Policy Recommendations on Enhancing China's Environmental Management Capacity

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Preface

China's economic and social development has had severe environmental impact: from land and water resource deterioration, to China's becoming the world's largest greenhouse gas emitter, pollution has resulted in losses equivalent to 3.05 of GDP[1]. Furthermore, China's gross national product is only 10 percent of that of OECD members, indicative of immense potential for further growth of the economy and of environmental degradation. Without far-reaching and innovative measures, China will be unable to assume the staggering environmental damage and costs of ecological recovery.

At a time of ongoing administrative system reform in China, this report points to ways in which China's environmental management institutions can evolve in order to integrate environmental concerns into China's macro policy-making and increase the efficiency of compliance and enforcement. Convened by MAO Rubai, the tenth Chairman of the Subcommittee of Environmental Protection and Resources Conservation of China's National People's Congress (NPC); William K. Reilly, the seventh Administrator of the U.S. Environmental Protection Agency (EPA); and Alan Lloyd, former Director of the Air Resources Board of California EPA, a group of international and domestic experts drafted and commented on this report, with support from the China Sustainable Energy Program (CSEP) of the Energy Foundation.

This paper introduces international experiences on regulatory and enforcement authority of environmental agencies; describes the structural, personnel, and ginancial capacity of environmental agencies' organizational systems; and lays out practical recommendations and priorities for enhancing China's environmental management capacity.

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Section One: International Experiences on Regulatory and Enforcement Authority of Environmental Agencies.

Introduction

The most successful environmental agencies in the world use a combination of standards, permits, environmental assessment, regulations and enforcement mechanisms to achieve their objectives. These include the United States Environmental Protection Agency (U.S. EPA), the European Commission, the German Umweltbundesamt (UBA) and many others. These elements can be significantly enhanced through the participation of other governmental entities such as the judiciary. Routine public involvement, access to environmental information and media coverage also reinforce environmental norms.

Each element plays a vital role and cannot be omitted. **Standards** define goals and push cleaner technology into the marketplace. **Permits** establish a contract between industry and government and describe what constitutes acceptable environmental behavior. **Environmental assessments** forecast the future, account for multimedia effects and weigh the tradeoffs between various alternatives. **Product regulations** assure good planning and the prevention of avoidable harms. New and emerging regulations take that a step farther and address cradle-to-grave and transboundary environmental effects. **Enforcement mechanisms**, including monitoring and recordkeeping, tie these elements together into an effective whole.

Despite the differences between elements, they all have characteristics in common. Clarity and completeness are crucial to success in every environmental program. Standards and regulations must be transparent so everyone knows what is expected. The regulatory process must be straightforward, timely and predictable. Finally, environmental requirements must be specific enough to rule out loopholes or misinterpretations and to ensure compliance in the field.

Environmental protection is primarily an executive branch function. However, legislation is needed to put programs in motion and establish legal parameters. Legislatures also conduct periodic oversight. The judiciary protects individual rights (including the right to a healthful environment). The judiciary also helps to resolve complex environmental disputes. Involving the judicial branch in prosecution can increase the effectiveness of environmental enforcement by expanding the range of potential penalties to include injunctions, civil fines and criminal prosecution.

To date, most countries have succeeded environmentally by concentrating, first and foremost, on what goes on within their borders. Globalization and climate change have changed that picture forever. Going forward, each country needs to consider how its policies affect the entire globe and whether they are sustainable for the long term. The current international biofuels debate is but one example of this principle. Nations are learning under great duress that the entire lifecycle of fuel stocks has to be considered when setting renewable fuel targets. The potential impacts on struggling 3rd world economies has also been raised, stirring demands for environmental justice. None of this is easy to manage. Having a solid foundation for domestic environmental programs is a good start and provides a greater ability to engage in even more complicated international debates.

I Regulatory Authority

1. Environmental Standards

There are several kinds of environmental standards. The three most important types are 1) health protective standards – defining what level of contamination or pollution is safe for human beings, animals and the ecosystem; 2) performance standards – indicating what level of emissions are permissible from each type of source including rate-based emissions and absolute caps, and 3) record-keeping, monitoring and maintenance standards – identifying what actions must be routinely undertaken to ensure compliance. The major standard setting bodies in the world include the World Health Organization (WHO), the European Commission and the U.S. EPA. However, all nations have standard-setting authority and many have established numerous standards of their own at the federal, regional and local levels.

The **key elements** of environmental standards are the numerical value or values of the standard (parts per million, grams per kilometer, etc.) and the averaging time over which that value shall be measured (one hour, one day etc.). The standard must also specify the measurement method or technique so that its application is consistent. **Key considerations** in designing environmental standards include health data and epidemiological studies, the status of leading and emerging technologies, limits of detection, and other technical factors.

Science-based principles dominate the establishment of standards. What is truly health protective? What can advanced engineering achieve? What statistical method best ensures against false negatives or false positives? Economic impacts are secondary because they are fluid and change considerably over time – particularly after governments implement new, more stringent standards. When faced with new imperatives, industry and the general public both find ways to minimize their costs or avoid certain activities altogether. (See Lesson Learned #1, next page.)

Lesson Learned #1
Responses to New Environmental Imperatives

When new regulatory standards are imposed, the affected businesses can be relied upon to predict large, potentially disastrous economic impacts to their industries. To determine the gap between fact and reality, the Natural Resources Defense Council (a prominent NGO in the US) conducted a retroactive analysis of ten years of rulemaking in the automotive sector. The Council found that vehicle manufacturers consistently predicted costs 7-10 times greater than their actual expenditures following the adoption of new regulations. The Council's conclusion was that business will find the lowest cost path when faced with new regulatory realities. Also, that industry may keep that information from government regulators in the hopes of avoiding any costs at all.

Although consumers are attached to certain products, they adjust quickly to newer, lower emitting forms. Over the past two decades, California consumers have been presented with water-based paints, catalyst equipped lawn mowers, formaldehyde-free composite wood furniture, and every virtually consumer good in between. Poor engineering of prototype projects can produce a temporary backlash. For example, the first supposedly "leak-proof" home storage gasoline cans had a tendency to dribble after use, which angered consumers. But these problems are quickly resolved by enforcement action or by market forces alone. Often times the best product reformulations gain a larger market share than they had previously, which encourages manufacturers to invest sufficient time in engineering and design.

The biggest **implementation issue** for environmental standards is keeping the standards current. Health data change. Technology advances. Measurements become more precise and are able to reach lower detection limits. Atmospheric chemistry becomes better understood. For all these reasons and more, environmental standards need to be revisited and revised at least once every five years. California follows that practice and, by example, prompts other environmental agencies to do the same. (See Lesson Learned #2, next page.)

Lesson Learned #2
Why Standards Should Be Periodically Revised

The U.S. Clean Air Act requires that air quality standards be reviewed at least once every five years. In 1987 the U.S. EPA adopted standards for particulate matter less than ten microns in diameter (PM10). Less than a decade later, the medical community determined that fine (PM2.5) and ultrafine particles (PM<1.0) were the most hazardous. Based on this information, EPA adopted new standards for PM2.5 in 1997 and slightly revised the federal PM10 standard at the same time. In 2006, after several epidemiological studies tied PM exposure led to premature mortality, EPA changed the federal standards again. The 24-hour PM2.5 standard was strengthened to 35 micrograms per meter squared (versus 65 ug/m3 previously). At that time, EPA also revoked the annual PM10 standard. Research is continuing into the characteristics of individual PM components and underlying biological mechanisms. Results from these studies may prompt further changes to the federal standards.

In 1999, the California Legislature passed a new law requiring that all air quality standards be reviewed to ensure they adequately protected children and infants. The law also required that toxic air contaminants most dangerous to children be identified and prioritized for additional control. Looking at these issues through a new lens – the special sensitivity of developing human beings – produced different results. As regulatory agencies conducted the review process, the existing standards were uniformly found to be lacking. The agencies also identified serious gaps in children, infant, neonatal and prenatal health researches that are only now starting to be closed.

2. Environmental Permits

Environmental permits are one of the main instruments for implementing environmental law and have existed for decades. In the U.S., the number and types of environmental permits have proliferated since the 1970's. There is considerable interest in permit integration, however, and notable pilot projects in the states.

By contrast, the EU has been moving toward integrated environmental permitting ("single permit system") since 1996, when it passed the Directive on Integrated Pollution Prevention and Control (IPPC). Three European nations began integrating their environmental permits even earlier: Sweden in 1969, Denmark in 1972 and the United Kingdom in 1990. In the near future, EU member states will be expected to bring all of their permitting requirements into a single legal document.

Figure 1.1
Types of Environmental Permits in the U.S. (partial list)

Air Quality
Asbestos
Water Quality (discharges)
Water Resources (use)
Aquatic / Coastal Resources
Drinking Water (underground injections)
Wetlands
Land Use
Solid Waste Disposal
Hazardous Waste Management
Livestock
Wildlife
Agricultural Burning
Radiation Protection
Archeology and Historic Preservation

Whether integrated or multi-sectional, the general content of environmental permits are the same. The **key elements** include a complete description of the project and underlying processes, the determination of best available technology, emission limitations, specified measurement methods, record keeping requirements, designation of the permitting authority, and identification responsible party (typically the project owner and/or operator. The permitting process itself has additional requirements including but not limited to public notification, screening analyses, modeling, and pre- and post-construction checklists. *(See "Guiding Principles for Effective Environmental Permitting Systems," Sixth Ministerial Conference, "Environment for Europe," Belgrade, Serbia, October 2007.*

There are four major **implementation issues** for environmental permitting: complete permit application data; governmental capacity to review, issue and enforce permit conditions; the determination of "best available control technology;" and the specificity of applicable requirements. Multi-media impacts may arise in some permitting situations and need to be addressed as well.

First, it is essential that the permit application be complete at the start of the process.

In the U.S., permits sometimes languish for months due to lack of complete project descriptions and supporting data. In addition, that technical burden should be placed on the permit applicant where it belongs. Government engineers have more than enough work to do in the review process itself. Finally, although there is constant pressure to streamline permitting operations, governments should resist demands for automatic or presumptive approval after so many days have elapsed. A permit conveys the legal right to operate. It must be properly issued with all necessary environmental conditions.

The second major factor is sufficient institutional capacity to act on a permit application. That capacity includes well qualified engineers to review the project proposal, a permitting authority with sufficient authority to impose the necessary environmental conditions, and enforcement staff to conduct regular follow-up inspections. The U.S. EPA, the fifty states and local authorities all have permit engineers on staff to make these judgments. Inspectors are also available at the federal, state and local level to confirm proper operations. The largest percentage of these employees is in local permitting agencies, but the state and federal presence is also very significant.

Third, the determination of best available control technology (BACT) must be accurate because there is only one opportunity to "build it right." The US and the EU operate

BACT clearinghouses to make this information readily available. Both nations also publish detailed technical guidance on how to interpret and apply BACT principles in the field, by individual source categories. These follow widely accepted engineering and scientific principles and are available for translation to any language. BACT may appear to be prohibitively expensive but it is always cheaper to control emissions at the start. Trying to retrofit existing facilities or clean up pollution after the fact is cumbersome, expensive and may even be infeasible – putting the entire operation at risk of closure.

The fourth implementation step is to ensure that the text of the permit itself is specific, thorough and unambiguous as to what is required for lawful operation. Plant operators change and may have more or less technical education. They need to be able to understand exactly what the facility is expected to do. Likewise, government inspectors and judges can only enforce what is written on the permit documents. If it is not written down and the facility contends it is operating lawfully, odds are it will win its case in court.

Nations using multiple permits must be mindful of multimedia impacts and make special efforts to reconcile those conflicts when they arise. The integrated permit system addresses that issue automatically.

3. Environmental Impact Assessment (EIA)

The U.S. pioneered environmental impact assessment in 1970. It spread to Europe in the mid-1980s and expanded from there to several other industrialized nations. Today, it is rapidly becoming the international norm for all environmental agencies including those in the developing world. Initially focused on disclosure only, the EIA process has become a critical pathway for public participation and education. In recent years, the content and scope of mitigation and alternative project analyses have received much greater attention as stakeholders have learned more about potential options.

The changes in EIAs were driven by transparency and greater access to technical information. Previously, government agencies went through the motions, simply disclosing environmental impacts as legally required. Then, when no one challenged those findings or pressed for alternatives, the lead agency deemed the environmental impacts as unsolvable or less important than the project under review. Although still *legally* permissible it has become more difficult *politically* to make a finding of "overriding considerations" without some attempt to mitigate the impacts.

The EIA represents a one-time opportunity to modify a project before it is built. There is no legal obligation to address environmental impacts discovered after the fact unless provided by separate statutes. Similarly, there is no real monitoring or enforcement of required mitigation measures, unless those conditions are set forth in other legal documents. The EIA is essentially a design-level check on whether the project has been thoroughly though out and optimized for environmental sustainability.

EIAs are required for projects, major (non-ministerial) plans and for policies which may have significant environmental impacts. In every case, the burden is on the proposer to analyze and, where necessary, abate the impacts of the proposed activity. A single government agency should have the lead role for reviewing and certifying the EIA. Other national, state and local agencies play supportive roles.

Figure 1.2
Key Elements of EIA Process

1. Mandate to perform EIA for activities that may have a significant environmental impact, including the stage at which the EIA is required.
2. Criteria and procedures for determining which activities require an EIA, including guidelines for preliminary assessments and screening analyses.
3. Designated authority(ies) to require EIAs, set requirements and administer the process.
4. Timetables, communication and other procedural requirements.
5. Format of EIA report.
6. Review process, including scientific and technical aspects.
7. Public participation rights and process.
8. Mitigation for identified environmental impacts.
9. Transboundary effects, notification, consultation and accommodation
10. Decisionmaking process
11. Rights of appeal – administrative, quasi-judicial and judicial
12. Ongoing monitoring requirements.

Theoretically, the EIA process allows for public participation. In the real world, public access and involvement vary widely around the globe. The biggest barrier to participation on the government side is failing to make information readily available and understandable. Sincere efforts to reach out can bring that barrier down. Electronic access, using simple language, and having an ombudsman or public information officer to provide one-on-one assistance are all well established techniques to improve public participation. World class environmental agencies have active public information offices, keep detailed mailing lists and provide extensive web access. Many agencies also have ombudsmen to assist small businesses; that function can be expanded to assist all stakeholders (as California's Air Resources Board has done).

The biggest barriers on the public side are having enough time, interest and commitment to endure a lengthy and complex process. Citizens have trouble keeping up with the technical details no matter how passionate they are. Non-governmental organizations are in the best position to close this gap and bring more voices to the table. Government can facilitate that process by providing focused NGO training or partial funding to keep NGOs afloat.

The EIA process is time consuming and can be very controversial, particularly when negative impacts are anticipated. In those instances, it is vital that the responsible government agency explore the mitigation options fully. The lead agency also needs to clearly explain its reasoning for selecting or rejecting the mitigation options or the controversy will continue. Procedural errors in the EIA process can also delay projects from being built. Failing to perform an evaluation, failing to notify the public, or failing to consider reasonable alternatives are all grounds for challenging the final approval decision. Currently, procedural challenges represent the majority of EIA lawsuits in the United States.

4. Product Regulations

Virtually any consumer good can be designed or modified before it enters the marketplace to reduce its emission potential, toxicity and/or waste impacts. Manufacturing inputs can also be regulated to reduce environmental burdens (e.g., removing heavy metals) prior to production. The challenge for environmental agencies is selecting the most important

consumer sectors for regulation and pushing the design process as far as can go. The European Union is the world leader on product regulations from a depth and breadth perspective but Japan, Singapore, the U.S. and California are close behind.

Wherever consumer product regulations exist, the clear authority to set such standards also exists. Countries lacking consumer product standards can enact detailed legislation of their own and start from scratch. Alternatively, they could shortcut the process by requiring that only EU-certified, US-certified, or California-certified products be sold in their domestic markets after a certain date, depending on which agency has the best standard. Enforcement is a relatively simple process of checking for the right documentation or label, though periodic laboratory testing is also advised.

Vehicles and fuels are the largest sources of emissions, worldwide. Accordingly, they receive the most attention and the most stringent regulations. However, not all countries treat vehicles and fuels as a system. Today's advanced emission controls for vehicles are utterly dependent on fuel quality. For example, unless sulfur is dramatically reduced and other fuel properties are held within consistent parameters, the most powerful catalyst technologies will be ineffective. Fuel-borne metals can have the same effect or bypass the exhaust treatment altogether creating different environmental problems. Even fuel oils need to be considered, particularly in heavy-duty vehicles. Engineers have determined that fuel oil ash is a significant fraction of particulate emissions in newer diesel and natural gas vehicles, bringing yet another technical issue to the fore. In short, fuel certification, vehicle certification, and fuel oil formulas all need to be considered at the same time. For that reason, putting vehicles and fuels under the same regulatory authority is highly recommended and will lead to the best environmental results.

Other products eligible for pre-manufacturing regulation include: paints, appliances, utility equipment, small engines, solvents, cleaning products, electronics, off-road vehicles, boats, fuel additives, pesticides and many other goods. California is unique in its ambitious programs to require best available design across the board. For example, California has determined that every internal combustion engine – regardless of size – should be catalyst equipped and use vapor controls. Similarly, California is pursuing particulate filters and oxides of nitrogen controls (where feasible) on every diesel engine in the state. California is also regulating consumer products to reduce gaseous emissions and has achieved a 50% reduction since the program began in the 1980's.

Chemicals entering the market place deserve special attention. Some are so acutely toxic they need to be removed from commerce altogether. Others pose tremendous risk to humans, animals or the ecosystem and need to be drastically reduced. But the largest category by far is chemicals for which there are little or no data as to their ultimate fate in the environment. Countries are grappling with these problems in various ways. For the most toxic substances, bans may be employed (e.g., removing lead from gasoline, toys and paint). Risk assessment and risk reduction strategies have become commonplace for many other chemicals, with varying degrees of stringency. The biggest limitation on government action is the need to prove that substances are harmful prior to regulating them. Only recently has the burden of proof shifted to industry to prove that the chemicals they introduce in the marketplace are safe, and only in Europe thus far. This topic will be discussed further in the next section.

II Enforcement Mechanisms

The three main elements of enforcement are monitoring, recordkeeping and penalties for noncompliance. Inspections and audits are the means for insuring that the information provided to government is truthful and complete.

Numerous reports have already outlined for the Chinese government how environmental penalties should be structured and what the penalty amounts should be. This paper will

focus on monitoring and recordkeeping instead for two reasons: first, because these mechanisms are the primary test of industry compliance in every country in the world; second, because these mechanisms define the relationships between environmental agencies themselves.

1. Monitoring

Monitoring is the direct measurement of emissions or pollutants in some media (air, water, etc.). Properly functioning monitors do not lie; they are unparalleled sources of environmental data. Automated monitors reduce the risk of human error. If equipped with internal diagnostics, automated monitors can detect human malfeasance as well. That is why the trend in industrialized nations is toward automated systems wherever technically feasible. Examples of these are ambient pollution monitors that report ozone levels directly from the field to data banks, continuous emission monitors in industrial stacks, on-board diagnostics and on-board measurements in vehicles, and self-monitoring gasoline delivery systems.

Whether automated or technician-operated, it is vital that everyone follow the same monitoring protocol, criteria and methods within a given domain. Otherwise, there is no way to meaningful compare what the monitors are detecting. Careful calibration and the use of certified gas standards are also critically important.

The US has strict, non-negotiable standards for the placement of ambient air quality monitors, selection of monitoring technology, and for quality assurance and quality certification. Also, there are routine evaluations of the entire monitoring network to screen out false positives, false negatives and abnormal or inexplicable readings. These evaluations include temporarily co-locating new monitors next to existing monitors to see if they get the same results. The same approach is followed when transitioning from one monitoring technology to another, to see if the new system has any overall bias (high or low) compared to the old one. US EPA is also pursuing a national laboratory accreditation system to improve overall data quality. Several other European nations have a similar system and the EU recently launched the "Metropolis" networking project to amass scientific evidence and to publicize the best scientific tools for environmental monitoring.

As an aside, water monitoring is not nearly so advanced. Science is just catching up to the water policy issues of today and to all the potential sources of water contamination. But there is hope on the horizon. The most important gaps and needed improvements have been identified (by the US Intergovernmental Task Force on Water Quality Monitoring, among many others). Work to close those gaps continues.

2. Record-keeping

Recordkeeping fills in where monitors do not exist. Such records include fuel usage data, operating temperatures, failure rates in new production, and many other statistics. What is most important about records is that they conform to established formats and data processing software so that anomalies can be quickly detected and investigated. The records that pass between government agencies are just as important. These describe the activities of each agency in quantitative terms. For example, the number of inspections conducted or the quantity of penalties issued per quarter. When money changes hands – for example, through loan or grant programs – another whole level of fiduciary responsibility is involved with its own accounting standards. In the United States the public is legally entitled to see any public environmental records that may exist, except those shielded by trade secret protection. (See Lesson Learned #3, below.)

Lesson Learned #3
Why Monitoring and Recordkeeping Are So Important

California's decision to impose "right to know" reporting mandates on large emitters of toxic air contaminants (TACs) led to immediate reductions of those substances. Under this 1988 law, businesses had to disclose TAC emissions that posed a risk of more than 10 cancer deaths per million persons exposed, to residents within one mile of their facilities. In addition, facilities posing such risks had to prepare comprehensive risk mitigation plans. Before the deadline for public notice arrived, TAC emissions in California plummeted. No company wanted to be seen as a bad neighbor. Academic research suggests this case was not unique. Reporting requirements can be as powerful as noncompliance penalties in influencing corporate behavior. Of course, it only works if the reports are truthful. Government reviewers must be constantly on the look out for fraudulent submissions.

In 1985, the State of Utah established daily monitoring for particulate matter less than ten microns in diameter (PM10). That was fortuitous since the Geneva Steel Mill in Utah Valley closed the following year and remained closed through 1988. By comparing medical records to ambient PM10 measurements, researchers learned that hospital admissions nearly doubled each winter that the steel plant was open versus when it was closed. This "intervention study" by Dr. C. Arden Pope is cited worldwide as evidence that reducing ambient PM10 has a demonstrable, positive effect on human health. The research could not have been done without reliable baseline air quality measurements.

Recordkeeping is not just a regulatory function. Various standard-setting bodies have a large influence on environmental reporting and the degree to which it is harmonized around the globe. These bodies include the UK Accounting Standards Board, the US Financial Accounting Standards Board, CEN (the European Committee for Standardization) and many others. In addition, nation after nation has established environmental accounting guidelines so that the full costs of environmental compliance can be tracked across their economies.

3. The Role of the Judiciary and Environmental Litigation

No environmental mandates come easy. They are hard fought and hard won all over the globe. Likewise, environmental "peace" is not enduring; it rests on constantly shifting ground. At any particular time, someone or multiple individuals are aggrieved that their rights have been trampled or that their concerns have not been addressed.

At those times, the prevailing environmental and economic balance may come into question and need to be renegotiated. When the executive branch is unable to resolve those disputes the judiciary is drawn in.

The judiciary determines what the legislature intended to do and whether environmental laws have been properly interpreted and applied. The judiciary also points out where the laws are unclear and require congressional action to resolve. Finally, the judiciary

imposes appropriate remedies or penalties, depending on the nature of each case. (See Lesson Learned #4, below.)

The United Nations has recognized the vital role of the judiciary in advancing environmental compliance, environmental justice and sustainable development. Accordingly, the UN operates a special training, networking and information-sharing program for judges and other legal stakeholders around the world. The UN effort started in 1996 with informal symposia for judges and expanded in 2003 with the adoption of a comprehensive capacity building work plan.

Lesson Learned #4
How the Judiciary Can Enhance Environmental Protection

The Maastricht Treaty gives the European Commission power to take action against member states that are not respecting their environmental obligations. After notice and final warning the Commission can take its case to the European Court of Justice. If the Court agrees, it requires the offending nation to take remedial action. If that nation still does not comply, the Commission may seek and the Court may impose financial penalties. Including the judicial enforcement clause was wise. Since 1992, the Commission has brought numerous cases against member states including Italy, Spain, Portugal, France, Germany, the UK and Belgium. Some are for a single breach (for example, missing an environmental reporting deadline). Others span the breadth and depth of environmental programs, citing numerous deficiencies. (A list of pending cases can be found on www.eccenet.org). The EU is currently weighing a proposal to make environmental disasters a crime punishable by law. Penalties would include business closure, imprisonment for up to five years, fines and full financial restitution. The goal is to eliminate any and all "safe havens" for environmental crimes in the EU. The proposal was prompted by a recent hazardous waste disaster in the Ivory Coast in which ten people died.

In the **United States** environmental litigation cuts both ways: against the government for not doing enough, and against individual companies for not fully complying with the law. There are also "slap" suits against NGOs or private citizens to prevent them from libeling businesses (or just to intimidate them overall). In **India,** the judiciary has become an active environmental policy-maker, stepping in to demand action (clean fuel buses, for example) when the executive and legislative branches were unable or unwilling to act. At the other end of the spectrum, **Japan's** judiciary is relatively less involved in environmental affairs. Instead, executive branch agencies mediate issues between aggrieved individuals and polluting Japanese businesses.

At its best, the judiciary breaks down impasses and enables environmental programs to move forward. The judiciary is also uniquely qualified to address and redress environmental harms to specific individuals. At their worst, courts become a way to stall or frustrate environmental activism altogether. Good, bad or indifferent, judicial involvement grows apace with environmental lawmaking. Each new environmental law creates rights and obligations. Many of those laws also shift the boundary between the public and private sphere. The best defense against poorly reasoned legal decisions is to help judges become more familiar with environmental science.

III New Regulatory Authorities in a Changing World

The nature of environmental regulation is changing rapidly in the modern world. Life cycle emission analyses, cradle-to-grave product tracking, international carbon "footprints," multi-media impact evaluations and similar considerations have altered the landscape. Countries who get ahead of this curve will be the environmental leaders of the future. On the other hand, nations who fail to think broadly may actually deepen environmental problems within their own borders and elsewhere on the planet.

Climate change is forcing the biggest paradigm shift of all. Aggressive source-specific controls are no longer sufficient. Countries must analyze how their environmental regulations will affect the broader marketplace and whether they will ultimately increase or reduce *global* emissions of greenhouse gas pollutants (carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6)). Likewise, regulatory instruments must change to address this new international reality. Environmental agencies need to acquire new skills and new institutional capacity to succeed in the new regime. All countries are equal in this respect. A few are ahead of the game on institutional development – such as Europe with its emission trading system (ETS) and all of the related entities. However, no nation is truly proficient in controlling greenhouse gases from all sectors. Most face the same enormous challenge of reworking the very foundation of their energy-based economies.

Europe's **REACH** program, which took effect June 2007, applies sustainability principles to the narrower category of chemicals. The Registration, Evaluation, Authorization and Restriction of Chemicals program is designed to protect human health and the environment by identifying and addressing the intrinsic properties of chemical substances before they are widely used in commerce. REACH also requires substitutes for, or gradual phase-outs of, the most toxic substances. REACH will be implemented over the next 11 years. Because of its global impact on multinational companies, REACH is likely to affect many more parts of the world than just Europe alone.

Electronics and **electrical equipment** are the focus of a new set of regulatory initiatives aimed are reducing toxic content, energy consumption, packaging, and waste disposal impacts. Three closely related European directives – **RoHS, WEEE** and **EuP** – comprise these rules. **RoHS** is the Restriction of Hazardous Substances (like mercury) in electrical and electronic equipment; it came into force January 2006. **WEEE** stands for Waste Electrical and Electronic Equipment. This law took effect in February 2003 and sets collection, recycling and recovery targets for electrical goods. Finally, **EuP** is the eco-design of Energy Using Products. This ambitious and sweeping new law took effect July 2007 and covers the vast gamut of electrically powered consumer goods.

IV Overall Considerations for the Authority of Environmental Agencies

As noted in the introduction, environmental agencies need a broad array of tools to achieve their goals. No single strategy is sufficient. This section discussed environmental standards, permits, environmental impact assessments and product standards, and enforcement mechanisms as basic elements of an effective program. Emerging regulatory regimes were identified to show the path to the future. Finally, the role of the judiciary in enhancing overall program effectiveness was also discussed.

The next section of this paper discusses the kind of capacity (funding, staffing and skills) that environmental agencies need to do their jobs. The next section also describes the

horizontal and vertical management issues that arise from the various organizational structures seen around the world. As will be shown, clear lines of authority are essential to implement the tools described thus far. Any confusion over who is empowered to make final decisions will only weaken, not strengthen, environmental commands.

These are the bread and butter aspects of environmental agencies' authority. However, it is important to recognize that "authority" takes many forms and needs to be cultivated on several different levels.

Moral authority is necessary for political legitimacy. Environmental agencies need to be perceived as doing the right things for the right reasons. Also, their decisions must be well reasoned and just. Depending on societal values, the degree of public participation in decision-making is also a factor.

Scientific authority comes from focused, timely and complete scientific research and engineering analyses. There is no substitute for knowing a subject inside-out. Defining the state of knowledge at any given time also reduces uncertainty, which is greatly appreciated by decision makers. Peer review helps to maintain scientific and technical integrity, as do statistical analyses.

Regulatory authority is conferred by legislation. It cannot be asserted where it does not clearly exist in law. The thorniest implementation problems in the environmental arena stem from unclear or incomplete statutes. Deficient environmental laws create unreasonable expectations and push stakeholders into unnecessary conflict. For this reason, legislators must be thorough, practical and courageous when establishing new regulatory regimes. Providing initial and continuing environmental education to elected officials may help in this regard.

Enforcement authority also stems from the law but is moderated by discretion in the field. Lawmakers are responsible for creating true deterrents to environmental crimes by setting effective maximum fines and penalties. Inspectors may consider factual bases for adjusting those penalties on a source-by-source basis, but cannot overcome a flawed legal foundation. The judiciary enhances enforcement authority by expanding the breadth and depth of prosecutorial options.

Ultimate authority rests with the supreme leader of each country. Each President, Premier, or Prime Minister sets the environmental compass for his or her nation state. Leadership is essential to setting the right tone across governmental institutions and for drawing committed individuals into public, environmental service. Environmental agencies can acquire more power by elevation to ministerial or cabinet status. However, the day-to-day expression of that power will be strongly enhanced by a chief executive who espouses and acts upon the same environmental values.

Section Two: International Experiences on Structural, Personnel and Financial Capacity of Environmental Agencies' Organizational Systems

Introduction

Environmental protection has enormous benefits but comes at a price. It requires a substantial amount of money, time, staff, institutional capacity and clear implementation authority. International experience bears this out. Nations that have dealt well with the environmental impacts of population growth, economic development, urbanization and industrialization have been at it for decades. In addition, they have spent billions of dollars and devoted thousands of people to their efforts.

Historically, the size and scope of environmental programs has followed a similar pattern. Water services, sewage management and waste treatment came first as populations grew and density increased. Air pollution controls, natural resource management and hazardous chemical measures followed. Today, there are a myriad of environmental pressures requiring ever more elaborate regulations, institutions and governmental investments to abate.

Budgets and staffing also follow common pattern. In most countries there is a pyramidal structure to environmental agencies. Advanced nations employ thousands (1,000s) of people at the national level, tens of thousands (10 x 1,000s) at the regional level, and hundreds of thousands (100 x 1,000s) locally. Environmental investment by the public sector ranges from 0.5% to more than 3.0% of each nation's gross national product, depending on its stage of development. However, environmental expenditures are still relatively small compared to total government spending, in the range of 1-3% of each country's annual budget.

I Comparative Budgets

As noted in the introduction, public sector environmental investment has followed a similar pattern around the globe. The first, most expensive phase is creating adequate infrastructure to handle water, sewage and waste. While undergoing this process, countries spend three percent (3%) or more of their gross domestic product (GNP) on environmental infrastructure per year. Nations that have moved on to the second phase of regulating industrial activity spend quite a bit less; more on the order of 0.5% of GNP annually. It remains to be seen how the emerging third phase – achieving a low carbon economy – will affect overall government investment. Sir Nicholas Stern and others have provided some indication as to what is coming. However, the public share of those costs is not well defined and is subject to major policy decisions.

1. Environmental Budget and Expenditures

The **annual budget** for various national, regional and local environmental agencies is shown below in Figure 2.1, for the most recent year available. These budgets are compared relative to total Gross National Product and per capita costs in Figure 2.2.

Figure 2.1
Annual Budgets of National and Local Environmental Agencies

Country	**Japan** (2007)	**United Kingdom** (2007/08)	**Germany** (2007)	**United States** (2007/08)
National level	$17.4 billion - all federal government for environment Includes $1.8 billion for the Ministry of Environment (MoE)	$7.3 billion** - Department for Environment, Food & Rural Affairs (DEFRA) Directs $3.6 billion to environmental protection (excluding natural resources which are budgeted separately)	$11.4 billion – all federal government for environment Includes $1.25 billion for Ministry of Environment, Nature Conservancy & Nuclear Safety (BMU)	$33.1 billion – all federal government for natural resources and environment Includes $7.2 billion for U.S. Environmental Protection Agency (USEPA).
Regional level	$9.3 billion – prefectures (2001) 84% on sewage and waste treatment services & facilities	$2 billion – Environment Ministries of England, Wales, Scotland & Northern Ireland	$146.5 billion – Lander and local government environmental expenditures Includes $5 billion federal funds (EUROSTAT 2003)	$15 billion – state agencies (2003 estimate) 30% from federal funds
Local level	$39.5 billion – municipalities (2001) 95% on sewage and waste treatment services & facilities	$11.6 billion - all government environmental expenditures (2004 DEFRA statistics)		$135 billion – local government environmental expenditures (2003/04 estimate)
Approximate Total*	**$66 billion**	**$21 billion****	**$158 billion**	**$183 billion**

* *Sum of different fiscal years, based on available information.*
** *Does not include all federal spending related to the environment.*

Figure 2.2
Relative Environmental Expenditures (EE) in 2007

Country	**Japan**	**United Kingdom**	**Germany**	**United States**
National EE as percent of federal budget	2.2%	1.2%*	2.9%	1.2%
Total EE as percent of GNP**	1.5%	0.9%*	5.8%	1.2%
Per capita GNP	$33,752	$37,829	$32,676	$44,850
Total EE per capita per annum ***	$518	$345*	$1,917	$608
Per capita EE as percent of per capita GNP	1.5%	0.9%	5.8%	1.3%

* *Does not include all national expenditures related to the environment*
** *International Monetary Fund estimates of Gross National Product, calculated on a purchasing power parity basis.*
*** *Approximate amounts calculated from sum of different fiscal years.*

National environmental agency budgets are comprised of four major elements: direct staffing costs (# of personnel years x $100,000 is a good rule of thumb), administrative overhead including facility expenses, capitol or infrastructure investments, and various pass-through funds to local agencies. A rough break-down of each country's federal environmental expenditures is provided in the paragraphs below.

Japan's $17.4 billion at the national level is spread across several ministries and categorically divided between surface and groundwater quality (39%), global environmental protection (24%), nature conservation (14%), air quality (13%), waste management and recycling (6%), chemical policy (less than 1%) and other (3%).

Of the $1.8 billion assigned to the Ministry of Environment (MoE), approximately $90 million (5%) is budgeted for staff salaries and general operating costs. The rest is allocated on a project-by-project basis. A detailed breakdown of expenditures is not available. However, several reference sources indicate Japan's largest public sector pollution abatement costs are sewage treatment and water infrastructure (60-80%), due to heavy public subsidies.

The **United Kingdom** does not have a unified budget for total environmental expenditures so that figure is unknown. However, environmental spending in England, Northern Ireland, Scotland and Wales clearly exceeds the budget of the jointly operated DEFRA. For example, the UK has an Environmental Transformation Fund of $780 million per year to which DEFRA contributes 47%. The rest is provided through other ministries' budgets. Regarding DEFRA's own $7.3 billion budget, administrative costs including staff are capped at 10% or $0.7 billion. The rest is divided between capital investments ($1.6 billion) and resources ($5.0 billion). Capital costs are dominated by climate-related and energy facilities (47%), water infrastructure (23%), and waste management (9%). Resource dollars are demand driven and are divided between animal health and welfare (11%), environmental protection which includes water (45%), sustainable farming, food and fisheries (6%), natural resources and rural affairs (18%), the rural payments agency (10%) and other (10%).

Germany's $11.4 billion federal environmental budget is distributed across nine ministries, the foreign office and three other program areas. The largest shares are for environmental protection loans (43%); Ministry for the Environment (11%); aid to developing countries (10%); noise abatement, urban rehabilitation and marine protection by the Ministry of Transport, Building & Housing (9%); and environmental research (8%). The internal budget breakdown for the Ministry of Environment (BMU) is not readily available. However, its largest division – the Umweltbundesamt (UBA) or Federal Environment Agency – posts some budget information on the web. In 2006, the UBA's spent most of its funds on direct personnel costs (46%) and managing funds assigned by other sectors (30%), including research awards and project assistance.

The **United States'** $33.1 billion federal environmental budget is divided functionally across conservation and land management (29%), pollution control (25%), water resources (21%), recreation resources (8%) and other. Most of the U.S. EPA's $7.2 billion budget goes to subordinate agencies in the form of categorical grants ($3.4 billion) and infrastructure assistance ($2.6 billion). The remaining funds ($1.2 billion) are spent by the EPA on its own regulatory, scientific, technical and enforcement work.

2. The Budgeting Process

In a perfect world, the **budgeting process** for environmental agencies would be driven by the size of the environmental problems at hand. In reality, no nation has that luxury. There are funding limitations, competing societal priorities, shortages in qualified labor and significant information gaps. Even the most committed countries fall short. As a

result, environmental improvement tends to happen incrementally, like all other governmental activities.

Environmental agencies *can* strengthen their **negotiating position** in the budget process and claim more of society's resources, however. The key is to assemble the most compelling evidence for new funds. In the U.S. and the EU, budget proposals commonly monetize the environmental harms being incurred. Similarly, the budget proposals forecast the likely harms that will result from inaction. Recently, these analyses have begun to cite human mortality effects as international epidemiological research has increased. There is nothing more compelling than the risk of premature death or disease, particularly if those can be avoided or significantly reduced through government action.

California has found that detailed, program-specific work plans help to secure more resources. These documents identify staff, equipment, and contract costs, along with major milestones and deliverables. Successful past performance is very important too. That implies environmental agencies should only promise what they can deliver or it will hurt their credibility over the longer term. Outside constituencies for funding lend added strength to environmental agencies' hands. When enough people demand that an environmental problem be fixed, their elected representatives in the Legislature, Parliament or Congress usually find a way to oblige them.

3. Polluter Pays Principle

The polluter pays principle (PPP) first appeared in 1972, as part of OECD's "Guiding Principles Concerning International Economic Aspects of Environmental Policies."

PPP was then described as an instrument for allocating the costs of pollution prevention and control measures. In theory, PPP encourages pollution reduction, reduces trade distortions and achieves greater fairness by placing responsibility where it belongs: on those who create environmental impacts.

In its simplest form, PPP means that industry rather than government pays for pollution controls. Numerous OECD countries follow that approach. PPP can also be extended to partial or full liability for environmental contamination. Europe is moving in that direction for prospective harms and the U.S. has assigned retroactive liability for abandoned hazardous waste sites (with mixed results). Finally, PPP can be used as a revenue source. Multiple nations impose user fees to cover the cost of providing water, sewage and waste disposal services. These fall directly on individual consumers and residential households.

A few countries, regions and localities are imposing PPP fees to cover the cost of regulating industrial activity and enforcing environmental standards. California is the leading edge of this movement. The Golden State recoups 84% of Cal/EPA's operating costs through fees on business and the general public. This trend emerged out of necessity. California citizens resist new taxes and State law requires a two-thirds majority to enact them. By contrast, fees may be imposed with a simple majority vote provided the revenues go to activities with a clear "nexus" to the fee itself. For example, water discharge fees may only be spent on activities related to water clean-up. All of California's environmental fees are cycled back through the state budget and appropriated by the Legislature. In the meantime, they are kept in special accounts dedicated to the purpose for which they were collected.

In Europe and Japan eco-taxes are more common at the federal level, though regional and local governments in those nations rely heavily on user fees. In 2004, the UK collected a total of $68 billion in environmental taxes, about 3% of its national income. These took the form of fuel duties, other energy duties, vehicle excise taxes and a climate change levy. In Germany, eco-taxes (including fuel taxes, road tolls, land tax and tobacco tax)

were more than 10% of all government revenues in 2003. Environmental tax revenue may be spent on any governmental purpose but tend to flow toward environmental expenditures, at least in part.

II. Comparative Staffing

1. Staff Size

Environmental agencies have evolved alongside our collective understanding of the nature and scope of environmental problems. At first, they simply grew; for instance, in the late 1800's with urbanization, and again in the 1970's with the worldwide environmental movement. For example, between 1970 and 1980, the U.S. EPA's workforce more than tripled from 4,084 to 13,078 employees.

The size of environmental agencies eventually stabilizes as laws and procedures become standardized, and as staff mature and become proficient at a wide range of tasks. Again, using the United States as an example, U.S. EPA's workforce has hovered around 18,000 for the last fifteen years. The European Union has had a similar experience for total public sector employment: peaking at approximately 30% of all employment in the mid-1980s then holding constant or slightly declining since then.

The current staffing of various national, regional and local environmental agencies is summarized in Figure 2.3 below.

Figure 2.3
Staffing of National and Local Environmental Agencies

Country	Japan	United Kingdom	Germany	United States
National level	1,134 - Ministry of Environment (MoE) 2,694 - Japan Water Agency	12,151 - DEFRA	2,870 – Ministry of Environment, Nature Conservancy and Nuclear Safety (BMU) 830 – Ministry Office 1,100 - Federal Environment Agency (UBA) 650 – Federal Agency for Radiation Protection (BfS) 290 – Federal Agency for Nature Conservation (BfN)	17,324 - USEPA ~6,000 at national headquarters; remaining personnel in 10 regional offices
Regional level	87,000 - local & prefecture governments 84% waste management 10% pollution control 4% nature conservation	13,300 – Environment Ministries of England, Wales, Scotland & Northern Ireland	Not available	50,000 – state environmental agencies
Local level		Not available	Not available	780,000 (2003/04 estimate)
Total Environmental Personnel in the Public Sector	>90,000	Not available	Not available	>840,000

These figures represent full time government employees (or their part-time equivalents) and cover all employee classifications from managerial to technical to administrative support. Contractors are excluded.

Staff classifications for each environmental agency are not available. However, U.S. EPA's personnel breakdown may be instructive. In 2000, U.S. EPA's 18,000 member workforce was comprised of 24% scientists, 15% environmental protection specialists, 13% engineers, 7% clerical, 6% attorneys, and 35% other (managerial, human resources, etc.).

Staff versatility is very important. Today, the most advanced nations tend to move their environmental people and institutional boxes around as priorities change, rather than continuing to grow absolutely. At the same time, there is a general slight upward staffing trend in many countries consistent with population growth. Standardized training and well integrated research institutions help make that possible. Well-trained staff and accessible, qualified environmental researchers enable nations to reorganize rather than expand when needs change. These factors are discussed further below.

2. Training and Out-Sourcing

Training and continuing education are vital to acquiring and maintaining an effective environmental workforce. The **California** EPA provides annual training on the fundamentals of environmental science, regulations and enforcement. The **US EPA** provides broad international training modules, operates a virtual on-line university for government entities, and provides topic-specific classes on key programs. **Germany** has similar programs. Germany also focuses heavily on vocational training, and on primary and secondary education, to ensure a solid labor pool in the future. **Japan** operates a National Environmental Research & Training Institute for domestic and international professionals. The **UK's** DEFRA includes training for local government within each program area. Beyond these government-led efforts, there are private training businesses offering environmental classes of every description.

As various environmental programs are "out-sourced," a whole new type of training and certification has emerged. In several countries, private companies and individuals can be certified to do work on the governments' behalf. Such work includes but is not limited to inspections, auditing, product testing, and data collection and reporting. The use of private purveyors is typically driven by economic or political considerations and is neither better nor worse than using government employees. However, regulating those purveyors and regularly checking up on them is critical to ensuring proper performance. The government needs to remain firmly in control of the accreditation process.

3. Supporting Organizations

Every nation with an advanced environmental program relies heavily on research institutions and other external experts for support. See Figure 2.3 on the following page for examples. These entities help the agencies keep pace with new science, emerging technologies and innovative techniques for controlling or remediating environmental pollution.

The size of each country's research and development (R&D budget) indicates its commitment to advanced science and technology. Japan, the US and Europe lead the world, respectively spending 2.9%, 2.7% and 1.7% of their total GDP. Government contributions to those investments are 0.74%, 0.62% and 0.58%, respectively, of total GDP. The rest comes from private industry and foundations.

Figure 2.3 Partial List of Supporting Organizations				
Country	**Japan**	**United Kingdom**	**Germany**	**United States**
Supporting Organizations	National Institute for Environmental Studies National Institute of Advanced Industrial Science and Technology National Institute for Minamata Disease Japan Environment Corporation	The Royal Society London School of Economics British Standards Institute (administers ISO 14001) Institute of Environmental Assessment & Management (administers EMAS scheme)	National Advisory Council on the Environment National Research Laboratories (16) Max Planck Society Institutes (80) German Science Council	National Laboratories (21) National Academy of Sciences National universities The Health Effects Institute

III. Vertical and Horizontal Management

1. Shared Responsibilities

Environmental problems force nations to confront the issue of governance itself. In every country, responsibility for environmental protection is shared between international, federal, regional and local authorities to a greater or lesser degree. This layered structure is entirely appropriate given the size of the challenge. All hands on deck are urgently needed. Also, environmental impacts may be localized basin wide, transboundary or international in nature. Matching impacts to the appropriate level of authority can increase both efficiency and precision.

Unfortunately, the multi-level approach creates problems of its own. These include confusion, duplication, conflict and dilution of authority. Each nation's success depends on how well it resolves these tensions without losing sight of the ultimate goal: a clean and healthy environment.

The biggest vertical management challenge is maintaining the integrity of environmental requirements at every level of government. Transparency, clarity and consistency are key. Transparency means being able to see what federal, regional and local agencies are actually doing. Clarity means defining environmental norms in specific, unambiguous terms. Consistency means using the same measurement methods, the same type of monitors and the same data processing programs so that nation-wide information can be meaningfully compared. There must be regular auditing as well to keep all government agencies in line.

The biggest horizontal management challenge is integrating environmental concerns into broader governmental policies. Environmental agencies need to have a seat at the table where those decisions are made. At the federal level, that means a cabinet level post. Also, environmental considerations need to be integrated, legally and procedurally, into general government functions. For example, the Minister of Transport should be legally required to consider how a proposed highway project will affect air and water quality and wildlife habitats.

There is no perfect solution to these challenges. That said, international experience suggests that federalism is the wave of the future. Environmental problems are becoming more complicated not less. Multinational corporations need certainty and market consistency. Adverse environmental impacts cross natural, geographical and political

boundaries, as do mitigation measures. All of these pressures are steadily forcing the locus of regulatory control upward.

For many aspects of environmental programs, federalism makes sense. Federal agencies are in the best position to set health protective standards, to conduct research, to establish monitoring procedures and other technical norms, to define best available technology, to regulate emission sources of national import or impact, to oversee and ensure the performance of subordinate environmental agencies, and to provide enforcement backbone for the entire system.

Yet federal governments cannot do it all. They lack information about local conditions. They are remote from concerned citizens and other stakeholders. Most worrisome, they move sluggishly and are adverse to experimentation. For these reasons, states and local governments need to retain the authority to leap forward, to innovate and to road-test new strategies. Regional governments are also particularly good at working horizontally through multi-media problems. They have enough perspective and can marshal enough information to resolve the thorniest problems. Local governments, of course, excel at local environmental management with two important caveats: they must have sufficient resources to do the job and clear marching orders.

In the **United States,** and increasingly in the **European Union**, federal authorities decide what is clean enough. States and member nations are expected to fall in line. However, they may adopt *more stringent* standards provided they do not interfere with national objectives or laws. The **US** and **EU** requirements also penetrate down to local government, at least in theory. Whether they can be effectively enforced at that level is an open question in the **EU**. There is more consistency in the **US** but still not full or perfect compliance with federal norms.

Clear authority and presence of federal "boots on the ground" has a great impact on local government follow-through. **US EPA**'s ten regional offices are particularly effective in this regard. The regions are empowered to bring enforcement action against laggard states, against non-compliant local governments, *and* against the individual emission sources that are escaping federal regulations. DEFRA in the **UK** has eight (8) regional offices; however, their role is distributing financial assistance to rural communities, not enforcing environmental standards. Like the UK, **Japan's** regional units are focused on other activities than enforcement. MoE has seven (7) regional offices which protect natural resources and wildlife, collaborate with local government on waste management, and promote public awareness of environmental issues and solutions.

Germany has a well-earned reputation for stringent environmental laws. At the same time, it has a strong tradition of regional government dating back to the late 1800s. These two factors are often in conflict with each other. Germany's sixteen states (Lander) must concur with the environmental laws they are expected to implement.

The federal **BMU** cannot compel the Lander to comply, nor bring direct enforcement action against companies under Lander control. The only environmental rules outside this framework are those which are directly implemented by the federal government such as vehicle or fuel standards. Overarching **EU** regulations will eventually change this picture because those will apply to the ultimate implementing body. However, enforceability will still be an issue based on the EU's limited span of control.

As a unitary government, **Japan's** federal government does not have to defer to local environmental authorities. Nevertheless, social values and past practice have produced a highly cooperative system with environmental policies formed from the bottom up. For example, MoE has embraced the voluntary agreements reached between industry and local governments for pollution control. MoE also encourages community initiatives that are frequently more stringent than federal requirements. For non-industrial facilities,

Japan uses direct command and control methods, like the U.S. and the EU. Such regulations are implemented directly by the MoE or other ministries.

2. Incentives for Local Authorities to Implement National Laws

Though local authorities cannot be compelled in every instance to obey national laws, they can be positively and negatively induced to do so. The biggest **incentive** is money. Most local governments are fiscally constrained. Unless the terms are infeasible, they will readily agree to environmental conditions in exchange for new or continuing funds.

Other positive incentives include green labeling as a "clean community," recognizing local leaders as "environmental heroes," linking annual performance to salary enhancements (or other monetary and non-monetary rewards), technical assistance, training and other information tailored to local circumstances.

Negative incentives include the loss of funds, loss of power or discretion, public shaming through published reports and/or media coverage, brown labeling as a "polluted" or "unhealthy" community, the threat of legal action, and various enforcement penalties.

Factors that may be positive or negative (and which induce all environmental agencies to perform better) include public education, web access, transparency, media pressure, citizen demands, and judicial oversight.

The nations with the most advanced environmental programs employ all of the strategies listed above, by design or by default. Viewed historically, the single greatest factor leading to environmental success is broad, unshakable public support. That is why – although it is messy, time consuming, and occasionally unpleasant – the greatest environmental good usually results from having the greatest number of people involved.

IV. The Value Proposition

Environmental programs are worth the investment. While not every program can be quantified, the U.S. EPA estimates that its pre-1990 air quality controls returned $10 in health benefits for each dollar expended. Post-1990 measures are still favorable, achieving $4 in health benefits per dollar of control costs. California estimates that its ambitious global warming solutions plan will have a net positive effect on the state's economy resulting in $4 billion dollars of growth, 83,000 jobs, and significant new export markets by 2020. Researchers around the world are tracking the emergence of "green" industries and their ripple effect across domestic economies. Nations that invest in public health protection can be confident of positive returns to the environment *and* to their local economies.

Regarding greenhouse gases, the jury is still out on the potential, aggregate costs to the world under business as usual trends versus various scenarios. However, there is widespread agreement that energy efficiency measures will reduce those costs tremendously. A 2007 McKinsey report on US economic impacts concluded that almost 40% of the necessary abatement could be achieved at a negative marginal cost. That means those investments would generate positive economic returns over their lifetimes. According to the World Bank, many energy efficiency projects quickly pay for themselves, with typical returns on investment of 20-40%. The International Standards Organization (ISO) is pressing for harmonized international standards to promote energy efficiency and the use of renewable energy sources. Of course, the 3 Country Energy Efficiency Project (3CEE) launched by the United Nations and others in 2001 is already making headway on this front in China, India and Brazil.

To be truly sustainable, energy efficiency policies need to be fully integrated with environmental and public health objectives. Otherwise, carbon could be reduced at the expense of higher particulate emissions, just to give one troublesome example. Doing careful lifecycle analyses and monetizing the impacts to the greatest extent possible should make this negative trade-offs more apparent and preventable.

Section Three: Policy Recommendations

Introduction

Numerous studies by international organizations and domestic think tanks confirm that weaknesses in environmental management—e.g. lack of a robust environmental legal system, insufficient law enforcement, failure to punish illegal acts—are largely accountable for the extent of environmental damage in China. The main mechanism for improving supervision and management is rebuilding environmental management institutions.

At a time of ongoing administrative system reform in China, this report points to environmental management institution's restructuring opportunities that can integrate environmental concerns into China's macro policy-making and increase the efficiency of compliance and enforcement. The report was drafted by the China Sustainable Energy Program (CSEP) of the Energy Foundation, and was revised based on comments by an expert group of foreign and domestic scholars. The recommendations are formed on the basis of (1) a review of recently published reports by various international institutions with policy recommendations on environment legislation, supervision systems, management mechanisms, and policy instruments; and (2) presentations and discussions from the "International Forum on Enhancing China's Environment Management Capabilities," which was organized by the Environment and Resources Protection Committee of the National People's Congress, and held in Beijing on January 22, 2008. Attendees included experts from China, U.S., U.,K., Germany, and the European Union, who presented on China's environmental management challenges, foreign environmental management systems, institution-building, personnel arrangements, and budgets.

The report summarizes and analyzes major challenges to environmental management in China, then puts forth two categories of policy recommendations. The first category covers institution-building, and emphasizes three core elements of robust environmental administration: strong laws, good science, and abundant personnel and budget. These elements are the key to improving management efficiency and administrative capacity, and should thus be required for any environment management project or policy. The second category includes ways to address the most prominent and controversial issues in environmental management, such as the roles of central vs. local government, insufficient capacity for monitoring and statistical analysis, sources of funds for environment protection, application of legal measures, the role of public participation, and the role of environmental protection departments in coping with new environmental problems (e.g. climate change).

I Challenges for China's Environment Management Capacity

A review of six reports on China's environmental performance and capacity identified the following major challenges to environmental legislation, institutions, compliance and enforcement:

i. Environmental protection institutions lack the capacity and tools to coordinate with other departments and incorporate environmental concerns into economic decision-making;
ii. The central government lacks capacity to supervise environmental law enforcement by local governments, and the environmental management responsibilities of various levels of government are not adequately defined;
iii. Environmental restrictions have not been fully utilized (e.g. the environmental impact assessment system has had little effect);
iv. The environmental monitoring and statistics system is unreliable;
v. There is an over-reliance on command-and-control measures;
vi. Legal provisions are ambiguous and the authority of legislative bodies, law enforcement agencies and judicial bodies are inconsistent;
vii. The public has limited rights to participate in decision-making and to obtain environmental information.

II Core Elements of a Robust Environment Management Institution

Solving the severe environment problems of the current stage of economic and social development is a long-term endeavor, since the goal of improving government control, supervision measures, market-oriented policies, and environmental monitoring is a systematic issue that requires society-wide participation, including enterprises and the public.

However, as far as the administrative capacity-building of environmental management institutions is concerned, the practices of developed countries1 indicates that strong laws, good science, and abundant personnel and budget are the three core elements that must be present to enhance the environmental management of all projects and policies.

1. Strong Laws

The rule of law is a basis of good governance, especially in environmental management. Strong laws entitle environmental agencies to both develop and enforce environmental regulations, standards, policy instruments and technical guidelines. The first step to addressing environmental challenges, identified in Section II, should be legislation. For example, legislation requiring all comprehensive policies issued by the central government to be reviewed by environmental agencies could ensure that environmental concerns are addressed. Another example would be regulations allocating staff and budget to reflect the priority of environmental management and performance.

[1] Especially United States and European Union as a whole

To enhance environmental agencies' legal backing, the NPC and State Council should first empower the environmental agencies' more authority over the development of laws and regulations. Resources should put to a scientific and prudent legislative process, to create practical, specific, forward-thinking laws and regulations, which are based on consensus, best available technologies, and moral justice. Stakeholders from the government, industries, academicians and NGOs should be involved throughout the process. Policies, once made, must be enforced strictly, and also with periodic review.

2. Good Science

Good science is not only the primary basis for decision-making, but is also necessary for environmental management departments to conduct monitoring, formulate standards, and identify best technical practices. Furthermore, scientific decision-making and policy evaluation processes directly affect the effect of implementation and supervision of policies.

Scientific analysis is also an important tool for obtaining political and public support. The experiences of numerous countries indicate that environmental supervision can be negatively impacted by interest-group politics or because it is not prioritized in the government's agenda; the best antidote is scientific evidence. When scientists worldwide reached a consensus on climate change, many countries adjusted their development strategies and established government departments to control greenhouse gas emissions. In addition, the participation of the Chinese public in environmental protection lags significantly behind other countries due to practical obstacles, including the lack of a clear definition of the causal link between health damage and pollutants, unclear mechanisms to compute compensation for pollution victims, and insufficient technical support for local residents to participate in environmental monitoring and assessment. All of these problems can be solved through scientific analysis and technical progress.

3. Sufficient Personnel and Budget

Environmental protection requires money, time, and staff. Nations that have dealt well with the environmental impacts of population growth, economic development, urbanization and industrialization have been engaged in the endeavor for decades, spending billions of dollars and involving thousands of staff.

In the experience of developed countries, the number of environmental management personnel tends to increase rapidly during urbanization, and the size of environmental agencies eventually stabilizes as laws and procedures become standardized, and as staff mature and become proficient at a wide range of tasks. In most countries there is a pyramidal structure to environmental agencies. Advanced nations employ thousands (1,000s) of people at the national level, tens of thousands (10 x 1,000s) at the regional level, and hundreds of thousands (100 x 1,000s) locally. Staff versatility is very important. Today, the most advanced nations tend to move their environmental people and institutional boxes around as priorities change, rather than continuing to grow absolutely. At the same time, there is a general slight upward staffing trend in many countries consistent with population growth. Standardized training and well integrated research institutions help make that possible. Well-trained staff and accessible, qualified environmental researchers enable nations to reorganize rather than expand when needs change. It is now a critical period for China to control pollution and allow ecosystems to recover, and with the booming economy booming and urbanization, SEPA cannot

possibly manage China's numerous environmental challenges with just over 2000 employees2.

Environmental investment by the public sector ranges from 0.5% to more than 3.0% of each nation's gross national product, depending on its stage of development. As noted in the introduction, public sector environmental investment has followed a similar pattern around the globe. The first, most expensive phase is creating adequate infrastructure to handle water, sewage and waste. While undergoing this process, countries spend three percent (3%) or more of their gross domestic product (GNP) on environmental infrastructure per year. Nations that have moved on to the second phase of regulating industrial activity spend quite a bit less; more on the order of 0.5% of GNP annually. It remains to be seen how the emerging third phase – achieving a low carbon economy – will affect overall government investment. China's environmental budget during the 11th Five-year Plan is predicted to account for 1.35 percent of GDP, which is close to that of OECD members (1.3%). However, as the source of these figures points out, 60 percent of China's environmental budget goes to infrastructure construction for wastewater and water purification systems.

It is urgent for China to increase the environmental budget by a large margin. We endorse Asia Development Bank's suggestion to increase this budget to at least two percent of GDP. Besides pollution control and infrastructure, it is more crucial to greatly increase the budget for environmental agencies' capacity building, including "soft capacity": staff training, policy consultation and review, research and development, data collection and release, and technology improvements for monitoring and supervision.

III Recommended Priorities for Strengthening China's Environmental Management Capacity

1. Delineate Lines of Authority between Central and Local Governments

The central government has announced a diverse array of environmental protection requirements, but implementation by local government has been rare, due to political and capacity-related barriers. Higher-level environmental protection departments have had difficulties supervising lower levels, and information transmission has often been problematic, leading to frequent and sudden environment accidents. The question of setting up a "vertical" or "semi-vertical" management model from central to local governments is very controversial.

We recommend toe establish vertical environmental management system below the provincial level. An international trend in environmental management is the decentralization of authority for enforcement, using financial incentives and penalties to spur local governments to comply. Compared to the current horizontal system, a wholly vertical environmental management system between the national level and local level might not be more effective, because the decreased incentive would not capitalize on local governments' creativity and motivation for environmental performance.3 Such a system would also limit cross-sector coordination on compliance and enforcement at the local level.

[2] Around 200 in SEPA and the others in SEPA afflicted research bodies and monitoring centers.
[3] We can understand this self-motivation varies among provinces since China's is such a comlex of developed and developing areas.

A solution is vertical environmental management system below the provincial level. Under this system, the central environmental agency would allocate full responsibility for enforcement and compliance to local government and its environmental agency, while appointing local EPB leaders, increasing its financial control over the local government and EPB, and supervising local governments' environmental performance. Provincial EPBs would still report to the local government, authorized to communicate directly with the municipal- and county-level authorities. This could facilitate county-level EPBs to inspect of major entities that are under the supervision of provincial or even national government.

2. Prioritize Resources at the Centered Level

While the establishment of Ministry of Environmental Protection (MOEP) has spurred the clarification of ministries' responsibilities, the more pressing task is to optimize administrative responsibilities and operations within SEPA. Making the best use of resources requires prioritization.

Internationally, environmental agencies tend to focus on environmental legislation, environmental impact assessment (EIA), environmental permits, standards-setting, and the collecting and release of environmental statistics. Compliance and enforcement are also important. The more effort the central environmental agency puts into developing practical, specific, forward-thinking laws—based on involvement of various stakeholders and experts, best available technologies, and moral justice—the better the long-term compliance and enforcement, and the better the overall strength of the environmental protection institutions.

In addition to weak enforcement, implementation failures are also caused by regulations that are not rational, practical, or stringent enough, often developed without stakeholder involvement. . Priorities for the new MOEP include reviewing macro-level economic and social policy to ensure that environmental concerns are addressed; modifying current legislation to reflect MOEP's authority; update environmental standards; refine EIA procedures; improve the permit system; and establish a reliable monitoring, statistics and information release system.

Of the above tasks, the highest priority is to develop specific policy mechanisms for addressing environmental concerns in macro-socioeconomic policy making. Currently, the use of EIAs for policy, planning, and regulatory analysis has proven successful internationally. Also, a series of "Green Economic Policies," including green credit, green insurance, and green IPO requirements, would be a positive step. Implementation of these measures requires the development of practical follow-up policies, which will necessitate more research and analysis. Another question is whether China should be a testing-ground of creative policies from around the world. Many international best practices may need refining to fit China's conditions.

3. Increase National Environmental Budget and Expenditures

As mentioned above, its recommended to increase the total environmental protection input to more than 2 percent of GDP: Although investment in environmental protection in China is continually increasing, its proportion in GDP is still very low. During the 8th Five-Year Plan, total investment for environmental protection was 110.2 billion yuan, accounting for 0.69 percent of 1990 GDP, falling below the targeted 0.85 percent. During the 9th Five-Year Plan, the proportion increased to nearly 1 percent, but was still below the 1.5 percent of developed countries. Furthermore, although economic and fiscal conditions were favorable, 90 billion of the planned investment of 450 billion yuan was not invested. During the 10th Five-Year Plan, actual investment again fell short of the

planned 700 billion yuan. For the 11th Five-Year Plan, planned investment for environmental protection is 1.3 trillion yuan, equal to 1.35 percent of GDP. This percentage exceeds the average investment of OECD members (1.3 percent). However, after the investment in capital construction is deducted, the actual investment for pollution treatment accounts for only 0.6 percent of GDP4.

International experience indicates that it takes at least 1-1.5 percent of GDP investment in pollution treatment to control Environmental deterioration, while three percent can significantly improve the environment. This report supports the Asian Development Bank's recommendation that the annual investment for environmental protection be at least two percent of GDP.

More important is to optimize the utilization mechanisms for environmental investment: China's economic development and improving political will for environmental protection indicates that investment in the environment will increase. However, there have been many costly environmental protection projects that failed, due to insufficient scientific, economic, and social analysis.

This report suggests that China increase total investment in environmental protection, and asserts that funding for pollution treatment and ecological recovery should receive particular augmentation. The expenditures for administration and capacity-building of environmental protection departments should be increased, including budgets for scientific research, policy evaluation, personnel training, and monitoring system setup. China should expand and diversify financing channels and investment sources, to include fiscal budgets, bonds, commercial bank loans, private sectors and international financial institutions, and economic measures such as an environment tax, environment fund, and ecological compensation fund. Market mechanisms should be used to improve the utilization efficiency of investment in environmental protection.

4. Rebuild the Environmental Permit System

Environmental permits have been widely used for decades, but have had little success in China. Whether integrated or multi-sectional the general content of environmental permits are the same. The key elements include a complete description of the project and underlying processes, the determination of best available technology, emission limitations, specified measurement methods, record-keeping requirements, designation of the permitting authority, and identification of the responsible party (typically the project owner and/or operator.

There are four major factors at work with environmental permit systems: completeness of application data; governmental capacity to review issue and enforce permit conditions; determination of "best available control technology;" and specificity of requirements. Multi-media impacts may arise in some permitting situations and need to be addressed as well.

First, it is essential that the permit application be complete at the start of the process (in the U.S., permits sometimes languish for months due to incomplete project descriptions and data). The technical burden should rest on the permit applicant, leaving government engineers to focus on the review process itself. Finally, though there is constant pressure to streamline permitting operations, governments should resist demands to rush approval. A permit conveys the legal right to operate, and must be issued with all necessary environmental conditions.

[4] Source of data: Environment College of Renmin University of China

The second major factor is institutional capacity to handle permit applications, including qualified engineers, permitting entities with sufficient authority to require environmental conditions to be met, and enforcement staff to conduct regular follow-up inspections. The U.S. EPA, the fifty states, and local authorities all have permit engineers on staff. Inspectors are also available at the federal, state, and local level. The largest percentage of these employees is in local permitting agencies, but the state and federal presence is also very significant.

Third, the determination of best available control technology (BACT) must be accurate, because there is only one opportunity to "build it right." The US and the EU operate BACT clearinghouses to make this information readily available. Both nations also publish detailed technical guidelines on how to interpret and apply BACT principles in the field. These principles are in accordance with engineering and scientific consensue, and are available for translation to any language. BACT may appear to be prohibitively expensive, but control at the outset is always cheaper than "mop-up:" for instance, retrofitting existing facilities or pollution clean-up are cumbersome, costly, or even infeasible.

The fourth factor is ensuring the specificity, thoroughness and unambiguousness of the permit text. The text must be comprehensive to plant operators (who vary in terms of technical knowledge and experience). At the same time, government inspectors and judges can only enforce what is written on the permit documents. If requirements are not explicitly delineated and the facility contends it is operating lawfully, odds are it will win its case in court.

5. Establish a Vertically-Managed Environmental Monitoring and Statistics System

Sufficient and accurate environmental statistics are the basis of scientific policy making, and full public access to environmental data facilitates supervision. Environmental monitoring, and the collecting and release of data, should be the key responsibility of the new MOEP. Currently, China's environmental monitoring system consists of independent affiliates of the environmental management system, each reporting to SEPA or EPBs at various local levels, and often reporting statistics biased toward local government. The lack of vertical integration has resulted in fraudulent data and information asymmetries.

We suggest adopting vertical management of environmental monitoring from the national, to the regional, provincial and local levels. At the national level, MOEP should provide funding and staff to monitoring centers at all levels; expand the monitoring network to more sites, technologies, and staff skills; and, most crucially, to improve information transmission mechanisms. E.U. practice is for national environmental agencies to take full responsibility for information collection, to make sure its quality. Making the information public is a major tool of public participation.

There is a lack of environmental releasing mechanism in current environmental agency, while it's counterparts in US and EU countries take it as a core responsibility. In new Ministry of Environmental management, a new organization in charge of information releasing should be established and open to the public. This could leverage public participation greatly.

6. Promote Professional and Orderly Public Participation

Public participation is recognized internationally as an effective way to supervise legislation, justice, and enforcement of environmental law. The lack of public pressure for environmental protection in China is one of the factors causing the present weakness of enforcement. SEPA has putting much effort into increasing the openness of information and engaging the public in environmental assessment. However, members of the public often need more knowledge and expertise to effectively participate. It's very important to encourage the development of environmental NGOs and foster professional and orderly public participation.

The effectiveness of public participation in environmental decision-making and supervision depends on its professionalism and level of organization. NGOs are a means by which the public can express opinions in a more organized, constructive, and efficient way, at lower social cost, as they can systemize dialogues between the government and citizens. Action that the government can take immediately to create a more favorable policy environmental NGOs includes decreasing the difficulty for, NGOs to meet with officials and to participate in government and political affairs, and to increase the social standing of NGOs. The current legal framework in China contains a number of barriers to establish and maintain environmental NGOs, including complicated registration requirements, limitations on financing, and limitations on establishing membership institutions.

In addition, information disclosure is a precondition for public participation. Legislation for public participation in environmental protection also needs to specify what information must be made public, how it is to be publicized, how the public can receive the information, who disseminates the information, how to cover the cost of government departments' information disclosure, and procedures for addressing failure to disclose or false information. The major barrier is lack of access to sufficient and reader-friendly environmental information. Information releasing is not only a basis for public participation, but also an area where government and NGO can develop partnership. Many local NGOs are experts of environmental education and good at translating technical environmental data into interesting and reader friendly information at very low cost. Government should seek cooperation or hire NGOs to work on information releasing.

7. Increase Capacity to Handle Newly-Emerging Global Environmental Issues

The "Eleventh Five-year Plan" of National Environmental Protection released by the State Council "requires enhanced monitoring and statistical analysis of greenhouse gas emissions, clarification of the tasks and measures to control the emission of greenhouse gases, and efforts to reduce the emission of greenhouse gases such as carbon dioxide, to improve China's ability of adapting to climate change." It is widely accepted internationally that carbon dioxide and other greenhouse gases are major air pollutants. In order to reduce emissions of those pollutants, a powerful, specialized institution is needed for unified decision-making and supervision of policies and implementation. The organ responsible for pollution control under SEPA shall bear the primary responsibility, and should be established as soon as possible.