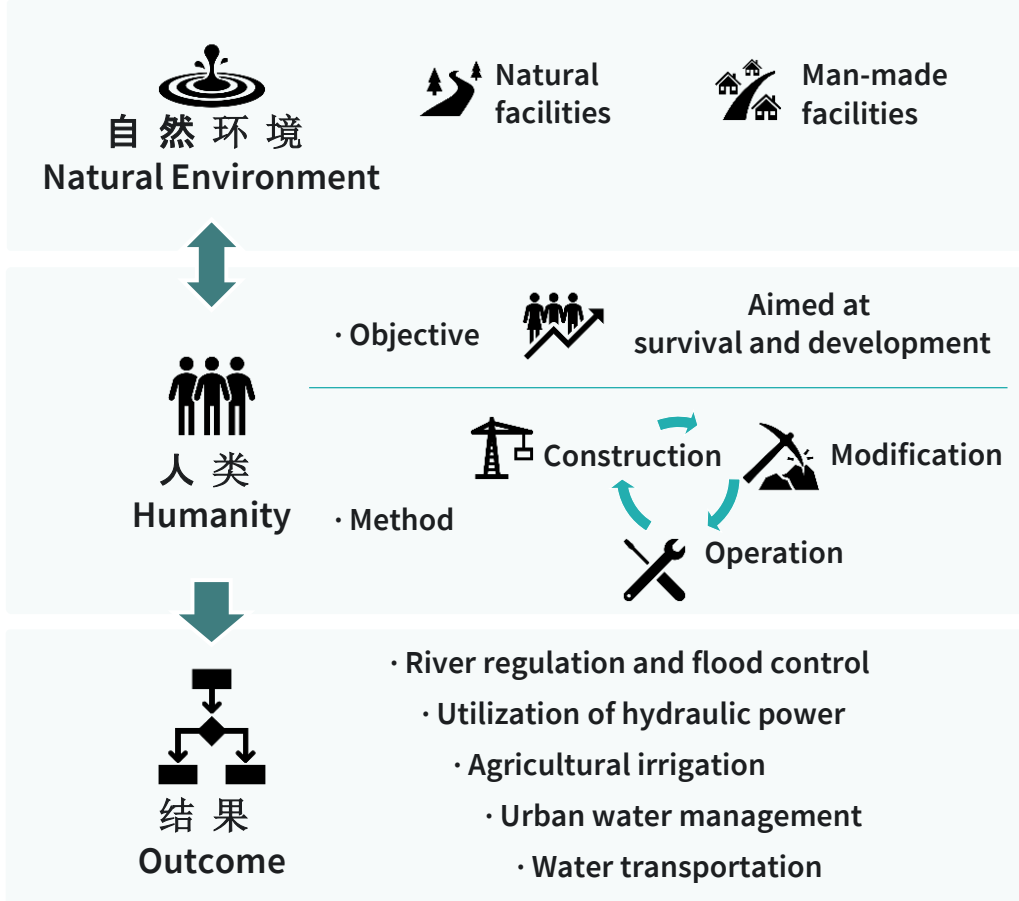
Industries have entered the scientific era in an all-round way

Machines search for patterns in massive fields

# 水利：一门追求人与自然共存相处的古老行业

Water Resources Management: An Ancient Industry Striving for Human-Nature Coexistence

## 人与自然共存相处 Harmony Between Humans and Nature



# 迈向协同信息化：水利行业的协同管理难题

## Moving Towards Collaborative Informatization: The Challenge of Collaborative Management in the Water Resources Industry

### 决策难 Difficult Decision-making

Involves Multiple Factors, Data Sets, and Levels

### 涉及要素多 Involves Multiple Factors

- Hydrological Information
- Tributaries and Main Rivers •
- Flow Rate •
- Evaporation Rate •
- Sediment Load •
- Flood Discharge Area •

- Meteorological Information
- Precipitation Amount •
- Precipitation Duration •

- Geographical Information
- Topography and Terrain •
- Mountainous Information •
- Altitude Information •



自然环境  
Natural Environment



水利设施  
Water Resources Facilities



人员调度  
Personnel Scheduling

- River Management
- River Dredging •
- Riverbank Stabilization •
- Flood Levee •

- Drainage System
- Urban Drainage •
- Drainage Canal •
- Pumping Station •

- Reservoir Information
- Total Reservoir Capacity •
- Usable Reservoir Capacity •
- Reservoir Water Level •
- Water Quality Indicators •

- Meteorological Administration
- Astronomical Forecast •
- Disaster Warning •

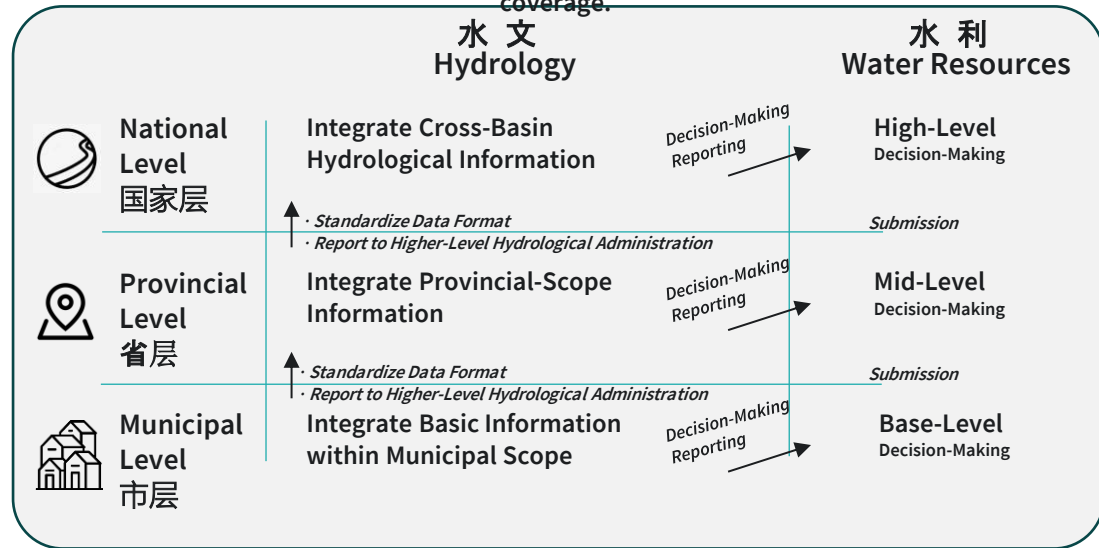
- Hydrological Administration
- Data Collection •
- Data Monitoring •
- Information Logging •
- Hydrological Research •

- Ministry of Water Resources
- Water Resources Management •
- Flood Control and Management •
- Water Resources Decision-Making •

- Ministry of Emergency Management
- Early Warning Monitoring •
- Emergency Response •
- Coordinated Command •
- Disaster Assessment •

### 覆盖面广 Extensive Coverage

China has numerous main and tributary rivers, requiring hydrological and water resource departments at all levels for comprehensive coverage.





# 水利发展的不协调性：数据与设施的不断提升与决策发展的停滞

Discoordination in Water Resources Development: Ongoing Improvements in Data and Facilities vs. Stagnation in Decision-Making

## 决策能力 Decision-Making Ability

### 决策经验难以泛化和沉淀

Difficulty in Generalizing and Accumulating Decision-making Experience

### 决策点指数级增长

Exponential Growth in Decision Points

### 对决策力要求提高

(覆盖更全面、颗粒度更细)  
Higher Requirements for Decision-making  
(More Comprehensive Coverage, Finer Granularity)

Increasing Complexity in Decision-making

## 决策因为技术条件依旧受限被迫停留在第一、第二范式

Decision-making Limited to the First and Second Paradigms Due to Technological Constraints

Technical Limitations of Missing Data in Decision-making Process

Technical Limitations in Decision-making Coverage



Improving Facility Construction

Increasing Data Elements and Diversified Collection Methods

## 水利设施技术 Water Infrastructure Technology

### 水利基础设施建设处于起步阶段尚不完善

#### Water Infrastructure Construction in Initial Stage and Still Incomplete

- Developing Along the Lines of River Management, Agricultural Water, and Waterway Transportation.
- Mainly Utilizing Rivers, Lakes, and Groundwater to Build a Series of Irrigation Channels, Reservoirs, Water Gates, and Dams.

### 水利基础设施建设实现蓬勃发展

#### Water Infrastructure Construction Flourishing

- Steady Advancement in River Management Projects.
- Increasingly Complete Water Hub System.
- Rural Water Projects Thriving.

Improving Facility Construction

## 数据收集 Data Collection

### 经验与猜测

#### Experience and Guesswork

Predicting Natural Disasters for the Year Through Divination and Limited Experience.

### 天文历法

#### Astronomical Calendar

Knowledge Based on Practical Production Experience, Such as Moon Phases, Solar Terms, etc.

### 人工采集数据

#### Manual Data Collection

Traditional Manual Collection, Manual Inspections for Collecting Hydrological, Meteorological, and Geographical Data.

### 远程控制终端 (RTU)

#### Remote Terminal Unit

Automated Information and Data Collection to Achieve Majority of Automated Coverage.

### 数据采集新技术

#### New Technologies in Data Collection

Exploring Drone Inspection Technology and Autonomous Inspection Technology.

Increasing Data Elements and Diversified Collection Methods

## 发展历程 Development Process

### 中国古代水利工程

#### Ancient Chinese Water Engineering

Over 4,000 Years Ago, Yu the Great's Water Control Projects Opened a New Page in Chinese Civilization.

### 中国近代水利工程

#### Modern Chinese Water Engineering

Projects like the Yellow River Dams, Three Gorges Dam, South-North Water Transfer Project, and Western Development Water Projects Have Played Significant Roles in Improving Water Management and Promoting Economic Development.

### 中国现代水利工程

#### Contemporary Chinese Water Engineering

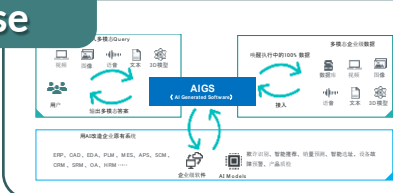
With Technological Advancements, Entered a More Energy-Efficient, Environmentally Friendly, Scientific, Informative, and Digital Stage, Also Increasingly Emphasizing Sustainable Development.

# 新技术的发展为水利行业提供迈向第四范式的可能

New Technologies Pave the Way for the Water Industry to Enter the Fourth Paradigm

New Phase

## 大型语言模型等生成式AI Large-Scale Generative AI Models



Capturing Process Details Using Generative AI Technology.

e.g. Large-Scale Hydrological Models

New Phase

## 大型专用决策模型 Large-Scale Specialized Decision-Making Models



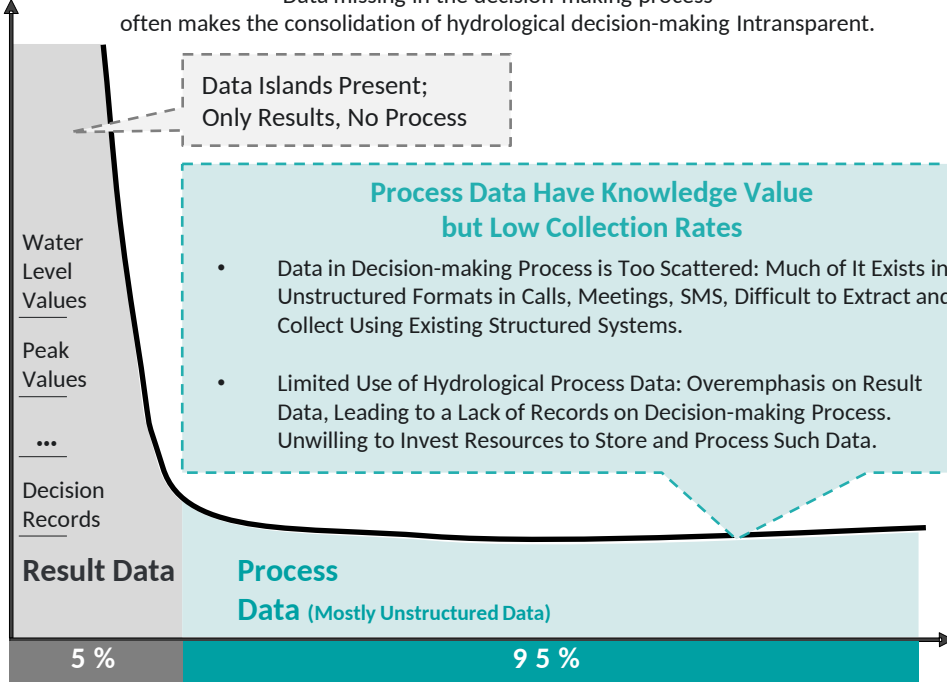
Achieving a Wide Range of Decision-making Capabilities Using Decision AI Technology.

e.g. Full Coverage of Decision-making in Tributaries

Current Situation

### 追求更好的水利决策能力沉淀 Pursuing Better Consolidation of Hydrological Decision-Making Abilities

Data missing in the decision-making process often makes the consolidation of hydrological decision-making Intransparent.



Data Islands Present; Only Results, No Process

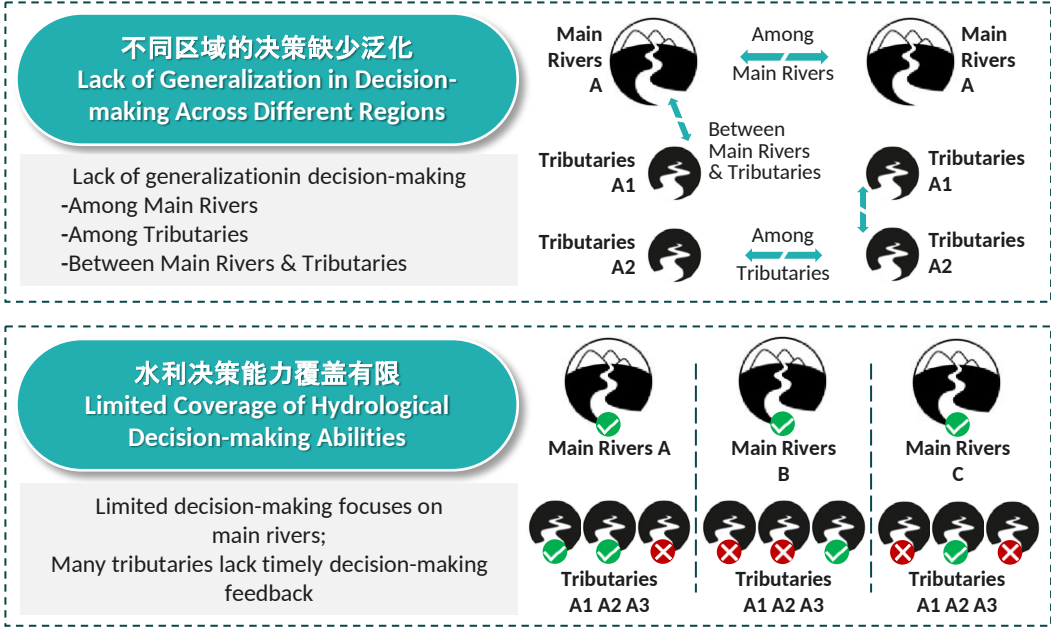
#### Process Data Have Knowledge Value but Low Collection Rates

- Data in Decision-making Process is Too Scattered: Much of It Exists in Unstructured Formats in Calls, Meetings, SMS, Difficult to Extract and Collect Using Existing Structured Systems.
- Limited Use of Hydrological Process Data: Overemphasis on Result Data, Leading to a Lack of Records on Decision-making Process. Unwilling to Invest Resources to Store and Process Such Data.

Current Situation

### 追求不同区域间的更有效的决策泛化 Pursuing More Effective Decision-making Generalization Across Different Regions

River Basins Vary, Lacking Effective Generalization in Deep Decision-making; Tributaries Lack Decision-making Coverage.



不同区域的决策缺少泛化  
Lack of Generalization in Decision-making Across Different Regions

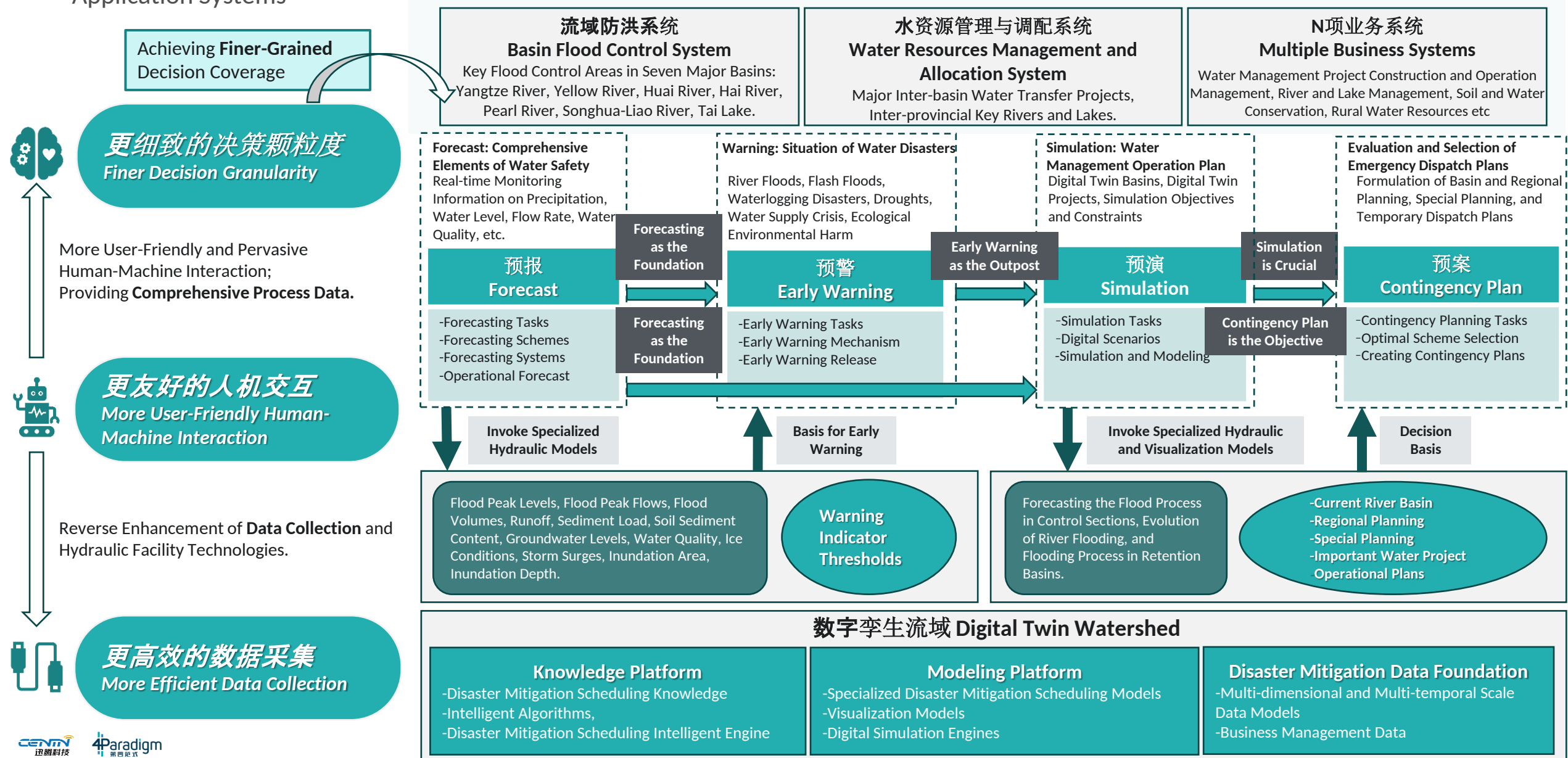
Lack of generalization in decision-making  
-Among Main Rivers  
-Among Tributaries  
-Between Main Rivers & Tributaries

水利决策能力覆盖有限  
Limited Coverage of Hydrological Decision-making Abilities

Limited decision-making focuses on main rivers;  
Many tributaries lack timely decision-making feedback

# 展望：迅腾&范式，数字赋能水利现代化高质量发展的智慧水利业务应用体系

Outlook: Centn & 4Paradigm, Digitally Empowering the High-Quality Development of Modern Smart Water Management Business Application Systems





# 谢谢聆听

AI for everyone.

