Draft of 2 September 2012

Advancing integrated river basin management in the Mississippi basin – suggestions from international experiences on institutional arrangements, organisational roles and responsibilities and shared leadership.

Bruce P. Hooper, PhD
Independent water advisor
Brisbane, QLD. AUSTRALIA
Web: LinkedIn E: bphooper@gmail.com

1 Purpose of this paper

This document is a discussion paper about the type of institutional arrangements, organizations and shared leadership necessary to advance integrated river basin management (IRBM) in the Mississippi River Basin. The paper ambitiously proposes a Mississippi River Basin Commission, which can be formed and operate using attributes of international best practice in river basin management.

This paper takes the Mississippi basin to refer to the large watershed of both the Mississippi and Missouri basins, including the international portion of the basin originating in Canada. The term Mississippi Basin will be used to refer to this entire system. Table 1 shows a subdivision of the Mississippi basin into nine valley systems. . This subdivision can be useful as an organisational framework for river basin management, based on existing and hydrological-ecological functions of the vast Mississippi Basin and using valley names which resonate with local understandings of water flow.

Table 1. Mississippi-Missouri basin rivers and major tributaries

#	Valley	Major tributaries and main stem stretches
1	Missouri (excluding Yellowstone and Platte)	Upper Missouri main stem, James, Big Sioux, Grand, Cheyenne, White, Niobrara, Kansas, Osage, Milk [Including international waters originating in Canada]
2	Yellowstone	Yellowstone main stem, Bighorn, Tongue, Powder
3	Platte	North Platte, Loup and South Platte
4	Upper Mississippi (upstream from Cairo, IL., excluding Missouri)	Illinois [including water quality issues related to interaction with the Great Lakes], Upper Mississippi main stem
5	Ohio	Ohio main stem, Wabash, Kanawha, Big Sandy
6	Tennessee	Tennessee main stem, Duck, Little Tennessee, Holston
7	Arkansas	Arkansas main stem, Fountain Creek, Pawnee, Verdigris, Neosho, Cimarron, Canadian
8	Red	Red main stem, Washita, Ouachita
9	Lower Mississippi (Cairo, IL., to delta, excluding Arkansas and Red)	White, Yazoo, Lower Mississippi main stem

While the thrust of this paper is on surface water management from rainfall and snowmelt, the approach recommended here is to recognise groundwater as a key resource in water cycle management. This will require further consideration of how surface-groundwater basins be defined hydrologically and hydraulically for conjunctive water resources planning and management, according to latest US know-how.

2 Implementing integrated river basin management

IRBM is defined as a coordinated, stakeholder driven approach to achieve sustainable water management, in which watersheds (large river basins, medium sized valleys and local watersheds) form several lenses for integrated management. Why use an integrated, river basin approach? Several pre-existing conditions favour an integrated approach in the Mississippi basin:

- There are many water resources problems which include different sectors - cooperation and consensus is needed and this normally requires respect, trust and goodwill, and a willingness to participate voluntarily in a process,
- Several serious water resources problems exist which requires more than one agency to solve (e.g. hypoxia in the Gulf of Mexico, competing demands for rivers (e.g. navigation versus recreation), increasing demands for water extraction, ageing water infrastructure, competing demands for water between agricultural and water users),
- No one agency, line department or group has all the answers, either at State or Federal level,
- No one agency, line department or user group has all the rights to water use; in fact some groups are excluded from the water management processes and need inclusion, and

- Upstream versus downstream benefits and disbenefits occur amongst water stakeholders.

Much has been learned from previous experiences in IRBM in the USA and throughout the world. This paper extrapolates the author's previous findings from an international review of these previous experiences, undertaken while he was a Fellow with the US Army Corps of Engineers (Hooper, 2006) and recommends a best practice approach, outlined in summary form in Table 2.

The best practice approach derives from experiential learnings from river basin organisations, government departments, non-government organisations, individual experts and academics. While there is no hard and fast rule as to what contributes 'best' practice, the list provides insight into what water sector organisations and individuals have found to be 'what works best' in bringing about successful outcomes for water resources management at the basin level, using an integrated approach. Rather than focusing on hindrances to integration, it outlines a positive set of best practices.

Table 2 lists 35 best practices, grouped into 11 categories representing institutional, human resources, organisational, financing, technical and other attributes. They include governance, empowerment and implementation issues as well as critical, people-oriented skills and organisational procedures. Table 2 also provides an indicator for each practice which could be used by a proposed Mississippi river basin organisation (RBO). Each practice and indicator is described very briefly. It is not possible in this paper to discuss each in great detail due to space and time constraints.

Table 2. Organisational, empowerment and implementation practices and indicators, as applied to a proposed Mississippi basin organisation

Best practices	#	Practice used by a proposed Mississippi basin organisation	Indicator
A. Mission goal clarity, staging and completion	1	Clear specification of the roles and responsibilities of the Mississippi basin organisation in national policy and legislation, including 'rules' which specify participation and membership and members' roles in decision-making.	Rules governing basin organisation structure and functions exist
	2	Following extensive consultation, there is clear specification of priority natural resources management issues, how they can be addressed and a thorough understanding of the basin's hydrology; this will be part of the goal formulation by the Mississippi basin organisation.	Need, scope and context stated in basin management plan
	3	There are well-defined objectives for river basin management at national and valley (including inter-state) level with mutually beneficial and desirable goals, and where resource development forms part of a long-term integrated basin management plan for the Mississippi. There is: - awareness of constraints and opportunities on water resources development in basin; - awareness of "turf" disputes between states and government departments; - a strategic planning and implementation process in place using communications, coordination and cooperation, including cost-sharing - realistic and informed understanding of what are feasible water resources management options.	Realistic goals stated in an integrated basin management plan
	4	There is definition of the scope of the problem-shed, range of issues, environmental policies and management activities occurs; and a clear boundary to the basin's problem to avoid ambiguity.	Problem scope specified in an integrated basin management plan
	5	Basin management moves from a pure resource exploitation ethic to incorporate water security and environmental management in its work plans.	Integrated basin management plan uses sustainability goals of water security & environmental management
	6	A Mississippi basin organisation exists and makes decisions, aware of the reality of existing conditions; often compromise on the best practices is required; a staged implementation procedure is needed - addressing the most pressing resource management issues first, and recognizing what is possible in the short term; this process must be backed up by long-term planning.	Stepped planning process in place by basin organisation
	7	Evidence that projects are completed on time and within budgets; ex-post project evaluation mechanisms in place; reporting to management boards occurs.	Project completion reports exist and reported to basin stakeholders
B. Clarity in institutional arrangements	8	For international sub-basins, there is an international agreement which dictates water sharing and which recognises mutual benefits to and from the river and to and from Canada and USA.	Benefit shares stated in an international agreement

Best practices	#	Practice used by a proposed Mississippi basin organisation	Indicator
	9	Fragmentation and overlap of responsibilities between and within Federal and State agencies is addressed by supportive legislation, clear specification of roles and responsibilities of basin partners exists at both state and national level.	Roles and responsibilities of basin partners listed in basin management plan and signed off by basin partners
	10	There is clear management role and jurisdiction of a Mississippi basin organisation in national water policy and legislation, and which is supported by the riparian states.	Management roles and responsibilities of Mississippi river basin organisation stated in national law and water policy
C. A workable enabling environment	11	Water, as a common-pool natural resource, is more likely managed by the public sector and at the local level by the private sector; the State (Federal, State and local agencies) will take the lead role to develop, implement and manage river basin management activities together.	Management roles and responsibilities stated in integrated basin management plan
	12	There is ample opportunity for the private sector to enact river basin management functions, especially at the local level. This can be realized through joint ventures, cost-sharing arrangements and common projects.	Management roles and responsibilities stated in basin management plan
D. A functioning legal environment	13	The Mississippi basin organisation is supported by strong and comprehensive, but flexible legislation, regulations, decrees etc. which ensures "fairness" in basin-wide decisions and a process of accountability. "Policing" is required by an independent body (or bodies) with enough authority to insist on improvements.	Laws stating basin 'water shares' exist and practised
	14	There is a need for established and accepted basin rules or laws including the legislation which clearly identifies the Mississippi basin organisation functions, structure and financial base.	Laws stating basin 'water shares' exist and practised
E. An adaptive, coordinated management style	15	The Mississippi basin organisation uses a "learn by doing" approach – planning and management are adaptable and it uses stakeholders in decision-making	Evidence of 'learning by doing' in decision-making in place; decisions are linked to outcomes of previous basin planning and management reviews
	16	Rules are defined for the array of coordination activities (who is involved), how binding or permissive is the coordination (what can be done) and on what basis is the involvement (law, policy, informal agreement).	Coordination and adaptive management processes in place
	17	The Mississippi basin organisation promotes integrated action across all natural resource issues, which means national and state agencies do not find singular solutions but look at impacts and improvements across the spectrum of natural resources, and the development of regional (basin scale) natural resources management policies.	Coordination and adaptive management processes in place
	18	The Mississippi basin organisation uses a multiple agency approach and leads overarching coordination.	Coordination body in place
	19	The Mississippi basin organisation uses organisational structures which allow cross-sectoral planning and management; will focus on coordination and advisory roles; will focus on oversight, management and planning as defined in its incorporation.	Coordination and adaptive management processes in place
	20	Basin-wide planning is used to balance all user needs for water resources and to provide protection from water related hazards; agreement on commitments within the basin, and mechanisms for monitoring those agreements are led by the Mississippi basin organisation.	'Balanced', agreement-driven management documented in methods used to select best management options and reported in a basin management plan
F. An emphasis on water security and water use efficiency	21	Basin-wide water management is linked to water security plans for irrigated agriculture, industrial and urban water users	Secure, tradeable water entitlements established, quantities dependent on sustainable levels of extraction
	22	Increasing the productivity of water diverted from rivers is less important than being able to capture water more effectively in the soil profile; mechanisms for raising local productivity through local watershed initiatives are the fundamental tool for local water management; the challenge is to get more crop, cash and jobs for each drop.	Water use efficiency plans used in sub-basin land and water management plans
G. Strengthened procedures	23	The Mississippi basin organisation recommends how management decisions can be made (consensus, voting etc.) in sub-basin land and water resources management plans and if the local plans are congruent with an integrated basin management plan. [This could be enacted valley by valley, as in Table 1]	A basin management plan includes guidelines for participation in local groups; local land and water management plan is congruent with overall basin

Best practices	#	Practice used by a proposed Mississippi basin organisation	Indicator
			management goals.
	24	The Mississippi basin organisation provides guidelines for local government agencies to enact zoning mechanisms, local government pollution controls, and other planning tools to manage local natural resources	A basin management plan includes guidelines for local government planning, congruent with overall basin management goals.
H. Improved capacity in human resources management	25	The Mississippi basin organisation will have available well-trained staff with the capacity to work in teams and plan across sectors and disciplines.	The Mississippi basin organisation provides staff training relevant to key needs and quality assured by external auditor
	26	The Mississippi basin organisation will have staff with skills to a mandate to ensure they take a 'big picture' in river basin management; they provide the leading voice on basin wide water issues; they inform their constituencies and decision-makers in all sectors and at all levels of decision-making in both the public and private sector; they will be well-trained, articulate, responsible and exercise good listening skills.	Leadership training program used by basin organisation
I. The use of economic tools	27	The Mississippi basin organisation will promote pricing mechanisms and cost-sharing arrangements to national, state and local governments which are best applied to contexts where mechanisms for water charges can be collected; the price of water retains a poverty clause to provide water as a fundamental human right in low income counties; alternative demand management technologies are used where pricing is inappropriate and used in conjunction with pricing where users have a capacity to pay.	Water pricing and demand management used in water sharing agreements, with a poverty clause based on household income
	28	The Mississippi basin organisation will have financial resources adequate to make substantial decisions which address priority natural resources management issues. There are a variety of mechanisms to fund the Mississippi RBO including direct government grants, user charges and levies	Mississippi basin organisation budgets include adequate finances to address priority needs
J. Public involvement in decision-making	29	The Mississippi basin organisation will develop a strong and on-going stakeholder awareness and use stakeholder participation processes to enhance greater ownership of basin scale plans of action at the local level; local actions plans will have a communication system directly to the heads of government land and water resource management agencies and heads of the Mississippi basin organisation.	Stakeholder awareness program used by Mississippi basin organisation and quality assured by external auditor
	30	The emphasis is placed on representative stakeholder participation in decision-making at all levels; the key stakeholders are not excluded from involvement; transparent mechanisms ensure participation.	Representatives of stakeholders included in key decision-making processes
	31	Local training and participation opportunities are made a priority to empower disenfranchised groups, including first peoples, to participate in planning and management decisions at the local, sub-basin and overall basin level.	The Mississippi basin organisation provides/facilitates training for disenfranchised groups, where needed
K. The use of a flexible and adaptive information exchange process	32	The Mississippi basin organisation operates a high quality, reliable, uniform and comprehensive data network, available to all stakeholders in ways which suit their needs; systems and modelling tools will be used to analyse and select best management options (e.g. Shared Vision Planning http://sharedvisionplanning.us/).	Basin-wise information system in place, used to identify best management options and quality assured by external auditor
	33	The Mississippi basin organisation facilitates a well designed research program with research partners and which informs all stakeholders of best management options for sub-basin watersheds; the program is assisted by the provision of data, monitoring and understanding of the basin structure, functions and resource use activities.	Research program in place, linked to basin-wise information system
	34	Information is provided in an integrated, interpreted form at both valley (e.g. North Platte) and whole of basin (Mississippi) levels; resource managers do not necessarily need raw data (this is provided by States and US EPA for example), but information, knowledge and wisdom about what works best and where - informed by the latest science, resource engineering, resource economics, indigenous knowledge and practical experience.	Stakeholder reporting system, linked to basin information system, exists and used at least annually
	35	The content of the information used by participants is specified; the form of the information and the timing of information exchange is known; the methods of exchange are accessible, appropriate, equitable and affordable.	Information management system includes procedural rules

As well as the indicators listed in Table 2, there is the need to establish *resource condition indicators* which gauge the improvement in resource health. Such indicators could include water quality, water shares (between in stream requirements and consumptive uses), riverine ecosystem health and biodiversity. The EPA's watershed indicators programme could be harnessed to represent such indicators in valleys, at which level they become more meaningful for management.

3 Basin-level organisational and institutional arrangements

A way forward in river basin management in the Mississippi is to establish a basin organisation for the Mississippi watershed. This section outlines organisational and institutional arrangements to achieve this, using a Commission model of a river basin organisation.

3.1 An interstate river basin commission

A first step is to establish a Mississippi basin organisation which has the power, authority, financial support and engagement skills to address basin-wide needs. In most of the world's river basins, there is a need for processes to link 'top-down' with 'bottom-up' actions, processes to link government agencies to a broad range of other water stakeholders and existing processes within government water agencies. An interstate river basin organisation has the potential to link stakeholder advisory committees with top level government water administrations and provide flatter structures (fewer levels of management) between the two.

There are three broad functional groups of river basin organizations (World Bank, 2006):

- those that monitor outcomes, investigate processes, and coordinate actions. They oversee conditions and trends in the use and effectiveness of basin resources and propose methods to coordinate decisions for improved governance.
- planning and management commissions, whose missions are more prescriptive than the first, and
- development and regulatory authorities, which include regulatory bodies and enforcement agencies.

These three functional groups can be recognised in one or more of nine types of river basin organizations (Table 3). The choice of which type of organisation is appropriate to the Mississippi Basin will be contentious due to different expectations of stakeholders. The key to progressing a basin organisation in the Mississippi is to choice an organisational type that minimises litigious behaviour while maximising agreed natural and environmental management and development outcomes. This suggests the need to establish a mechanism within a proposed basin organisation which seeks to achieve a jointly agreed vision for the basin as one of its first projects.

One option for consideration is to establish a **Mississippi Basin Commission** (MBC) with a mandate for integrated water resources management. The name 'Basin' not 'River Basin' is used to include groundwater management. The roles and responsibilities of the MBC are discussed below. A commission is preferred as it can be a strong, legal entity combined with advisory/education roles, monitoring roles, undertaking works on the ground and fulfilling the goals of a charter of many governments.

Table 3. Types of River Basin Organisations

Type 1: Advisory Committee ~ A formalized or quasi-formal organization in which individuals take responsibility for undertaking action planning and provide advice; governments 'hand over' strategic planning to such organisations; they frequently have no or limited legal jurisdiction. Example: Verde Watershed Association, USA
Type 2: Authority ~ An organization which makes planning decisions at a central or regional government level; may set and enact regulations, or have development consent authority; authorities are founded on democratic principles and a framework of law to which all relevant individuals and institutions are subject in a basin setting. Example: Grand River Conservation Authority, Canada
Type 3: Association ~ Similar to an Advisory Committee, this is an organization of like-minded individuals and groups with a common interest. In a river basin they have varying roles: providing advice, stimulating basin awareness, education and ownership of basin natural resources management issues; educational functions and information exchange. Example: Upper Missouri River Basin Association, USA
Type 4: Commission ~ An organization which is delegated to consider natural resources management matters and/or take action on those matters. A basin commission's powers vary, and include advisory/education roles, monitoring roles, undertaking works, fulfilling goals of a specific government's charter or an international agreement. Commissions normally are instituted by a formal statement of a command or injunction by government to manage land and water resources; commissions may also have regulatory powers. Example: Delaware Basin Commission, USA; International Commission for the Protection of the Rhine, Western Europe
Type 5: Council ~ A formal group of experts, government ministers, politicians, NGOs and lay people brought together on a regular basis to debate matters within their sphere of basin management expertise, and with advisory powers to government. A council is contrasted with a commission which, although also a body of experts, is typically given regulatory powers in addition to a role as advisor to the government. Example: Fraser Basin Council, Canada
Type 6: Corporation ~ A legal entity, created by legislation, which permits a group of people, as shareholders (for-profit companies) or members (non-profit companies), to create an organization which can then focus on pursuing set objectives, and is empowered with legal rights which are usually only reserved for individuals, such as to sue and be sued, own property, hire employees or loan and borrow money. Example: the former Snowy Mountains Engineering Corporation,, Australia
Type 7: Tribunal ~ A basin entity which has formalized procedures and quasi-judicial powers; a heavy emphasis on bureaucratic decision making; stakeholders may formally participate through hearings; major decisions are taken by independent bodies, like a water pricing tribunal. A tribunal acts as a special court outside the civil and criminal judicial system and which examines special problems and makes judgements, e.g. a water tribunal, which resolves disputes between water users.

Example: Valencia Water Court, Spain

Type 8: Trust ~ A trust is legal device used to set aside money or property of one person for the benefit of one or more persons or organizations. It is an organization which can undertake river basin works, develop and implement a strategic plan; its mandate is to be the river basin 'advocate'; it co-ordinates local programs through Memoranda of Understanding or other agreements; it raises local levies (funds) for is works and programs. A trust keeps monies raised in 'trust' for the benefits of its citizens. Example: Hawkesbury-Nepean Catchment Management Trust (now part of the Sydney Catchment Authority), Australia

Type 9: Federations ~ A collaboration of departments within one government or between state and national governments and non-government organisations to establish and undertake actions for river basin management. Local government groupings have emerged in some locations such as in the USA for regional natural resources governance. Examples: Chesapeake Bay Commission and the Chesapeake Bay Agreement, USA; European Commission - Directive on River Basin Management.

Adapted from Hooper, 2005.

The charter of a proposed MBC is formidable covering one of the largest and most highly developed river basins of the world. The MBC could be served by nine valley organisations coordinated by and reporting to the overall MBC. River basin organisations tend to be more effective and easier to create if they emerge from existing organisations. One option is to reform the existing Mississippi River Commission into an IRBM-focused organisation. The new entity could comprise a **Joint Ministerial Council** from the members states and the US national government, similar to the original formation of the Murray-Darling Basin Commission in Australia in the 1980s. This body could be advised by a separate independent stakeholder (not government) advisory committee.

This will require new river basin management legislation. This legislation can specify how high-level ministerial coordination is to occur, who and how oversight of the basin organization will be provided, created, its roles and responsibilities and interactions with member states and non-government organizations. This will require *high-level ministerial coordination* to ensure that all relevant ministries work toward a common vision or set of objectives to achieve IRBM (World Bank, 2006), similar to high level coordination in the implementation of the European Framework Directive for management of Europe's river basins. Overall, the aim is to minimize duplication of government services, by mechanisms such as interagency personnel exchanges, cost-sharing projects and joint ventures between the private and public sector; and to ensure a high level of accountability of the MBC to all stakeholders.

3.2 High level policy goals, role of water law, and financing

The practices listed in Table 2 are challenging yet fundamental tasks of large scale river basin management. Consultation is necessary if a basin organisation is to achieve agreement on ways forward in the contested space of water policy goals and aspirations for sustainability. The preceding critical task is to establish basin-wide agreement on a **shared vision for the Mississippi**. The shared vision must articulate the shared benefits of water use and management in the basin (see also 3.6).

A shared vision, embedded in national and state water policy goals, could be the first role of the proposed MBC. . It could be reported, for example, in a 'Mississippi Water Resources Needs Assessment, Shared Values and Water Resources Management Strategy' document, or more simply a **'Shared Vision for the Basin'** report. This document could identify the benefits provided by water (both rivers and aquifers) within and between States and to the nation in general. A chapter of the needs and strategy document can also address international water sharing in the upper Missouri sub-basin with Canada and interstate water sharing across the whole basin.

Any new proposal for water planning and management in the US, as in other domains, quickly becomes a mine field for legal analysis, lobbying and endless lawsuits. This process cannot be avoided but can be minimized by an approach to water management that is driven by a consensus movement in the basin, using a benefit sharing framework, and reported in the 'Vision for the Basin' report. One option to do this is to avoid overt naiveté by placing the achievement of high level goals in the hands of leaders with consummate negotiation skills. This is not to neglect the importance of doctrines of both prior appropriation and riparian water rights as they exist in the US. Coupled to this initiative is public and private financial support for the first step, the agreed 'Vision for the Basin' report. This will demonstrate commitment to the strategy.

3.3 Key tasks, needs assessment, basin strategy and location of headquarters

A complementary, initial task of the proposed MBC can be to undertake a needs assessment of basin wide issues and develop a strategic direction in how they can be addressed. Much of this work is more than likely done in existing studies in the basin since the early US basin work of the 1930s, as has been reported through numerous national and state agencies. The output of this needs assessment can be a **'State of the Basin Report'** in which there is:

- Clear summary statements on the condition of natural resources

- Clear summary statements on who are the key stakeholders, their roles and responsibilities
- Any agreement of priority issues and location of critical basin 'hotspots'
- A suggested roadmap on 'where to from here'.

This task needs to be done by a national government department even before a basin commission has been created with presidential endorsement to achieve recognition, national and basin awareness raising and financial support.

A central location in the basin of the MBC headquarters is both symbolic and practical. Care must be taken in selection so as to demonstrate to all stakeholders that the MBC is endeavouring to capture their involvement and represent their interests. If the MBC is directly connected to national government, there will also be a need to have an agent in Washington DC.

3.4 Leadership

Leadership is a critical factor ensuring the success of basin management. Visionary leadership can be the key to ensuring clear procedures and outcomes. Without this vision, it is not possible to have a meaningful planning process. When there is basin leadership and a shared vision across a range of sectors, it is more likely that river basin management will succeed. Leadership can be difficult though and many strong egos amongst stakeholder leaders potentially lead to conflict if focus or momentum is not maintained.

Strong MBC leadership is essential. It will bring together the affected publics, private sector and government interests, working in partnership with common objectives. This will result in a high degree of trust in the MBC, when lead by capable CEO – a person with political acumen who can engage both willing and combatant stakeholders. However, dependence on capable leaders can be problematic. Dependence on one individual with strong and capable leadership skills can lead to river basin management programs being vulnerable without a strategy for leadership succession. When selecting a CEO for the MBC, consideration can be given to:

- an authoritative, visionary and embracing leadership style;
- a reporting process to a Joint Ministerial Council of the MBC;
- leaders with conflict resolution and time management skills;
- supporting information systems to provide leaders with unambiguous information about best practice, data on the financial status of their organisation and access to key political, industry and community people;
- leadership training facilities;
- a processes for initiation and development of the stages in river basin organisation development (Table 4); and
- financial incentives (at CEO level) to engage leaders to remain involved in river basin management,
- a process of leadership succession and the need to invest public resources and support mechanisms to provide programs to assist leadership development.

3.5 Stepped approach

Table 2 provided a comprehensive list of 35 best practices of mature basin organisations. These include management capacities and procedures emphasising coordination, institutional design, legal and financial requirements, stakeholder engagement and information requirements. The key functions of the proposed MBC are summarised in Table 4 as a stepped approach (over say 5-20 years). It is often difficult for a basin organisation to achieve these functions in the short to medium term (say 5-10 years). There will be a need for a stepped approach if a Mississippi basin organisation is created, one which establishes core functions to address the most strategic needs first. Those needs must be identified using extensive stakeholder consultation.

Table 4. Functional stages in the evolution of an adaptive Mississippi basin organization

Functions	Initial stage	Emerging Auto-adaptive stage	Mature Auto-adaptive stage
Group 1: Water (and natural resource) data collection and processing, systems modelling, water and natural resources planning, stakeholder consultation & issue clarification, development of an agreed 'Shared Vision for the Basin' *Best practice attributes*: 1-5, 21-22, 25-26, 28, 32-35, 29-31*	X	X	X
Group 2: Policy, legal and strategy development for economic, social and environmental issues, stakeholder awareness and participation *Best practice attributes: 7-10, 13-14, 29-31, 25-26*	X	X	X
Group 3: Project feasibility, design, implementation, operation and maintenance, raising funds,		X	X

Functions	Initial stage	Emerging Auto-adaptive stage	Mature Auto-adaptive stage
ongoing stakeholder consultation and awareness raising *Best practice attributes: 5-7, 15-20, 21-22*			
Group 4: Allocating and monitoring water shares (quality and quantity and possible natural resources sharing), cost sharing principles and benefit sharing approach *Best practice attributes: 11-12, 15-21, 27, 23-4, 29*		X	X
Group 5: Monitoring water use and shares, monitoring pollution and environmental conditions, oversight and review role for projects promoted by RBO partners, monitoring and assessing the health of the basin's natural resources, monitoring the sustainability of resource management, review of strategic planning and implementation of modified plans *Best practice attributes: 32-35, 6, 7, 21, 29*			X

* Best practice attributes refer to those listed in Table 2.

Source: Original functional stages are those modified from Comfort, 1999 and World Bank, 2006.

Table 4 provides a suggested sequence of functions, but this needs 'ground-truthing' and refining by local water experts in each Mississippi valley and the basin overall. There is no hard and fast rule on the stages, the functions nor the attributes relevant to each group and each stage, but the overall sequence of Group 1 to Group 5 functions holds true in most basin situations. The proposed MBC will need to play it by ear to some extent.

The key is to become an 'auto-adaptive' basin organisation; one able to respond to needs as they arise, one able to learn from the experience of past basin management, one able to listen to its stakeholders about ways forward. This can be done my ensuring there are mechanisms in place to feed back information from the implementation of management options to planning and management practices.

3.6 Benefit sharing

The concept of benefit sharing was developed by Sadoff and Gray (2005). It can be applied as a tool to account for and share benefits in water resources management in river basins, both within the water sector and with other sectors of economies (Table 5). Benefit sharing refers to a commitment to channel returns, whether monetary or non-monetary, back to the range of designated stakeholders for the distribution and use of water resources.

Table 5. Types of benefits of cooperation on rivers

Type	The Challenge	The Opportunity
Type 1: Increasing Benefits To the River	Degraded water quality, watersheds, wetlands and biodiversity	Improved water quality, riverflow characteristics, soil conservation, biodiversity and overall sustainability
Type 2: Increasing Benefits From the River	Increasing demands for water, sub-optimal water resources, management and development	Improved water resources management for hydropower and agricultural production, flood-drought management, navigation, environmental conservation, water quality and recreation
Type 3: Reducing Costs Because of the River	Tense regional relations and political economy impacts	Policy shift to cooperation and development, away form dispute/conflict; from food (and energy) self-sufficiency to food (and energy) security; reduced dispute/conflict risk and military expenditure
Type 4: Increasing Benefits Beyond the River	Regional fragmentation	Integration of regional infrastructure, markets and trade

Source: Sadoff and Grey (2005), page 2

This approach can be used in the Mississippi to identify, analyse, quantify and equitably share benefits across the river basin in Group 4 functions of Table 4 (allocating water shares). It can be a tool to calibrate the net sum gains to the river and all stakeholders in integrated management.

4. Conclusion

This paper outlines an ambitious but doable approach to integrated river basin management in the Mississippi basin. It will be a formidable task to achieve this, but using a stepped, shared approach, and a river basin commission model, there is some room for optimism based on the experience of other highly developed, mature water economies in the world, such as in Australia and Western Europe. One practice that rings true in many basins is to achieve some practical and observable outcomes in the first two years of the existence of a basin organisation. These outcomes can include basin works (e.g. soil conservation practices, restored wetlands, river

clean-up), inclusion of all stakeholders and a sense of ownership, and top-down recognition of the importance of the task at hand (political support). The key is to get out, try it and learn by doing.

References

Comfort, L. 1999, *Shared Risk: Complex Systems in Seismic Response*. New York, Pergamon Press.

Hooper, B.P. 2005. *Integrated River Basin Governance – Learning from International Experiences.* IWA Publications. London. ISBN 1 84339 088 4.

Hooper, B.P. 2006. *Key Performance Indicators of River Basin Organizations.* Visiting Scholar Program. US Army Corps of Engineers. Institute of Water Resources. Virginia. 2006-VSP-01.

Sadoff, C.W. and D. Grey, 2005. Cooperation on International Rivers. A Continuum for Securing and Sharing Benefits. *Water International*. 30 (4), 420-427.

World Bank. 2006, *Integrated River Basin Management - From Concepts to Good Practice. Briefing Notes.* Washington, DC, World Bank/Bank-Netherlands Water Partnership Program/World Bank Institute.