



CRBOM Small Publications Series No. 8

The planning spiral of Brantas River Basin

by

Fahmi Hidayat

**Center for River Basin Organizations and Management,
Solo, Central Java, Indonesia**

September 2009

The '*Small Publications*' are intended for knowledge-sharing and dialogue. In some cases they may present facts, information and lessons learnt. In other cases, they provide news, opinions, ideas or open questions for discussion.

They express the opinions of the author(s) and not those of CRBOM.

They can be freely copied and disseminated.

Contributions are most welcome - in English or in Bahasa Indonesia.

The author:

Fahmi Hidayat, Chief, Water Resources Management and Technology Unit, PJTI,
and Deputy Director, CRBOM,
fahmi.hidayat@crbom.org

CRBOM
Center for River Basin Organizations and Management,
Solo, Central Java, Indonesia
www.crbom.org
info@crbom.org

Contents

Acknowledgement.....	i
Summary.....	i
Acronyms and abbreviations.....	ii
Glossary.....	ii
1 Introduction.....	1
2 Spiral planning.....	1
3 Water-related development planning.....	1
4 Evaluation.....	4
4.1 Institutional framework.....	4
4.2 New challenges.....	4
5 Keys to success.....	5
References.....	5
Appendix 1: The Brantas River Basin.....	6
Appendix 2: PJTI.....	8
Appendix 3: The IWRM spiral.....	9

Acknowledgement

The paper is based on work and publications by individuals and staff teams of Jasa Tirta I Public Corporation, part of which is listed under references. Furthermore, comprehensive use has been made of the recent UNESCO-NARBO IWRM guidelines (March 2009).

Summary

Brantas River Basin, East Java, has a population of some 16 mio. people, most of whom depend on water for their livelihoods. Since 1961 (when the population was less than half of what it is today), a sequence of four master plans have been formulated and implemented, under the principle of '*one river - one plan*', covering individual themes that reflected the development agenda at the time: Flood control; irrigation; and water conservation/water resources management.

The planning process has provided the framework for construction of 8 reservoirs; 4 river improvement schemes; 4 barrages; and 3 rubber dams. The total investment under the first 3 master plans (1960-2001) was 8.6 trillion IDR, or around 3 bio. USD.

Acronyms and abbreviations

IWRM:	Integrated water resources management
MPW:	Ministry of Public Works
NARBO:	Network of Asian River Basin Organizations
O&M:	Operation and maintenance
PJTI:	Perum Jasa Tirta I, Jasa Tirta Public Corporation I
RBO:	River basin organisation

Glossary

IWRM (integrated water resources management) (as defined by Global Water Partnership): A process which promotes the co-ordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems

Master plan: A comprehensive, well documented implementation plan for a set of related projects (or development initiatives) that have been identified as desirable and feasible. Traditional master plans cover one sector (or theme) and are intended for implementation by one administrative body; but a master plan can also span across sectors and include activities to be implemented by different agencies, in support of a shared over-all development goal

Scoping (of a development plan) can include a thematic delineation; formulation of a vision (or an over-all development goal); and formulation of related development priorities (or operational development goals)

Stakeholder (in the context of water resources management): (i) A person or an organisation with an interest in water resources management or water-related development; or (ii) a person or an organisation likely to be affected, positively or negatively, by a planned development initiative, intervention or regulation

1 Introduction

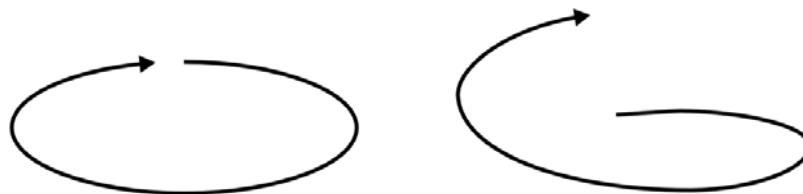
This paper describes a sequence of water-related plans, prepared and implemented over five decades in the Brantas River Basin, East Java. This basin has a population of some 16 mio. people, most of whom depend on water for their livelihoods.

2 Spiral planning

Most planning is cyclic - moving from scoping to formulation to implementation to evaluation. This is the case at project level - as reflected by the school of project cycle management - to comprehensive master plans and national 5-years social and economic development plans.

Still, a cycle is not a fully accurate concept, because you don't end up in the place where you started. The very purpose of the planning is to generate changes, and during implementation, the context will change: Better knowledge, new technology, and new opportunities and challenges. A spiral is a better illustration. When the planning cycle is repeated it will take place at a higher level.

Figure 1: The cycle and the spiral



3 Water-related development planning

Background

In 1961, a tunnel was completed¹ to drain the Ngrowo sub-basin. The benefits were visible and significant, converting large areas into fertile agricultural land. The scheme illustrated the potential benefits of water-related development.

In consequence, Ministry of Public Works initiated a basin-wide water resources development planning study, based on the principle of '*one river, one plan*'. The planning emerged as a sequence of master plans, prepared and implemented in a step-wise manner, in accordance with national development requirements.

¹ with support from the Japanese government, which also supported the subsequent master planning

The planning approach

The development planning proceeds as follows:

- 1 A master plan is formulated as a development guide, shared by the involved sector agencies, and reflecting agreement and coordination between the agencies
- 2 An immediate development objective is formulated, reflecting a priority theme. The first master plan focused on flood control, which was, at the time, a serious concern
- 3 The planning is conducted in stages, reflecting prevalent development needs
- 4 The planning is reviewed and carried forward on a background of the ever-changing social and economic conditions, around once in a decade

The planning sequence

The planning sequence has been of master plans is as follows:

Master Plan I (1961) emphasized ***flood control*** by developing dams in the upper part of the basin, and by improving the drainage capacity of relevant reaches

Master Plan II (1973) was made after most of the objectives of the first plan had been achieved. It focused on ***irrigation development***, in response to the national food security policy

Master Plan III (1985) was made following comprehensive development of irrigation schemes and intensified cultivation. In response to ongoing urbanisation, it aimed at ***domestic and industrial water supplies***

Master Plan IV (1998) addresses the need of water conservation and effective ***water resources management***

The planning sequence clearly appears as a '*spiral*', as illustrated in Figure 1 below.

Results

The planning process has provided the framework for construction of 8 reservoirs; 4 river improvement schemes; 4 barrages; and 3 rubber dams. The total investment under the first 3 master plans (1960-2001) was 8.6 trillions IDR, or around 3 bio. USD².

Today, domestic supplies are 300 Mm³/year and industrial supplies 91 Mm³/year (2008). The irrigated area is 304,000 ha, of which 83,000 ha is supplied from reservoirs. This has supported a significant increase in cropping intensity, from 0.8 crops per year in 1960 to 2.2 crops per year in 2008. Flood protection has been provided for an area of 60,000 ha; and the hydropower production has been increased from 170 mio kWh/year (1960) to 1.1 bio. kWh/year (2008).

Some major structural developments are listed in Table 1 below.

²

Indicative conversion at actual exchange rate (which has changed dramatically in the period)

Figure 2: The planning spiral in Brantas River Basin

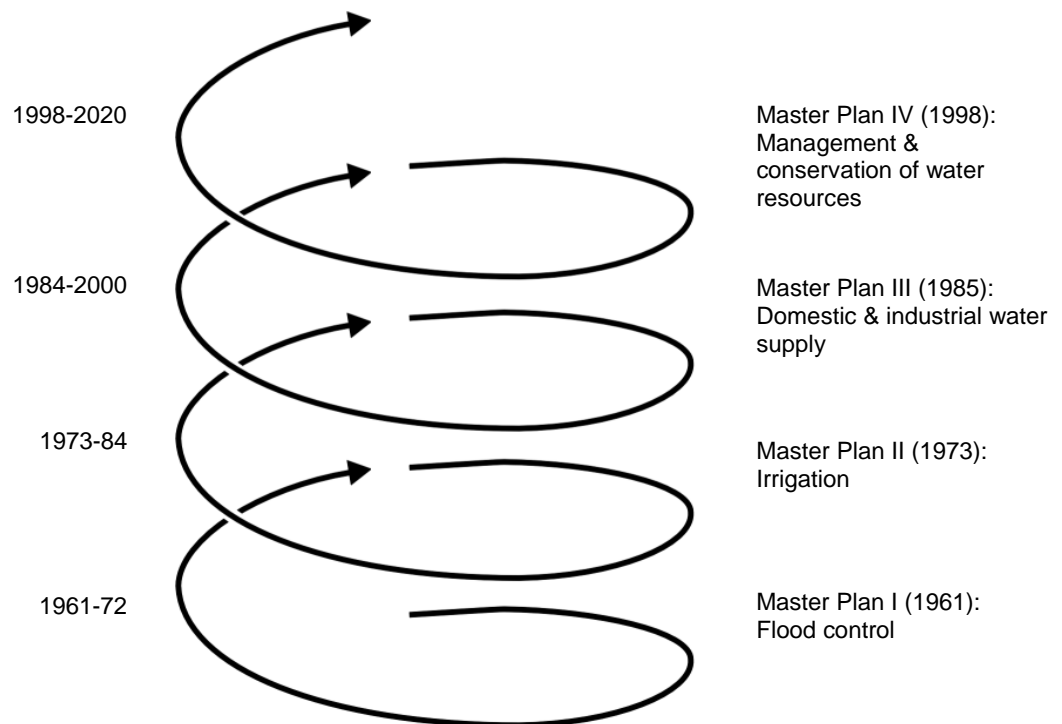


Table 1: Major water-related developments 1960-2001

2000	Wonorejo Dam	Multi-purpose
1993	Jatimlerek Rubber Dam and Menturus Rubber Dam	Irrigation
1992	Mrican Barrage	Irrigation
1990	Gubeng Rubber Dam	Domestic supplies
1990	Wonokromo Barrage	Flood control
1988	Sengguruh Dam	Sediment control, hydropower
1986	Tulung Agung Gate	Multi-purpose
1984	Bening Dam	Multi-purpose
1983	Lodoyo Dam/Barrage	Hydropower
1981	Jagir Barrage (rehabilitation)	Domestic supplies
1981	Gunungsari Barrage	Irrigation
1978	Wlingi Dam	Multi-purpose
1977	Lahor Dam	Water supplies, flood control
1974	New Lengkong Barrage	Domestic supplies, irrigation
1972	Sutami Dam and Selorejo Dam	Multi-purpose
1969	Ngrowo Tunnel	Drainage

Multi-purpose schemes serve three or more of the following objectives: Domestic/industrial supplies, irrigation, hydropower, flood control, recreation

4 Evaluation

4.1 Institutional framework

Until 1990, planning and plan implementation were undertaken by a temporary body, '*The Brantas River Basin Development Project (BRBDP)*'. In the course of time, however, the need of effective O&M indicated a permanent organisation rather than a temporary, construction-oriented one.

In consequence, Jasa Tirta Public Corporation 1 (Perum Jasa Tirta I, PJTI) was formed in 1990 to manage the water resources in Brantas Basin. (Later, in 2000), its field of work was extended to include the Bengawan Solo Basin as well).

Please refer to Appendix 2 for a short description of PJTI.

It has been observed that a good collaboration (and coordination) between sector agencies is a precondition for good water resources management, water conservation, and economic growth.

4.2 New challenges

The following challenges and issues are seen as the most likely to influence the future water management in the basin:

Economic growth

Economic growth will cause a shift of water demands between sectors - such as between agriculture and industry, and, later on, tourism and recreation. This, in turn, leads to new efficiency requirements and new supply-delivery requirements. Economic growth generates pressures on the water quality, in the short term by sewage production, and in the long term the more complex aspect of balancing the water demand in terms of not only quantity but also quality. A strong economy can allow for greater flexibility in the water management by economic instruments for regulation. (In contrast, the recent global economic crisis has demonstrated that a weak economy does not alleviate misuse of water).

Social shifts

Population growth and urban migration directly affect the water demand and utilisation. The population of the basin has increased by a factor 2.3 since 1960 and is presently growing by around 2 percent per year. This increases the pressure on all natural resources, including water, and can strongly amplify a general water-stress. Urbanisation increases the demand of supply, sanitation and sewage treatment and disposal. Public support must be mobilised to support resource conservation.

Environmental degradation

Environmental degradation affects the water availability in terms of quantity (over-exploitation) and quality (pollution). The governing cause-effect relationships span across economic growth, public health and social welfare. Here again, public awareness and support are required, along with political will and appropriate instruments for enforcement.

Shift of paradigms

The over-all socio-economic development has changed the perception of water as a fee good to water as a social and economic good. Hereby, the role of the state has shifted from a provider towards an enabler; the management perspective has shifted towards the basin level; the water sharing has shifted towards a multi-sector allocation; and the scope has broadened for public participation.

5 Keys to success

Several aspects have contributed to the successful developments, such as:

- The thematic delineation of each plan has provided a clear focus, which has in turn facilitated political and public support, inter-agency collaboration, and inter-sector synergies (as illustrated by the many multi-purpose schemes promoted under the planning);
- the institutional framework has evolved in parallel with planning and implementation, from a temporary to a permanent body (PJTJ), recently supplemented by the Brantas Water Council, which assembles government and non-government stakeholders to provide support to policy formulation and strategic planning.

The UNESCO guidelines (March 2009)³ list the following '*keys to success*' for the Brantas River Basin:

Aspect	Key to success
Applying integrated river basin development and management concept	Advocate the importance of water resource management at the basin level and promote coordination among all sectors to be addressed in policies and national strategies.
The comprehensive plan must be positioned as a national priority and as a regional (river basin wide) priority	Set priorities among the problems to be solved, taking into account constraints such as time and funds.
Managing water resources and infrastructures in the basin	Continuously monitor and evaluate the effectiveness of IWRM activities (plans, projects, infrastructure, legal framework, organisations, etc) in the basin.
Coordination among sectors and all stakeholders	The amended water law of 2004 provided for public involvement in every step of water resources management. Political and technical support is socially acceptable through public consultation and community involvement.

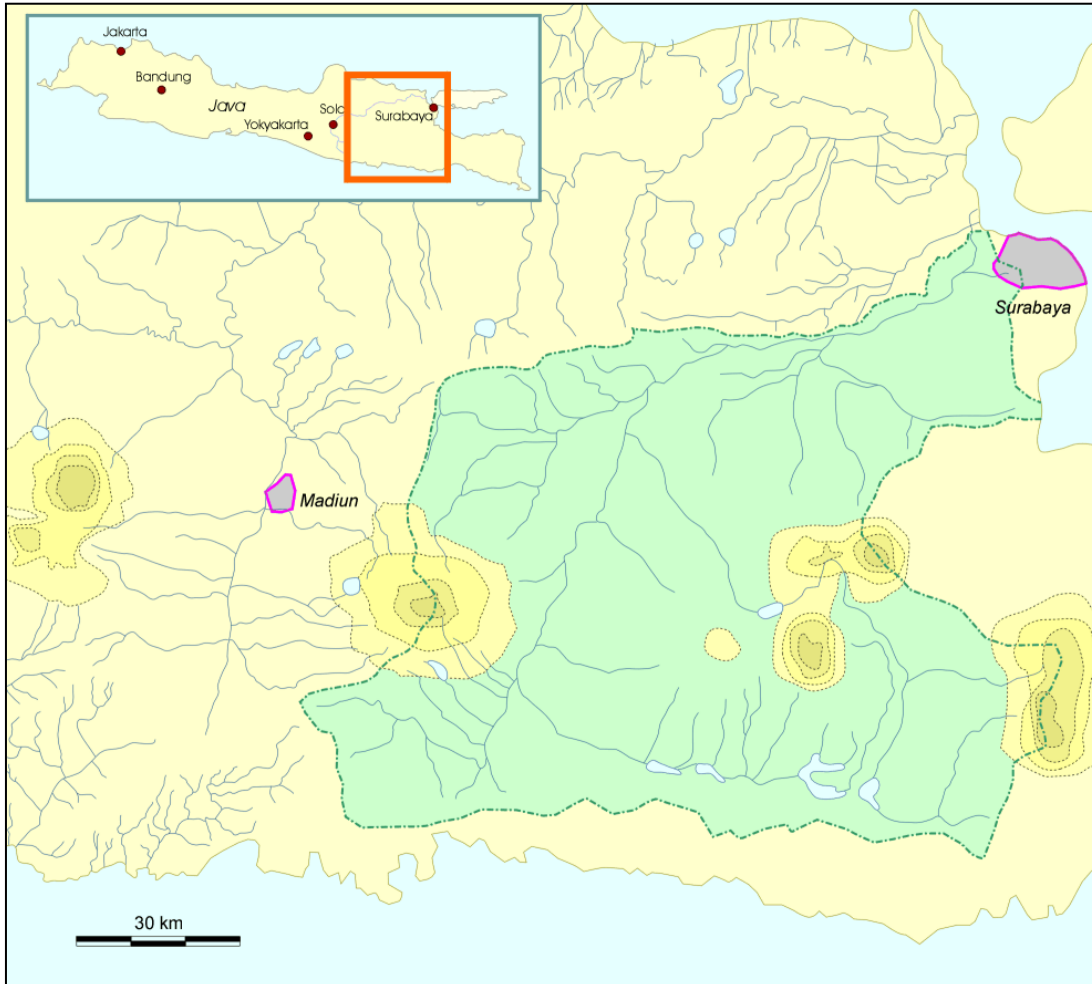
References

- Fahmi Hidayat, Harry M Sungguh and Harianto (Sep 08): Impact of climate change on floods in Bengawan Solo and Brantas River Basins, Indonesia. Paper presented at 11th River Symposium, Brisbane, Australia
- PJTJ (Apr 09): Brantas River Basin Organization and Management. Paper presented at the Regional Launch Workshop of the Center for River Basin organizations and Management, Solo, Central Java
- PJTJ (Sep 09): Information and Issues on Brantas River Basin. Presentation to Scoping Team for Water and Climate Change Projection and Adaptation in Java Island and Citarum, Bengawan Solo and Brantas River Basin, Indonesia
- PJTJ: Integrated water resources development and management in a river basin context: The Brantas River Basin's experience
- UNESCO and NARBO (Mar 09): IWRM guidelines at river basin level. (Please refer to Appendix 3)

³ Part 2-1, Chapter 5, pp. 61-72

Appendix 1: The Brantas River Basin

Figure 3: Map of the Brantas River Basin



Note: The Brantas water management district comprises the river basin itself plus some additional areas

Basin area:	11,800 km ²
Population (2003):	15.5 million
Average rainfall:	2,000 mm/year
Water potential:	12 billion m ³ /year
River length:	320 km
Active volcanoes:	Mt. Kelud & Mt. Semeru
Land Use (2004):	
	paddy field 39%
	dry land 12%
	plantation 22%
	forest 11%
	settlements 12%
	others 4%



General

The Brantas Basin is one of the largest and most developed river systems in Indonesia. It functions as the most important source of water supply in East Java Province.

It contributes some 8% of national GDP (as of 2003).

Agriculture is dominated by paddy, nearly all of which is irrigated. Irrigated, dry-footed crops (known as *polowijo*) are primarily grown in the dry season; they include maize, soybeans and peanuts. Other important crops are cassava, tobacco, coffee and sugarcane. Typical crop rotation schedules are paddy-paddy-polowijo; paddy-paddy-fallow; and paddy-polowijo-vegetables.

Important water-consuming industries are sugar processing; pulp and paper; leather; and food products.

Figure 4: Cultivation on sloping ground



Development agenda

- Vegetation cover and morphological management (erosion and siltation, including reservoir siltation and scour around structures), and sand mining
- Water availability and supplies - domestic, industrial and irrigation; including storage capacity
- Floods (including flash floods) and drought
- Water quality
- Biodiversity, water-related tourism and recreation
- Hydropower development
- Fisheries

Appendix 2: PJTI

Jasa Tirta Public Corporation 1 (Perum Jasa Tirta I, PJTI) was formed in 1990 to manage the Brantas Basin. In 2000, its management area was expanded to include the adjacent Bengawan Solo Basin.

This is one of two such organisations in Indonesia: PJTII covers the Citarum Basin.

The organisations are public corporations, expected to combine healthy corporation principles and accountable public services, operating in a dialogue with the public and private sectors and the water users. They undertake

- Water allocation and drought management, as agreed with the Provincial Water Resources Management Committee (Panitia Tata Pengaturan Air, PTPA);
- flood control, flood forecasting and flood warning;
- watershed management;
- recommendations on water licensing (to the PTPA);
- water quality monitoring;
- provision of technical recommendations for wastewater disposal;
- general maintenance and minor rehabilitation of infrastructure;
- sediment removal in reservoirs and channels;
- monitoring and control of sand mining; and
- land use planning (especially around reservoirs and river corridors); related technical recommendations on licensing of river corridor utilization; and related monitoring.

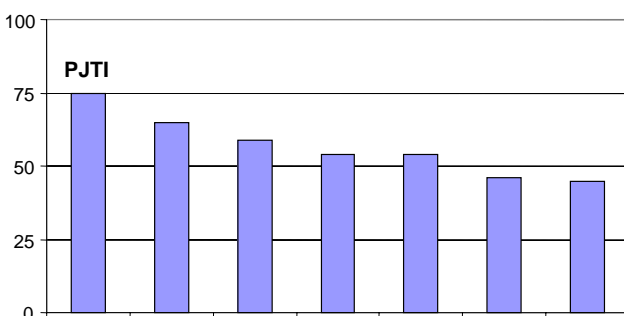
Funding is provided in three ways:

- Beneficiaries pay for water services, rendered in form of water service fee (except farmers)
- Polluters are obliged to pay pollution fee and tax (not yet implemented but legal background is being drafted)
- The government pays for social services such as flood control, water quality control and water resources conservation

PJTI applies quality management according to ISO 9001 for the Brantas Basin, as well as accreditation of its laboratories by international standards.

In a recent national benchmarking, PJTI was ranked as the best performing river basin organisation among the 7 participating organisations. The benchmarking applied indicators covering mission; stakeholder relations; learning and growth; internal business processes; and finance.

Figure 5: Benchmarking of Indonesian River Basin Organisations (2008-09)

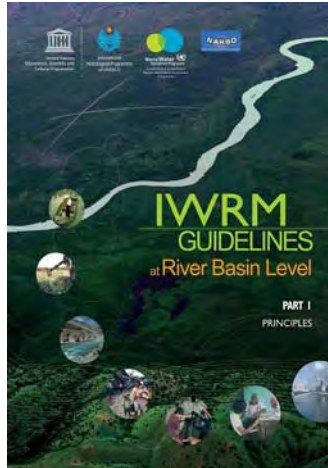


Appendix 3: The IWRM spiral

Ref.: UNESCO and NARBO (March 09)

http://www.unesco.org/water/news/newsletter/214.shtml#news_4

The spiral concept was introduced in the '*IWRM guidelines at river basin level*', prepared by UNESCO in collaboration with Japan Water Agency (JWA) and Network of Asian River Basin organisations (NARBO), with support from many organisations and individuals.



The guidelines are structured in four volumes:

Part 1: Principles

Part 2-1: The guidelines for IWRM coordination

Part 2-2: The guidelines for flood management

Part 2-3: Invitation to IWRM for irrigation practitioners

They cover the entity (and interdependencies) of socio-economic, geographic, hydrological and technological aspects, as well as the legal and institutional framework, information flows and the decision process.

IWRM is regarded as a process - not merely a continuum, but a sequence of major steps, such as master plans or other high-impact initiatives. This is referred to as the IWRM spiral - with

each cycle representing a significant achievement.

The time scale of a cycle becomes somewhere between a number of years to several decades.

It is noted that a good-understanding of sectoral perspectives and their relationships is key for IWRM: Domestic, industrial and agricultural water uses; sewage and sanitation; hydropower; the environment; flood management; and more.

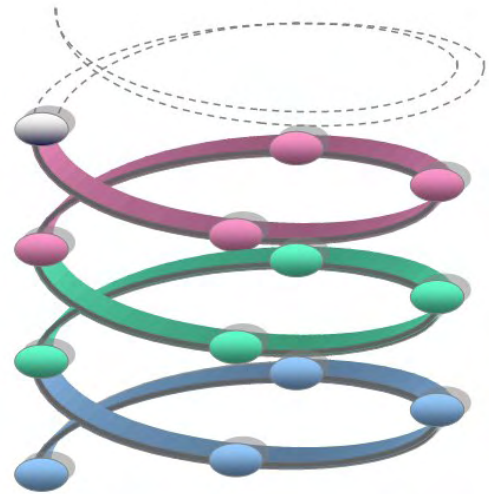
Key messages

General

- Water is important for sustainable development
- IWRM at the river basin level is a process that leads to water security and helps mitigate water-related risks

Benefits of IWRM at the river basin level

- The river basin is an appropriate unit for integrated management
- IWRM can effectively deliver a triple bottom line of economic efficiency, social equity and environmental sustainability that are essential for sustainable development
- Applying IWRM enables appropriate inclusion of water-related disaster management and alleviation of environmental impacts
- The importance of water should be recognized at the highest level of decision-making as well as at the basin level
- Each sector benefits by participating in IWRM
- IWRM is the foundation for progressing adaptation to climate change



IWRM as an evolutionary process at the river basin level

- IWRM is an iterative, evolutionary and adaptive process, conceptualized as a 'spiral', which permits immediate action, builds understanding, develops local capacity and creates ownership
- Reassessment of basin hydrology improves understanding of a changing water cycle
- Drivers of change at the basin level should be recognized and prioritized for adaptation
- Reassessment for adaptation to changes can be an opportunity to consider and address special drivers such as climate, land-use changes and the agricultural footprint in the evolving IWRM process

The implementation process

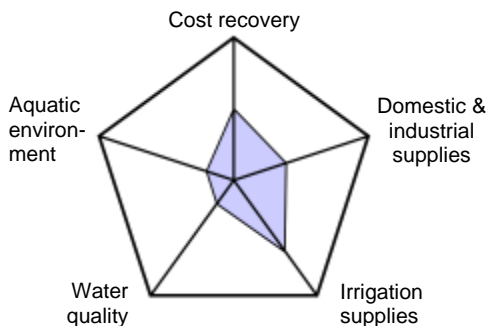
- Embark on IWRM whether the institutional processes are well-developed or not
- Recognize water is managed by many agencies, organisations and individuals
- Access to actors outside the water box is essential to move political will, sectoral support and public pressure for IWRM implementation
- Upgrading new technologies is vital for effective performance
- Water resources development coordinated among various sectors and users is facilitated by preparation of a master plan that reflects the individual sector plans and offers the most effective and efficient utilization of the resource
- Although not essential to begin the IWRM process, river basin organisations do provide a good institutional mechanism for moving forward
- The application of IWRM by basin organisations varies according to each river basin's specific conditions and requirements

Enhancing performance and accountability

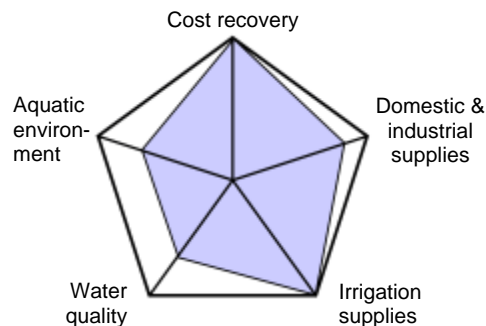
- Water managers have a responsibility to inform the public and other stakeholders and conduct self-assessments
- Enhancing performance and accountability through regular assessments using performance indicators and benchmarking, reporting and knowledge networks are keys to moving up the spiral to better integrated water resources management
- Performance benchmarking systems and peer review programmes provide pragmatic perspectives for assessment and improvement of basin management performance

Progress can be synthesised in pentagrams, as follows:

Before



After



Case studies included in Part 2-1:

Brantas River Basin, Indonesia

Büyük Menderes River Basin, Turkey

Davao River, Philippines

Lake Biwa, Yodo River Basin, Japan

Murray-Darling Basin , Australia

Negro River Basin, Argentina

Sacramento-San Joaquin River, USA

Tama River, Japan

Tone River, Japan

Volta River (Benin, Burkina Faso, Côte D'ivoire, Ghana, Mali, and Togo)

Yoshino River, Japan

**Center for River Basin Organizations and Management,
Solo, Central Java, Indonesia
www.crbom.org, info@crbom.org**