
Underlying Causes of Environmental Harms Facing APEC

Addressing the environmental harms confronting APEC's members requires an understanding of their underlying causes—market and government failures. Economic theory tells us that the free market can be expected to produce an efficient and welfare-maximizing level of resource use, production, consumption, and environmental protection if the prices of resources, goods, and services capture all of the social costs and benefits of their use. The corollary of this principle is that if private costs—which are the basis for market decisions—deviate from social ones, then there will be “market failure,” resulting in allocative inefficiency in general, and suboptimal resource use and pollution levels in particular. Unfortunately, market failures are a hallmark of the environmental domain. Prices in the marketplace often do not capture the social costs (or benefits) of pollution (or pollution control) or the scarcity value of common resources. As a result, economic actors are able to spill onto others all or part of the environmental costs they generate.

Some market-failure-driven problems could be addressed by appropriately allocating, enforcing, and vindicating environmental property rights. But in other cases, the resources are inherently “open access” or “common” or otherwise not amenable to a resolution based on property rights. In these circumstances, government intervention will be required to avoid the allocative inefficiency of, and welfare losses from, market failures. But governmental regulatory efforts often go awry as well, resulting in suboptimal environmental results. Moreover, in their pursuit of goals in other policy areas—like energy and agriculture—many governments have adopted policies that have deleterious effects on the environment. In

the context of rapid economic growth, demographic factors—such as expanding populations and urbanization—often magnify the harms attributable to market and government failures. Designing an optimal APEC environmental policy requires first understanding these various failures, next sorting out which problems are best dealt with at the regional level, and then carefully tailoring a strategy to respond to them.

Market Failures

The breadth and depth of environmental problems reflects the ubiquity of market failures. Certain failures in particular are responsible for many environmental harms: (1) externalities or pollution spillovers, (2) over-exploitation of open access or common resources, (3) intertemporal misallocation of resources reflecting the inability of future citizens to participate in decisions made today that will affect the world they inherit, and (4) failures arising both from the absence of perfect information assumed to underlie smoothly functioning markets and from the uncertainty and complexity that are dominant features of environmental decision making.

Externalities

Externalities—situations in which consumers or producers can spill pollution harms onto others without paying for them—represent the core environmental market failure (Baumol and Oates 1988; Stiglitz 1988). Externalities arise because the social costs and benefits associated with the use, production, and consumption of resources, goods, and services are not properly aligned with the private costs and benefits that determine individual and corporate behavior (Hanley, Shogren, and White 1997). The ability to disregard some of the costs of pollution leads to a misallocation of resources and insufficient incentives for pollution control, resulting in inappropriately high levels of pollution. In designing policy responses to market failures, it is important to separate out several distinct categories of externalities.

Negative and Positive Externalities

Externalities may be either negative or positive. *Negative externalities* arise when some part of the costs of an activity are not borne by those who produce or consume the good or service in question. For example, when a cement factory in Sydney emits pollutants into the atmosphere they may cause visibility problems, may affect the health of local residents, and may also contribute to global warming—all costs that are not factored into the price of cement, because they do not have a direct impact on the production process. As long as the costs of cement production do not

reflect the full costs to society—and externalities remain uninternalized—the factory will not operate with optimal economic or environmental efficiency.

Positive externalities, conversely, arise when the full benefits of an activity are not internalized by the regulating jurisdiction. For example, when Indonesia grants timber companies logging concessions, it does so in return for revenues that supposedly reflect the value of the timber to be cut. But the value of forests in supporting biodiversity, together with the value of the trees as carbon “sinks,” is generally not reflected in the price of the concessions, because those who benefit from these forest amenities—citizens around the world—are not involved in the transaction. In other words, the price the government (and thus the Indonesian public) receives for use of its environmental resource—the forest—does not reflect the full social value of the resource as judged from a worldwide perspective. As a result of the disconnect between the social value and private value of the resource, the price of the concession is lower than it should be, and the resource is overconsumed.

Regular Externalities and “Super Externalities”

We find it useful to distinguish between regular and “super” externalities. *Regular externalities* are those that arise in situations in which harms are not paid for by the producer or consumer of a good but the damage caused is limited in geographic scope to a single political jurisdiction. In these cases, regulators could internalize the externality if they chose to, and a welfare-maximizing government will have an incentive to do so. In other cases, however, the geographic scope of the harm crosses political boundaries, spilling over onto other countries or onto the commons, beyond the jurisdiction of any nation. We call these spillovers *super externalities*. They represent a qualitatively more difficult policy problem because no single jurisdiction has an incentive to regulate such harms optimally, as viewed from an overarching perspective.

To understand the difference, consider a steel mill in South Korea that emits particulates, sulfur dioxide (SO₂), and carbon dioxide (CO₂) into the atmosphere. The particulates are likely to cause local visibility problems and inflict respiratory distress on those immediately downwind. The local government in the jurisdiction where the plant is located has an incentive to address these problems because its own citizens are the ones who pay the price for the harms that are being externalized by the mill. The government is well positioned to intervene to internalize these costs and to force some degree of pollution control to ensure that the mill’s local benefits exceed the local costs.

To the extent that the SO₂ emissions fall on downwind Korean citizens, the national government will have some incentive to address the harm and to optimize the level of pollution abatement required. But because

some of the emissions drift beyond the Korean border, the government will not have the full spectrum of environmental costs in mind when it makes its regulatory decisions about how much pollution control to require. Indeed, some of the sulfates travel hundreds of miles downwind and fall on citizens of Japan. And the CO₂ released blankets the planet, contributing to the global greenhouse effect. The public health and ecological costs inflicted by these transboundary harms are unlikely to be factored into the regulatory calculus of the jurisdiction in which the plant is located. When some of the cost bearers of pollution or beneficiaries of regulation lie beyond the jurisdiction of the regulating authority, there is no reason to believe that the harms will be internalized; thus, they become super externalities.

These cross-border harms are especially hard to handle in the international environmental policy context because agreements between jurisdictions to optimize pollution control spending from a comprehensive viewpoint are often not in place. Indeed, to the extent that South Korea would have to bear the full costs of any acid rain or greenhouse gas controls undertaken within their jurisdiction, they are unlikely to properly invest in SO₂ and CO₂ emissions controls (from which they will get limited benefits) absent collective action.

In sum, uninternalized externalities represent the most common and threatening type of market failure in the environmental context. Whether a particular pollution spillover is likely to be addressed by government intervention—and thus not cause a market failure—depends very much on whether the harm is within the scope of a single regulating jurisdiction. In the case of regular externalities, there are many reasons why the government may not optimally control the emissions, but at least it has an incentive to do so. When the emissions span several regulating jurisdictions or the entire world, there is an increasing likelihood that the government whose facility is causing the harm will choose not to act, because its own cost-benefit calculus does not justify intervention.

Psychological and Economic Spillovers

While spillovers of physical pollution are the paradigmatic externality, they are not the only type. When people suffer psychological distress as a result of another's choices about resource use or environmental protection, economists describe the welfare loss as a *psychological externality* (Cooper 1994).¹ For example, when a decision was made to dam the scenic Franklin River in the Australian state of Tasmania in the early 1980s, Australians across the country felt aggrieved and demanded that steps be taken to

1. These spillovers are also sometimes referred to as “nonuse” or “preservation” externalities (Stewart 1992). We might also call them “moral” or “values” spillovers because the external harm suffered often arises from a sense of what the harm bearer considers morally acceptable.

prevent the proposed construction of the hydroelectric project (Hall 1992).² Similarly, the deaths of endangered sea turtles at the hands of Thai and Filipino shrimp fisherman inflict real psychological welfare losses on American animal rights activists. Whether the externality is physical or psychological, the economic effect from a welfare perspective is the same.³ Whenever costs or benefits are not accounted for in the use or consumption decision, a misallocation of the resources in question will result.⁴

A final important category of spillovers is *economic* or *competitiveness externalities*. As traditional barriers to trade are reduced or removed and international competition becomes more intense, differences in various domestic policies, including environmental standards, become more significant in determining competitiveness and hence the pattern of trade and investment flows. By affecting competitiveness, environmental standards alter a country's terms of trade—a change that has associated effects on exchange rates, employment levels, and growth. These competitiveness pressures may induce “regulatory competition” among jurisdictions as governments work to make their location attractive to industry, both to lure investors who intend to construct new facilities and infrastructure and to prevent their present industrial base from relocating overseas to take advantage of lower environmental compliance costs. In some circumstances, competitiveness pressures will induce governments to regulate efficiently and the competition will thus be welfare enhancing (Tiebout 1956; Revesz 1992). But in other cases, competition among horizontally arrayed jurisdictions may precipitate a welfare-reducing “race toward the bottom” in which countries lower their environmental standards to suboptimal levels, fail to enforce existing rules, or refrain from raising their standards.⁵

2. After a legal action testing the validity of the federal government's decision to designate the area a protected World Heritage area failed, the project was ultimately abandoned (*Commonwealth of Australia v. The State of Tasmania* [1983] 46 A.L.R. 625).

3. While economists accept the welfare effects of psychological spillovers, they note that in practice, such externalities are hard to measure. In particular, they fear that without a way to measure such harms, those who are claiming psychological injury can easily exaggerate their losses. But this problem of “moral hazard” is a methodological problem, not a theoretical one.

4. Psychological externalities are gaining more prominence as people increasingly demand that their psychological welfare—reflected in their preferences for conservation—be factored into decisions with environmental effects. Psychological externalities also underscore the sharp cultural differences—particularly noticeable among APEC's diverse members—about which environmental harms are important and which provide a legitimate basis for regional cooperation when there is no physical spillover. We take up these issues in chapter 7.

5. Because the race-toward-the-bottom dynamic arises as a result of competition among jurisdictions, it may also be thought of as a government failure.

Problems of the Commons

Market failures often arise when goods are “public” or when resources are commonly owned (Cornes and Sandler 1986). Public goods, such as the atmosphere, are recognized by two defining criteria: consumption of the good by one person does not reduce the amount available to anyone else and no member of the public can be excluded from consumption of the good (Samuelson 1954; Hanley, Shogren, and White 1997). Commonly owned resources—resources that, arguably, are held by governments in trust for the public (Sax 1970, 1980)—such as national parks, lakes, and rivers, while not undepletable in the same way as public goods, are characterized by the absence of a clear allocation of ownership rights to individuals.

In the case of both public goods and commonly owned resources, the “tragedy of the commons” often leads to suboptimal environmental results (Hardin 1968; Cooper 1994; Vogler 1995). Because the costs of overusing such resources are borne collectively while the gains are enjoyed privately, individuals have an incentive to exploit shared resources to a greater extent than if they had to pay for their use. The lack of ownership also creates a disincentive for private actors to preserve the resource, since doing so may impose costs but not benefits on the actor, as others are free to continue their consuming or polluting. Thus each individual, acting rationally, will seek to “free ride” on the conservation efforts of others.

A number of regional environmental challenges reflect problems of the commons. For example, the depletion of the Pacific fisheries can be attributed to the fact that each fishing nation—indeed each fishing boat—has an incentive to land as many fish as possible, even though when every other country and every other boat does the same, stocks are depleted, and everyone’s capacity to make a living and enjoy the full benefit of the resource is diminished. The same dynamic exists with regard to resources of the global commons, such as the atmosphere. Since countries and their polluting entities do not pay for greenhouse gas emissions into the atmosphere, no one has an incentive to undertake expensive pollution control to mitigate possible climate change effects when any benefits will be dissipated in the face of others who are not exercising similar restraint.

Intertemporal Market Failures

A further set of allocative inefficiencies arise in the context of pollution or resource management problems that stretch across time (Brown Weiss 1993). Indeed, as mentioned earlier, many environmental harms only become apparent over time as certain critical thresholds are exceeded or as conditions become more crowded. Activities that seemed not to cause harm in the past may one day produce serious and apparently sudden

environmental damage. Because for some environmental problems the time delay may stretch out over decades or even centuries, the optimal allocation of rights to pollute, and the responsibility to clean up, over time may be hard to determine, particularly since future citizens are not present today to affect the decision process by casting their “market” votes. The prospect of intertemporal resource misallocations is heightened by the tendency of politicians to have a short-term focus. As discussed below, because politicians have what economists call high “discount rates,” they put little value on harms that will accrue in the future, beyond their own term of office.

Uncertainty and Information Problems

Each of the three market failures identified above—externalities, problems of the commons, and intertemporal misallocations of resources—is exacerbated by a lack of information about how much harm pollution is causing. Even if one were to establish, for example, a mechanism to internalize environmental externalities, there would remain a great deal of debate over just how much should be paid for the harm caused. The owners or guardians of environmental resources often do not know the benefits they receive from these resources, nor do polluters and resource users always know the extent of the harms caused by their activities. Not only is there difficulty in measuring the harms, but there is additional uncertainty created by honest dispute over the value of environmental amenities. How much is it worth to protect a scenic view? What price should be put on a human life saved?

The Central Role of Property Rights

In many respects, the environmental market failures discussed above—in particular, externalities and problems of the commons—can be attributed to a lack of clear property rights (Rose 1994; Hammer and Shetty 1995; Hanna, Folke, and Mäler 1996). In fact, if property rights over all environmental resources were clearly defined and enforced (Demsetz 1967), and if the transaction costs involved in buying them were low, then a free market for environmental resources would produce environmental-harm-internalizing, welfare-maximizing (Coase 1960), and fair outcomes.⁶ Under such conditions, disputes about pollution spillovers and resource ownership could be addressed through a framework of tort and contract law. The problem, however, is that property rights in the environmental domain are frequently undefined, poorly delineated, or difficult to vindicate.

6. “Fair” in this context refers only to the issue of respecting property rights. A broader fairness issue—whether the initial endowment of rights is equitable—remains open.

Undefined Property Rights

That property rights in public goods and community-held resources are frequently unspecified largely explains the problem of the commons identified above (Snape 1994). Defining rights in relation to waterways, the air, or other public goods is inherently difficult, given their diffuse and incorporeal nature. These resources cannot be easily “privatized,” because of the difficulty of excluding nonowners from use.⁷ Although some resources, including national parks and lakes, are not strictly “public,” they nevertheless have a long tradition of being held in common. It would be possible to define and allocate property rights in such resources—for example, by selling a national park to private property holders—but this “efficient” result is unlikely to be satisfactory to the citizens who believe that such resources are their patrimony. While the absence of well-defined rights with respect to shared resources is common to all APEC members, it is a particularly acute problem in China and Vietnam, where many facilities and much property are collectively owned.

Poorly Delineated Property Rights

Further confusion arises over the rights and responsibilities that attach to property ownership. Most private property systems are grounded on the owner’s right to use his or her property, the right to exclude others from the land, and the power to transfer title to others. Ownership, however, also implies a responsibility to respect the rights of neighboring citizens and other property owners. Courts and legislatures across the APEC region have attempted to resolve the tension between rights and responsibilities, but a number of issues remain unresolved or unclear. Does ownership mean that landholders have a right to engage in polluting activities? Or do neighbors have a right not to be polluted? What degree of harm triggers the right to insist on protection from spillovers? How should governments deal with situations in which harms are diffuse or unidentifiable? How do the responsibilities of property owners change as activities that were once thought to be harmless are recognized as causing damage? Who holds the rights with regard to behavior that has little effect in uncrowded circumstances, but that inflicts injuries when repeated by thousands or millions of people under more crowded conditions? In the absence of clear property rights, status quo behavior often goes unchallenged. This “default rule,” under which polluters pollute with impunity and resource users consume with abandon (Esty 1996b,

7. Despite the significant technical problems in defining and allocating property rights, some successful efforts have been made. For example, the 1990 Clean Air Act amendments effectively created “rights” to air in the United States, through the allocation of tradable emissions permits for SO₂.

582-85), benefits actors who have the weight of prior and continuous activity on their side, even when these activities cause harm to others.

In a number of APEC countries, further problems arise because of uncertainties surrounding traditional common property rights. For example, in countries like Indonesia, Malaysia, and the Philippines, the uncertain duration of community land tenure does not encourage long-term stewardship of property and resources but rather extraction of maximum short-term value from the land and the spilling of harms onto others (Brandon and Ramankutty 1993; Lynch and Talbott 1995). In other APEC countries, the existence of native title to land creates uncertainty vis-à-vis more recently established common law property rights. For example, in Australia, the recent determination by the High Court that native title and pastoral leases can coexist on the same land has fueled debate over property rights.⁸

Difficulty in Vindicating Property Rights

Even where the ownership of environmental resources is clear, the property rights at issue may not be enforceable or vindicable at law. Much of the problem can be explained by examining the relative stakes of polluters and pollutees—and determining who bears the costs of action or inaction. Polluters benefit when they can push wastes from a smokestack or effluent pipeline onto society at large. The “victim” of these emissions is a diffuse public, in which each individual in most cases suffers only minor harms—rarely enough to justify counteraction.

Because of the high cost of vindicating one’s property rights through legal action or the political process, most individuals simply accept their losses. In the face of diffuse harms caused by politically powerful and well-organized polluters who are unafraid of lengthy and expensive litigation, emissions often go unaddressed even when they clearly violate property norms and rights.

The difficulties involved in enforcing and vindicating rights are further complicated when the source of the harms is an actor in another jurisdiction. In these cases, which we have called super externalities, the absence of an overarching legal regime (Ellickson 1979) makes recovery even more difficult and gives further license to polluters and consumers of public resources.⁹ In sum, in the absence of appropriate mechanisms for the

8. See *Wik Peoples v. State of Queensland and others* (1996) 141 A.L.R. 129.

9. While there may be a norm of customary international law that proscribes transboundary environmental spillovers (Sands 1994a), international litigation based on customary law is unlikely to be successful (Bodansky 1995). Many of the remedies available through domestic legal channels, moreover, are unavailable in the international arena, including punitive damages, criminal fines, and injunctive relief. And as Stone (1993, 69-70) notes, there are “various jurisdictional and doctrinal problems: jurisdiction is noncompulsory, trials are

vindication of property rights, a Hobbesian state of nature prevails, leaving the strong free to seize common resources and to pollute without restraint. This outcome is neither economically efficient nor fair (Esty 1996b, 584).

Government Failures

Some resource issues and environmental harms could be addressed by establishing and strengthening mechanisms for the determination, adjudication, and enforcement of property rights. Many environmental harms are not, however, amenable to property rights solutions; in other cases, the obstacles to establishing an appropriate property rights regime appear insurmountable. This creates a need for governmental intervention to protect the environment (Stiglitz 1988; Baumol and Oates 1988).¹⁰ Governments can take various actions to align private and social costs, such as imposing pollution charges or taxes, subsidizing emissions contracts, or promulgating regulations to restrict socially harmful behavior (Pigou 1920; Hahn and Stavins 1992). Unfortunately, just as the market fails and delivers suboptimal environmental outcomes, so too government efforts to protect the environment frequently fall short (Hammer and Shetty 1995). Not only do governments fail in their environmental endeavors, but their policy choices in nonenvironmental areas often have unintended negative effects on pollution or resource management. The list of government failures does not end with policy failures—both environmental and nonenvironmental—but includes public choice problems and structural failures.

Policy Failures

There are a number of different ways in which poor policy choices may lead to bad environmental results or even create new environmental harms. First, suboptimal outcomes may result simply because environmental policy is extremely complex and because governments lack the capacity or resources to perform regulatory functions adequately. Second, policies in certain sectors of the economy—in particular, energy, agriculture, and transportation—may have important derivative impacts on the environment. And finally, a government's development policy may give inappropriate priority to growth at the expense of environmental goals.

complex and time-consuming, and recovery is, in all events, unlikely. Irreversible damage may proceed far faster than the legal system that is pursuing it.”

10. While this view is widely accepted, some commentators doubt that governments can ever design and implement regulatory policies that counteract market failure; they label this proposition the “nirvana fallacy” (Demsetz 1969; Menell 1992).

Incapacity and Regulatory Complexity

Many of the public health and ecological problems in APEC countries can be traced directly to environmental policy failures that derive from the inherent complexity of environmental policymaking and the regulatory incapacity of many nations. Environmental policymaking involves a large number of steps—problem identification, data collection, fate and transport analysis, epidemiological and ecological studies, risk assessment, policy design and alternatives development, cost-benefit analysis, implementation and enforcement, and evaluation—each of which requires a degree of technical knowledge and sophistication (Esty 1996b).

At each stage of the process, a lack of regulatory capacity—insufficient human resources, inadequate technical and scientific infrastructure, and insufficient financial resources for policy implementation, monitoring, or enforcement—can cause policymaking to go wrong (OECD 1996). With respect to water resources management, for example, the environmental agencies of China and most members of the Association of Southeast Asian Nations (ASEAN) lack skilled staff, suffer from a shortage of equipment to monitor discharges, and possess inadequate enforcement powers (UNESCAP 1995, 104). Insufficient monitoring capacity or human and financial resources also hampers urban air pollution control in many APEC countries (UNESCAP 1995, 153). Industrial pollution goes virtually unregulated in many developing APEC nations. In Thailand, for example, as late as 1989, a mere 700 staffers were available to monitor and enforce emissions and effluent standards at more than 50,000 industrial plants (Siwabut 1992). Forest management across APEC also suffers from regulatory incapacity (UNESCAP 1995, 44).

In a number of APEC's developing countries, furthermore, responsibility for environmental protection is fragmented among a number of government agencies and departments. Even when responsibility has been consolidated into one agency, "bureaucratic resistance on the part of the long-dominant economic ministries to any encroachment on their authority" (O'Connor 1994, 53) makes serious regulation difficult. This problem helps to explain why, as discussed below, a number of APEC's developing members appear to be placing too high a priority on economic development and growth, to the detriment of the environment.

Sectoral Policy Spillovers

In many cases environmental damage results from spillovers caused by policy choices made in other economic sectors. Whether these harms arise from government decisions that affect the quality of the environment directly—such as transportation planning choices that ignore air pollution effects—or indirectly as a result of the incentives placed before private-sector actors—such as price supports that induce farmers to grow on environmentally sensitive marginal lands—very real environmental

impacts can be traced to unsound government policymaking in the non-environmental realm. Poor energy, agriculture, and transportation policies are especially significant causes of environmental harm across APEC.

Some of the most serious policy failings arise from subsidies¹¹ that distort price signals and lead to inefficient resource use and pollution (World Bank 1997; Panayotou 1993; Munasinghe and Cruz 1995; Earth Council 1997; de Moor 1997). Not only are many subsidies environmentally harmful, but they also cause economic welfare loss and disrupt efforts to promote freer trade. Although the extent of the problem is, in many cases, well documented and the solution (elimination of the subsidy) well known, entrenched political forces make policy rationalization difficult.

Energy production is subsidized in many ways, including through direct government grants, tax breaks to producers or distributors, rebates to consumers, and restrictions on competing energy sources and imported fuels. Whatever form subsidies take, the result is that prices paid by consumers do not reflect the true economic costs of energy consumption, never mind the full social (including environmental) costs of production and consumption. The outcome is overconsumption of energy, persistent inefficiencies in the use of energy, blunted incentives for conservation, and unnecessarily high levels of pollution.

Subsidies for coal in Australia, Canada, China, Japan, and the United States cause more of this fuel to be burned than would otherwise be the case. Such preferential treatment leads to higher levels of emissions of greenhouse gases, sulfur dioxide, and particulates, as well as to landscape and habitat destruction from coal mining. Subsidies for diesel fuel and gasoline in many APEC countries result in worsening carbon dioxide emissions, carbon monoxide pollution, the release of lead, and nitrous oxide emissions.

Agricultural subsidies for logging, fishing, crop and livestock production, and agricultural inputs also wreak havoc on the environment in Asia (World Bank 1997; Roodman 1997). Below-cost timber sales in Australia, Canada, Indonesia, Malaysia, and the United States accelerate deforestation and cause siltation of streams, soil erosion, and increased flooding. In the multibillion-dollar fishing industry, massive subsidies in some countries to fishers for fuel, equipment, and income support create sig-

11. Defining *subsidies* has proved to be notoriously difficult. The broadest definition captures both explicit and implicit subsidies and includes direct government payments to producers or consumers (cash subsidies); government guarantees, interest subsidies, or soft loans (credit subsidies); reductions of tax liabilities (tax subsidies); government equity participation (equity subsidies); government provision of goods and services at below-market prices (in-kind subsidies); government purchases of goods and services at above-market prices (procurement subsidies); and implicit payments through government regulatory activities that alter market access or prices (regulatory subsidies) (Clements, Hugounenq, and Schwartz 1995).

nificant overcapacity, promote overfishing, and threaten the long-run viability of coastal communities and oceanic ecosystems (Stone 1997; Associated Press, 2 June 1997). Below-market-cost grazing fees for livestock on public lands in Australia, Canada, and the United States encourage overgrazing and land degradation.

Many APEC countries also subsidize public irrigation projects and drinking water systems, encouraging overconsumption of water and discouraging conservation. Falling water tables, deterioration of water quality, and, in some places, salinization of water supplies result. Subsidies for pesticides and fertilizers lead to chemical-intensive agriculture that causes groundwater contamination, public health problems for farmworkers, chemical exposure, food safety concerns, the emergence of pesticide-resistant insects, degradation of water quality, and deterioration of ecosystems.

The transportation sector is another policy realm with significant environmental policy spillovers (E. Frankel 1997). Most important, private vehicular use is subsidized by publicly funded roads and automotive fuel priced well below the true environmental costs. More cars driving more miles means more smog, particulates, oxides of nitrogen (NO_x), and greenhouse gas emissions, as well as damage to habitats arising from road construction.

In cataloging the harms that can be attributed to subsidies, almost all of the major environmental problems currently facing APEC's members appear. The implication is clear: before launching a move to adopt the much-vaunted "polluter pays" principle, "pay-the-polluter" programs need to be stopped.

Misguided Development Choices

One of the primary contributors to environmental injury in developing countries is the choice of development strategies that give short shrift to environmental concerns (Bello and Bullard 1997). Indeed, many APEC nations seem to have opted for a "pollute-now-pay-later" approach to development (O'Connor 1994), based on the belief that a period of "darkness" and heavy pollution is the necessary price for industrial development and economic modernization. Those pursuing this course often cite Japan's development pattern as their model.¹² After World War II, the Japanese government placed overriding priority on industrialization and export promotion (World Bank 1993), with the effect that by the late 1960s, pollution was so severe and widespread that Japan gained a reputation as a "wasteland of pollution" (Fujisaki 1995).¹³

12. South Korea and Taiwan, in particular, appear to have followed the Japanese model (Bello 1993).

13. Of course, the model of Eastern Europe, where the legacy of toxic wastes now represents a significant drag on future economic prosperity, can also be described as conforming to this "developmentalist" path (Esty 1997a).

A development strategy that always places growth ahead of environmental protection is, however, economically irrational. First, it falsely assumes that there are no environmental investments worth making in the early stages of development. On the contrary, at every stage of economic development there are environmental investments whose benefits vastly exceed their costs (Esty 1997a). In fact, it is the poorest countries that can least afford to overlook low-cost, high-return pollution control opportunities. The World Bank found, for example, that an investment of just \$20 million to reduce water pollution from the top 100 dischargers in Manila would result in labor productivity improvements and reduced risk to fisheries valued at \$150 million a year (cited in ADB 1997, 239). Thus, while some pollution is likely to accompany industrial growth and a target of zero emissions would be unwise at any level of development, every country has the opportunity to put itself on a development trajectory that is sustainable and that minimizes the environmental effects of economic growth.

Second, the pollute-now-pay-later approach does not take into account that some environmental harms either are irreversible, such as biodiversity loss, or will be more expensive to clean up later, such as disposal of heavy metals and bioaccumulative toxins in waterways. Finally, because many capital investments are expected to contribute to economic activity for long periods of time, it is often expensive to change direction once a particular policy course has been set. China's commitment to power generation through hundreds of small-scale, highly polluting, coal-burning power plants may meet short-term economic needs. But this policy is likely to be demonstrably suboptimal for a richer China 20 years from now, when these highly polluting power plants are only halfway through their life cycles. Indeed, the net present value of expenditures to retrofit existing pollutive plants and factories will, in many cases, be substantially more expensive than it would have been to install the appropriate environmental technologies in the first place.

Public Choice Problems

In discussing efforts to formulate policy, we have assumed that governments know and act on the desires of their citizenry for environmental protection. But it is clear that in many cases, APEC's member governments do not faithfully and accurately reflect the environmental preferences of their citizens. Failures to follow public preferences fall under the rubric of "public choice" problems.

Unrepresentative Governments

In a number of APEC countries, the translation of public preferences into regulatory outcomes is not a first-order goal of the political leaders.

Particularly in China, and to a lesser extent in Indonesia and Malaysia, the wishes of the citizenry appear to have taken a back seat to the attainment of other objectives, primarily rapid economic development and perpetuation of the ruling regime. As a result, human health and the environment have suffered.

Where democratic traditions are absent or weak, not only may governments fail to accurately reflect citizen preferences, but those preferences may themselves be distorted by a lack of accurate environmental information. In particular, citizens living under such regimes may have low expectations about environmental and health standards simply because of a paucity of information about harms, as well as the absence of vigorous public debate about whether and how harms can and should be addressed.¹⁴ Thus, there exists a strong correlation between sound environmental policies and the presence of a free press and a right to free speech, as well as the existence of environmental groups and other non-governmental organizations (NGOs) (Andersson, Folke, and Nyström 1995).¹⁵

Interest Group Manipulation

Even in APEC countries that have representative governments, public choice problems persist. In fact, decisions concerning environmental protection and resource use are particularly susceptible to special interest manipulation because the costs of pollution control are more concentrated and tangible than the benefits. This asymmetry in the concentration of regulatory costs and benefits means that polluters have a systematic incentive to intervene in the political process (Ackerman 1985) and are often easily organized to do so. Mobilizing the diffuse public for large-scale political activity, in contrast, presents a much greater challenge (Buchanan and Tullock 1962; Olson 1965; Noll 1989).

Interest group influence takes many forms, including lobbying, campaign contributions, and publicity campaigns. In other cases, the special interest influence can be attributed to payoffs, outright bribery, or other special relationships between political and business leaders.¹⁶

Short-Run Focus

Many environmental problems, as noted above, are marked by long time lags before harms emerge. The resulting tendency to focus on the benefits

14. O. Young and Demko (1996) highlight the importance of public education to make people aware of environmental issues.

15. While the presence of democratic traditions is generally an indicator of the degree of representativeness of government, it does not always predict environmental performance. Singapore, for example, has a system of government that many consider undemocratic, in which there is only nominal opposition to the ruling party. Nevertheless, Singapore has done a very good job of dealing with many of its most pressing environmental problems.

16. Parnwell and Bryant (1996) attribute these problems to “crony capitalism.”

of economic activities (jobs, new factories, etc.) and to disregard not-yet-apparent issues is exacerbated by another public choice problem—the disconnect between the time horizons, or “discount rates,” of politicians and those of the general public (Viscusi 1995). Specifically, politicians, concerned about the next election (Downs 1957), often give little weight to costs or benefits that arise in the future (Esty 1996b, 599). This problem systematically biases decision making against addressing harms that will only emerge in full force some years hence.

Structural Failures

While every APEC government succumbs to some extent to policy and public choice failures, they all try to address environmental issues that affect their citizens. But when environmental harms fall, in part, beyond a nation’s borders—creating super externalities—governments have a reduced incentive to take the problem seriously, as well as a reduced capacity to respond appropriately. Fundamentally, there exists a structural mismatch between the scale of their jurisdiction and the geographic scope of the harm.

Nations have little incentive to take transboundary harms seriously because they are primarily concerned with the welfare of their own citizens, not welfare generally. This focus on national rather than global welfare leads governments to ignore positive or negative environmental effects on others.¹⁷ Environmental policies turn on cost-benefit analyses that disregard the preferences of those beyond the government’s jurisdiction, no matter that in some cases, the “omitted voices” may have a big stake in the policy outcome (Graham and Wiener 1995).¹⁸ Thus, while US coal-fired power plants and industrial facilities cause acid rain in Canada, US regulators have no incentive to consider the effects on Canadian cities and citizens. Disregard for effects beyond one’s own borders skews the policy calculus, yielding a more than optimal level of industrial activity. Benefits that accrue outside the jurisdiction where the activity is taking

17. In the trade arena, the world community has come to realize that a broad focus on global welfare is preferable to a narrow focus on national welfare. The successful reconfiguration of international trade from a zero-sum “beggar-thy-neighbor” game into one in which the aim is to increase global welfare is, in fact, one of the major successes of post-World War II international relations (Lawrence, Bressand, and Ito 1996; Jackson 1969). The trade regime may thus provide a useful model for addressing super externalities.

18. The problem of omitted voices occurs not only across space but also across time. To the extent that future generations are not able to have their views heard and counted, their interests, which may be deeply affected by current policy decisions, will receive insufficient attention. And while some analysts suggest that the interest of people in protecting their children will prevent a bias in decision making toward the present, a considerable body of work (Diamond 1977; Brandts and de Bartolome 1988; Brown Weiss 1989) suggests that bequest motives are insufficient to protect the interests of future citizens.

place similarly will be ignored. Unable to capture the biodiversity and carbon sequestration benefits of its forests, Malaysia's decisions about how much timber to cut reflect only the national benefit of lumber sales while disregarding the nonmonetizable value of standing trees. The level of tree cutting is set at the national rather than the worldwide optimum.

In addition to having little inclination to respond to their own transboundary transgressions, countries are limited in their ability to respond to harms inflicted on them that emanate from outside their borders, since the principle of national sovereignty limits the regulatory competence of countries to activities arising solely within their geographical bounds. Territorial sovereignty, often exalted as the cornerstone of international relations, fails as a governing principle in a world of ecological interdependence (Pallemaerts 1994; Esty 1997c). Canadian regulators are unable to address harms from US coal power plants, though they know that the acid rain originating in the United States causes billions of dollars' worth of damage in Canada. The only way that progress has been made is through collective action, namely, the conclusion of an Acid Rain Treaty between the United States and Canada. Similar acid rain problems exist between China and Japan. Japan has been forced to address the problem by paying for the installation of scrubbers on the offending Chinese power plants. Without clear property rules and an overarching legal regime to enforce them, China (the polluter) seizes the property rights. Japan (the victim) is reduced to paying the Chinese not to pollute.

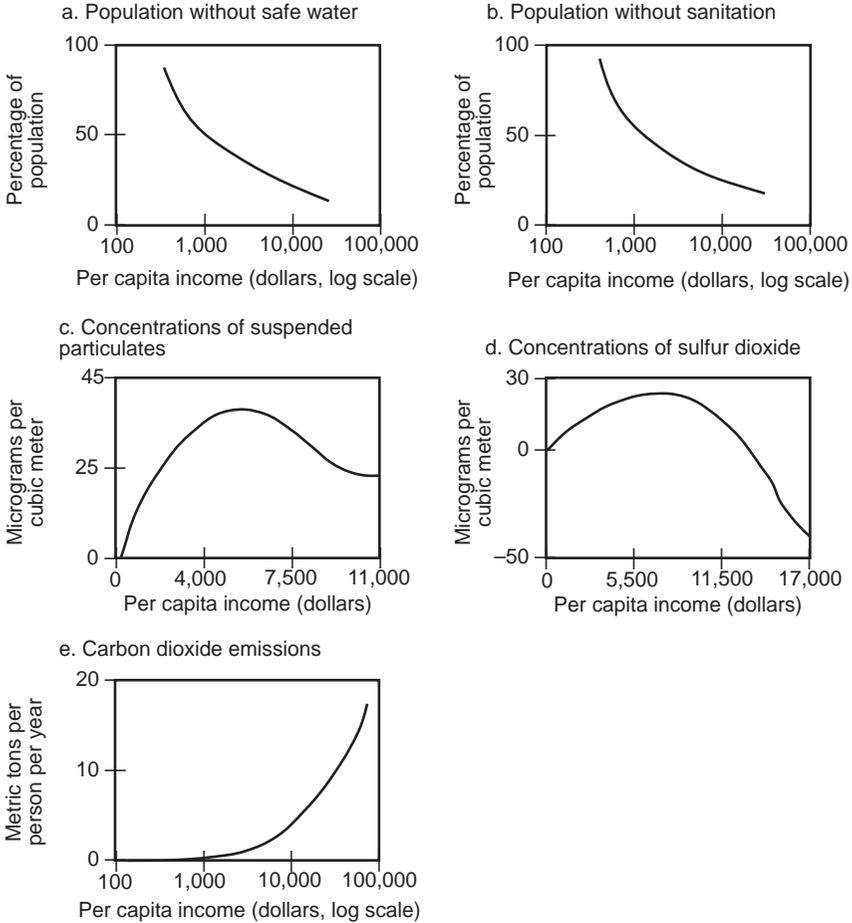
The structural mismatch between the scale of the jurisdiction and the geographic scope of the harm exists whenever damages (or benefits) spill over from one country to another, from a country to a commons, from a commons to a country, or from one user of a commons to another. In each case the dynamic is the same: there is a systematic disincentive for the regulating authority to take into account costs and benefits that either are borne by or accrue to citizens of other countries or citizens outside their jurisdiction.

Relationship Between Income, Scope of the Harm, and Abatement

Structural mismatches help to explain why, although localized pollution harms improve as countries become wealthier, regional and global harms tend not to. Specifically, it appears that as incomes rise, environmental problems follow one of three distinct patterns of abatement, which turn primarily on the geographic scale of the harm and, to a lesser extent, on the visibility, severity, and temporal immediacy of the injury (figure 4.1).

In the first category, environmental conditions improve monotonically as incomes grow (figures 4.1a and b). The downward sloping harm-income curve—evident, for example, in improved access to clean water and sanitation services (Shafik and Bandyopadhyay 1992) and in falling concentrations of lead and cadmium in waterways (Grossman 1995)—

Figure 4.1 Relationship between income and abatement of harms



Sources: Shafik and Bandyopadhyay 1992; Grossman and Krueger 1993.

occurs when problems are plainly apparent, serious, and highly localized in the public health harms and costs they impose. Governments recognize the benefits to their constituents of action. They understand that even if the costs of providing improved environmental infrastructure are significant, the gains to their citizens may be even bigger (and quickly appreciated by the voting public). This particular pattern—where the costs and benefits of action fall within the territory of the regulating authority—yields a high probability of action by local or national governments without outside intervention. Environmental investments are likely to be made commensurate with the financial and technical resources available. Policy intervention will probably begin even at the earliest stages of develop-

ment, because some investments will immediately deliver benefits that exceed their costs.

A second set of environmental problems does not improve monotonically with income but instead follows an inverted-U relationship between income and environmental conditions (figures 4.1c and d). In these cases, environmental quality deteriorates in the early stages of economic growth, but improves at higher income levels. A number of studies have found that basic air and water pollution often fit this pattern. A number of studies, for example, have found that particulates and sulfur dioxide levels worsen in the early stages of development, peak at GDP per capita levels (PPP-adjusted) of between \$5,000 and \$8,000, and decline thereafter (Shafik and Bandyopadhyay 1992; Grossman and Krueger 1993, 1995; Grossman 1995; Selden and Song 1994; Islam 1996). These studies have reached similar conclusions with regard to water pollutants, including fecal coliform and arsenic.

The logic behind this environmental “Kuznets curve” is quite straightforward (Kuznets 1955).¹⁹ In the early stages of industrialization, countries are poor; deciding they cannot afford much environmental protection, they make tradeoffs between pollution and growth that favor economic expansion. As a country becomes richer, however, its capacity for investment in pollution prevention and control becomes greater. Not only are resources available for these investments but a wealthier public is likely to demand them more insistently, strengthening the environmental regime and improving performance (Radetzki 1992; Crowley and Findlay 1996). Moreover, highly polluting industries are likely to emerge in the early stages of development, with cleaner production activities coming on line over time.

The kinds of problems that follow the inverted-U harm-income relationship are likely to be somewhat less localized in their impacts—the harms may be spread over a wider area and may not be felt immediately. While this pattern of more diffuse costs generates a less clear cost-benefit logic to national investments in pollution prevention or control, the fact that the harms accrue to the country’s own citizens ultimately provides a sufficient basis for acting.

Based on their empirically derived inverted U-curves, Grossman and Krueger (1995, 370) conclude that there is “no evidence that economic growth does unavoidable harm to the natural habitat.” Yet even Grossman (1995, 43) recognizes that this statement is too sweeping, because some types of pollution continue to rise “with national output throughout the entire range of income levels.” Thus, the third income-abatement pattern (see figure 4.1e)—an ever-rising level of harm—reflects a set of environ-

19. Kuznets showed that an inverted-U relationship existed between income inequality and level of development.

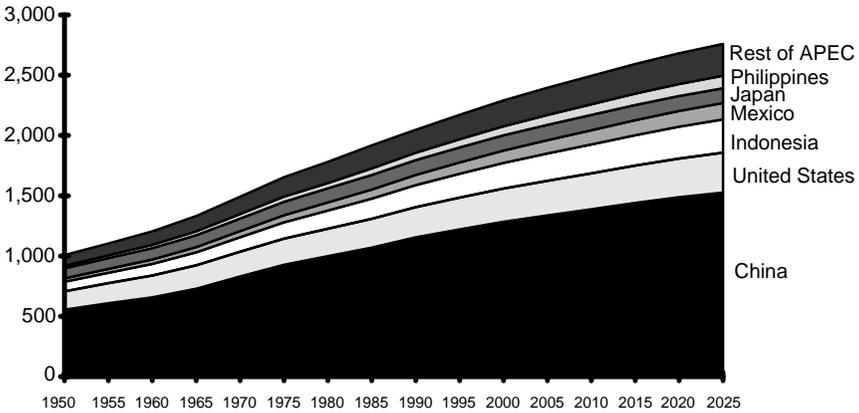
mental problems that do not appear to lessen with wealth. This pattern emerges when a harm is largely externalized—spatially or temporally—beyond the jurisdiction responsible for deciding on the level of abatement and there is thus a structural mismatch between the scope of the harm and that of the regulating authority. Emissions of carbon dioxide, for example, continue to rise as higher levels of GDP per capita are achieved, albeit at a decreasing rate (Shafik and Bandyopadhyay 1992; Selden and Song 1994). The fact that CO₂ emissions rise irrespective of income can be explained by the distribution of cost bearers and beneficiaries—in particular, the diffusion of the harms caused and the concentration of the burdens to be borne by investments in abatement.

Quite clearly, when a large portion of the harm from an environmental problem drifts across borders, the regulatory cost-benefit calculus will be skewed. Specifically, the benefits of pollution prevention or control (much of which accrue to those beyond the jurisdiction's borders) will never justify the costs (which will have to be fully borne by those within the jurisdiction). Thus, in dealing with the carbon dioxide emissions that blanket the globe and that may contribute to climate change at some point in the future, no jurisdiction has much of an incentive to control its emissions unilaterally. As a consequence, rational action on the part of each actor will yield demonstrably suboptimal results overall. With regard to transboundary pollution harms, no country chooses to undertake the appropriate environmental actions, preferring instead to free ride on the actions of others, producing, in game theory terms, a “lose-lose” Nash equilibrium.

Once the three types of income-abatement relationships identified above are understood, several important policy implications emerge. First, those environmental harms with the most immediate and serious impacts on local communities will likely be attended to as soon as incomes rise and as long as governments are reasonably diligent and capable in their environmental activities.

Second, there are a range of other harms that are also likely to respond to higher incomes, although only after a period of worsening degradation during the earlier stages of development. These are not as clearly and closely connected to local habitats or health, and are therefore not the most pressing policy priorities. The shape of the curve—and thus the magnitude and duration of the harm—can, however, be affected by policy-makers. In particular, with an increased awareness of environmental harms, the development of environmental technologies, and the opportunity to learn from their richer counterparts, APEC's low-income countries should be able to make the inverted-U shape turn down earlier, abating harms at lower income levels. The inverted-U curve might also be made flatter, reflecting a lesser degree of accrued harm, if countries were to respond appropriately to the various sources of environmental harms.

Figure 4.2 APEC population, 1950-2025 (millions)



Note: Figures for 2000-2025 are estimates.

Source: UN 1994.

Such policies would require, among other things, properly defining property rights, internalizing externalities, reassessing development-first practices, removing subsidies, strengthening environmental policymaking capacity, and informing the public about the harms they face.

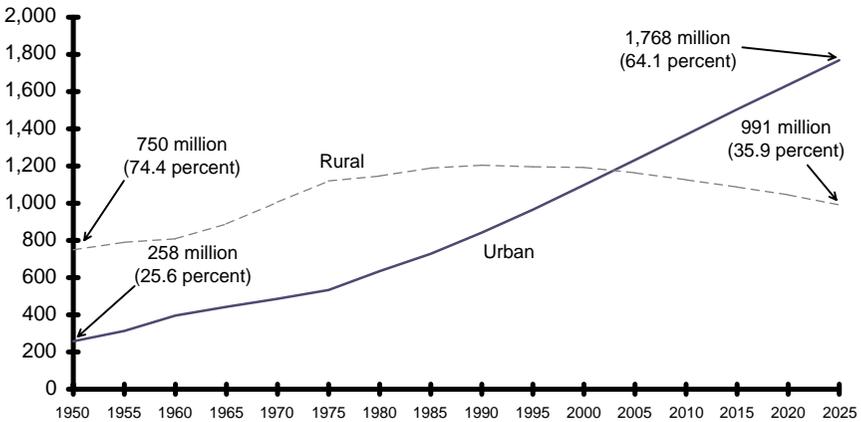
Third, where environmental problems do not yield to increases in income—as is the case for many transboundary harms—only collective action will overcome the incentive for free riding and ensure that all those playing the “game” can escape the lose-lose outcome (Carraro and Siniscalco 1995). As chapter 6 argues, there exists an important need for international structures—like APEC—to facilitate the requisite policy coordination. This conclusion flows directly from standard economic theory and garners support from even the most devoted free traders in the economic literature (Bhagwati 1993a; Cooper 1994; Nordhaus 1994).

Demographic and Economic Magnifiers

A number of studies have identified population pressures, urbanization, poverty, and industrialization as critical underlying causes of environmental degradation (Brandon and Ramankutty 1993, 28-29). These economic and demographic factors are not, however, independent causes of environmental harms but rather magnifiers of market and policy shortcomings (Hempel 1996).

In 1995, APEC’s population was about 2.2 billion people—38 percent of the global total. China alone represented 1.2 billion people. By 2025, according to United Nations estimates, APEC’s population is expected to be 2.8 billion (figure 4.2). At that time, six APEC members—China, the

Figure 4.3 Urban and rural population growth in APEC, 1950-2025 (millions)



Note: Figures for 2000-2025 are estimates.

Source: UN 1994.

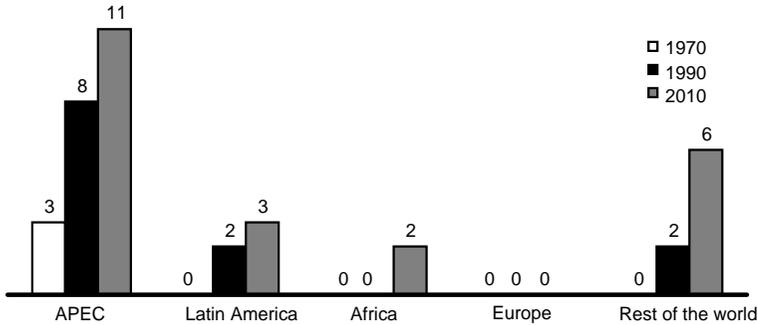
United States, Indonesia, Mexico, Japan, and the Philippines—will have populations exceeding 100 million people. Rising populations inevitably cause resources to be spread thinner and can result in serious environmental stress.

By 2025, much of APEC’s population will have moved from rural to urban areas. As figure 4.3 shows, between 1995 and 2025, demographers expect APEC’s urban population to almost double from 965 million to over 1.75 billion. China’s urban population is forecast to increase by 125 percent to over 830 million. UN projections suggest that the proportion of APEC’s Asian population living in urban centers will increase from 37.2 percent today to 59.1 percent. Rapid urbanization will create megacities in many APEC countries (figure 4.4). By 2010, APEC will be home to 11 urban centers with populations greater than 10 million. The rural population will fall from a peak in 1995 of 1.2 billion to about 990 million.

Although poverty levels continue to fall across the Asia Pacific region, 150 million APEC citizens are still likely to be living in dire poverty in 2010. As we noted earlier, the pressures of day-to-day life under conditions of severe deprivation often translate into short-term thinking and environmentally harmful actions.

Industrialization also heightens the environmental policy challenge. As countries develop, they experience an evolution in their industrial structure, with a corresponding change in the composition of the ecological and public health problems they face. In early stages of development—when countries are reliant on resource-based industries and light industrial activity—countries find themselves preoccupied with land degrada-

Figure 4.4 Global distribution of megacities, 1970-2010



Note: Figures for 2010 are estimates.

Source: UN 1994.

tion, water scarcity, and water pollution. Later, as they move into heavier industries—such as metals processing, petrochemicals, cement, and glass—they face issues relating to air pollution, toxic chemicals, and heavy metals. Finally, as production shifts to industries with lower pollution intensity—electronics, advanced machinery, and services—nations are confronted with a new set of challenges, particularly problems arising from consumption of polluting goods such as cars.

These demographic and economic factors—population, urbanization, poverty, and industrialization—often interact to further magnify environmental stresses. Smoke from home cooking using biomass fuels, for example, may be of little consequence in uncrowded rural villages. But in densely populated urban areas, the same behavior may cause serious air pollution. Similarly, problems in urban centers arising from exposed sewage and poor water sanitation facilities will increase as urban populations multiply, if governments fail to develop sewage and sanitation infrastructure at a rate that keeps pace with this demographic change. Experience in many APEC countries demonstrates that where increasing population is coupled with widespread poverty, increased deforestation and unsustainable land management can be expected as citizens are forced to make environmentally damaging choices to ensure their own short-term survival.

Moreover, because many of APEC's economies are industrializing very rapidly, they are faced with new sets of environmental challenges before they have been able to attend to existing problems. Both Thailand and Indonesia, for example, have just entered the most pollution-intensive phase of their development with major investments in petrochemicals and metals processing. Yet they still face serious pollution problems from past resource-intensive industries, such as timber and mining. And at the same time, both countries are also experiencing rapid growth in

“advanced” industries, such as electronics and transport equipment, that create significant hazardous waste and toxic chemical problems. The telescoping of the development process creates multiple overlapping environmental demands (Beckerman 1992) and compounds the policy challenge of achieving sustainability.

While population pressures, urbanization, poverty, and industrialization can increase the scale of environmental harms, the real culprits remain market and regulatory failures. Indeed, the experience of the northeastern United States, Japan, and Singapore—all of which have undergone industrialization, and all of which have high population densities and a significant degree of urbanization but comparatively modest environmental problems—demonstrates that good government policies that address underlying market failures can alleviate environmental harms.

Conclusion

While significant efforts have been made to understand the drivers of Asia Pacific economic growth, much less attention has been devoted to analyzing the sources of the region’s environmental harms. But progress in addressing the pollution and resource issues that plague APEC members cannot be achieved without an understanding of these causes.

- Most environmental harms can be attributed to one of four *market failures*: externalities, problems of the commons, intertemporal trade-offs, and imperfect information.
- Many of the environmental harms caused by market failures—in particular, externalities and problems of the commons—can be overcome by appropriately allocating, defining, and vindicating *property rights* and, where necessary, strengthening the rule of law.
- When property rights solutions are not readily available or are impractical, government intervention to mitigate market failures will be required. Governments, however, frequently succumb to various types of *government failures*:
 - *Policy failures*: In regulating to protect the environment, governments frequently regulate suboptimally. Moreover, government policies in nonenvironmental areas often have unintended environmental consequences, creating or exacerbating environmental harms.
 - *Incapacity and regulatory complexity*. Since many harms across APEC persist because of regulatory incapacity, improving environmental policymaking and program implementation should be a goal for national governments and supranational bodies. Regulatory complexity can be addressed by APEC-wide exchange of data, science,

risk analysis, cost-benefit studies, policy options, and program evaluations.

- *Sectoral policy spillovers.* Eliminating agricultural and energy subsidies and reforming policies that distort transportation incentives offer the promise of significant environmental and economic gains.
- *Misguided development choices.* APEC's members need to revise their development strategies to reflect the welfare effects of environmental harms. By strengthening their project appraisal capabilities so that the economic value of environmental assets is appropriately measured, APEC's developing countries will find that many environmental investments are both economically and environmentally attractive.
- *Public choice problems:* Better environmental policy and improved environmental outcomes in APEC countries require diligent efforts to ensure that policy choices reflect and represent informed public preferences. This entails open debate in APEC countries about existing circumstances and policy alternatives, a process enhanced by a free press, an active NGO community, and an informed public.
- *Structural failures:* Collective action is required to respond to the structural mismatches that undermine national incentives to respond to regional and global harms. APEC can play a role in facilitating the requisite cross-jurisdictional cooperation.

Unless pollution spillovers are externalized, commons problems are addressed, and government policies that distort resource prices are reformed, APEC's economic goals will be hard to achieve. Allocative inefficiency will be widespread and the integrity of the emerging regional economic system will be compromised. The market and governmental failures enumerated above must be addressed not only to abate environmental degradation but to improve the efficiency of markets across the Asia Pacific, an objective that underlies APEC's efforts to liberalize trade and investment.