THE APPLICATION OF ENVIRONMENTAL MANAGEMENT SYSTEM (EMS) PRINCIPLES TO WATERSHEDS

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BACKGROUND: EVOLUTION OF ENVIRONMENTAL MANAGEMENT SYSTEM

There is a worldwide movement today to systematize environmental management. It has roots in the attempts by the industrialized world to come to grips in a management sense with the vexing environmental crises confronted by society over the last thirty years.

In the 90's, voluntary systems for environmental management virtually exploded into view. The global economy had witnessed increasing reliance on global standards in a variety of key industries, including telecommunications, electronics, computers, information management, banking, shipping, airline operations, and maritime operations. The trend was reflected in the Geneva-based International Organization for Standardization (ISO), where environmental representatives from 100 countries agreed on the elements of an Environmental Management System (EMS) and promulgated the ISO 14001 EMS Standard (as part of the ISO 14000 Series) in September 1996.

While the terms of the standard are directed to the generic "organization," it actually grew out of the creation in 1990 of the Business Charter for Sustainable Development, an organization of 50 business leaders. The standard was intended to create tools and systems to improve *corporate* environmental performance and safeguard companies against negative impacts on trade and commerce. The standard does not prescribe substantive environmental performance requirements from an organization, but, rather, a set of sound environmental management procedures.

The standard had immediate implications for the global supply chain. Not a regulatory requirement, ISO 14001 instead is becoming an advanced form of economic incentive. Many companies see it in their economic self-interest to adopt a conforming EMS as a passport to the international marketplace.

The standard reflects a compilation of sound management *processes* that, together, may be constituted into a management framework or become an organizing principle for a variety of organizations, including those in the public sector. The premise of ISO 14001 is that, if an EMS is properly established and maintained, "continual improvement" in environmental performance will inevitably result and the system's objectives and targets will be met.

This paper argues that the application of EMS principles to the development and/or the protection of a watershed can similarly help both the public and private sectors to achieve their goals. More particularly, they include the efficient integration of water quantity and water quality, environmental as well as human health protection, industrial growth, and the systematic management of water and related land resources.

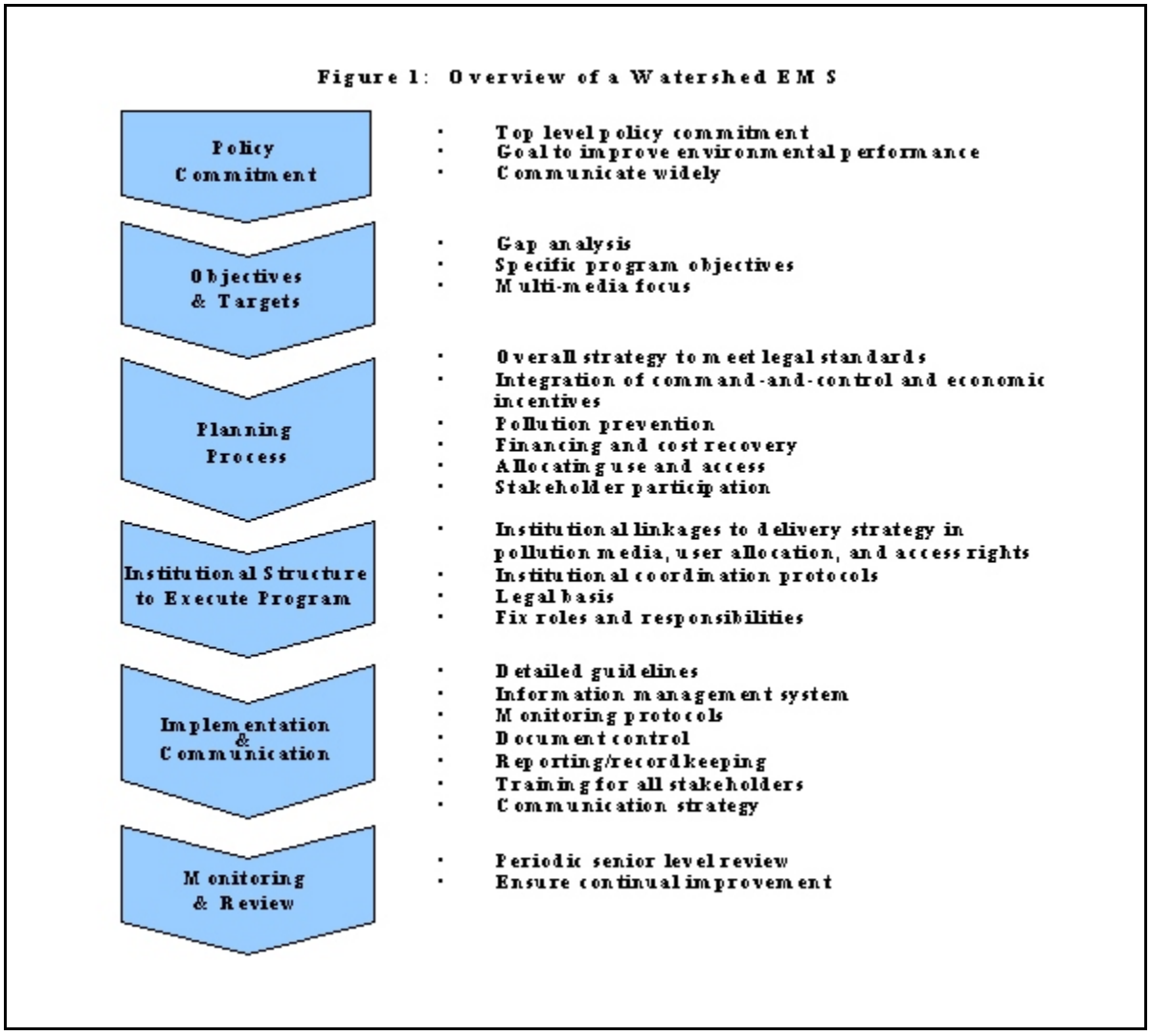
SUGGESTED COMPOSITION OF AN INTEGRATED MULTI-MEDIA WATERSHED EMS

The following management principles are common to all EMSs:

- A policy that articulates a commitment to a specific level of environmental performance;
- Specific measurable quantity and quality objectives and performance targets;

- A planning process and strategy to meet the commitment;
- An organized institutional structure to execute the strategy;
- Implementation programs and support tools to meet objectives;
- Communications and training programs; and
- Measurement and review process to monitor progress.

Figure 1 presents an adaptation of the ISO 14001 management tools to a watershed setting. This adaption specially recognizes the *institutional* and *programmatic* dimensions of the watershed EMS, especially in the developing world. The *institutional* dimension, like the ISO standard, addresses the question of whether a set of institutional linkages and specific procedures is in place to manage the watershed; and, if so, how effective they are as management tools; and, if not, what institutional linkages and procedures need to be created. The *programmatic* dimension, generally uncharacteristic of the ISO standard, assesses the adequacy of existing management or regulatory programs (or whether relevant programs exist at all); and, if they exist, how effective they are at delivering program goals; and, if they do not exist, what mix of programs needs to be created (borrowing from command, financial incentive, pricing, allocation of use and access, recharge, pollution prevention, information management, and other such programs). Since certification need not be a goal (unlike the application of the ISO standard to corporations), the standard's features can be adapted, as shown below and in the examples that follow, to the needs and legal culture of the jurisdiction in question. If such jurisdiction contains a multiple-use watershed, care should be exercised to evaluate it's multi-media impacts and whether it requires an integration of solutions.



APPLICATIONS OF THE INTEGRATED EMS DESIGN

In the context of a watershed EMS, the terms "integrated" and "multi-media" have special importance. An "integrated" EMS combines government intervention tools, such as regulatory/enforcement programs, with market-based incentives, including resource and pollution pricing, to attain environmental goals *at least cost to society*. A "multi-media" EMS applies these tools across all environmental media (air, water, land) to avoid transfers from one medium to another. So structured, an integrated, multi-media EMS assures that resources are allocated to users based on full information and internalization of all allocation costs, including concerns for both quantities of resources consumed and the quality of those resources.

EMSs have been implemented at many levels to solve a wide range of environmental management challenges. Single industrial locations have developed EMSs to manage their environmental performance in water, air, and solid waste. Cities have developed EMSs to improve the efficiency and effectiveness of their environmental programs or to engage multiple stakeholders in an equitable program of continuous environmental improvement. Regional EMSs have also been successfully applied within large industrial or trade zones.

Following are two project examples of the application by Hagler Bailly of several of the foregoing principles. The first, as reflected in **Exhibit 1**, is the special purpose district of Laguna Lake Development Authority (LLDA), which oversees the development of, and regulation of discharges into, the Laguna de Bay, the largest fresh water lake in Asia. The lakeshore is home to countless industries, and LLDA was specially created to manage the development and water pollution control of this unique multiple-use watershed whose uses were threatened by a lack of effective management, enforcement, and incentives. Hagler Bailly designed and implemented a program that integrated technical, institutional, financial, incentive, legal, and data management elements. This was done through extensive stakeholder meetings, and was followed, in the implementation phase, with an effective training regimen of LLDA staff. After only the first year of operation, there was a dramatic decrease in BOD contamination, and the hope of upgrading the water quality classification of the lake in the future. This model is especially relevant for the management of a regional watershed.

Exhibit 1: Philippines Special Purpose District

EMS Elements	Components
Policy Commitment	▸ Program supported by Philippines Department of Natural Resources and LLDA management.
Objectives and Targets	▸ Reduce BOD loadings in Laguna de Bay, the largest freshwater lake in Asia. ▸ If successful, expand reach of the program to other parameters.
Planning	▸ Fee system designed to focus on BOD initially, but expandable to other parameters. ▸ Action plan formulated outlining the procedural documents necessary, a budget, and an implementation timeline. ▸ Extensive stakeholder dialogues.
Institutional Structure	▸ Institutional development plan to support the administrative needs of the program (fee assessment, permits, billing, collection, appeals process, enforcement, fund management).
Implementation and Communication	▸ Drafted authorizing legislation and operational guidelines for a permit and monitoring programs. ▸ Capacity building program. ▸ BOD levels reduced 78% in first year of operation.
Monitoring and Review	▸ Government is developing plans to apply the EMS nationally. ▸ With continued improvement, LLDA someday hopes to upgrade the lake from Class C (non-contact recreation and industrial water supply) to Class A use (public water supply).

The second project, as reflected in **Exhibit 2**, addressed the groundwater problems of an industrial city in Egypt called the 10th of Ramadan. With twenty percent of its drinking water pumped from nearby deep wells, the Municipal Authority, at our suggestion, found evidence of heavy metals and other contamination in well samples. Unlined oxidation ponds, capturing liquid industrial wastes from 800 industries, were secretively sluiced to the fields of itinerant farmers to water their crops and their livestock. With extensive stakeholder input, Hagler Bailly designed a multi-media totally integrated program that combined command and market-based instruments. Borrowing liberally from other management disciplines, such as pollution prevention and the ISO 14000 standards, the program, currently awaiting implementation funding from USAID, features detailed implementing guidelines for both government officials and industry managers, and has been heralded as the most significant environmental program in the Gore-Mubarak Partnership. It is expected to be implemented over time in more than 20 industrial cities in Egypt.

Exhibit 2: Egyptian Industrial City

EMS Elements	Components
Policy Commitment	▸ Pressure to comply with new regulatory requirements (Law 4). ▸ Agreement on EMS memorialized in Memorandum of Agreement (MOA) by Ministries and City's Board of Trustees (representing industrial investors).
Objectives and Targets	▸ Reduction of wastewater discharges. ▸ Elimination of promiscuous dumping of solid waste.
Planning	▸ Multi-media coverage: air, water, waste. ▸ Integration of a command system and economic incentives. ▸ Provisions for licensing, monitoring, EIA. ▸ Pollution charge system as a central management tool. ▸ Environmental fund: revenues expected to cover administrative costs and subsidize environmental investments by industry. ▸ Data management system to store and retrieve compliance-related data.
Institutional Structure	▸ Institutional linkages defined and roles and responsibilities fixed.
Implementation and Communication	▸ Extensive advocacy dialogues. ▸ Detailed guidelines for both government and industry. ▸ Implementation at top of Egypt's environmental agenda. ▸ USAID technical assistance for implementation in late 1999.
Monitoring and Review	▸ Government to monitor implementation. ▸ Other industrial cities want this.

APPLICATION OF EMS PRINCIPLES TO WATERSHEDS

Other applications of the EMS approach are possible, including more geographically expansive watersheds that accommodate a wide variety of uses. Common problems in watershed management include a lack of: authority, enforcement, management know-how, funding, and incentives. An EMS approach offers distinct advantages over more traditional watershed planning and management approaches with power to deliver measurable, sustainable results in:

- striking a balance between regulatory and market-driven incentives to change water use and polluting behavior;

- capturing value-added in the benefits stream and using cash flows to offer financial incentives linked to behavioral change; and
- decentralizing the management structure design, with consensus-based rules of participation and roles for government and private entities.

One approach to addressing watershed management problems is to implement three pilot EMS structures aimed at different environmental problems in different locations. Pilots will address at least the following critical problems in water resources management (known in ISO 14001 EMS parlance as "objectives and targets"):

- Increasing the efficiency of water use, especially in the agricultural and industrial sectors;
- Improving the quality of wastewater in the municipal and industrial sectors to support reuse opportunities; and
- Attracting private-sector participation in water resources management.

Each EMS pilot could be designed to address specific water resources problems within a well-defined watershed. The process of designing each EMS pilot will engage all stakeholders within the watershed, which, in turn, helps ensure broad acceptance of problems to be solved, resulting resource management activities, potential changes in resource pricing, and new roles and responsibilities for management. Typically, a watershed-level EMS results in decentralized institutional roles and local actions that cannot be achieved through centralized approaches. The EMS framework is designed to create economic incentives for industry, agriculture, and local governments to participate in and execute management actions that cannot be achieved through more traditional regulatory means.

Each pilot EMS might require the preparation of six products that would fit appropriately within the EMS organizing principles related to planning, support, and implementation strategies:

- ***Response Model*** - A simulation model of water resources/water quality responses to changes in management activities attributable to the EMS;
- ***Data Management Tools*** - Database and/or other data management tools to store, retrieve, and manipulate ambient environmental, water use, and discharge data, plus related data elements specific to the EMS and needed to track and report on environmental outcomes and progress;
- ***Financial Management Mechanisms*** - Systems, institutions, and/or processes that create or manage the flow of funds from and to stakeholders as conditions of participation in the EMS;
- ***Government Guidelines*** - A set of detailed instructions that specify exact roles and responsibilities for all central and local government entities that must execute portions of the EMS during the implementation phase;
- ***Industry Guidelines*** - A set of detailed instructions that specify exactly what private sector participants must do to execute relevant portions of the EMS during the implementation phase; and
- ***Memorandum of Understanding*** - A legal document signed by the cooperating national and local government entities that commits each to carry out its responsibilities as specified in the *Government Guidelines*.

It is likely that the design phase will take 18 months to complete, and another 12 to 18 months should be allowed for implementation. This allows sufficient time to monitor and measure results, and abstract from each pilot appropriate lessons for purposes of modification of the design or application to other watersheds within the subject jurisdiction.

Hagler Bailly argues that it is only through this kind of comprehensive application of management principles (that include policy commitment, a planning process, an institutional strategy, implementation support tools, communication strategies, and periodic measurement and review) can decision-makers address seemingly intractable systemic problems often associated with a multiple use watershed.

AUTHORS

Jack J. Schramm, with Hagler Bailly since 1989 and currently senior counsel for environmental management, leads the firm's international practice in institutional and program strengthening. He has formulated laws and regulations, and developed multi-media integrated programs and strengthened the institutions that administer them in 17 countries throughout the world. A former senior administrator with the U.S. Environmental Protection Agency, Mr. Schramm holds degrees in politics and philosophy from Colgate University and in law from

Kenneth I. Rubin is Chief Executive Officer of Hagler Bailly Services, Inc., having joined the firm in 1997 as a result of Hagler Bailly's acquisition of Apogee Research, Inc., a public works consulting firm that he co-founded in 1986 and served as President and CEO. Dr. Rubin serves on Hagler Bailly's Executive and Management Committees and directs the Water Global Business Sector for the firm. While at the US Congressional Budget Office from 1980-1986, Dr. Rubin had responsibility for budget, finance, and policy research supporting authorizing, appropriations, and budget committees with jurisdiction over all US water and environmental infrastructure agencies including the US Army Corps of Engineers, the Environmental Protection Agency, and the Bureau of Reclamation. Prior to that at the US Water Resources Council, Dr. Rubin directed a multi-million technical assistance program supporting state water management agencies. Dr. Rubin holds both a Ph.D. and SM in Water Resources Systems Engineering form Harvard University, an MSPH in Environmental Engineering from the University of North Carolina at Chapel Hill, and a BS in Civil and Environment Engineering from Cornell University.