

ECOSYSTEM MULTIPLE MARKETS

A White Paper on the Concept

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Prepared by

KIESER & ASSOCIATES
Environmental Science & Engineering
310 E. Michigan Avenue, Suite 505
Kalamazoo, Michigan 49007

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EXECUTIVE SUMMARY

Market-based environmental regulations, first proposed by economists in the 1960s as an alternative to the traditional command-and-control approach, have promised cost savings and technological innovations in pollution control. After over two decades of experimenting and particularly after the successful implementation of the national Acid Rain Program in reducing the SO₂ emissions in the US, market-based regulations are seeing increased acceptance by policy makers as well as economists.

These market-based programs have been able to demonstrate advantages of reducing the cost of achieving pollution reduction goals and incorporating social benefits besides environmental improvements. Nevertheless, these programs typically focus on situations where impairments have occurred or individual pollutants are the targets. In many cases, this approach results in fragmented efforts rather than holistic management. Such fragmentation is caused by the segregated management of various ecosystem components and resources that are close-knit and inter-dependent by nature. Therefore, a paradigm shift is needed to broaden (de-fragment) and weave these markets together to optimize environmental improvements that will serve to holistically benefit the broader ecosystem. The goal of going beyond a minimal level of compliance towards higher levels of improvement—optimally functioning ecosystems—through profitable investment in ecosystem functions and uses, provides opportunities for multiple market-based environmental improvement incentives. This white paper is a first attempt to lay out a conceptual framework and identify opportunities for the operation of multiple markets within current economic and political realities.

The Ecosystem Multiple Markets Concept

Ecosystem multiple markets (EMMs) are defined here as ecosystem-oriented and market-based trading framework that is centered around multiple environmental commodities. These environmental commodities are generated by activities leading to the prevention or eradication of

environmental degradations or the improvement of ecosystem functions. By building markets for such commodities, EMMs can stimulate investment in ecosystem restoration and enhancement, address compliance requirements, encourage invention and innovation in environmental protection technology, and produce economic returns.

This concept of utilizing markets to cost-effectively achieve ecosystem improvement goals is compatible with other prevailing single market approaches that introduce market-based incentives to meet regulatory caps, offset requirements, or voluntary agreements. However, it differs fundamentally from those approaches in two aspects. First, while there is only one type of tradable environmental improvement in any of the single markets (e.g., SO₂ reduction in the acid rain emission allowance market), trading activities in EMMs include multiple environmental improvements, services, and/or ecosystem functions produced by pollution control measures or ecosystem restoration activities. Second, rather than establishing individual markets for targeted pollutants within different sociopolitical boundaries, EMMs would integrate, according to ecological principles and other natural laws, these individual markets into a unified trading framework to achieve both environmental improvements and economic returns across these man-made boundaries.

This white paper builds the theoretical framework for EMMs and presents a feasibility analysis on the potential application of the concept. Specifically, the paper

- conceptualizes the EMMs framework;
- illustrates why EMMs can lead to functioning ecosystems;
- illustrates why EMMs can maximize returns on environmental investments;
- identifies market potential for EMMs; and
- defines operational needs for future pilot demonstration projects.

This white paper focuses its research on the Great Lakes region to address application issues. The opportunities and issues identified in this region, however, are applicable in principle to other regions in the nation.

The Ecosystem Multiple Markets Framework

The EMMs framework is built on two objectives: (1) to create market demand for environmental commodities and (2) to stimulate the production of these commodities. The center piece of the framework (Figure ES-1) is the production of multiple environmental commodities. The hypothesis is that the more such commodities are produced, the closer we are to the goal of functioning ecosystems. Environmental commodities can be emissions credits, environmental services (e.g., habitat for endangered species and ecological functions of wetlands such as denitrification and flood storage), and/or units of treatment and pollution controls. Because most of the environmental improvement levels required by current law and regulations are necessary to achieve some minimum ecosystem functions (e.g., designated uses), in order to realize optimally functioning ecosystems, only environmental commodities produced in absence of these law and regulations or in exceedance of the required improvement levels can be traded in the EMMs to generate economic returns.

Ecosystem Multiple Markets

Current Ecosystem Management

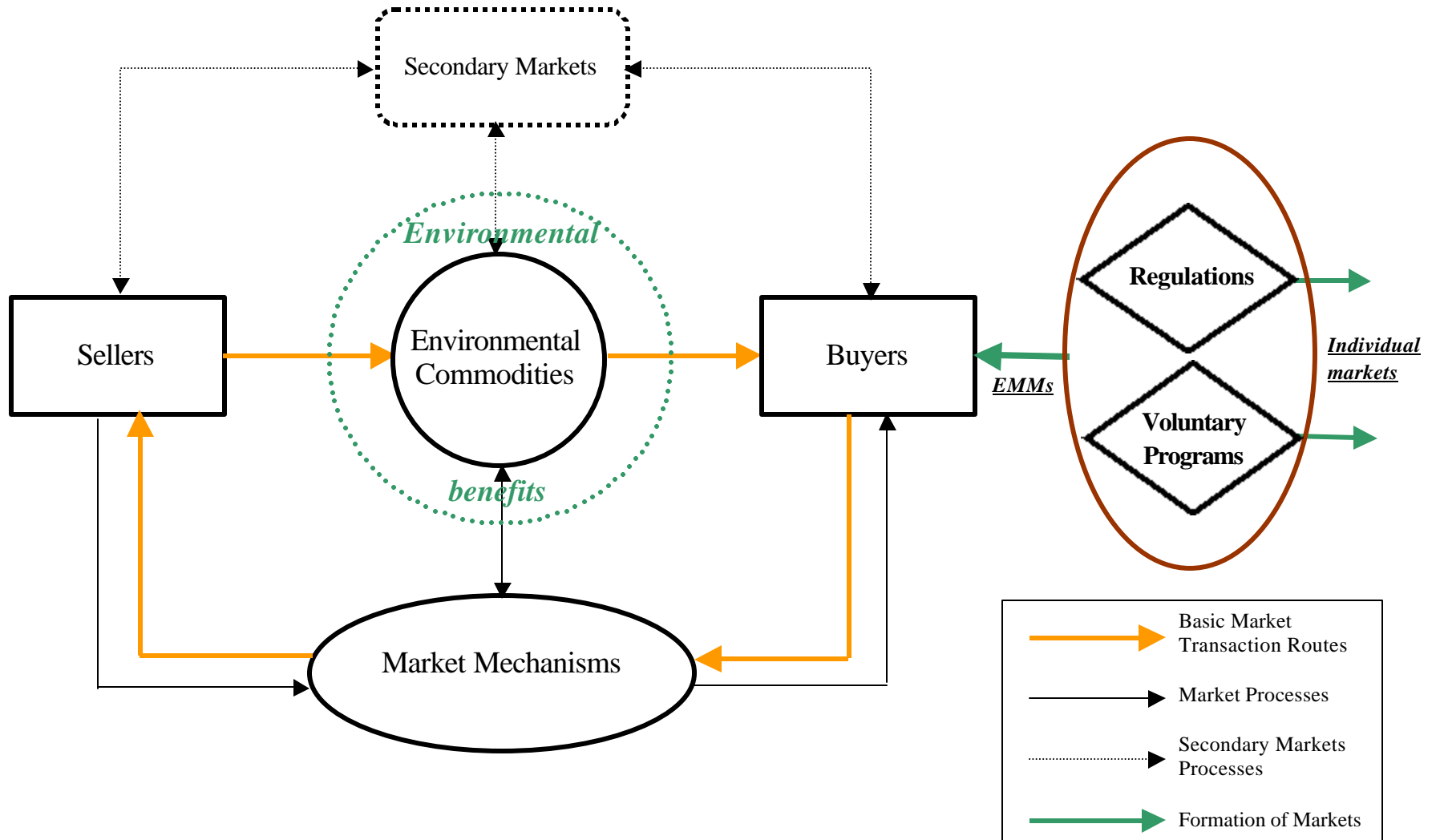


Figure ES-1. Simplified Conceptual Framework of the Ecosystem Multiple Markets (EMMs)

By allowing purchase of environmental commodities to reduce the cost of compliance (e.g., air emission and water quality standards), ecosystem improvement (e.g., habitat restoration), and/or environmental risk management (e.g., pollution prevention and flood storage), the EMMs framework would create the markets and subsequently, demand for these commodities. Demand stimulates supply and promises economic returns on investment in producing these commodities. By designing market mechanisms to facilitate the exchange of multiple environmental commodities in an integrated market place, the EMMs framework would increase the flow of these commodities on the markets. A high volume of commodity exchange reflects a high production level of this commodity, which can lead to an efficient allocation of resources used to produce the commodity. Furthermore, as the primary markets develop and mature, the EMMs framework encourages the growth of secondary markets to facilitate trading and reduce business operation risks (e.g., environmental financial products).

Why Might EMMs Work?

Fundamentally, it is envisioned here that EMMs would foster an ecologically integrated environmental market, allowing capture of the synergies among various ecosystem management efforts. The ability of EMMs to integrate fragmented environmental markets can be illustrated by nitrogen management in the EMMs framework.

Currently, nitrogen management is still centered around traditional solutions, namely conservation subsidies to farmers, the use of best management practices (BMPs), and tighter controls on point sources. The limited progress we have achieved so far in reducing nitrogen loading to our nation's water bodies made it apparent that these conventional approaches are not adequate. The reasons are clear—these traditional solutions are too expensive and address too small a segment of the problem. The EMMs framework, on the other hand, can take advantage of the synergies among water quality, drinking water protection, wildlife habitat, and climate protection that nitrogen control can provide.

Nonpoint sources, particularly agriculture, contribute significantly to water pollution and remain largely unregulated. The National Research Council estimates that approximately half of the national nitrogen and phosphorus residual results from excess nutrient use. Nitrogen not only contributes to fresh and estuarine water quality problems, it is also a contributor to climate change. Nitrous oxide is one of the most powerful GHGs, with the ability to trap 310 times as much heat as carbon dioxide. About three-quarters of total U.S. emissions of nitrous oxide emissions come from agricultural production each year.

Many of the same activities can improve water quality, reduce or prevent GHG emissions, and provide wildlife habitat. For example, fertilizer management plans reduce the surplus nitrogen available to be lost to water as well as to the atmosphere. Protected or restored wetlands can remove nitrogen from the water and prevent it from transforming to nitrous oxide. Forested buffer zones can simultaneously protect water bodies from diffused nitrogen sources, increase carbon sequestration, and provide habitat for wildlife. Research by World Resources Institute (WRI) has shown that a well-targeted water quality program aimed at reducing nutrients and using market-based mechanisms to provide flexibility in meeting water quality goals in the Mississippi River Basin, could also provide climate co-benefits of up to 15% GHG reductions in

all the sub-basins. In the EMMs framework, all these co-benefits would be commodities explicitly defined and tradable. As a result, nitrogen management would be geared towards generating the most possible co-benefits. This coincides exactly with the essence of the holistic ecosystem restoration approach—considering all interconnected aspects of an ecosystem.

Because of the markets and the economic incentives associated with them, the EMMs framework has the potential to promote innovative pollution reduction approaches, new technology, and more ecologically holistic improvements. Compared to the individual environmental commodities markets, EMMs would transform environmental protection activities from reactive measures to proactive undertakings. In addition, in EMMs because ecosystem services such as habitat restoration are produced and traded just like other commodities in the economy, these services are brought to the general public with a realization of their existence and their economic as well as ecological value.

Another important beneficial consequence of ecologically integrated markets is the increased market size for environmental commodities. One restoration project may generate multiple environmental commodities for markets of various sizes. Each commodity may be sold to pools of buyers and over different geographic ranges. As a result, each commodity market is expanded.

Feasibility of Demonstrating EMMs in the Great Lakes Region

The best way to convert the EMMs concept into real markets is implementing a pilot project. This white paper outlines the potential of demonstrating the EMMs framework in the Great Lakes region. The issue is approached from the following perspectives: existing market-based environmental programs and political and legal infrastructures, political willingness, public acceptance, and market potential for EMMs.

The Great Lakes region has hosted a number of pioneering programs and feasibility studies on market-based ecosystem management approaches. These studies and programs include for example, the demonstration trading project in the Kalamazoo River Basin, the Chicago Climate Exchange (CCX), trading under NPDES permits in the Minnesota River Basin, and the South Nation River Watershed water quality trading program in Ontario. The State of Michigan's water quality trading rules and the newly released water quality trading policy by the US EPA can provide regulatory support for market-based environmental management approaches in the region.

In terms of political willingness and public acceptance of market-based approaches to environmental protection in the region, the Kalamazoo River Water Quality Trading Demonstration Project from 1997 to 2000 identified common interests between environmental and economic goals critical to the community and watershed. When concerns were addressed and the benefits of a trading program were understood, municipalities, industrial and agricultural sectors all eventually became trading partners. Trading is now an identified element of a unique Kalamazoo River/Lake Allegan phosphorus TMDL Implementation Plan. Hundreds of point-nonpoint source pollutant trades have occurred in the Minnesota River Basin via NPDES permits. Trading in the South Nation River Watershed in Ontario has resulted in a stakeholder-

led process where a community-based watershed organization is the broker for phosphorus credits and all project field visits are done by farmers rather than paid professionals.

Under the current regulatory conditions, with the experience gained from previous projects, and through existing and developing market-based programs, four potential environmental commodities have been identified in this study for trading in an EMMs pilot program in the Great Lakes region:

- Water quality credits from direct water quality improvement measures
- Ecosystem function mitigation for wetlands
- Green house gases (GHGs)
- Endangered species/wildlife habitat

By investigating the potential market value of restoring coastal wetlands in the Great Lakes region, this feasibility analysis suggests that the annual market value of 1,970 acres of coastal wetlands could reach up to \$168 million for a combination of all the above four environmental commodities.

Funding opportunities for initiating projects to generate environmental commodities are also examined in the study. Among other sources, provisions in the 2002 Farm Bill create the Conservation Innovation Grants (with a 50% match) as part of the expanded Environmental Quality Incentives Program (EQIP). This newly established grant program awards government or non-government organizations or individuals that leverage federal funds to implement innovative approaches to conservation including market-based incentive approaches.

Steps in the Implementation Phase of a Pilot Project under the EMMs Framework

This white paper examines in detail, the fundamental elements of EMMs in the context of an experimental framework. Demonstrations would serve to identify functional aspects and requirements leading to operating markets.

Incorporated as a not-for-profit organization, the Environmental Trading Network (ETN) is the leading organization to conduct the EMMs pilot project. Carrying out a pilot EMMs project in the Great Lakes region involves identifying the supply and demand of environmental commodities, establishing market institutions to facilitate trading, and tracking/brokering actual trades. Four steps are proposed here to accomplish these pilot elements.

1. Project site selection—in this step, one geographic area (likely a watershed) or multiple areas in the Great Lakes region will be chosen to implement the EMMs framework.
2. Framework building—in this step, the institutional arrangements for the EMMs are created to facilitate and oversee trading in the framework. This step would include designing market institutions for each environmental commodity to ensure environmental efficacy and market efficiency of the EMMs. Proposed market structures would utilize and incorporate currently available exchange markets (e.g., the CCX) and trading tools (e.g., the NutrientNet by the WRI).

3. Environmental commodity production—in this step, the design/engineering work is performed to improve or restore ecosystem functions and generate tradable credits.
4. Transaction of the environmental commodities—in this step, various commodities generated in the pilot project are traded in the experimental market framework.
5. Research and report on the pilot project.