CHEMICAL AND PESTICIDES RESULTS MEASURES II
REVISION 6

Project Working Document

November 9, 2001

A Cooperative Agreement between the Office of Prevention, Pesticides, and Toxic Substances of the U.S. Environmental Protection Agency and the Program for Environmental Policy and Planning Systems at the Florida State University Institute of Science and Public Affairs.

In February 2001, PEPPS extended its cooperative agreement with OPPTS to evaluate, update and expand the Chemical and Pesticides Results Measures (CAPRM) – a system of 74 indicators associated with chemical and pesticides issues. The following document reflects all modifications to the original CAPRM indicator system.

This document, as well as the original CAPRM document and executive summary, are available online at http://www.pepps.fsu.edu/caprm. Please e-mail any questions or concerns to Dr. Gil Bergquist, PEPPS Director, at: gbergqui@garnet.acns.fsu.edu.

PROJECT SUMMARY

National planning initiatives such as the Government Performance and Results Act (GPRA) and the National Environmental Performance Partnership System have laid the foundation for improving planning and management of environmental programs by focusing attention on environmental results, elevating the importance of planning, and highlighting the need for meaningful stakeholder participation and positive intergovernmental relationships. A strong planning system is fundamental in keeping attention focused on important goals and concerns. Higher demands for closer intergovernmental cooperation, greater legislative scrutiny, demands for more public accountability, and tighter, more competitive budgets have compelled states and tribes to improve their management systems, particularly planning. Fundamental to the functioning of effective planning programs is the ability to measure mission-based results. Without such measurement strategic goals cannot be set, accomplishments cannot be documented, and programs cannot be adaptively managed.

The Program for Environmental Policy and Planning Systems (PEPPS) at the Florida State University entered into a cooperative agreement with the Office of Prevention, Pesticides, and Toxic Substances (OPPTS) of the EPA to lead a stakeholder process to develop a national set of environmental indicators that can be used by states, tribes and non-governmental organizations, the private sector and the EPA to describe and understand environmental trends and conditions associated with chemical and pesticide issues. For the past year, an external workgroup of representatives from state governments and the private sector has, with the support of CAPRM project staff and an internal OPPTS workgroup, identified strategic issues relating to chemicals and pesticides and provided oversight of the development of 74 indicators.

As of February 2001, the first phase of the CAPRM project is complete. PEPPS recently extended its cooperative agreement with OPPTS for an 18-month second phase for CAPRM. This second phase will comprise an evaluation, update and expansion of the indicator system developed in the first phase of CAPRM. This working document enables working group members, OPPTS staff and other stakeholders to follow the progress of the CAPRM indicator system. It is designed to reflect the organization of the indicators around an issue structure, as well as key information about each indicator.

The Classification of Indicators in CAPRM

PEPPS classifies all of its indicators according to their immediate availability for use into one of three types:

Type A: Indicators for which adequate data are available now and can be used to support the indicator without significant cost considerations.

Type B: Indicators which are presently feasible and for which data exist but cannot be provided due to inordinate cost, analytical complexity, time limitation or legal constraints.

Type C: Prospective indicators for which indicator quality data do not exist and there is no reasonable prospect of development.

PEPPS also uses the Hierarchy of Indicators, which was first developed by the Chesapeake Bay Program, to categorize the relative power of indicators to reflect environmental values. The Hierarchy of Indicators is illustrated below:

CAPRM Revised Hierarchy of Indicators						
Administrative		Environmental				
1	**2**	**3**	**4**	**5**	**6**	**7**
Actions by Federal or State Regulatory Agency	Responses of the Regulatory Community or Society	Changes in Discharge or Emission Quantities	Changes in Ambient Conditions or in the Quantities of Natural Resources	Changes in Uptake and/or Assimilation	Changes in Human and/or Ecological Health Risk	Changes in Health, Ecology or Other Effects

The tables in the following sections feature a column to display the type (data availability – A, B or C) and level (1-7 in the Hierarchy of Indicators) for each prospective CAPRM indicator.

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INSTITUTE OF SCIENCE
AND PUBLIC AFFAIRS

PROGRAM FOR ENVIRONMENTAL
POLICY AND PLANNING SYSTEMS

UNITED STATES • ENVIRONMENTAL PROTECTION AGENCY

SECTION I: ENVIRONMENTAL ISSUES

Environmental Issue 1: Human Health
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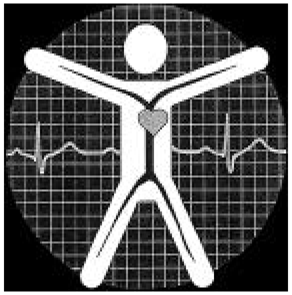

ENVIRONMENTAL ISSUE 1—HUMAN HEALTH

There are approximately 70,000 chemicals currently in use in the U.S. and the U.S. Department of Agriculture has reported that over the last 10 years approximately 270 active ingredients have been used in pesticides. Of great concern to many people is how those chemicals affect their health and quality of life. In 1997, there were 105,040 cases of pesticide poisoning and 19 attributed deaths. Additionally, 70,413 people were reported to be poisoned by chemicals; 38 of these poisonings were fatal. Perhaps of more interest than these acute health effects are the long-term outcomes, or chronic health effects, resulting from low levels of chemical exposure over a long period of time. Of particular concern are children, who are much more vulnerable to chemical exposure and who may sustain developmental damage that can effect their physical health, mental capacity, and behavior for the rest of their lives. In general, the measurement of chemical associations to health outcomes is not supported by enough strong science to support indicator development. The data systems to measure the association between chemicals and chronic health effects are only now being constructed. But, indicator quality data is projected to be available within the next several years, which will greatly improve understanding of this issue. There are, however, current measurement systems that can track certain health outcomes (e.g., risk and acute effects) of chemical and pesticide exposure.

Issue Dimensions

1.1.1 Pathologies

Scientists have determined that there are twelve distinct human systems or major organs that are affected by toxic chemicals. Evidence suggests relationships between exposure to toxic chemicals and cardiovascular disorders, developmental disorders, endocrine system dysfunction, gastrointestinal or liver dysfunction, weakening of the immune system, kidney failure, musculoskeletal disease, neurological and behavioral dysfunction, interference with sexual function or the ability to reproduce, respiratory system dysfunction, and skin or sense organ dysfunction.

The most powerful indicators of human environmental health would be those that can measure direct relationships between chemical exposure and physical health effects. Unfortunately, the science and the data needed to support these relationships are not currently available. Many health effects have multiple causes that prevent measurement of the contribution of specific chemical exposures to specific health effects. For many chemicals, it is unknown precisely what long-term effects they will have on human health. For those chemicals about which some effects are known, there still exists the ignorance of some long-term risks. The Centers for Disease Control and Prevention (CDC) is initiating new data collection processes that may produce the evidence necessary to establish such relationships. If and when such relationships are established, then long-term tracking through indicators can occur.

1.1.2 Health Risk

A potential intermediate measurement of the impact of chemicals on human health is the estimation of the change in risk associated with increases or decreases in chemical exposure. While the concept of risk is thoroughly integrated into the culture of environmental protection agencies and risk-based analysis is increasingly employed to make environmental decisions, risk-based data sets suitable for indicator development have not existed until recently. The Risk Screening Environmental Indicators project at the EPA permits the estimation of human health risk resulting from modeled exposure to Toxics Release Inventory chemicals. The indicators is in this section use health risk as a proxy for health outcomes.

1.1.3 Chemical and Pesticide Safety

This issue focuses on the issue of chemical and pesticide safety in the general population. To a larger extent, the issue of safety is examined within the context of workers with increased risks of exposure to chemicals and pesticides. These classes of workers are identified below.

Agricultural Workers: Agricultural workers compose a population that is at high risk of exposure to pesticides and other agricultural chemicals. As workers in this sector encounter pesticides with great frequency, there is the risk of short-term pesticide poisoning. Additionally, the agricultural workers' extended exposure to these toxic substances increases their risk of developing chronic health problems.

Industrial Workers: Industrial workers are a population that is highly susceptible to exposure to toxic chemicals. For the purpose of this project, industrial workers are defined as those who are either responsible for the production of chemicals or pesticides or those who are involved in manufacturing processes that use chemicals as an integral component of the production process. As workers in this sector encounter toxic substances with great frequency, the risk of chemical poisoning is very great. Additionally, industrial worker's extended exposure to these toxic substances greatly increases their risk of developing any of the associated health problems.

Non-agricultural Applicators: Another group at risk from pesticides are individuals who apply pesticides as employees of government or professional firms that apply insecticides, herbicides, rodenticides and other chemicals. Private individuals who apply such products on their own property are similarly at risk. A similar set of risks exist for professionals and private citizens who apply a variety of pesticides inside commercial, institutional and residential indoor setting.

1.1.4 Chemical Toxicity of the Indoor Environment

Twenty-five states have completed comparative risk assessment studies in which they identified and ranked environmental issues based on their relative risk. With regard to human health, the majority of those studies identified indoor environmental quality as the greatest risk. The average person spends approximately 90% of their time indoors. Some populations –infant children, elderly, the infirm, and the institutionalized - spend virtually the entire day inside. Tight construction and poor ventilation often limits air exchange. In this restricted environment, people are exposed to literally thousands of substances. There are estimations that nearly 90% of all homes use some form of pesticide and that home exposures may account for up to 75% of all pesticide-related injuries and emergency room visits. Whether in the home or the work place, individuals use products that have varying levels of toxicity. Exposure to toxic substances like asbestos, volatile chemicals, as well as the release of potentially toxic vapors that occurs when carpet is installed or walls are painted. In addition, there is the risk of exposure to a wide variety of other chemical products - such as varnishes, paints, cleaning products, disinfectants, copy toner - that can cause adverse health effects.

1.1.5 Bioaccumulation

Of particular concern are toxic chemicals that persist in the environment, bioaccumulate in human and animal tissues, and result in negative health effects. Such chemicals - known as persistent bioaccumulative toxics (PBTs) - are worthy of special consideration because of the serious health risk they pose. The measurement of bioaccumulation of these substances does not measure direct health effects, but it is a good surrogate measure.

The Longitudinal Cohort Study and the National Exposure Report Card being developed by the Centers for Disease Control and Prevention will provide annual, high-quality data for a range of important chemical constituents found in human tissue. The first year data was released in 2000 and will provide the baseline for subsequent studies. A series of indicators are currently available for the following toxic substances, lead, mercury, organophosphates, and phthalate metabolites.

1.1.6 Public Health

Chemicals and pesticides are used to manage diseases through the control of infectious organisms. When such chemical agents are ineffective, a variety of public health effects can result. Hospital disinfectants that inadequately control bacteria can lead to a rise in secondary infections. Ineffective insecticides can lead to increases in mosquito borne disease (equine encephalitis, malaria) or tick borne diseases. The indicator in this section tracks the incidence of vector-borne disease in the United States.

1.1.7 Subsistence Diet

There are populations of individuals and families in the United States that - for reasons of personal preference, life style or economic necessity - have diets that place them at higher risk of chemical exposure. Individuals who catch and eat fish or other seafood as a major component of their diet are at risk of consuming high levels of PBTs. For example, the Inuits of North America, while distantly removed from any significant source of direct pollution, have very high levels of PBTs in their blood and tissue. This is attributed to their status as an end-of-the-food-chain consumer, whose diet is almost solely composed of seafood and marine mammals that are effective concentrators of fat-soluble toxic chemicals. Similarly, individuals who grow their own vegetables and apply their own pesticides may have an additional risk of chemical exposure if they are not well-trained in the use of such products.

Indicators

Pathologies

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Design Indicator(s): Pathologies Caused by Chemical or Pesticide Exposure	Longitudinal Cohort Study	CDC	C / 7	Complete – No change	SC

Health Risk

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Chronic Human Health Risk Index for Toxic Releases	Toxics Release Inventory (TRI) & Risk Screening Environmental Indicators (RSEI)	EPA	A / 6	In Process	SC
Acute Human Health Risk Index for Toxic Releases	TRI & RSEI	EPA	B / 6	Complete - No change	SC
Chronic Human Health Risk for Releases of	TRI & RSEI	EPA	A / 6	In Process	SC

Items shaded in turquoise are indicators that are ready for review.
Indicators may be reviewed by clicking on the shaded areas.
AF: Albert Frederick; SC: Suzanne Clark; TD: Tina Deater

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Hormone Disrupting Chemicals					

Chemical and Pesticide Safety

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
~~Number of Occupational Poisonings due to Pesticide Exposure~~	~~Toxic Exposure Surveillance System (TESS)~~	~~American Association of Poison Control Centers (AAPCC)~~	~~B / 5~~	~~Recommended for Deletion~~	~~TD~~
~~Number of Occupational Poisonings due to Chemical Exposure, by Medical Outcome~~	~~Toxic Exposure Surveillance System (TESS)~~	~~American Association of Poison Control Centers (AAPCC)~~	~~B / 5~~	~~Recommended for Deletion~~	~~TD~~
Number of Fatal and Non-Fatal Poisonings due to Pesticide Exposure	TESS	AAPCC	A / 5	Updated	SC
Number of Fatal and Non-Fatal Poisonings due to Chemical Exposure	TESS	AAPCC	A / 5	Updated	SC
Annual Pesticide Use on Select Field Crops, by Pesticide Product Signal Word	Agricultural Resources Management Survey (ARMS)	USDA National Agricultural Statistics Service (NASS)	A / 3	Updated	TD
Annual Pesticide Use on Select Vegetables, by Pesticide Product Signal Word	ARMS	USDA NASS	A / 3	In Process	TD
Annual Pesticide Use on Select Fruits, by Pesticide Product Signal Word	ARMS	USDA NASS	A / 3	Complete – No Change (7/02)	TD
Occupational Lead Exposure	**ABLES**	**CDC**	**A / 5**	**Complete**	**SC**
Occupational Incidence of Respiratory Conditions due to Toxic Agents	**SOII**	**Bureau of Labor Statistics, DOL**	**A / 7**	**Complete**	**SC**
Occupational Incidence of Poisoning	**SOII**	**Bureau of Labor**	**A / 7**	**Complete**	**SC**

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		Statistics, DOL			
Number of Occupational Chemical and Pesticide-Related Injuries and Illnesses	**SOII**	**Bureau of Labor Statistics, DOL**	**A / 7**	**Complete**	**SC**

Chemical Toxicity of the Indoor Environment

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Sales and Use of Carcinogenic and Cholinesterase Inhibiting Neurotoxic Pesticides In and Around Residential Areas		EPA OPPTS, Home & Garden Survey	B / 4	In Process	SC

Bioaccumulation

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
~~Design Indicator(s): Bioaccumulation of Toxic Substances~~	~~National Report on Human Exposure to Environmental Chemicals~~	~~CDC~~	~~B / 5~~	~~Developed into new A indicators~~	~~SC~~
Blood Mercury Levels in Women of Childbearing Age	**NHANES**	**CDC**	**A / 5**	**Completed**	**SC**
Levels of Organophospate Pesticide Metabolites in People Ages 6-59 Years	**NHANES**	**CDC**	**A / 5**	**Completed**	**SC**
Levels of Phthalate Metabolites in People Ages 6 and Older	**NHANES**	**CDC**	**A / 5**	**Completed**	**SC**

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Blood Lead Levels in Peoples Age 6 years and older	**NHANES**	**CDC**	**A / 5**	**Completed**	**SC**

Public Health

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Reported Cases of Vector-Borne Diseases	Morbidity and Mortality Weekly Report	CDC	A / 7	Updated	SC

Subsistence Diet

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Number of Fish and Wildlife Advisories, by Type	National Listing of Fish and Wildlife Advisories	EPA	A / 4	Updated	SC

ENVIRONMENTAL ISSUE 2—ECOLOGICAL HEALTH

Commonly, when people think about chemical contamination, they focus on human health concerns. However, the health of wildlife, natural plants communities, and, indeed, the health of entire ecosystems are profoundly affected by toxic chemicals and pesticides. Toxic chemicals and pesticides can affect wildlife and ecosystems at several levels. Large doses of sufficiently toxic chemicals and pesticides can have acute, short-term effects as high mortality rates. Similarly, they may disrupt the food chain by selectively eliminating certain species necessary as a food supply to other organisms. Chemical contamination may also weaken wildlife species, diminishing their ability to compete and survive. Over longer periods of time, chemicals and pesticides, at relatively low doses, can have serious developmental impacts on wildlife that may have long-term effects on the survivability of whole species. At the highest level, chemical contamination can have broad, systematic effects across large, integrated ecosystems like the Everglades, the Great Lakes, and the Chesapeake Bay.

Issue Dimensions

1.2.1 Flora and Fauna Impacts

The use or release of pesticides and toxic substances affects not only human health, but wildlife as well. The rapid growth in the use of pesticides, from the 1960s to the present, has been accompanied by an observed increase in wildlife impacts. The use of DDT, for example, was associated with population declines in bald eagles, peregrine falcons, and brown pelicans. All of these birds species are predators that suffered the impacts of biomagnified DDT loadings. DDT caused the thinning of egg shells and diminished the ability of eggs to survive. As a response to the observed effects of pesticides such as DDT in the environment, new less-persistent pesticides were developed. However, these newer pesticides can, in some cases, be more acutely toxic to wildlife in the short term. The effect of pesticides on fauna that serve as the food supply for others, such as insects, can reduce the ability of higher species to compete and survive.

More insidious are the long-term effects of chemical and pesticide exposure. While some pesticides may cause immediate death, others may lead to a decline in health that will eventually lead to sickness, death, and species decline. As with humans, pesticides and toxic chemicals can disrupt development processes. Such disruption can result in a variety of effects, including: behavior changes, physical deformities, sexual and reproductive dysfunction, and offspring mortality. Weakened wildlife may become easier prey and may lose their ability to adapt to environmental changes. Of particular concern are endangered species in the U.S. At present there are 735 species of plants and 496 species of animals listed as threatened or endangered. Given their low and precarious numbers, pesticide or toxic chemical incidents can be particularly damaging.

1.2.2 Major Ecosystems

The presence of toxic substances and pesticides has the potential to disrupt the functioning of whole ecosystems. An example of a major ecosystem that has been affected by chemical pollution is the Florida Everglades, where mercury from national and international air deposition, stormwater runoff, and the disturbance of mercury-bearing peat have created significant environmental impacts. Ongoing research is finding that an international deposition pathway is responsible for increased mercury loadings. Mercury from Europe and perhaps even China is atmospherically transported to Florida through a unique pattern of global atmospheric circulation. Through the process of biomagnification, mercury is being transferred up the food chain and is beginning to have system-wide effects on wildlife. For example, an endangered Florida panther is believed to have died from mercury poisoning, as a result of preying on contaminated wildlife.

The Great Lakes Program has focused heavily on the role of chemical contaminants. For years, the Great Lakes have been the recipients of huge amounts of chemicals and pesticides; the effects on wildlife were initially systematic and devastating. To manage the restoration of the Great Lakes, the Great Lakes Program and the Canadians have jointly prepared seven pollution related indicators and have another twelve in development. Similarly, the Chesapeake Bay suffered from long-term loadings of chemicals from urban runoff and atmospheric deposition. The Chesapeake Bay Program has identified toxic chemical contamination as one of the four top stresses on the Bay. To support their restoration efforts, they have developed eighteen chemically-based indicators and have an additional three indicators in development. These indicators support a goal-driven, results-based management system that is a model for ecosystem management.

Projects now underway in other areas of the country are also looking at chemical impacts. The Mid-Atlantic Integrated Assessment (MAIA), the Mid-Atlantic Highlands Assessment Program (MAHA), and the Western Pilot Study all have chemical contamination related elements. In several years, when all of these projects are fully functioning, the assessment and monitoring of chemical and pesticide related health effects and contamination on a national scale will be possible.

Indicators

Flora and Fauna Impacts

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Chronic and Acute Ecological Health Risk	TRI & RSEI	EPA	B / 6	Complete – No Change	TD
Number of Terrestrial and Aquatic Incidents and Associated Mortalities from the 15 Pesticides Currently Causing the Most Wildlife Mortalities	Ecological Incident Information System	EPA	B / 7	Complete – No Change	TD

Major Ecosystems

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Major Ecosystems: Great Lakes					
Contaminants in Avian Eggs	**SOLEC**	**EPA/Environment Canada**	**A / 5**	**In Process**	**TD**
Toxic Chemical Concentrations in Offshore Water	**SOLEC**	**EPA/Environment Canada**	**A / 4**	**In Process**	**TD**
Brownfield Redevelopment	**SOLEC**	**EPA/Environment Canada**	**A / 1**	**In Process**	**TD**
Mean Sum PCB Concentrations in Snapping Turtle Eggs from the Great Lakes	**SOLEC**	**EPA/ Environment Canada**	**A / 5**	**In process**	**TD**
External Anomalies in Brown Bullhead from the Great Lakes	**SOLEC**	**EPA/Environment Canada**	**A / 4**	**In process**	**TD**
Concentrations of Transported Trans-Nonachlor	Lake Michigan	EPA	B / 4	Complete- No	TD

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in Lake Michigan	Mass Balance (LMMB) Project			Change	
Concentrations of Transported Mercury in Lake Michigan	Lake Michigan Mass Balance (LMMB) Project	EPA	B / 4	Complete- No Change	TD
Concentrations of Transported Atrazine in Lake Michigan	Lake Michigan Mass Balance (LMMB) Project	EPA	B / 4	Complete- No Change	TD
Concentrations of Transported PCBs in Lake Michigan	Lake Michigan Mass Balance (LMMB) Project	EPA	B / 4	Complete- No Change	TD

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Major Ecosystems: Chesapeake Bay					
Bald eagle population count		EPA/Chesapeake Bay Program	A / 5	Complete	TD
Industry reported releases and transfer of chemical contaminants		EPA/Chesapeake Bay Program	A / 3	Complete	TD
Industry reported releases and transfers of Chesapeake Bay toxics of concern		EPA/Chesapeake Bay Program	A / 3	Complete	TD
Releases and transfers of contaminants from federal facilities		EPA/Chesapeake Bay Program	A / 3	Complete	TD
Cropland acres under Integrated Pest Management		EPA/Chesapeake Bay Program	A / 2	Complete	TD
Pesticide collection and disposal programs		EPA/Chesapeake Bay Program	A / 1	Complete	TD
Pesticide container recycling programs		EPA/Chesapeake Bay Program	A / 1	Complete	TD
Kepone in finfish tissue		EPA/Chesapeake Bay Program	A / 5	Complete	TD
Declines in Maryland oyster tissue contaminants		EPA/Chesapeake Bay Program	A / 5	Complete	TD
Tributyltin concentration levels		EPA/Chesapeake Bay Program	A / 4	Complete	TD
Trends in rainfall metals concentrations		EPA/Chesapeake Bay Program	A / 4	Complete	TD
Copper concentrations in sediments		EPA/Chesapeake Bay Program	A / 4	Complete	TD
Benzo[a]pyrene Concentrations in Sediments		EPA/Chesapeake Bay Program	A / 4	Complete	TD
Ambient toxicity in the Chesapeake Bay, water column data		EPA/Chesapeake Bay Program	A / 4	Complete	TD
Ambient toxicity in the Chesapeake Bay, sediments data		EPA/Chesapeake Bay Program	A / 4	Complete	TD

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Chesapeake Bay ambient toxicity for sediments		EPA/Chesapeake Bay Program	A / 4	Complete	TD
Major Ecosystem: Mid-Atlantic Highlands Assessment (MAHA)				**Complete**	**TD**
Major Ecosystem: Mid-Atlantic Integrated Assessment (MAIA)				**Complete**	**TD**
Major Ecosystems: Western Pilot				**Complete**	**TD**
Major Ecosystem: Gulf of Mexico				In Process	TD

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ENVIRONMENTAL ISSUE 3—FOOD

The EPA's 2000 Strategic Plan states that "the foods Americans eat will be free from unsafe pesticide residues." For the purposes of this project, it was important to measure not only the degree to which foods are affected by the use of pesticides, but also the degree to which other industrial chemicals might affect food safety. Other industrial chemicals include chemical classes such as dioxins, furans and polychlorinated biphenyls (PCBs). What was revealed during the course of this project was that there is a great deal more information regarding pesticides than there is for industrial chemicals in the context of food safety. This wealth of pesticide information is presented in the indicators related to this issue.

The common definition of a pesticide is "any agent used to kill or control undesired insects, weeds, rodents, fungi, bacteria, or other organism" (EPA 1999). The U.S. Department of Agriculture estimates that approximately $7.5 billion is spent each year in the United States on agricultural pesticides (USDA 1996). As an industry that many argue is essential to the sustained production of food not only the U.S., but also throughout the world, there is considerable pressure to ensure that the benefits of pesticide use outweigh the costs. While the degree to which benefits must outweigh costs is obviously difficult to quantify, the EPA has worked diligently to ensure that the risks posed to the population by pesticide use are as low as possible. It is also the goal of the EPA to ensure that these risks continue to decline. To help understand the relative risk pesticides and industrial chemicals pose to the nation's food, William Schafer of the University of Minnesota Extension Service developed a hierarchy of potential food hazards. On this hierarchy, which has six different levels, pesticides posed the second lowest risk and industrial chemicals were part of the group that posed the third lowest risk to human health. Food additives were considered to pose the lowest risk of food hazards, while microorganisms posed the greatest.

Issue Dimensions

1.3.1 Pesticide Residues

Pesticides are used to enhance the agricultural yield and avoid the use of marginal land for crops by reducing the number of pests that prey on the crops. Scientific evidence suggests that some pesticides used to protect agricultural products may adversely affect human and biological health. While the EPA is responsible for registering pesticides and establishing the specific tolerances (maximum amounts of residues that are permitted in or on food) associated with those pesticides, the Food and Drug Administration bears the principal authority for monitoring the majority of the U.S. food supply. Extensive scientific review has determined reasonable limits of pesticide exposure. These limits are used to guide the monitoring of the U.S. food supply.

1.3.2 Industrial Chemical Residues

Though there is limited information regarding the degree to which industrial chemical residues affect the U.S. food supply, this issue is still one of great importance. Industrial chemicals released into the environment can be absorbed into crops during their growth. They can also be absorbed into animals or fish either by direct absorption from the animals' habitats or by consuming other animals that have accumulated toxic chemicals in their tissues. By consuming these chemically tainted foods, humans absorb toxic substances into their bodies. Scientific research has shown that certain types of these chemicals may adversely affect human health. The chemical groups that are currently of greatest concern are dioxins, furans and polychlorinated biphenyls (PCBs). Dioxins and furans are chemicals that are inadvertently produced by a variety of human activities. Natural processes can also produce these chemicals. PCBs, on the other hand, are entirely synthetic. In 1977, the production of these chemicals was ceased, but only after 1.5 billion pounds had already been manufactured in the United States (EPA 2000).

1.3.3 Agricultural Pesticide Use

The United States and much of the world has become reliant on the use of pesticides in the production of food. Pesticide use is believed to enable farmers to produce greater quantities and varieties of food at lower costs. Pesticide products, however, are developed from chemicals that have potentially harmful effects. To ensure that the food produced is safe for consumption, the EPA thoroughly reviews pesticides before allowing them to be sold for use in agricultural production. The objective of this regulation is that the manufacturers of agricultural pesticides will find ways to make their products safer over time.

The pesticides used to enhance food production are commonly separated into four different categories: herbicides, insecticides, fungicides, and other conventional pesticides. Other conventional pesticides include chemicals used as rodenticides, nematicides and fumigants. Some pesticide use estimates also account for chemicals registered as pesticides but produced mostly for other purposes (e.g., sulfur and petroleum). It is estimated that, of the three major categories of pesticides, insecticides are generally the most toxic followed by herbicides and then fungicides. These estimates are based on both chronic and acute toxicity scores (USDA 1996).

1.3.4 Biotechnology

The concept of biotechnology, as it applies to the current scientific and political debate, can be defined as "the use of cellular and molecular processes to solve problems" (BIO 2000). A paper written by Marshall Martin, et al. and published by the Purdue University Cooperative Extension Service defines biotechnology as "a set of tools that utilize living organisms or parts of organisms to make or modify products, to improve plants or animals for agriculture, or to engineer microorganisms for specific purposes" (1996). While the debate has been invigorated in recent years, the techniques of biotechnology have been used for centuries to breed livestock or to produce foods such as bread, cheese, beer, wine, pickles, and yogurt. Current attempts at genetic modification of pesticides and crops have been regarded with a substantial amount of caution.

Public concern about the current agricultural forms of biotechnology is largely the result of a lack of understanding of the issue and a lack of scientific consensus. A study of public perceptions of agricultural biotechnology conducted in New Jersey by William Hallman and Jennifer Metcalfe suggests that much of the public's fear of biotechnology is based on a lack of understanding of the issue. Compounding this problem is the lack of a clear position on the issue of biotechnology from the scientific community. Part of the challenge for the scientific community is due, in no small part, to the fact that biotechnology is affecting many different branches of science ranging from agriculture and waste management to stem cell research and genetic cloning. Each of these different branches is studying entirely different types of technologies with vastly diverse potential environmental impacts.

1.3.5 Import/Export – International Food Safety

As the world's economies continue to globalize, the volume of food that moves across international borders increases. In 1998, the United States imported nearly $42 billion worth of agricultural products from other countries (FAO 2000). This amount has increased dramatically over the past 40 years. While technological advances around the world have made the production of food more efficient and generally of higher quality, food safety will continue to play an important role in the internationalization of food production. John Lupien, the former Director of the Food and Nutrition Division of the Food and Agriculture Organization of the United Nations (FAO) states: "As the volume of food traded increases, the potential increases for exposing consumers in one country to the food quality and safety-related problems of other regions of the world" (CAST 1998).

Indicators

Pesticide Residues

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Percent of Foods with Detectable Pesticide Residues	Pesticide Data Program (PDP)	USDA	A / 4	Updated	TD

Items shaded in turquoise are indicators that are ready for review.
Indicators may be reviewed by clicking on the shaded areas.
AF: Albert Frederick; SC: Suzanne Clark; TD: Tina Deater

~~Strikethroughs mark indicators that have been deleted from CAPRM~~
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Percent of Foods with Pesticide Residues that Violated or were Presumed to Violate Tolerances	PDP	USDA	A / 4	Updated	TD

Industrial Chemical Residues

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Percent of Foods with Detectable Industrial Chemical Residues		FDA	B / 4 (Analysis)	Complete- No Change	TD

Agricultural Pesticide Use

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
U.S. Annual Volume of Pesticide Usage, by Type of Active Ingredient	Pesticides Industry Sales and Usage	EPA	A / 3	In Process	TD
Annual Pesticide Use on Select Field Crops, by Type of Active Ingredient	ARMS	USDA NASS	A / 3	Complete	TD
Annual Pesticide Use on Select Vegetables, by Type of Active Ingredient	ARMS	USDA NASS	A / 3	In Process	TD
Annual Pesticide Use on Select Fruits, by Type of Active Ingredient	ARMS	USDA NASS	A / 3	Complete – No Change	TD

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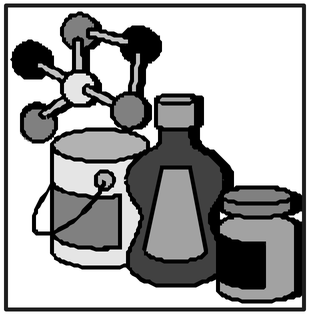
				(Next Update: 7/02)	

Biotechnology

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Percent of Harvested Acres where Farmer Reported Use of a Genetically Modified Variety	Crop Production Reports	USDA NASS	A / 3	Updated	TD

Import/Export – International Food Safety

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Percent of Imported Foods with Detectable and Violative Pesticide Residues	Pesticide Monitoring Program	FDA	A / 4	In Process	TD



ENVIRONMENTAL ISSUE 4—PRODUCTS

American consumers expect that the products they purchase are safe to use. Indeed, there are a host of federal regulations and agencies that help to ensure the safety of consumer products. The EPA, Consumer Product Safety Commission, and the Food and Drug Administration are the key federal agencies responsible for identifying and controlling chemical hazards posed by consumer products. These agencies conduct this work under the authority of federal laws such as: the Toxic Substances and Control Act; the Federal Insecticide, Fungicide and Rodenticide Act; the Federal Hazardous Substances Act and the Consumer Product Safety Act. Despite this web of federal consumer protection, there are still many chemical hazards posed by consumer products. These hazards occur when safety relies on: compliance with voluntary product standards, proper usage of the product, and patchy surveillance of potential product hazards (Dawson 1998). Also contributing to this problem is the fact that consumer protection is more often reactive than proactive; that is to say, recalls and bans often happen only after a consumer product has caused injuries or illnesses in the population. Moreover, toxic hazards (from chemical constituents) are often more difficult to identify and prove than mechanical hazards (from product malfunctions).

Issue Dimensions

1.4.1 Product Toxicity

1.4.2 Chemical and Pesticide Product Misuse

Registered chemical and pesticide products are deemed safe only in the context of proper product usage. In the processes of product manufacturing and product regulation, some risk is transferred to the consumer. It is expected that consumers use a product only for its intended application and in accordance with all warnings and directions accompanying the product. Studies have shown, however, that consumers are often risk-taking and ignore product safety information (Diamond 1988). Indeed, the fact that safety is not the primary consideration of product choice for many consumers (price being the primary consideration) creates a disincentive for firms to make their product as safe as possible (Curlo 1999). There are economic costs attached to making products safe, which must be reflected in the final price of the product. Thus, the overall safety of a particular chemical or pesticide product is the outcome of tradeoffs between the costs and consumer demand for safety and the ability of the firm to produce a reduced-risk product. Therefore, because the production of zero-risk products is economically and sometimes technologically unfeasible, the misuse of chemical and pesticide products poses risks to human health and the environment.

1.4.3 Non-Agricultural Pesticide Use

Non-agricultural pesticide use represents only about one-third of total pesticide use in the United States (Aspelin and Grube 1999). Non-agricultural pesticide use (also called urban pesticide use) is not as well documented or as studied as is agricultural pesticide use. Urban pesticide use includes individual consumer and professional applicators in home and commercial settings for lawn and landscape care and turf management at golf courses, parks, cemeteries, roadways, railroads and pipeline (Hodge 1993). While professional applicators typically undergo training and licensing, home users are unregulated and untrained in correct pesticide use.

Patterns of pesticide use differ in non-agricultural sectors from agricultural sectors. In agriculture, pesticides are often applied in one large application, typically within a 2 to 3 week period around planting. Home and garden pesticide use typically comprises 3 to 5 small applications throughout the spring and summer months (Gold and Groffman 1993). Although the volume and pattern of urban pesticide use may seem inconsequential, it still poses serious risks to the environment. In its National Water Quality Assessment (NAWQA) Program, the U.S. Geological Survey (USGS) found that urban pesticide use has created water quality problems in and around urban areas. The USGS observed a widespread water presence of insecticides commonly used in homes, gardens, and commercial areas. These insecticide detections occurred at higher frequencies, and typically at higher concentrations, in urban streams than in agricultural streams (USGS 1999). Insecticides, which are generally more toxic than herbicides, were commonly found in urban streams at concentrations that exceeded EPA safe guidelines for aquatic life. It is important to note that, unlike agricultural sectors, data are not collected on the volume of specific active ingredients applied in non-agricultural sectors. This prevents the estimation of the average toxicity or health risk posed by non-agricultural pesticide use.

Indicators

Product Toxicity

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Toxicity of Incinerator Ash				**In Process**	**AF**

Toxicity of Landfill Leachate				**In Process**	**AF**
~~Design Indicator: Concentrations of Toxic Chemicals in Children's Products~~			~~C / 4~~	~~Complete Recommend for Deletion~~	~~AF~~

Chemical and Pesticide Product Misuse

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
~~Number of Human Poison Exposure Cases, By Medical Outcome, due to Chemical Misuse~~	~~TESS~~	~~AAPCC~~	~~B / 5~~	~~Complete Recommend for Deletion~~	~~AF~~
~~Number of Human Poison Exposure Cases, By Medical Outcome, due to Pesticide Misuse~~	~~TESS~~	~~AAPCC~~	~~B / 5~~	~~Complete Recommend for Deletion~~	~~AF~~

Non-Agricultural Pesticide Use

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Annual Pesticides Usage by Non-Agricultural Sectors and Pesticide Type	Pesticides Industry Sales and Usage	EPA	A / 3	In Process (Update Fall 2001)	AF

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ENVIRONMENTAL ISSUE 5—GLOBALIZATION OF ENVIRONMENTAL EFFECTS

A complex aspect of environmental protection is the fact that environmental effects do not respect international borders. Actions taken in other countries can create adverse environmental conditions for the U.S. and vice versa. Environmental effects are globalized through human activity, such as international trade, and natural processes such as atmospheric circulation. Such globalization processes serve to magnify the impact of local pollution and create risk for non-local ecosystems and populations. At the core of this issue is the question of equity: who pays for the globalization of environmental effects and who benefits from it? Analysis of the sub-issues suggests that the costs are borne by many while the benefits of the globalization of environmental effects are reaped by a few. The indicator system developed for this issue will help to identify the precise distribution of these costs and benefits and represents a necessary step in ensuring transboundary environmental justice.

Issue Dimensions

1.5.1 Transboundary Management of Toxics

Approximately 350 million metric tons of toxic waste are generated annually, with over 90% of this generated in industrialized countries (World Resources Institute 1998). Almost all industrialized countries have adopted hazardous waste management policies in order to minimize the ecological and human health risks posed by the generation and management of this waste. These stringent policies have resulted in rising costs for the treatment and disposal of toxic waste. Also contributing to these rising costs is the limited number of disposal and treatment facilities. Many existing facilities are nearing capacity and few new facilities are built due to strong public objections against their presence.

An unintended consequence of stringent policies, rising disposal costs, and public objections to local disposal has been the shift toward transboundary management of toxic wastes. Approximately 2 million metric tons of toxic waste are traded among developed countries in the Organization for Economic Cooperation and Development (OECD) (World Resources Institute 1998). Hazardous wastes are illegally exported to developing countries because of the lax to non-existent environmental regulations there and the significantly lower costs of treatment and disposal. The major problem of this practice is that most of these countries do not have the technical expertise or facilities for safe management and disposal. In these countries, unanticipated situations of environmental damage adverse human health effects and high economic costs have been documented.

1.5.2 Environmental Transport of Chemicals and Pesticides

Pollutants in one ecosystem can often be traced to source pollution hundreds or thousands of miles away. Persistent organic pollutants (POPs) have been observed to undergo extensive movement and redistribution on a global scale. Scientists have studied the movement of POPs and have discovered a pattern of global distillation whereby POPs migrate from warm regions of release to colder regions of condensation. Called the "grasshopper effect," multiple cycles of evaporation, air transport and condensation allow POPs to travel large distances in relatively short periods of time (Newman 1998). In cold climates, low evaporation rates trap transported POPs locally, where they often enter the food chain. These POPs are known to bioaccumulate in the food chain, as significant concentrations have been detected in humans. For example, in some Inuit women in northern Canada, blood levels of PCBs have been found to exceed Health Canada standards and levels of certain POPs in their breast milk have been detected that are up to nine times higher than that of women who live in southern Canada (Environment Canada).

Pesticides are commonly transported from the site of application into non-local water sources and sediments. Trace concentrations of pesticides have been detected in regions as isolated as the Arctic (Bidleman and Falconer 1999). In a sampling of tree bark sites around the world, the banned pesticide Hexachlorobenzene was found to be globally distributed over large distances from the points of emission (Bidleman and Falconer 1999). The U.S. Geological Survey's National Water Quality Assessment (NAWQA) Program found that pesticides pose contamination risks in water bodies both near and far from the site of pesticides application.

1.5.3 International Trade in Toxic Chemicals and Pesticides

International trade is one process by which chemicals and pesticides pose a transboundary environmental risk. Much of the international pesticides trade involves developing countries, in which pesticides are used for a number of agricultural and public health purposes. Because of the limited financial resources of many developing countries, many of the pesticides exported to them are less expensive, highly toxic, obsolete or even banned. The Foundation for Advancements in Science and Education (FASE) found that large quantities of hazardous (banned, severely restricted, never registered or restricted use) pesticides are annually shipped from the U.S. to developing countries. Many of these shipments are illegal, but bypass detection due to inadequate federal controls (FASE 1998).

The environmental and human health risks of these hazardous pesticides are further magnified by the poor state of pesticides management, weak to nonexistent regulatory capacity, and working conditions found in the developing world. A 1996 survey by the

United Nations Food and Agriculture Organization (FAO) revealed that safe storage of pesticides is a serious problem in 48% of developing countries. Also, in 75% of developing countries, pesticide distributors are not adequately trained to inform buyers about the safe and efficient use of pesticides. The inappropriate packaging or labeling of chemical and pesticide products, lack of facilities for proper storage, and lack of user education increase the potential for product misuse, environmental contamination, and adverse human health effects.

Indicators

Transboundary Management of Toxics

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Volume of U.S. Exports of Hazardous Waste, by Treatment Method and Receiving Country	Hazardous Waste Export Systems	EPA	A / 3	In Process	TD
~~Design Indicator: Volume of U.S. Imports of Hazardous Waste, by Treatment Method and Country of Origin~~			~~C / 3~~	~~Complete-Recommend Deleting~~	~~TD~~

Environmental Transport of Chemicals and Pesticides

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Mercury Deposition in the Florida Everglades	Mercury Deposition Network	National Atmospheric Deposition Program	A / 4	Complete	TD
Atmospheric Deposition of Toxic Chemicals and Pesticides into the Great Lakes	Integrated Atmospheric	Environment Canada and EPA	A / 4	Complete	TD

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	Deposition Network				

International Trade in Toxic Chemicals and Pesticides

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Hazardous Pesticides Exports from the U.S.	Exporting Risk: Pesticide Exports from U.S. Ports	Foundation for Advancements in Science and Education	A / 2	In Process	TD
U.S. Imports and Exports of Persistent Organic Pollutants	Tariff and Trade DataWeb	US International Trade Commission	B / 2 (Analysis)	Complete- No Change	TD

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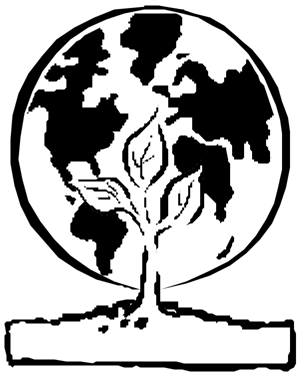
INSTITUTE OF SCIENCE AND PUBLIC AFFAIRS

PROGRAM FOR ENVIRONMENTAL POLICY AND PLANNING SYSTEMS

SECTION II: POLICY ISSUES

Policy Issue 1: Sustainability
Policy Issue 2: Pollution Prevention
Policy Issue 3: Environmental Justice



POLICY ISSUE 1—SUSTAINABILITY

The goal of sustainability is to maintain or improve the current quality of life without diminishing the potential quality of life of future generations. A sustainable society does not consume resources at a rate that does not allow for the needs of those who will follow; nor does it leave a legacy of pollution for which others must pay the costs. From the perspective of chemicals and pesticides, sustainability entails eliminating or restricting the release of harmful chemicals into the environment, reducing the need for chemicals, ensuring that the chemicals we use are safe, and cleaning up pollution that is generated.

Issue Dimensions

2.1.1 Cumulative Chemical Impact/Chemical Footprint

A special set of indicators is currently being researched and developed to determine the overall cumulative impacts of chemicals and pesticides in the United States. When complete, this set of indicators can serve as an accounting tool to keep track of the total impacts associated with chemicals and pesticides. Five major sections characterize these impacts: production, usage, economic impacts, exposure, and toxicity and health risks. Some of the questions that can be addressed with these indicators include: how dependent is our society on chemical and pesticides?, how many pesticides and chemicals are used to support the typical American lifestyle?, and what are the public and private costs of managing chemicals and pesticides throughout their lifecycle? Determining the cumulative impacts of chemicals and pesticides on human health is a difficult task since many of the health risks associated with chemicals and pesticides remain unknown. Future research is necessary to determine the link between pathologies and exposure to specific chemicals and pesticides. However these new indicators can serve as a preliminary analysis in helping determine the cumulative impacts of chemicals and pesticide use in the U.S.

2.1.2 Toxicity of the Ambient Environment

Every year chemicals are released into the environment. For 1998, the Toxics Release Inventory reported 7.3 billion pounds of total toxic releases to the environment. This amount represents only a fraction of the total chemical releases from all sources in the United States. To this sum must be added the 975 million pounds of pesticides that were applied directly to the indoor and outdoor environment in 1997. These numbers, however, reflect only activities in the United States and do not consider the pollution of Europe, South America, or Asia, much of which is transported to the U.S. The toxicity of these chemicals, their persistence in the environment, their level of concentration, and their distribution are concerns that have important consequences, not only for current populations, but also for generations to follow. The indicators in this section measure the releases of chemical and pesticides into the environment and assess the characteristics of those releases that relate to long- and short-term environmental health.

2.1.3 Safer Chemicals

The impacts of chemical use on everyday life have been both positive and negative. Recognizing that the inappropriate use of toxic chemicals can harm human and ecological health, efforts need to be taken to continuously produce safer chemicals and promote the safe use of chemicals. To protect the environment for future generations, chemicals must be developed that have lower levels of toxicity and are generally safer for the environment. The indicator in this section measures the trend in safer pesticide use.

2.1.4 Persistent, Bioaccumulative and Toxic Chemicals

Of particular concern is a class of toxic chemicals that persist in the environment, bioaccumulate in human and animal tissues, and result in negative health effects. These chemicals also transfer quite readily from one medium to another and are capable of distribution on a global scale. Such chemicals - known as persistent bioaccumulative toxics (PBTs) – are worthy of special consideration because of the serious ongoing health risk they pose. Increases in concentrations of these substances has implications, not just for current populations, but for future populations as well.

2.1.5 Alternative Farming Systems

Agricultural operations in the U.S. routinely and extensively use a variety of pesticides and herbicides. In 1997 approximately 770 million pounds of active ingredient were applied in the U.S. The use of these chemicals has generated much public concern and scientific inquiry about how human and ecological health are affected by their use. The indicators in this section measure trends in farming techniques that eliminate or greatly reduce the use of agricultural chemicals.

Indicators

Cumulative Chemical Impact/Chemical Footprint

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Production					
Total Chemical and Pesticide Volume of Production in the U.S.	High Production Volume Chemicals	EPA		In Process	SC
Total Chemical and Pesticide Volume of Production Per Capita in the U.S.				In Process	SC
Usage					
Total Chemical and Pesticide Use in the U.S.	Pesticides Industry Sales and Usage	EPA		In Process (Fall 01)	SC
Total Chemical and Pesticide Use Per Capita in the U.S.				In Process	SC
Economic Impacts					
Total Sales of Chemicals and Pesticides in the U.S.	Pesticide Industry Sales and Usage	EPA		In Process (Fall 01)	SC
Public and Private Costs of Managing Chemicals and Pesticides in the U.S.	RCRA, waste operators, Superfund, gov't/private sector clean-up costs			In Process	SC

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Public and Private Costs of Managing Chemicals and Pesticides Per Capita in the U.S.				In Process	SC
Exposure					
Cumulative Human Exposure to Chemicals and Pesticides in the U.S.	TRI, NASS, NAWQA (industrial pest residues on food, air/water releases, bioassays, leechate from landfills)	EPA, USDA, USGS		In Process	SC
Cumulative Human Exposure to Chemicals and Pesticides Per Capita in the U.S.				In Process	SC
Toxicity and Health Risks					
Cumulative Health Risk from Chemicals and Pesticides in the U.S.	Production by classes of chemical & pesticides			In Process	SC
Cumulative Toxicity from Chemicals and Pesticides in the U.S.	TRI/RSEI	U.S. EPA		In Process	SC

Toxicity of the Ambient Environment

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Toxicity Index for Releases and Managed Waste	TRI & RSEI	EPA	A / 3	In Process	SC
Average Toxicity of Pesticide Active Ingredient Applied per Acre	USDA/AREI		B / 3	In Process	SC
Pesticide Detections in Ground and Surface	National Water	U.S. Geological	A / 4	Updated	SC

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Water	Quality Assessment	Survey			
National Emissions of Air Toxics	National Toxics Inventory	EPA	A /3 (2002)	Complete – no change	SC

Safer Chemicals

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Percentage of Agricultural Acres Treated with Reduced Risk Pesticides	AgroTrakTM	Doane Marketing Research, Inc.	A / 3 (Nov. 30, 2001)	In Process	SC

Persistent, Bioaccumulative and Toxic Chemicals

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Chemical Bioaccumulation in Mussel Tissue	Mussel Watch	National Oceanic and Atmospheric Administration	A / 5	Complete	SC
Dioxin and Furan Levels in the Dungeness Crab in British Columbia, Canada	Pacific and Yukon Region Environmental Indicators	Environment Canada	A / 5	Complete	SC

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Pesticide Detections in Fish and Bed Sediment	**National Water Quality Assessment**	**US Geological Survey**	**A/4**	**Complete**	**SC**

Alternative Farming Systems

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Number of Certified Organic Farmland Acres	US Certified Organic Farmland Acreage	USDA	A / 2	In Process (Email – ?/01)	SC
Percentage of Acres and Farms in Integrated Pest Management	Pest Management Practices	USDA NASS	A / 2	Complete	SC

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POLICY ISSUE 2—POLLUTION PREVENTION

Pollution prevention was established as national policy in the Pollution Prevention Act of 1990. Pollution prevention describes: a philosophy that is thoroughly integrated into the organizational culture of environmental agencies, an important agency policy to which all programs must be responsive, and an explicit set of programs designed to meet identifiable pollution prevention objectives. The most fundamental form of pollution prevention is source reduction, which is the reduction of generated pollution. The objective of pollution prevention programs is to reduce or eliminate the need to control, treat, dispose, remediate and suffer the health and quality of life consequences of pollution. Effective pollution prevention strategies and programs will reduce the short- and long-term stresses on the environment. It is a fundamental building block of a sustainable society.

Issue Dimensions

2.2.1 Waste

Waste is an unavoidable by-product of daily life. While it is impossible to eliminate the generation of waste entirely, it is important that attention be paid to the type of waste that is generated, as some types of waste pose more environmental risks than others. By definition, hazardous waste poses the most environmental risks. According to the EPA, for waste to be considered hazardous it must first be defined as solid waste (1997). Solid waste includes such discarded material as garbage, refuse and sludge (solids, semisolids, liquids, or contained gaseous materials). These types of waste are considered hazardous only if they exhibit characteristics of ignitability, corrosivity, reactivity, or toxicity. Other types of wastes may be considered hazardous if they are specifically listed as such by the EPA. In 1997, the EPA estimated that more than 2% of the 13 billion tons of industrial, agricultural, commercial, and household wastes were defined as hazardous by the Resource Conservation and Recovery Act (RCRA).

The Resource Conservation and Recovery Act was passed in 1976. The primary goals of this act are to: protect human health and the environment from the potential hazards of waste disposal; conserve energy and natural resources; reduce the amount of waste generated; and ensure that wastes are managed in an environmentally sound manner (1997). Part of the RCRA mandate is to establish the regulatory framework for "cradle-to-grave" management of hazardous wastes.

2.2.2 Eco-Efficiency

To some degree, the performance of the economy affects the demand for chemicals and can generate fluctuations in energy and water use, the amount of materials used and the amount waste and pollution produced. Such fluctuations may mask actual increases in environmental efficiencies by industry. Eco-efficiency measures standardize environmental outcomes by establishing a ratio between energy use, water use, materials waste and pollution and some measure of economic output. For example, these measures might permit industry, in periods when levels of waste and pollution are rising only because of accelerated economic growth, to show that they are maintaining or improving eco-efficiencies. Situations could also arise in which lower levels of waste and pollution reflect economic stagnation or recession and mask pollution inefficiencies. By standardizing progress, eco-efficiency measures facilitate a more accurate assessment of it.

2.2.3 Product Stewardship

Industry is increasingly taking responsibility for the environmental quality and impacts of its products. This may include taking steps to ensure that products are safe to use or may take a more long-term perspective by integrating concepts such as health, safety and environmental protection into the life-cycle of products. This life-cycle analysis includes the manufacture, marketing, distribution, use, recycling and disposal of particular products. The measurement of life-cycle stewardship for indicator purposes is not well-developed and is presently tied to specific efforts by individual companies to better manage their products.

Indicators

Waste

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
RCRA Hazardous Waste Generated, by Volume and Type	RCRA Biennial Reporting System	EPA	A / 3 (Nov. 01)	In Process	SC
RCRA Hazardous Waste Managed, by Volume and Method of Management	RCRA Biennial Reporting System	EPA	A / 2 (Nov. 01)	In Process	SC
Indicator Set: NEWMOA Pollution Prevention Metrics Menu	Pollution Prevention Metrics Menu	NEWMOA	N/A	Complete	SC

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Eco-Efficiency

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Toxicity of Releases and Managed Waste per Dollar of Economic Output Index	TRI & RSEI	EPA	A / 3	In Process	SC
Toxicity Per Pound Index for Releases and Managed Waste	TRI & RSEI	EPA	A / 3	In Process	SC
Volume of RCRA Hazardous Waste Generated per Dollar of U.S. Gross Domestic Product	RCRA Biennial Reporting System	EPA	A / 3 (Nov. 01)	In Process	SC

Product Stewardship

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Volume of Pesticides and Toxic Chemicals Recovered by Clean Sweep Programs			C / 1	Complete – No change	SC

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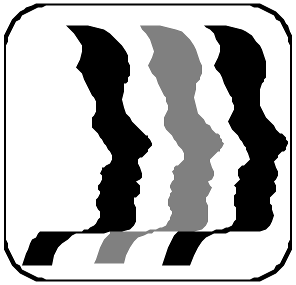

POLICY ISSUE 3—ENVIRONMENTAL JUSTICE

A major cross-cutting policy issue of the Environmental Protection Agency has been their concern that the burden of human environmental impacts has been inequitably shared across society, and that heaviest burden has been borne by segments of society that are the least capable of protecting themselves. All programs at EPA have been charged with the responsibility of identifying and correcting such disproportionate and inequitable impacts. For OPPTS such environmental justice concerns center around the differential impacts of exposure to toxic chemicals and the application of pesticides for populations defined by social, ethnic, cultural, and economic divisions.

The measurement of environmental justice with indicators is not well developed. The lack of appropriate environmental data that can be effectively overlaid with social, ethnic, economic and cultural data is a major limiting factor. There are, however, a few opportunities that will produce viable indicators. CAPRM will examine existing data sets and methodological tools for developing useful environmental justice indicators.

Issue Dimensions

Indicators

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Comparative Chronic Health Risk Index – Race	**RSEI**	**EPA**	**A / 6**	**In Process**	**AF**
Comparative Chronic Health Risk Index – Income	**RSEI**	**EPA**	**A / 6**	**In Process**	**AF**
Comparative Blood Lead Levels in Children, By Race	**NHANES**	**CDC**	**A / 5**	**Complete**	**AF**

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Comparative Incidence of Asthma in Children, By Race	**National Health Interview Survey**	**National Center for Health Statistics, American Lung Association**	**A / 5**	**Complete**	**AF**
Comparative Occupational Incidence of Respiratory Conditions due to Toxic Agents, By Race	**Safety & Health Statistics**	**Bureau of Labor Statistics, DOL**	**A / 7**	**Complete**	**AF**
Chemical and Pesticide Body Burden in Children, By Race	**NHANES**	**CDC**	**B / 5**	**In Process**	**AF**
Comparative Occupational Lead Exposure, By Race	**Healthy People Health Status Indicators**	**CDC**	**B / 5**	**Complete**	**AF**

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INSTITUTE OF SCIENCE
AND PUBLIC AFFAIRS

PROGRAM FOR ENVIRONMENTAL
POLICY AND PLANNING SYSTEMS

SECTION III: SPECIAL POPULATIONS

Special Population 1: Tribes
Special Population 2: Children

SPECIAL POPULATION 1 – TRIBES

The use of environmental data for monitoring or indicator development by tribes is difficult. It is clear that national and state data systems, which provide a relatively wealthy data environment for states and locals, are severely limited or useless in providing data to tribes. The non-urban character of many tribes, their general remoteness, and their relatively small, scattered populations have served to keep them out of the path of monitoring systems and other data collection systems. This lack of environmental data is a serious impediment to effective tribal environmental planning and management systems. Without good environmental data, important planning activities such as goal setting, progress measurement, and program evaluation cannot meaningfully take place.

CAPRM will examine existing data sets for opportunities to develop indicators for tribes and will work with tribes to identify important data gaps that OPPTS might be able to fill.

Issue Dimensions

Indicators

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Sustainability					
Toxicity Index for Releases and Managed Waste On or Near Tribal Lands	**RSEI & TRI**	**EPA**	**A / 3**	**In Process**	**AF**
Pesticide Detections in Ground and Surface Water On or Near Tribal Lands		**U.S. Geological Survey**	**A / 4**	**In Process**	**AF**
Emissions of Air Toxics for Tribal Lands		**EPA**	**A / 3**	**In Process**	**AF**

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Food Sources					
Concentrations of Polychlorinated Biphenyl Congeners in Great Lakes Fish					
Fish and Wildlife Advisories that effect Tribal Lands	**National Fish and Wildlife Contamination Program**	**EPA**	**A / 4**	**In Process**	**AF**
Hazardous Waste Management					
RCRA Hazardous Waste Managed for Tribal Lands, by Volume and Method of Management		**EPA**	**A / 2**	**In Process**	**AF**
Human Health					
Chronic Human Health Risk Index for Toxic Releases On or Near Tribal Lands	**RSEI & TRI**	**EPA**	**A / 6**	**In Process**	**AF**
Acute Human Health Risk Index for Toxic Releases On or Near Tribal Lands	**RSEI & TRI**	**EPA**	**A / 6**	**In Process**	**AF**
PCB Exposure to Children in Inuit Women Through Breast Feeding			**A / 7**	**In Process**	**AF**
CHILDREN					
Acute Health Risk Index from Toxic Releases for Children on Tribal Lands	**RSEI & TRI**	**EPA**	**B / 6**	**In Process**	**AF**
Chronic Health Risk Index from Toxic Releases for Children on Tribal Lands	**RSEI & TRI**	**EPA**	**B / 6**	**In Process**	**AF**
Health Risk Index from Releases of Chemicals Associated with Children's Environmental Health on Tribal Lands	**RSEI & TRI**	**EPA**	**B / 6**	**In Process**	**AF**
Chemical and Pesticide Body Burden in	**NHANES**	**CDC**	**A / 5**	**In Process**	**AF**

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Children On or Near Tribal Lands					

SPECIAL POPULATION 2 – CHILDREN

There has been increasing awareness over the past several years that children possess a special vulnerability to environmental pollution vis a vis their current and future health. Exposed to a pervasive and increasingly large number of chemicals and pollutants, children are exhibiting a wide variety of health effects at seemingly higher levels of occurrence than had previously been noted. As a result, research is increasingly focusing on the associations between environmental pollution and chemicals in the environment and children health effects. Asthma, respiratory infections, bronchitis, and pneumonia have all been linked to poor indoor and outdoor air quality. The incidence of childhood cancer increased between 1973 and 1994 and is now the fourth largest cause of death for children under the age of 15. Toxic substances and some pesticides are believed to be associated with this increased incidence of cancer. Neurotoxic substances such as lead and other heavy metals, solvents, pesticides, and polychlorinated biphenyls (PCBs) are associated with a variety of developmental effects. Diminished intelligence, behavioral problems, sexual dysfunction, and physical deformity are some of the health effects believed to result from exposure to such chemicals. Children's environmental health is rapidly rising as an issue of important public policy. The indicators in this section measure the acute health effects and chronic health risk from chemical and pesticide exposure among children. The issues of acute health risks and chronic health effects will also be discussed in the context of potential future indicators.

Issue Dimensions

Indicators

INDICATOR	DATASET	SOURCE	TYPE / LEVEL	STATUS	STAFF
Number of Fatal and Non-Fatal Child Poisonings due to Pesticide Exposure	TESS	AAPCC	A / 5	Updated	SC
Number of Fatal and Non-Fatal Child Poisonings	TESS	AAPCC	A / 5	Updated	SC

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due to Chemical Exposure					
Blood Lead Levels in Children	National Health and Nutrition Examination Survey	CDC	A / 5	Complete	SC
Children's Acute Health Risk Index from Toxic Releases	TRI & RSEI	EPA	B / 6	Complete – No change	SC
Children's Chronic Health Risk Index from Toxic Releases	TRI & RSEI	EPA	A / 6	In Process	SC
Children's Health Risk Index from Releases of Chemicals Associated with Children's Environmental Health	TRI & RSEI	EPA	A / 6	In Process	SC
~~Design Indicator(s): Chemical and Pesticide Body Burden in Children~~	~~Longitudinal Cohort Study~~	~~CDC~~	~~B / 5~~	'A' Indicators in development	SC
Design Indicator(s): Pathologies in Children Caused by Chemical or Pesticide Exposure	Longitudinal Cohort Study	CDC	B / 7	Complete – No change	SC
Pesticide Residue Levels of Carcinogenic and Cholinesterase Inhibiting Neurotoxic Pesticides on Foods Commonly Eaten by Children	USDA & FDA data	OPPTS	B / 4	In Process	SC
Blood Mercury Levels in Children	**NHANES**	**CDC**	**A / 5**	**Complete**	**SC**
Chronic Children's Health Risk for Releases of Hormone Disrupting Chemicals	**TRI & RSEI**	**EPA**	**A / 6**	**In Process**	**SC**

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