Non-economic benefits of standards

Case study of the

Shenzhen Water Resources Bureau

by

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Summary

- **Background and objectives of the project**
- **Four steps to conduct the assessment**
- **Conclusion of the project**

ISO Methodology: *The four-step assessment process applied in this case study*

1 Understand the value chain

- Clarify the functions of the Water Resource Bureau
- Understand its value chain
- Selection of channel and dike management department for the assessment
- Analyze the river management value chain

2 Identify the impacts of standards

- Analyze the key value drivers
- Identify the standards used in river management
- Finalize the scope of the study

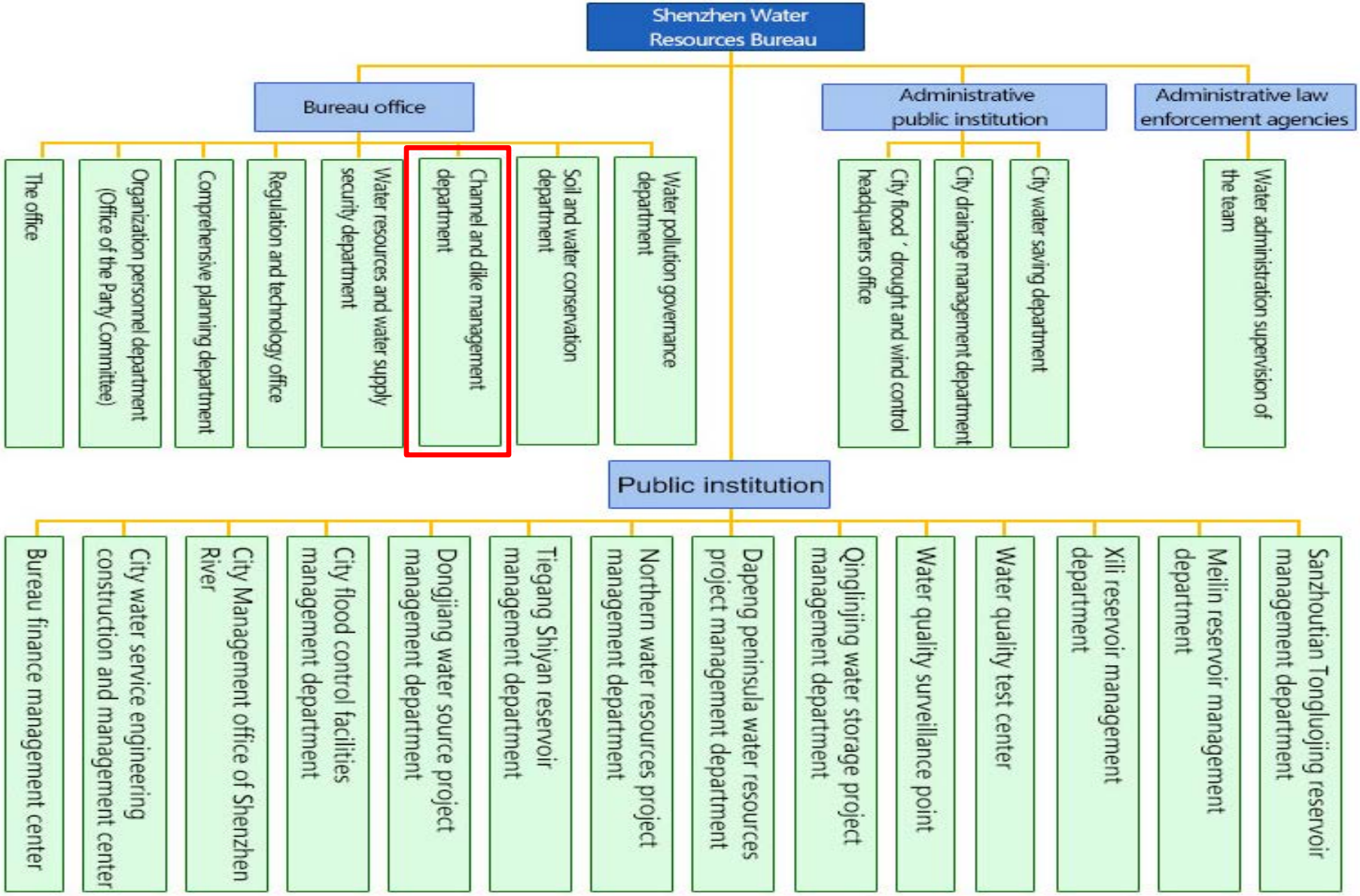
3 Select key operational indicators

- Select key operational indicators to measure the impacts

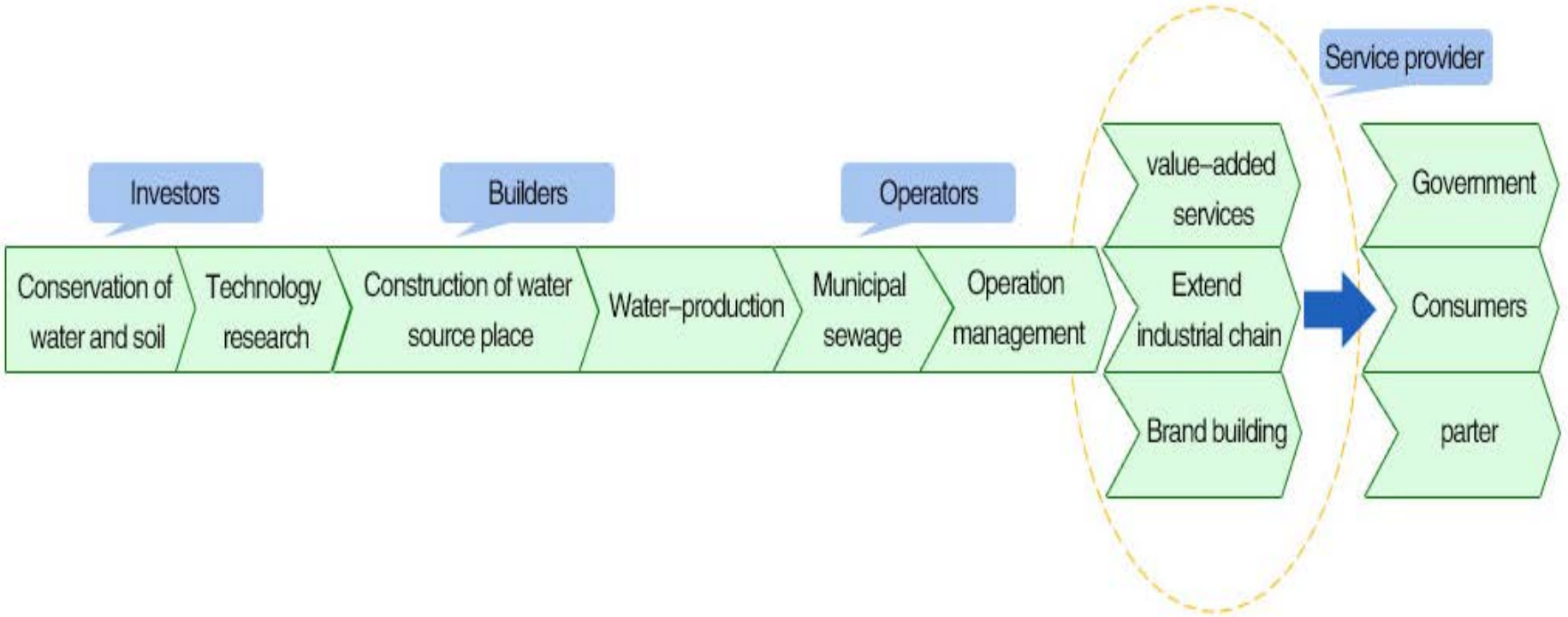
4 Measure the impacts of standards

- Undertake a comparative analysis of the standard implementation
- Qualitative analysis the impacts of standards
- Calculate the non-economic benefits

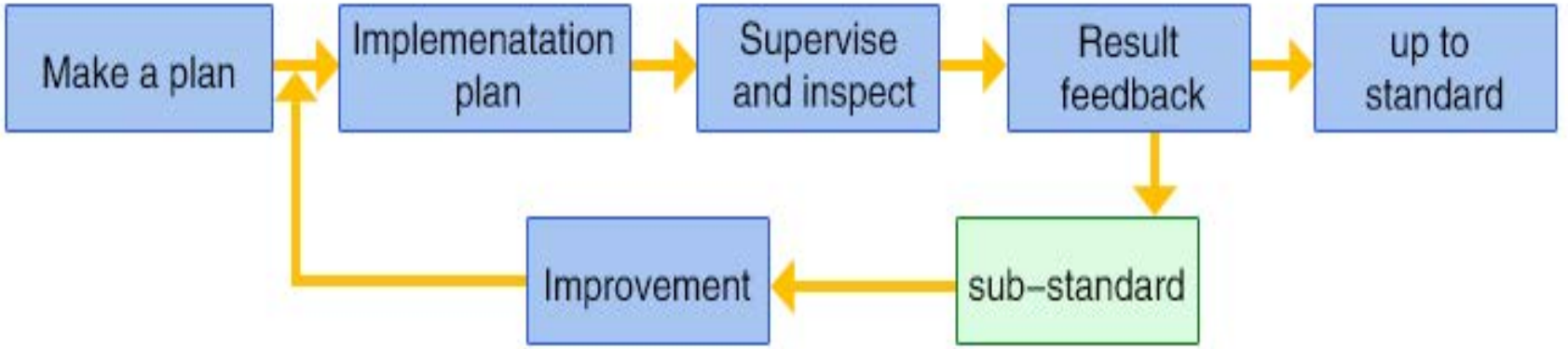
Step 1: *Understand the value chain*



➢ Value chain of the water work & water resource industry



➢ Process cycle of river management



Step 2: *Identify the impacts of standards*

- **Key value drivers in river management**

Key value drivers	Description
Water environment improvement	Improve the water environment of Shenzhen, including protection of the water resources, prevent their pollution, ensure river flood control, and governance and custody, soil and water conservation and biodiversity protection, etc.
Community involvement and development	Provide sports, leisure and entertainment venues for community residents.

➢ **Main standards used in river management: The most influential standard is the SZDB/Z 24-2009 (local standard of Shenzhen) which is at the center of this study**

No.	Business function	Standards reference	Title
1	River management	SZDB/Z 24-2009	Technical specification for river maintenance and protection
2		SL171-96	Design specification for levee project management
3		GB 3838-2002	Environmental quality standards for surface water
4		DB 440300/T6	Landscaping custody specification

Step 3: *Select key operational indicators*
(by analyzing key activities)

No.	Business function	Key activities	Standards reference	Title
1	River management	Embankment protection	SZDB/Z 24-2009	Technical specification for river maintenance and protection
			SL171-96	Design specification for levee project management
2		River bed desilting	SZDB/Z 24-2009	Technical specification for river maintenance and protection
3		Water-quality monitoring	GB 3838-2002	Environmental quality standards for surface water
			SZDB/Z 24-2009	Technical specification for river maintenance and protection
4		River cleaning	SZDB/Z 24-2009	
5		Virescence maintenance	SZDB/Z 24-2009	
			DB 440300/T6	Landscaping custody specification
6		Affiliated facilities	SZDB/Z 24-2009	Technical specification for river maintenance and protection

➢Identify and define operational indicators

No.	Operational indicators	Definition of the indicators (expected impacts of the standards)
1	Ecological security	Increase security of embankment revetment, stability of riverbed, and protection of the integrity of affiliated facilities
2	Water quality monitoring	Promote the water quality of the river
3	Ecology landscape	Promote ecologic greening construction engineering
4	Community satisfaction	Reflect residents satisfaction of river management
5	River management satisfaction	Reflect management department convenience of river management
6	New jobs	Promote the employment status

Step 4: *Measure the impacts of standard*

- **Comparative analysis of the standard's implementation**

- Before the implementation of the standard



- After the implementation of the standard


➢Coping with emergency situations timely and effectively

After the implementation of the standard

Qualitative conclusions before & after the use of SZDB/Z 24-2009

Before use of the standard

The residents living close to the river persistently complained about the lack of river management before the implementation of the standard. This included water quality, river clean-up, security of embank-ment revetment, etc. The river management (or the lack of it) directly affects the quality of life of the residents near the river.

After use of the standard

River management has achieved the following positive effects:

1.Consolidation of the river environment through a comprehensive treatment project and river governance

2. Environmental conditions have been significantly improved by cleaning up the river in reasonable time

3.The awareness of the importance of river protection by the residents has been raised significantly

4. The inspection and security of the river has been strengthened to ensure that the river operates normally

5.The ability to cope with emergency incidents has been improved

Quantitative conclusions

- Contribution of the standard SZDB/Z 24-2009

After interviews with the top management of the Water Resource Bureau, standards developers involved in the development of SZDB/Z 24-2009, standard users, the following conclusions were drawn relevant to the valuation of the impacts of the standard:

- The social and environmental benefits from river management are valued at 30% of the total costs of river management.
- The social and environmental benefits generated by using the standard are valued at 30% of the total social and environmental benefits.
- Therefore, the social and environment benefit from river management generated by using the standard are equal to 9% (= 30% of 30%).

Quantitative conclusions – *Overall social benefits*

1 **Employment opportunities increased**

The Shenzhen Water Resource Bureau invests CNY 50 million per year in river management projects, and created 302 new jobs.

2 **Water quality improved**

In **2009**, before the implementation of the standard, the water quality of the Longgang river reached only **class III** (according to Chinese National Standard GB 3838-2002);

In **2010-2011**, two years after the implementation of the standard, the water quality of the Longgang river had reached **class II**;

In **2012**, water quality had reached **class I**.

3 Public awareness of the importance of environmental protection has increased

Based on the achievements of river management at present,

- 91.26% of the residents surveyed agree that the government needs to take action in order to continuously improve the river environment.
- 98.36% of the residents surveyed said they will themselves take concrete actions and measures to improve the river environment.

Quantitative conclusions

- Application of the Contingent Valuation Method (CVM)

Definition of CVM (based on *Wikipedia*, entry: *Contingent valuation*):

A survey-based economic technique for the valuation of non-market resources, such as environmental preservation or the impact of contamination, which often do not have a market price as they are not directly sold – for example, people receive benefit from a beautiful view of a mountain, which would be difficult to value using price-based models.

Contingent valuation surveys, which are often referred to as *stated preference models*, are one technique to measure these aspects.

Typically the survey asks how much money people would be willing to pay (**WTP**) (or willing to accept) (**WTA**) to maintain the existence of (or be compensated for the loss of) an environmental feature or service.

Quantitative conclusions - *Environmental benefits*

1 Environmental benefit evaluation

Evaluation scope diagram

Residents' Willingness To Pay (WTP)

WTP (CNY)	number of people
0	18
10-20	69
20-50	55
50-100	28
100-200	4

Basis: 187 residents were surveyed of which only 5 persons stated that they had no willingness to pay.

Applying the Contingent Valuation Method (CVM) to assess the value of the environmental benefits, the following conclusions were reached:

- 95.08% of the residents who have been surveyed have a willingness to pay (WTP):

- Payments the local residents are willing to make (per month):
- Lowest level: **CNY 19.61**
- Highest level: **CNY 42.24**

2 Calculation of the total annual environmental benefits

Step 1:

The population density in the selected area is 2977 persons per km^2.

The geographic region with a radius of 1 km around the center area as an approximate size of 3.14 km^2.

The percentage of residents willing to pay (WTP) for a clean river is 95.08%.

The total number of residents with a willingness to pay is:
$2977 \times 3.14 \times 95.08\ \% = 9348$

2 Calculation of the total annual environmental benefits

Step 2:

The lowest WTP per month is CNY 19.61, the highest CNY 42.24. Using this information to calculate the value of the environmental services provided for the local residents results in (per year):

Lowest environmental benefit is: 19.61 x 12 x 9348 = CNY 2'199'771. Highest environmental benefit is: 42.24 x 12 x 9348 = CNY 4'738'314

Step 3:

The length of the river segment under consideration is 2 kilometers, the total length of the Longgang river is 19.9 kilometers.

The **total annual environmental benefit** is between:

- (19.9/2) * CNY 2'199'771 = CNY 21'887 721 (minimum)
- (19.9/2) * CNY 4'738'314 = CNY 47'146'224 (maximum)

Conclusion: Summary of the total non-economic benefits generated by standards

Identified **overall social benefits** due to the implementation of the key standard SZDB/Z 24-2009:

- Employment: Creation of 302 new jobs
- Water quality has significantly improved
- The public awareness of the importance of water quality amongst local residents has increased

The valuation of the environmental benefits due to the implementation of the standard (not including other non-economic benefits mentioned above) resulted in:

The **total annual environmental benefit** is between:

- (19.9/2) * CNY 2'199'771 = **CNY 21'887'721 (USD 3.545 Mill.)** (minimum) and
- (19.9/2) * CNY 4'738'314 = **CNY 47'146'224 (USD 6.637 Mill.)** (maximum)

Thank you!