

National Natural Resource Policies and World Markets The Role of Science in Policy Planning

Michal C. Moore
The University of Calgary
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Canadian Academy of Engineering and Technical Societies

Abstract

North America is a broad geographic entity basically comprised of three sovereign nations and territories, with diverse cultural and economic groupings. It is also host to a diverse mix of natural resources ranging from minerals, fisheries, forest products and water supplies. Fundamentally, these resources are mal-distributed on an inter-country level as well as within national boundaries. In a social and political context, they are subject to a wide range of regulatory and policy-level controls, which can influence wide and inconsistent price fluctuation and availability.

Natural resources are the heritage capital stock of a nation. In that each country is faced with an functional responsibility to balance resource management in a manner that maximizes long term reserves, while making sufficient quantities available for consumption and trade in current markets.

Each country develops its own natural resources as a function of internal supplies, capital stock for acquisition and processing and overall demand for various commodities. In this process, each nation is guided not only by current and projected demand, but also an historical and cultural framework for using heritage resources. Recent evidence underlines the importance of preservation and conservation practices in assuring continued access to natural resources, minimizing externalities and maintaining strong and resilient environmental quality. Examples such as NAFTA demonstrate that each country sees the value of cooperative trading rules and overall environmental management.

I argue that this system can expect limited long term success when confronted with uneven resource distribution and inconsistent rules and standards. A more cohesive and unified approach may be achieved by relying on a few key environmental and regulatory enforcement standards, ignoring the inherent market power represented by the uneven distribution and processing systems in each country.

Introduction

This paper explores the policy treatment of North American natural resources policies in the context of world markets. The range of natural resources found throughout North America is large, reflecting not only geographic reach, but widely disparate policies regarding preservation, conservation and extraction policies as well as geopolitical boundaries.

Each country trades with and depends on natural resources available across neighboring borders¹. A working agreement to limit trade restrictions was adopted in 1994² with the intention of diminishing trade barriers within North American countries; it has been challenged by practices for extraction and processing of primary commodities since inception, underlining the differences in policies among neighboring and very similar cultures.

Not only does each nation apply different standards and rules for the *use* of natural resources, but the volumes of resources involved, both in actively used as well as known reserves, have wide and persistent impacts on other markets and countries world wide.

I suggest an alternative planning policy for balancing the need for using while conserving natural resources. I observe that the disparate nature of natural resources and the capital needed to exploit them without long term environmental damage, argues for a new pan-continental treatment of natural resources which should transcend national boundaries in a manner similar to cross border control of air pollutants.

Achieving a balance of exploitation versus conservation or preservation of natural resources is arguably a function of national culture, indigenous supplies, capacity

¹ For instance, the majority of US oil and gas needs are met with imports from Canada.

² An agreement that created an *essentially* free trade zone among Mexico, Canada, and the United States, in hopes of encouraging economic growth in all three nations

to process and ship commodities and the overall demand for the resource (reflected in the world commodity price for it).

Most natural resource products are generally fungible in global markets. Demand thus reflects surplus and shortfall well outside domestic or even neighboring markets, suggesting and highlighting the interactive nature of bids for those products. Expansion to new sources of supply is both physically and geopolitically constrained, highlighting the end of an era of unconstrained access to resources³. The result is a predictable conflict between the need to preserve heritage capital stock while maintaining short term revenue flows and in turn supporting the public fisc which depends on continuous sales. One outcome is the potential overexploitation of the available stock.

Thus, a key policy question is how to harmonize the value and usefulness of indigenous natural resources while maintaining investment and support of the national economy.

In North America, a preferred solution to this dilemma is to use trade agreements which seek to maximize revenues overall by trying to agree on quotas, tariff limitations or volumes that can be sustained in the interest of maintaining consistent or growing economic activity in this area. The reality is that although similar, each country operates with distinctly different expectations based on national culture, available capital and processing capacity, and different stocks of indigenous supplies. Any set of agreements dealing with this range of differences will encounter difficulties in negotiating objectives (i.e. trade or labour protection versus environmental quality or import and export limits) not to mention the fact that the agreed upon objectives must be revisited rather frequently.

³ A well known observation on this effect was popularized by the economist Kenneth Boulding who dubbed it the Cowboy Economy, where growth and use of resources was generally *extensive* in nature. See Boulding, K. *The Economics of the Coming Spaceship Earth, Resources for the Future*, 1966

Since the value of these heritage resources is typically acknowledged by policy makers to be greater than the market or trade values for raw resources, it is worthwhile to establish a more objective view of how that value is calculated or represented.

Background

Every country, region, meta-region or continent exists as a geographic and socio-politically defined space. Within this space we include some known as well as undiscovered or unknown supply of natural resources. Broadly, these may be referred to as stock (resources whose known or expected quantity is fixed and not renewed in anthropocentric time scales) or flow resources (generally renewable resources including non-conate water, forests, fisheries and energy sources such as wind, geothermal or solar). As a consequence, in maximizing the potential value of heritage natural resources, each nation or political entity is faced with making a determination of the real and relative scarcity of indigenous resources over time; these in turn determine import or export practices reflecting conditions of scarcity and market demand.

If each nation, region or continent operated in near total autonomy (without the option of imports and exports to buffer demand) then rules of scarcity would prevail, forcing economy in operations, increasing prices over time for stock resources, encouraging substitution and redistributing capital resources.

Basic rules apply here and we can expect that scarcity falls in four broad categories:

- a. increasing resource scarcity forces a nation's labor or capital to be diverted from nonextractive to extractive activities

- b. scarcity will increase the value of extractive output to total output in current prices
- c. resources will be economized as they become more scarce and costly
- d. quality may decline over time

With access to global trade and exchange, this situation can be averted or deferred, since many core or basic resources are perfectly fungible as global commodities subject to trade tariffs, transportation costs and in recent times environmental quality standards⁴.

In general, natural resources have a current value equal to the present value of their expected future land rents, what economists refer to as the practice of discounting future values in order to determine their present worth. It is worth noting that the use of discounting for indigenous resources does not always imply use and depletion, for instance open space lands are often set aside and valued as if the alternative, development, were undertaken on them, in order to establish some relative value for acquisition or other use foregone. In this case, as always with any resource, questions will arise in the determination of the appropriate level of land rent involved and the choice of an appropriate discount rate.

Nonetheless, we can generalize the nature of natural resources of any type as commodities, available or produced where economic value can be assigned and where distribution and access are maldistributed and where use is inconsistently allowed when viewed from an external perspective.

⁴ A notable example includes the AB 32 carbon content fuel standards enacted in California in 2007, which regulates the characteristics of fuels imported to the State as well as emissions and fuel economy levels.

Natural Resources and National Policies

Natural resources are the basis of any nation's natural capital, and as a consequence, wealth. Either a country or nation is possessed of sufficient natural capital to support its population and sustain growth, or it must import the requisite resources.

Hawkin et al summarize this nicely, pointing out that an "economy needs four types of capital to function properly:

- human capital, in the form of labor and intelligence, culture and organization
- financial capital, consisting of cash, investments and monetary instruments
- manufactured capital, including infrastructure, machines, tools and factories
- natural capital made up of resources, living systems and ecosystem services"⁵

Thus, each country is faced with a set of active management issues. How they manage their indigenous or imported resources depends on:

- volume (indigenous supply plus known and yet to be discovered reserves)
- demand for raw or transformed resources
- some combination of discount rates
- private discount rates (that of private land owners, or those who lease public resources and must invest private capital to operate)

⁵ Hawken, P., Lovins, A. and Lovins L.H., *Natural Capitalism*, Little, Brown, 1999

- social discount rates (the value the public and their representatives put on using, conserving, preserving or even excluding use and access to resources)
- cultural discount rates (the preference exhibited by different cultures toward the use of resources - an artificial distinction used here to suggest a limit or valuation which informs uniquely a given nation's preferential treatment of indigenous natural resources)

Most natural resources tend to fall in the category of so-called *common pool* resources. By that we mean that generally the use of them is controlled by a public entity, in the interest of the population as a whole, with some return in the form of rents compensating for the use, alteration or diminishment of the existing stock. We can distinguish two different kinds of stock in the case of natural resources, fixed (or relatively fixed on a human time scale) and those that renew themselves annually or periodically.

Common pool goods are not well understood within the policy and legislative arena. They typically represent structured arrangements around management rules that are developed over time, with incentives for cooperative use (and ownership at times) and have structural institutional arrangements for compliance.

In many of the developing or less-developed nations, it has been noted that there has been resource degradation which was improperly attributed to common pool systems. Actually, this phenomena more properly can be attributed to the break down of *responsibility* for sustainable resource development and use patterns that formerly were directed at the local level. It can also be said that similar deterioration occurs outside the bounds of common pool property systems on private and public property.

The destruction of local level institutions or cultural patterns also represents the degradation of common pool rules into an open access pattern where consumption at rates faster than restoration is the norm⁶. Within most of these regimes, there are four very general management processes: public property ownership and management, private property ownership and development, common or shared properties and open access property management.

Overuse of natural resources, a local or regional problem or trend, when repeated widely becomes a global pattern. At a global or even a meta regional scale, identifying the issues let alone solutions or optimal use patterns becomes very difficult. The phenomena was anticipated in a seminal paper by Kenneth Boulding, who observed that

"For the sake of picturesqueness, I am tempted to call the open economy the "cowboy economy," the cowboy being symbolic of the illimitable plains and also associated with reckless, exploitative, romantic, and violent behavior, which is characteristic of open societies. The closed economy of the future might similarly be called the "spaceman" economy, in which the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution, and in which, therefore, man must find his place in a cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy. The difference between the two types of economy becomes most apparent in the attitude towards consumption. In the cowboy economy, consumption is regarded as a good thing and production likewise; and the success of the economy is measured by the amount of tile throughput from the "factors of production," a part of which, at any rate, is extracted from the reservoirs of raw materials and non-economic objects, and another part of which is output into the reservoirs of pollution. If there are infinite reservoirs from which material can be obtained and into which effluvia can be

⁶ For a thorough discussion of this phenomena, see Bromley, D.W. and Cernea, M.M., The Management of Common Property Natural Resources, World Bank Discussion Papers, 1989

*deposited, then the throughput is at least a plausible measure of the success of the economy."*⁷

Recognition of the decline in quality of indigenous resources or the externalities that have been associated with their acquisition, processing and use, have led many different nations as well as multi-lateral regions to develop planning or cooperative use compacts, designed to control or stabilize these patterns. Unfortunately, many of these compacts do not take into account the full effect of market processes or incentives on the acquisition of natural resources.

Because there is an association between land rent and intensification, private investors have large incentives to move as close as possible to the margins of economic or prescriptive rules in order to maximize profits. This can and does include moving operations to areas of more lenient regulation or policy. The nature of agreements which are not fully comprehensive is to encourage loopholes and excessive exploitation in response to more than regional demand for products.

This is illustratively portrayed in the curve of rent shown below which suggests graphically the fact that rent maximizing and the net present value of extraction and use of resources, are not equivalent or consistent.

In the case of renewable resources such as fish stocks or forestry obtaining the maximum volume or maximum sustainable yield (msy) is not the principal economic objective⁸. Extraction of the resource is an economic or market event and thus is concerned with maximizing rent and if possible, generating a profit⁹. Thus, the economic analogue of maximum sustainable yields is maximum economic rent (mer). The maximum economic rent can be defined as a point on

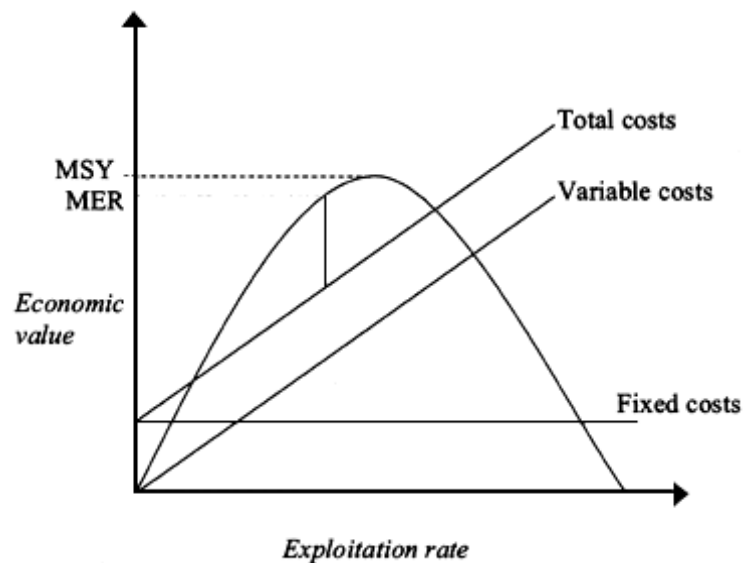
⁷ Boulding, K., op cite

⁸ Bonfil, R., Wildlife Conservation Society, New York, 2009

⁹ Economic profit is maximizing total revenue minus total cost.

the revenue yield curve where the difference between total costs of operations and revenues received is greatest. It will always be lower than the maximum sustainable yield and they cannot be coincident. In the race to lower overall costs relative to returns, there is always an incentive to keep exploiting the resource without regard to maintaining reserves. An alternative view of this phenomena is to see that it implies higher discount rates for private interests than those of the public.

Figure 1
Maximum Rent vs Maximum Yield



Source: Adapted from Bonfil, 2009

Conservation vs Preservation

There is an inherent dilemma reflected in the use of any country's natural resources, since they represent a cornerstone of domestic economic potential. This can be seen in the debate over the role of extraction and use versus conservation and preservation. Translated into economic terms, the concepts represent a range of discount rates, implying widely disparate rates of return as well as motivation. A graphic illustration makes this more apparent.



In the end, it is all about getting the discount rate to reflect societal needs for revenue, while factoring in desired values for environmental quality and the cultural values that are shared by the population. In North America the three countries involved share similar resources, but deal with their use in different ways that reflect not only the factors above, but the ability to understand the extent of the resources available and the capital resources to exploit, process and transport them. Trade agreements to harmonize and stabilize the use of natural agreements have been promulgated over a very long period of time in many different markets ranging from fisheries to forestry to energy. In each case, however, overexploitation of the indigenous resource was a matter left to national sovereignty, national or State or Provincial ownership and control.

This is generalized in the table below, and serves as an illustration of the difficulty in applying uniform standards when economic / ownership interests are the primary driver for agreements and standards.

Table 1
Comparative Control of Resources in North America

	Mexico	United States	Canada
Public Resource Ownership	Federal	Federal and State	Province
Fisheries	Federal	Federal	Federal
Forestry	Community and Federal	Federal and Private	Provincial
Minerals	Federal	Federal and Private	Provincial
Environmental Rulemaking	Federal	Federal with some State exceptions	Provincial with some Federal exceptions

The table above illustrates not only the range of control involved in the use of indigenous natural resources, but also implies a difference in economic motives. For instance, in Mexico, with community control over a resource such as forestry, there is an inherent motivation to protect the resource and match extraction to sustainable rates in order to preserve community values and long term income streams. This connection can arguably weaken with the more remote interest of a state or federal agency with a larger range of communities or economic interests to satisfy.

In addition, the availability of capital resources, especially native or indigenous, can determine the degree to which long term and sustainable management practices are feasible. The introduction of outside capital investors implies higher demands for returns to capital and increased pressure on resource development. As well, the stock of a resource available domestically can influence patterns of development, where a net import balance for a resource such as forest products, may actually support higher levels of domestic protection (underexploitation).

Table 2
Relative Import Export Balances for Key Resources

	Mexico	US	Canada
Oil	Net Import	Net Import	Net Export
Natural Gas	Net Export	Net Import	Net Export
Forestry products	Net Import	Net Import	Net Export

These generalizations mask the fact that on an internal geographic basis, one region such as Alberta in Canada may export oil while importing natural gas, a situation which is reversed on the east coast. They also illustrate the relative role of a resource rich country like Canada, which must depend on exports to sustain economic growth internally.

Long Term Stability and Policy for Natural Resources

Development of domestic natural resources can be divided roughly into three patterns. Those that are externally resource dependent such as Japan which imports the majority of raw materials and transforms them into finished products. The second are resource rich countries such as Canada, which must export resources to maintain national income and investment. Finally, there are countries which compete in both arenas such as the United States which must balance imports and exports depending on region and the relative scale of the indigenous resource.

In each case the use of natural resources by country reflects a complex distillation of policy, market demand and regulatory control tempered by an intangible cultural imperative regarding use, preservation and conservation or sustainable maintenance.

Results overall are inconsistent depending on the resource and the markets involved; however, it is clear that values other than economic or trade based in nature may have important roles to play if overexploitation and degradation of

resources' base are to be considered. Much of this may be reflected in the reservation price for resources¹⁰, which although imperfect, implies a future use or value which is undetermined but anticipated. An example might include the role of forestry, where alternatives may substitute for forest products, which when left standing, have a greater value for carbon sequestration than construction. In other words, avoided use may have market value which is difficult to calculate or compare in transnational terms.

Three forces ultimately determine success or failure in resource management: agreement on a regulator and regulatory standards and the regulator's enforcement power, the extent of natural resource conversion capacity, and the ability of the resource to generate competitive returns without being extinguished.

Conclusion and Comment

Much of what is expected in consistent regional or meta-regional management of natural resources depends on arguably unscientific criteria. Several examples of this have been referred to, such as logging or timber operations where they have long political or cultural historic ties, or water commitments for industries that are less competitive than in past periods, or the prohibition of transboundary shipments of commodities¹¹. An alternative which avoids the tendency to overexploit resources may be the use of agreements which specify environmental standards or criteria which must be met in terms of maintaining natural resource stocks. For instance, a pan-North American resource standard which cites minimum sustainable water quality, habitat stability or landform transformation can be substituted for the value of economic exchange independent of the rate of extraction of resources. In other words, a standard which can be scientifically defined or validate allows the market price and by

¹⁰ Effectively a non-market value for a good that cannot be traded or auctioned, such as open space or water quality or forest preserves.

¹¹ This area of concern is inconsistent at best. Most nations do not allow transborder shipments of water, which occurs to an unknown degree with water contained in fresh fruits and vegetables moving internationally.

inference, the rates of extraction to be moderated and reflect the resource value, encouraging substitution, innovation and resource efficiency rather than relying solely on achieving supply objectives which are based solely on economic rather than social discount rates.

Much of the above implies a social morality and cross cultural agreement which could be construed to be anti-competitive and which will leave stranded market assets at the risk of losing market share or becoming less competitive in global markets. It is not offered as a perfect substitute but rather as a point of departure for a new standard of valuing and ultimately using heritage natural resources where development potential as well as resources is unevenly distributed, and where market prices can distort the full value of the resources we own going forward.

As the economist Kenneth Arrow once noted "Like many economists, I do not want to rely too heavily on substituting ethics for self-interest. I think it is best on the whole that the requirement of ethical behaviour be confined to those circumstances where the price system breaks down. We do not wish to use up recklessly, the scarce resources of altruistic motivation".