Approaches for Introducing IWRM in the Mississippi River Basin and Downstream Gulf of Mexico based on Processes Utilized in other Basins

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Summary

The Mississippi River Basin and the Gulf of Mexico are linked water sub-systems like others around the world. The size and complexity have defied proper management. Coupled with unreasonable expectations for economic development, the two systems have been physically modified for economic gain to the point that they are vulnerable to damage from droughts and floods. The Great Flood of 2011 followed by the Great Drought of 2012 attests to the vulnerability. The modifications for agriculture, urban development, navigation, and energy resource exploitation have resulted in damaged ecosystems that no longer can yield economic and social benefits nor provide free buffers for droughts, floods, storms or carbon capture. The system is unsustainable without massive federal outlays to deal with the changed flow regimes.

These concerns have been noted for 100 years for floods and 40 years for the "Dead Zone" in the Gulf from excessive fertilizer use. Management measures have been targeted to certain geographic areas in a piecemeal and single sector fashion, which can have adverse impacts downstream and upstream. Use of IWRM seems absent or just starting and a comprehensive approach is lacking both in sub-basins as well as the entire water system. Lack of an adaptive, comprehensive approach based on IWRM and lack of overall national leadership and mandate for the entire system must change. The economic and social well-being of America's heartland and the South is at risk as frequencies of drought, floods, storms and pollution increase. The economic argument for use of IWRM to balance multiple uses of the linked water resources in an adaptive and comprehensive manner must be made and a national commitment to support multi-state and multi-federal agency unified action must be developed to protect lives and ecosystems.

This paper presents several cases of IWRM being utilized in the US and elsewhere in large water systems to achieve improved management in balancing competing and conflicting uses. These processes that were successful at different scales deserve application basin-wide in the Mississippi drainage and Gulf at different scales—from national to sub-basin, state, watershed and local. Experiences under the Boundary Waters Treaty of 1909 focusing on the Great Lakes-St. Lawrence Basin are detailed for possible application. Experiences of the Tennessee Valley Authority in floodplain management, reservoir releases optimization to balance uses, and integrated land and water management are presented along with the Chesapeake Bay cleanup. The case of the Danube River Basin linked to the Black Sea also is instructive. A two-track approach is proposed for discussion with both immediate action and future legislation. Failure to develop a national commitment to unified federal action through partnership with states and businesses means repeated loss of life and recurring economic and ecosystem damage.

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Introduction

Economic and social benefits from coastal waters often depend on upstream river flows. These downstream salt waters are part of the river system. Floodplains and wetlands are integral parts of river systems. When they are diked, drained, or converted, water has no place to flow and flood damage results. Basin land areas and underground water are also part of river systems, and their development for agriculture and urban areas influences downstream quality, quantity and ecosystems. The foundation for applying Integrated Water Resources Management (IWRM)—some might substitute the word "Basin" for "Resources"--and its coastal equivalent known as Integrated Coastal Management (ICM) lies in: (a) analyses for breaking down complex situations into manageable pieces at all geographic scales and (b) processes for involving stakeholders and coordinating sub-initiatives to balance competing and conflicting uses of land and water. Institutions need to be established at different scales in order to implement these comprehensive approaches and rebalance water and land use policy and practice. Now, more than ever, such institutions will need to employ a comprehensive and adaptive approach to management and partnerships with localities and the business community in order to be capable of addressing complex problems that unsustainable development has created in vulnerable basins and coasts.

The Mississippi Basin-Gulf of Mexico faces enormous challenges as illustrated in 2011 with an extraordinary flood and an extraordinary drought in 2012 that raised soybean and corn prices to record levels. This paper argues that regional initiatives in parts of the Mississippi-Gulf basin are making progress toward IWRM and ICM. However, they are not well coordinated or funded, opportunities are missed, and political support is not sufficient. With the magnitude of existing water concerns/risk, economic interest groups will generate political pressure for government funding at various levels for their single interest issue, which will likely produce further negative consequences. If this is correct, the situation will worsen in this vulnerable basin that has been made more vulnerable to hydrologic, economic and ecosystem catastrophe by inappropriate development. One example may turn out to be the 2012 Farm Bill that may reduce incentives for wetland protection/restoration, and contain a smaller conservation reserve program with the result of increased downstream flooding. If money inevitably will be spent, it should be in a more comprehensive, cost-effective manner with multiple benefits like payments for carbon capture.

With the political and economic climate of 2012 and beyond, only incremental progress may be possible now. However a second national track for new legislative authorities is necessary at the same time because the challenge is so large. Existing initiatives and institutions at all scales will need to work together with many interest groups and civil society to develop coordinated visions of action that fit together for the Basin and Gulf through comprehensive approaches operationalized by adaptive management institutions. A basin-wide, overarching partnership among interest groups such as the agriculture and housing industries, state and local governments, environmental groups, various NGOs, and the federal government is urgently needed basin-wide from the Canadian border out into the Gulf. Basin-wide cooperation among so many entities means that the federal government must make this a priority with action commitments and appropriate budget support building on existing initiatives.

Eventually, new legislative authority and funding will be needed in the different sectors to provide appropriate incentives and disincentives as well as budget support for transactions costs. Basin-wide scale work suggests the need for visioning processes among the various stakeholders. Lack of publicly available information on the costs of existing economic/ecosystem damage and projected future repeated damage can be overcome by use of modern modeling techniques and communication with special interest groups, government at all levels, the business community, and

citizens. For example, the existing economic value of floodplains and wetlands for many existing benefits and their presumed future value for carbon sequestration cannot be dismissed. Myths must be exposed, biased positions tossed aside through joint fact-finding, and a spirit of "we are all in this together" created in the Basin and Gulf. This is needed to rebalance all the conflicting and competing uses and adverse impacts created up and down the river, its tributaries, and coastal waters. A sense of urgency must be conveyed before the next disaster hits with sound science, proper economic and ecosystem analyses, and active participation of special interests.

This paper is limited in extent by its terms of reference. Consequently, it only superficially identifies a number of processes involving IWRM principles that some Mississippi River Basin states already have experience with. The idea is that processes familiar to some basin states would be more politically acceptable to test based on those states sharing their experiences with others. Follow-up work after the September meeting can summarize the experiences and processes in more detail if partners decide to purse the recommended, more comprehensive two track approach. Seven basin states have experiences under the Great Lakes series of Agreements and Protocol under the 1909 Boundary Waters Treaty between Canada and the US. Other provisions of the 1909 Treaty have authorized processes that other basin states like North Dakota and Montana have undertaken with Canada with assistance of the International Joint Commission (IJC). Seven other basin states have been involved with the Tennessee Valley Authority (TVA) since the 1930s, as it became a laboratory for the nation on integrated approaches to agriculture development, floodplain and land management, and practical approaches to IWRM. Processes undertaken by these two cases are presented. Additionally, the multi-state initiative for the Chesapeake Bay Basin and the multi-country initiatives for the Danube Basin and linked Black Sea provide other examples to illustrate that such processes involving IWRM can make progress. A final section pulls the two track approach together for discussion purposes.

Importance of Processes to Introduce IWRM and its Comprehensive Approaches

Use of IWRM involves balancing multiple uses for water supply, irrigation, hydropower, flood and floodplain management, fish/wildlife/ecosystem sustainability, recreation, and navigation among others. Developed countries have not utilized this approach in most basins nor have land decisions been coordinated with water resources decisions. In the 21st century, this more comprehensive approach coupled with greater recognition of services provided by wetlands and floodplains is essential to adopt given the extensive modifications to water systems and the associated high levels of ecosystem damage. Remedial measures are necessary to save human lives, reduce repeated economic loss, restore floodplain functions, and improve quality. Federal agencies can no longer afford outlays of $8 billion in payment for agricultural flood loss in just one flood event or billions more for levee strengthening and urban flood damage in floodplains.

Interest groups in many geographic areas of the Mississippi Basin and Gulf are clamoring for action and resources to be spent before the next drought, the next flood, the next storm, the next seasonal "Dead Zone" that decimates life in the Gulf. Money is going to be spent based through the use of political pressure. With solutions for the water quality problems in the waterways and the Gulf tied to flooding and floodplain problems far up in the Basin, more cost effective use of public funding can be achieved to balance protection of multiple uses through IWRM rather than a subsidy just for one narrow sector or interest group. Many studies have mapped a more comprehensive way ahead ranging from the 1994 "Galloway Report" to the work of the limited Mississippi River Commission and Upper Mississippi River Basin Association as well the more recent efforts in the lower basin for the "Dead Zone", coastal wetland restoration, Katrina, and the Gulf Oil Spill. Some of these geographic initiatives are moving forward on a more comprehensive path but widespread adoption

has not been forthcoming and opportunities are lost. Pilot projects have shown that watershed management and wetland/floodplain restoration can play an important economic role in flood damage reduction, storm protection, water quality cleanup, and in carbon sequestration to forestall global warming. Good ideas are out there but are ignored, need to be scaled up basin-wide and anchored in wider partnerships with businesses.

Use of IWRM and ICM can be the vehicle for adoption of this comprehensive way forward. Processes that can utilize such vehicles through existing institutions can at least provide a start in these tough budgetary times. In fact, once economic and social benefits of comprehensive and adaptive management are quantified and communicated, there may be a strong argument for significant federal, state, and local cost savings by investing in re-engineering and restoring the Basin and its Gulf. Various processes have been utilized by some Mississippi Basin states already while participating with the federal government under the 1909 Boundary Waters Treaty and through the pioneering work of the Tennessee Valley Authority.

Experiences from the International Joint Commission (IJC) and the 1909 Treaty

The 1909 Boundary Waters Treaty established the IJC, which has three commissioners from each country. The Commission follows the Treaty with processes to prevent and resolve water-related disputes. The Commission acts impartially in fact-finding and in formulating recommendations on issues, rather than representing the views of their respective governments. The Commission has set up more than 20 Boards, made up of experts from the United States and Canada, to help it carry out its responsibilities. In some cases the IJC plays the role of authorizing water uses while protecting competing interests in accordance with rules set out by the two governments in the Treaty. In other cases it plays a role in joint fact-finding and tendering recommendations on the subject of concern when requested by a "Reference" from the US and Canada.

The IJC has special responsibilities in the Great Lake-St. Lawrence River Basin under a series of Agreements and a Protocol that express basin-wide commitments, including those for processes to assist the eight states, two provinces and both national governments resolve and prevent conflicts. While many more states and agencies than these 12 jurisdictions would need to be involved in the Mississippi processes, they are still applicable to the Basin situation. The processes include:

- joint fact-finding in producing technical analyses at different scales;
- use of staff from the jurisdictions to undertake fact-finding and vet recommendations;
- operate a small secretariat and provide budget to support the Boards for joint-fact finding;
- commitments for large watershed and local scale remedial action programs with participation;
- foster partnerships with other stakeholders (for example, a Council of Great Lakes Research Managers, a Council of Great Lakes Industries, a Science Advisory Board to the IJC to ensure that stakeholders participate in discussions early in participative processes);
- organize a public participation program with stakeholder meetings, including a biennial meeting on the Great Lakes-St Lawrence Basin issues;
- tender recommendations to the Parties.

The Great Lake Basin states and federal agencies provide staff as part of their work to assist the Commission rather than the IJC undertaking the work with its own staff. Limited IJC personnel serve as secretariat to the Boards, sub-committees and task forces. This is an important concept because Mississippi Basin states and federal agencies in using such a technique would participate from the start and would buy-in on the analyses and then participate in formulating alternative

actions based on the analyses that would bring IWRM and rebalancing uses into the discussion in a unified fashion. This builds trust and confidence in levels of government working together and provides a forum for disparate programs of agencies and states to get their acts together as they subsequently participate in a unified fashion in other work groups with industry, NGOs, and citizens. Both quality and quantity issues can be addressed this way at various scales from watershed up to basin-wide and can include industry and NGO representatives such as the IJC utilized on its work on water levels in the lakes with flooding in the 1980s to downstream multiple uses below structures.

The IJC processes work at different scales, from basin-wide to local. The IJC role is to facilitate and administratively support the processes, for the commission to then tender recommendations, and then to produce reports on progress of action for accountability purposes. Under the revised Agreement, states and federal agencies commit to more comprehensive approaches. One such commitment is for federal agencies to work with states, localities, the business community, NGOs, and citizens to remediate 43 areas of concern in the basin. The processes of participative visioning, analysis, planning, and implementation for these local scale partnership actions is instructive for Mississippi Basin and Gulf stakeholders to discuss.

Several basin-wide scale processes for engaging stakeholders would also be of interest for the Basin and Gulf. The IJC has collaborated with other organizations such as the Great Lakes Commission (an interstate compact agency created by governors and provincial premiers) as well as a Great Lakes Council of Industries in basin-wide efforts. The Council of Industries would be a body to consider for the business community Mississippi basin-wide. It also has supported a Science Advisory Board and a Council of Great Lakes Research Managers. With membership from the science community from the states, universities and federal agencies, these two bodies help to bring sound science to management decision-making and to harness budgets of research institutions to focus on pressing matters of scientific uncertainty in IWRM.

The compact organization known as the Great Lakes Commission helped lead a visioning process basin-wide that resulted in adoption of the Great Lakes Basin Compact with key action commitments by the governors and granted consent by Congress. It illustrates that agreements among states and federal agencies can be updated over time as consensus is built. There is the Great Lakes Charter with unified commitments to principles that relate to IWRM to conserve levels and flows in the basin to balance ecosystem sustainability and a more recent Sustainable Water Resources Agreement in a new Great Lakes Compact enacted in 2008 following approval from Congress and President Bush. Similar compact organizations and sub-basin commissions exist in the Mississippi drainage and each can learn from understanding the work of the others and fostering collaboration. A series of commitments to principles, programs, and legal authority would be more complex to enact in the Mississippi but similar sub-basin organizations can be expanded or authority provided to the larger Mississippi River Commission.

In the interim, while consensus for action and commitments build, Executive Orders can be issued under the authority of the President. A good example is Executive Order 13340 issued by President Bush in 2004 where the US finally harnessed federal agencies to work together in a unified manner to support more comprehensive approaches to the Great Lakes St Lawrence River system. For years, Canada had such collaboration with a national agreement with provincial officials. The Executive Order created a Federal Interagency Task Force on the Great Lakes to stimulate collaboration and break stalled action. Such an Executive Order will be needed at the minimum to jump start basin-wide efforts in the Mississippi-Gulf. Federal agencies and seven Mississippi basin states have experienced such coordinated efforts already.

Applying Experiences of the Tennessee Valley Authority (TVA)

The TVA experience is well known among water management professionals. Created by Congressional legislation in 1933, the TVA was created to promote unified use, conservation, and development of the Tennessee River basin, a tributary of the Mississippi—the basin…its land and water and not just water. The basin covers seven states and the familiar TVA experiences would be valuable for sharing with Mississippi Basin stakeholders. TVA addressed economic development, agriculture development, land management, community livelihoods, and water and other natural resources management in a unified and balanced manner in partnership with valley jurisdictions and later with NGO groups. Three key features may be of interest:

*early approaches to floodplain management in partnership with communities
*system-wide integrated analyses and improvements in dynamic rule curves for reservoir releases optimization to balance more modern multiple uses not originally included in dam project purposes as authorized by Congress.
*integrated land, agriculture, and water resources management

TVA has been a leader in flood management. During the 1950s, it recognized that its dams still would not prevent all floods and staff operationalized the concept of "floodplain management". TVA pioneered providing technical assistance to communities and use of scientific methods to identify flood hazard areas, work with citizens to plan use of non-structural methods and local ordinances to prevent further development in these hazard areas, and provide cost-sharing incentives to implement measures. Additionally, in the 1960's TVA was the first federal agency to recognize that floodplains will be repeatedly flooded and that moving people out of the floodplain was the least costly option to save lives and minimize recurring economic damage. Restoring floodplain functions is a critical measure that only grows with importance as channels and flows become highly modified and floodplains inappropriately occupied.

TVA participated with sister federal agencies on the Federal Interagency Floodplain Task Force, which issued a landmark 1972 report. The Water Resources Council included such strategies for flood damage reduction in its 1973 Report to Congress. Perhaps in good economic times, the federal government could afford $8 billion in flood damage subsidies from one event to farmers that have occupied artificially drained wetlands and floodplains, but those days are over. As with urban development increasing in floodplains, insurance premiums will skyrocket as more disasters occur. It has been reported that since the Great Flood of 1993, tens of thousands of homes, malls, businesses have been built on 28,000 acres in floodplains near St Louis—more than in all years before the flood. This may place older levees, not up to current standards, at risk downstream in Illinois. The recurring costs cannot be borne by any level of government.

Many water management structures authorized by Congress have funding appropriated with specific project purposes. Some may see this as an impediment to modernization of flow regimes to balance competing uses that were never thought of years ago. The TVA is no exception and it utilized processes in the 1980s to undertake comprehensive analyses of its reservoir release system and employed participative processes with industry and other stakeholders to rebalance uses in the basins. Known as the "Reservoir Releases Improvement Program", this system-wide rebalancing of project purposes/uses (including those to protect ecosystems and incorporation of adaptive management depending on climate) are critical for all major river systems with old projects to optimize IWRM. These processes for producing flexible, new rule curves for releases are

important to adapt to new climatic realities as well as accommodate a different balance of uses to minimize repeated federal and state budget outlays for compensation from floods/droughts.

TVA has been a leader in agricultural development since the 1930s. Many of the fertilizers used globally were developed by TVA. They were part of the integrated strategy for land, water, economic and agricultural development pursued by TVA. TVA agricultural programs provided cost-sharing incentives in addition to later USDA incentive programs for sustainable land management, wetlands protection, and proper agricultural Best Management Practices (BMPs) to reduce erosion and waste of nutrients. This effort culminated in the "Land and Water 201" program in the 1980s in cooperation with USDA, the seven TVA states, farmer user groups, and the agriculture industry to achieve integrated approaches that increased farmer profits and reduced agricultural water pollution---especially nutrients that farmers were overusing (and profits were washing into the rivers creating "Dead Zones" in reservoirs). Such an effort is now needed Mississippi basin-wide to reduce nutrient use in agriculture and make agricultural expectations more reasonable for sustainability and small farmer profits.

The TVA also illustrates one other critical point. TVA is a federal agency and many federal water initiatives have benefitted from TVA staff participating on interagency task forces. A similar task force is needed on both the Mississippi and sub-basin scales because customized measures will need to be adopted for each sub-basin that fit together for IWRM and water use rebalancing. TVA's work on IWRM and land-water integrated approaches has been funded by Congressional appropriations in addition to power revenues. The importance of a second track on Congressional authority development is illustrated because without that, TVA would have no authority to utilize such approaches and work in partnership with so many interest groups.

Chesapeake Bay Basin Experience

The multi-state Chesapeake Bay "Dead Zone" cleanup is well known and described elsewhere. Such multi-state efforts need to be undertaken in decadal time frames with institutionalization of actionable commitments and budget in legal authority. The eutrophication problem in the Bay has been known for decades with study after study conducted in the 1970s and 1980s. Action lagged, however, until Congress included authority as part of the Clean Water Act Reauthorization and sufficient appropriations. While the language is not very aggressive in the Clean Water Act, commitments to cleanup targets, however, are included in a series of Agreements adopted by the governors of the basin states just as the governors of upper Mississippi basin states and the five states bordering the Gulf have concluded agreements. Two differences are that the upper basin agreement and the Gulf agreement do not have very specific targets and commitments to action like the Chesapeake Bay agreements nor appear to have authorization by Congress. However, various Mississippi sub-basin, single sector efforts, including environmental management, are authorized by Congress and would benefit from a more comprehensive approach toward IWRM, rebalancing uses and unified federal agency support. While an Executive Order may be needed to start, eventually Congress and states need to act.

These two points are institutionally critical for any effort in the enormous Mississippi Basin and Gulf. While a first track of an initiative might utilize existing instruments and work with industry, NGOs, and civil society to gain political support, it would seem to at least need an Executive Order to be issued by the President. If measureable improvement in risk reduction and damage is sought, a second legislative track is essential in state capitals and the Congress. In the case of the Chesapeake, the work is not finished, and billions of dollars more need to be spent on agriculture nutrient reduction and sewage treatment. But a program is in place, billions of dollars have been

spent, nutrient reduction is starting, federal agencies are working in a unified manner and the water system is responding positively. In the case of the Mississippi, partners need to have patience as it will take several decades to mount the kind of effort needed to reduce risks to life and property while restoring ecosystems that give free flood, drought, and storm protection.

Danube River Basin-Black Sea Experiences

The Danube is the world's most international river with 19 countries in the drainage. While it is only one-half the length of the Mississippi and has less than one-half of average runoff, the number of Danube countries can be compared to the number of states in the Mississippi and the linked downstream marine waters of the Black Sea compare to the situation in the Gulf. In fact, both the Black Sea and the Gulf had a massive problem with nutrient pollution in the 1980s-1990s. The difference is that a great reduction of nutrient loading and oxygen demanding pollutants has occurred with widespread legislative action and funding in Europe compared to less action in the Mississippi. The "Dead Zone" in the Northwest Shelf of the Black Sea is mostly a memory except during wet years as agriculture nutrients from the land and fertilizer-contaminated aquifers reach the river. No reduction is seen in the Gulf of Mexico with higher flow years showing greater "Dead Zones" as more agriculture pollution is washed into rivers.

The fall of centrally-planned economies, accession of countries into the European Union, and projects funded by the Global Environment Facility (GEF) through the U.N. and World Bank for nutrient reduction, improved water resource management through IWRM, and floodplain reconnection to rivers through restoration has resulted in 50% decreases in oxygen demanding pollutants and some nutrients that cause eutrophication. Danube basin countries act more like states of the US now with EU-wide minimum legislative policies for IWRM, water quantity and water quality management programs, and ecosystem restoration that countries must enact through their parliaments. This is similar to the US Clean Water Act where national minimum standards/policies are promulgated and states enact laws, standards, and enforcement programs to meet that minimum or exceed it. Several reports describing the Danube/Black Sea progress are listed at the end and are available from the listed websites.

Key elements of the Danube approach funded through the GEF include:

- Negotiation and adoption of a legally binding international agreement with principles for Danube management with IWRM principles and creation of the International Commission for the Protection of the Danube River (ICPDR) among the countries;
- Support for analytical investigations and visioning processes at basin-wide and sub-basin scales;
- Creation of Danube Environmental Forum—a network of NGOs that participate with ICPDR;
- Creation of Small Grants cost sharing program with communities to foster local participation;
- Complementary actions to the EU Accession Process and the EU Water Framework Directive;
- GEF support for linking Danube basin countries with Black Sea countries for collaboration;
- Adoption by ICPDR of the Action Programme for the Sustainable Flood Prevention with agreed principles, targets, and commitments for action at basin-wide and sub-basin scales;
- GEF support with the UN for subsidiary, sub-basin scale analyses, visioning, and institutions;
- GEF grant support with World Bank loans for local scale implementation of nutrient reduction BMPs in the agriculture, livestock, municipal sewage, and industry sectors as well

as for reconnecting floodplain wetlands with rivers to sequester nutrient pollution and reduce flooding-- $US 70 million in GEF grants and $US 450 mil from countries and loans;
- Support for a basin-wide industry cooperation group "Business Friends of the Danube";
- EU co-financing for GEF projects and $US billions in sewage treatment upgrades.

Many of the GEF-funded Danube measures for IWRM are similar to those developed through the IJC and result from GEF policy and recommended approaches. Work is undertaken at all scales from multi-jurisdictional to sector and watershed to localities. Participation from the business community and NGOS basin-wide as well in specific localities is assured by processes and partnerships adopted by the Danube Commission. All countries have made political commitments to action in a legally binding treaty and for certain issues adopted targets and principles for action. The ICPDR reports on progress toward IWRM, as does the IJC. All countries contribute funding to support the ICPDR and the work of its committees and partnerships. Subsidiary sub-basin approaches to IWRM are tailored to specific smaller drainages to address their specific priority concerns. The EU serves a role analogous to the US federal government through provision of funding incentives, minimum standards, policies, and legislation to ensue coherence and coordinated approaches among the countries.

Various analyses respectful of IWRM principles and visioning processes are undertaken at the basin-wide and sub-basin scales, and development of plans for specific issues are facilitated by the ICPDR secretariat through participation of the different jurisdictions party to the treaty. A good example is the "Action Programme for Sustainable Flood Prevention" with commitments to collaboration and policy coherence with regard to balancing water uses as flood damage is avoided and floodplains are restored. Grant funding from the GEF helped countries in the Basin reconnect floodplains to the river making room for floodwaters that reduce urban damage and trap toxics and nutrient pollution that would result in "Dead Zones" downstream in the Black Sea. Just as with the IJC, these processes are undertaken periodically in the spirit of adaptive management so that new commitments can be made to adjust to changed conditions. For example, increased climatic variability with a warming Earth demands such a non-stationary approach if challenges are to be met and some entity needs to take leadership for coherence.

The GEF also helped foster a change from just grants for agriculture BMPs and advanced sewage treatment to reduce the "Dead Zone" to a mix of grants and loans for the local implementation of needed measures. This parallels the US experience with clean water grants now transformed into a revolving lending program run by the states. This case illustrates that processes that can help introduce IWRM and comprehensive approaches can work not just in the St. Lawrence basin but also in Europe. The difference is that the situation of different countries working collaboratively and coherently basin-wide should be considered to be analogous to the situation of the many states in the Mississippi Basin and downstream Gulf.

Two-Track Approach for IWRM in the Mississippi and ICM in the Gulf

The preceding pages have outlined processes and approaches for introducing IWRM as well as comprehensive and adaptive approaches to management for discussion by Basin stakeholders. These suggested approaches have been successfully utilized by 14 of the Mississippi Basin states for other drainages, so there should not be barriers to use. Additionally, these processes have worked in Europe in the linked Danube Black Sea Basin, and other similar processes have been tried or are now being tried in sub-basins of the Mississippi. The first coordinated Gulf program among the five states was established in the 1980s, and upper basin environmental initiatives were authorized by the Congress in the Clean Water Act in the 1980s. The long history of these smaller Basin and Gulf

subsidiary initiatives and the experience of Basin states with the IJC and the TVA should reduce the opposition to application basin-wide. The Gulf of Mexico and upper basin programs, the Mississippi Basin-Gulf Watershed Nutrient Task Force, Mississippi River Commission, various sub-basin institutions such as for the Ohio River, and scores of initiatives, alliances, and NGOs can all be harnessed to serve as a coordinated and coherent platform for basin-wide scale work and constituency building with businesses and NGOs.

The scale and upstream-downstream linkages of Mississippi Basin-Gulf issues, future risks, and the recurring drain on federal and state budgets provides an imperative for basin-wide coordinated action among sub-basin initiatives. Establishment of basin-wide coordination, political commitments to action, incentives, and disincentives demands authority and funding and perhaps most of all political participation by the business community, NGOs, and citizens. This paper suggests a two-track approach of first harnessing stakeholders and their interest groups to establish basin-wide arrangements for coordination and coherence with processes previously presented to introduce more comprehensive, adaptive approaches that include IWRM and ICM. Once initial arrangements and funding are in place, appropriate and complementary legislative authority on the state and federal levels should then be pursued with stakeholders.

All scales of institutions from transboundary with Canada and Mexico to basin-wide, sub-basin, federal, state, local, and watershed must be engaged to introduce these approaches. Both top-down and bottom-up processes that are integrated and not just thematic are needed. To make change, the horizontal linkages spatially and across sectors (or agencies) and the vertical institutional linkages from national to state and local have to be pursued at the same time with businesses, NGOs, and citizens so that trust and working relationships can have a chance to develop. IWRM is about balancing different water resources uses and interests, so everyone will have to give in some and everyone will be disappointed.... but that will lead to a more sustainable system with fewer recurring costs if all the fragmented pieces can be brought together through some form of secretariat--perhaps the Mississippi River Commission--that can operate the coordination mechanisms. Foundation support may be needed to get the initiative off the ground. Wetlands and floodplains must be looked at comprehensively for their economic value for quantity, quality, aquifer recharge, biodiversity, and future carbon sequestration purposes. Replicating the good work already underway at pilot scales will be critical to generate local and special interest support. However, past experiences show this won't happen and opportunities will be missed without federal commitments to partnership and federal leadership among agencies. Likely, an Executive Order will be necessary and with special appropriations under existing authorities and eventually national/state legislation will be needed. Constituency building will be necessary to allow even existing authorities to be utilized instead of being blocked or subject to litigation such as section 303 Clean Water Act authorities on Total Maximum Daily Loads. EPA has been sued by NGOs for allegedly not enforcing authorities.

The business and NGO communities will also be critical for the second track in pursuing legislative action and follow-up funding appropriations. Many pieces of federal legislation will be required such as the Farm Bill, Clean Water Act Reauthorization, Water Resources Development legislation, Safe Drinking Water Act, and others. Subsequent state legislation, program funding, and implementation also need support. The lack of measureable results the last few decades is testimony to the need for new authority and funding. The recurring social, economic, and environmental costs demand new, more comprehensive action Mississippi Basin and Gulf-wide. If there is interest in such action, further elaboration of case studies for approaches briefly presented herein can be made for detailed stakeholder discussions.

Further Reading

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