Energy and Environmental Balance

Earl Finbar Murphy

PPS
PERGAMON
POLICY
STUDIES

PERGAMON POLICY STUDIES ON ENERGY AND ENVIRONMENT

Energy and Environmental Balance

Earl Finbar Murphy

Pergamon Press
NEW YORK • OXFORD • TORONTO • SYDNEY • FRANKFURT • PARIS

Pergamon Press Offices:

U.S.A.	Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, New York 10523, U.S.A.
U.K.	Pergamon Press Ltd., Headington Hill Hall, Oxford OX3 0BW, England
CANADA	Pergamon of Canada Ltd., 150 Consumers Road, Willowdale, Ontario M2J 1P9, Canada
AUSTRALIA	Pergamon Press (Aust) Pty. Ltd., P.O. Box 544, Potts Point, NSW 2011, Australia
FRANCE	Pergamon Press SARL, 24 rue des Ecoles, 75240 Paris, Cedex 05, France
FEDERAL REPUBLIC OF GERMANY	Pergamon Press GmbH, 6242 Kronberg/Taunus, Pferdstrasse 1, Federal Republic of Germany

Library of Congress Cataloging in Publication Data

Murphy, Earl Finbar, 1928-
Energy and environmental balance.

(Pergamon policy studies)
Includes bibliographical references and index.
1. Energy consumption. 2. Energy policy.
3. Environmental policy. I. Title.
HD9502.A2M87 301.31 79-22202
ISBN 0-08-025082-3

Printed in the United States of America

Energy and Environmental Balance

Pergamon Policy Studies on Energy and Environment

Cappon Health and the Environment
Constans Marine Sources of Energy
De Volpi Proliferation, Plutonium and Policy
Goodman & Love Biomass Energy Projects
Goodman & Love Geothermal Energy Projects
King, Cleveland & Streatfield Bioresources for Development

Related Titles

Barney The Global 2000 Report to the President of the U.S.
Fazzolare & Smith Changing Energy Use Futures
McVeigh Sun Power
Myers The Sinking Ark
Starr & Ritterbush Science, Technology and the Human Prospect
Taylor & Yokell Yellowcake
United Nations Centre for Natural Resources, Energy and Transport State Petroleum Enterprises in Developing Countries

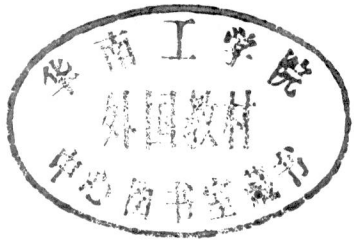
Acknowledgments

When the creation of a work takes years, the author owes debts to many. I am grateful to the late Dr. Samuel Polsky, co-director, Institute of Law and the Health Sciences, Temple University, and the late Dr. C.A. Doxiadis and the Athens Center of Ekistics. At the Ohio State University, I have had the rare privilege of teaching both in the School of Natural Resources, College of Agriculture, and the School of Architecture, College of Engineering, as well as at my regular post in the College of Law. I must thank the staffs of the libraries at the Ohio State University, most particularly the staff of the Law Library at the Ohio State University. I could not have produced this book without the assistance of the typing and reproduction staff at the Ohio State University College of Law.

During the decade of the 1970s, I have had the enriching experience of being a member of the American Bar Association's Special Committees on Environmental Law and Energy Law and the Advisory Committee on Industrial Siting. Working with the members and staffs, and on the projects, of these committees has instructed me, as also has my membership on the Executive Council of the World Society for Ekistics. I have learned a great deal from the operation of state government in Ohio both as chairman of the Ohio Environmental Board of Review and as a participant at meetings sponsored by various state departments, most especially the Ohio Department of Natural Resources.

And, finally, I thank my wife, Joanne Wharton Murphy, whose help has been essential, and dedicate this book to her.

Contents



1 The Competition Between Energy and Environmental Demand

THE PERMANENT NEED FOR MAKING HARD CHOICES

The issues of energy supply, growth demand, environmental response, capital and labor availability, inflation, and the equity of public welfare are growing in their urgencies throughout the world. All these problems can be dealt with by way of the political and economic processes to various degrees. Priorities can be reassigned. Demands can be cut back. Greater reliance upon labor can produce an alternative so that less reliance will be made on traditional investment capital, now lamentably described as being in "short" supply.(1) What cannot be done in any of these situations is the previously easy way of open-ended growth for every demand presented.

Experience with recurring oil crises has offered evidence that very little in the economy is price resistant. This does not mean that matters must be turned over to the market's disposal or to the consumer of goods and services who casts a ballot in the form of a purchase-price paid. Even were a pure market management system for society opted for, the act of making the market-favorable decision would be political. Vastly significant political changes would be required in order to create a structure within which such market-determinable decisions could be made.

It is doubtful that the twentieth century will witness this kind of dramatic change. Other practices have become increasingly established since the end of the nineteenth century in the movement away from reliance on the market. Law and politics have become too significant in reaching decisions on the allocation of resources, finances, and energy to be easily abandoned. Law and politics are affected by the market. Some of their powers could be delegated to the market. Nevertheless, law and politics are not going to be subordinated to the authority of the market in determining priorities.

Thus hard choices about competing demands must be made in the remainder of this century. Neither environmental activists nor those concerned with energy conservation are confused about the hard choices awaiting them. But they want all competitors for resources, capital, and energy to understand that the harshness of such choices is not to be borne only by those wanting conservation for environmental renewability and in energy conversion.(2)

Those who believe environmental renewability is threatened by the demands for rising energy conversion, growth in materials' exploitation, and the sprawl of urban usage over space cannot ignore the current and developing condition of the renewing environment. They insist that human society cannot survive without the existence of viable systems for renewability within the environment. Harmony is very desirable, they agree, between humanity and nature, although harmony cannot be purchased at the expense of nature's capacity to renew air, water, and the biomass for the sake of growth.

From the beginning, urban-industrial demand was cast as open-ended, undifferentiated, and without boundaries for whatever achievements were to be sought. As human numbers and human expectations have alike expanded, the finite character of the renewing environment has come to the fore.

Long before demand has exhausted the raw materials needed for energy conversion or industrial production, such demand will surpass the ability of air, water, and the biomass to serve as sinks for heat, toxic substances, and other matters. This limitation in nature will continue in an accelerating crisis through the rest of this century until either a crisis climax or a humanly arranged resolution has been reached. More than capital shortage, more than the inadequacy of energy supply, nature is growth's ultimate limit.

The competitive crunch for capital and the escalating price for fossil fuels result directly from the inescapable fact that nothing taken from nature is free, whatever its immediate profitability on cash flow charts. Economics and technology may claim that extracted materials were free in their inchoate and unsevered states, or that receiving bodies are able to freely take on wastes. But in terms of nature's finiteness in nonrenewable resources and the limitations that prevail in the operation of life-support systems, no such freedom exists. When urban-industrial demand is imposed upon the renewing environment, the costs come high – first, to nature in the ecological sense; second, in terms of cash costs to society itself.(3)

Conceivably existing social forms will produce behavioral changes which will permit an indefinitely long relationship between demand and the renewing environment.(4) This automatically peaceable future does not appear to be in prospect. Existing social forms can alleviate environmental and energy crises. Yet the intensification in demand traditionally made upon the renewing environment is continuing. Whatever ultimate happiness may lie concealed in events, the current scene points to a worsening of the world's environmental conditions.

The rising demands of urban industrial society, the capital inadequacies present within society to accommodate all demands, and the growing inability of the renewing environment to maintain its systems under these burdens make this clear. The renewing environment requires assistance from those who impose their demands and simultaneously complain of higher prices, capital shortfall, and energy shortages. Growth in energy supplies and affluence can come only within the renewable limits of the environment. To all but the insatiable, the limits remain wide relative to urban-industrial demand.

THE HISTORIC COMMITMENT OF URBAN-INDUSTRIAL SOCIETY

During the eighteenth century in northwestern Europe, societal attitudes toward energy and production changed. As a result, basic social structure correspondingly changed. Urban life and industrial activity had begun their rise to dominance: urban-industrial society had been formed.

The new form of society emphasized the growth of the city, the processing of all that was transmutable into commodities for trade, and the dominance of science and technology in accomplishing the most routine social functions. The impact upon the renewing environment was massive. Nature became another resource for satisfying the demands of an urban-industrial society whose foresight could perceive no limit – nor any need for a limit – to growth.

The impact of pre-industrial demand structures was slight compared to the impact of urban-industrial demand to the environment in the last two hundred years. This change alone has rendered obsolete much experience accumulated under earlier social forms. The impact upon the renewing environment of a high-energy demand structure has proven most unlike the effect of social forms which either were low in energy conversion or in demand for the production of goods and the provision of services.

The extent and the depth of the difference in impact was slowly realized. Discarding past experience as no longer relevant to changed conditions is culturally difficult. Even revolutionary upheavals in urban-industrial society have not always illuminated the absolute difference this society bears to its traditional predecessors.

At the end of the eighteenth century, for example, social theorists were still invoking classical Greece and Rome as models capable of imitation in the future. The American Revolution had occurred and the French Revolution was in full swing, yet these political events had not clarified the situation for theorists and observers. Although the Industrial Revolution had been in process for at least a couple of generations, few could see that it had made Greece and Rome incompatible societal models for the oncoming nineteenth century.

One contemporary critic, however, did grasp the change the Industrial Revolution introduced – a change that separated the past from the future like a chasm opening in a plain. This observer, the Abbe Sieyes, a

wily politician whose superior ability to perceive social change may have contributed to his survival, declared to the Estates-General on September 7, 1789:

> Modern European peoples resemble ancient people very little. The foremost question for us is one of commerce, agriculture, manufacture etc. The desire for wealth has turned all the states of Europe into a vast workship; and they dream of little more than production and consumption as constituting happiness. Also, today's political systems are based exclusively upon work; the productive faculties of men are everything. . .(5)

This solitary declaration exposed the inadequacy of the opposing conventional view. As Jean Jaures, the historian of the French Revolution, was to note early in the twentieth century, the Abbe Sieyes was the only philosopher of the Enlightenment who understood the power of surgent industrialism.(6) That power had already made the previously independent sectors of traditional society obsolete. Traditional social forms could only be overwhelmed when the new industrial system imposed its demands for production and consumption.

Social institutions offer a seeming stability of form which fosters the belief that all goes on as it did before. The ideas, demands, and functions composing urban-industrial society have been no exception to this belief. Despite the rushing change thereby introduced and despite the fragmentation of both traditional society and the renewing environment under the impact, the belief remains that urban-industrial society is merely an extension of the social forms preceding the Industrial Revolution. The Abbe Sieyes insight fully noted that such was not the case.

The Industrial Revolution had not merely increased both the supply and the demand for energy. Important as it was to have moved northwestern Europe into a high-energy situation by the introduction of steam motive-power, the shifting of values was to be far more influential on future events. As Abbe Sieyes observed, production and consumption became the dominant operative factor. Consequently a judgmental test for society itself was created whose measure for success or failure lay in the growth or decline of production and consumption. Thereafter people existed solely as producers and consumers, not because they had inherent value in themselves. Demands upon nature as a source of raw materials and energy, as well as a sink for wastes, accelerated in quantity and intensified in their qualitative impact.

Abbe Sieyes chose the word jouissance to describe "happiness" under these changed conditions, a term in law that could mean "interest payable." Under the conditions of rising urban-industrial demand and capital generation, this was of far more significance than a definition of mere unallocated delight. Happiness in the future began to have an inherent cash-and-carry quality.

Abbe Sieyes was concerned with the long-range effect this shift in values would have on human society and traditional morality. His concern was valid. So far, the shift in values has fragmented nature and processed everything into an homogenized production and consumption system. The refusal to recognize the seriousness of the situation by large sectors of the social leadership today is comparable to the conduct of the contemporaries of the Abbe Sieyes, who clung to Greece and Rome for their ideas.(7)

Whether widely noted, the shift in values had occurred before the eighteenth century closed. People had become units primarily for production and consumption. When the great political upheavals of the twentieth century broke out, it was not to Greece and Rome that their leaders turned for ideas. By then, the demands of urban-industrial society had become too well accepted. It was the vestiges of traditional society which had to be cleared away to allow those demands to be better serviced. Nothing in nature was allowed to block the meeting of these expectations.

Society had made its now historic commitment to growth. At no time since the late eighteenth century has any level of energy conversion been seen as more than a transitory stage to another greater surge in the supply of energy. No limits have been set for urban expansion, the exploitation of materials, the accumulation of capital, or the consumption of goods and services.

As the Abbe Sieyes foresaw, no one desires to give up on the promises of open-ended growth. And perhaps in theory that is a "democratic" right. Yet society cannot continue using nature as a free good to supply commodities and as a sink for wastes. Harm to nature will no longer be a cost which can be foregone in the satisfaction of rising urban-industrial demand.(8)

FRAGMENTATION AS PREPARATION FOR URBAN-INDUSTRIAL GROWTH

After more than two centuries of growth, urban-industrial demand promises to massively increase the burdens on nature before the end of this century. In the words of George Simmel, self-interest is the urban-industrial system's only objective measurable achievement. All elements within the system are thereby reckoned as mere numbers whose elements are indifferent in themselves.(9) Such rationality has had a profoundly fragmentizing effect upon systemic relationships.

But this fragmentation was necessary to stimulate growth. In order to measure items of interest, it has been easiest to isolate them from their surroundings. The emphasis upon production and consumption has broken up existing social and biological unities, thus isolating them from their environment.

And demands must be imposed to sustain urban-industrial society and those aspiring to make their societies a part of it. Both production and consumption must increase. Neither social forms nor natural

relationships are immune to the demands to produce and consume. All obstacles to continued growth have been swept aside. Raw materials are needed as resources. Air, water, and the biomass are needed to receive wastes. In order to fulfill these needs, all the elements have been isolated from such larger unities as the biosphere and the hydrologic cycle.

Thus fragmentation is an essential preliminary to processing nature into and through an economy which emphasizes how fast and how large production and consumption can grow. Resistant unities have been blended into artificial units. These units acquire their identity and values exclusively in terms of production and consumption rather than through any relationships present in nature. The universe has been reformed to meet infinitely expanding growth demands.

The ability of the life-support systems in nature to withstand such reformation may prove most defeating to the longevity of a social system engaged in processing what is renewable within the environment. The evidence is accumulating that such an ability is lacking. The systems for environmental renewability ultimately cannot withstand a process that fragments and homogenizes their established relationships into units measurable by a rationality that is indifferent to the consequences within those long-existing relationships.(10)

Among the demands urban-industrial society has imposed upon the renewing environment are those for rising energy supplies. It has been a comprehensive, infinitely expansive demand not previously known. The result is a widespread, usually unstated and unchallenged assumption that there must always be energy abundantly available, regardless of the effect upon the environment's capacity for self-renewal.

When steam power was almost choked off at inception by the consumption of the forests, the recourse was to coal. Coal's combustible properties had been known in western Europe since the ninth century A.D., but the heat it could then give was insignificant compared to what it could produce in the age of steam. When the use of steam power threatened the growth of urban-industrial demand, because of the impaction resulting from steam-power's need to concentrate energy sources and usages alike, freedom for more growth was found in the internal combustion engine fired by refined oil. The whole countryside of urban-industrial society was thereby opened up to urban sprawl and industrial expansion. And now that energy growth is threatened by possible limitations in all fossil fuels, society appears ready to risk nuclear power as an important source of future energy growth.

Energy growth seems fundamental to society today. The ambition to command energy cascades to meet any possible human demand is worldwide. There appear few dreams for the future that do not include enough energy to meet the most transient human whim. Modern Utopias, other than a handful opting for deliberately low-level energy demand as their cultural base, assume an almost infinite energy budget.

But one can assert that the proposed Utopias are no more extravagant than the existing energy calls of society. In the history of life, homo faber the high energy user is of relative insignificance. But in

that brief interval, the drafts on the energy stores have been huge. The drafts in the twentieth century in comparison with all other centuries particularly have been of massive proportions. The anticipated energy drafts in the near future are projected to be greater still.

Is such increase in available energy necessary to sustain the quality of life that urban-industrial society has come to expect? Many say no,(11) but this is still not the dominant opinion. The common expectation for the twenty-first century and beyond can scarcely find the language to describe future energy drafts.

In addition to abundance, a growth-insistent society wants energy supplied cheaply relative to other economic costs. Indeed, what has often delayed the acceptance of a new means of energy supply has been that it initially appeared more expensive than energy conversion processes already used. When proposed new means of supplying energy show themselves capable of providing energy more cheaply than previously employed methods, general acceptance has been won. Once the determination of cheapness and, hence, abundance is reached, there is indifference to the effects the new method may impose upon nature or the costs that may be diverted from human budgets to the systemic operation of the renewing environment.(12)

One can argue cogently that all societies demand cheap energy and, resultantly, also demand the social structures that produced such culturally defined "cheap energy." On a per capita basis, the use of energy in sixteenth-century Europe was enormous. And most of that energy went up the chimney in a wasteful technology for heating and cooking that sustained the contemporary quality of life.

Sixteenth-century Europeans worried little about energy or its sources, leaving such concerns to their eighteenth century successors at the beginning of the Industrial Revolution. And what makes concern over energy in the late twentieth century still more acute? It is the relatively greater consequence of a demand that enormously increases the conversion of energy and the release of its unwanted by-products in a brief historic span.

A multitude of relationships exist in nature. High demand for energy conversion breaks up these relationships into discrete and often unsustainable fragments. Sadly, this breaking up of natural relationships in the renewing environment is an incidental side-effect of purposes ever more unconcerned with nature.

The giant oil tankers, for example, are used to cheaply deliver a fuel essential to an economy that oil helped create. Only a brief span of days must be spent by these mammouth vessels in the stormy waters off the tip of South Africa. The economies of the voyage, therefore, insist upon a cheap construction that refuses to account for the perils inherent in that brief portion of the trip. Instead, the ships are built for the smoother seas in which they spend so much more time. This allows for a cheaper price for the delivered oil and most of the ships successfully make it. Those who do not, however, find their graves in the water off Africa's southern cape.

The tragedy to nature lies in the fact that these waters are among the most important for sustaining what riches the oceans possess. The damage to the marine world is simply peripheral to the urban-industrial interest – so peripheral that little is being done to correct the situation. Nature's relationships are disregarded or broken up for a cheaper energy source.(13)

Ignoring these natural relationships has immediate payoffs in return on capital investment. Most managers of economic enterprises or political institutions prefer not to absorb the costs of avoiding or redressing harm to the renewing environment. It seems simpler to pass the costs on to nature and to treat items drawn from nature as if they were parts rolling down an assembly line. As acts of simplification, these do achieve a certain success. All traditional modes of life, because of that success, have been replaced with new relationships capable of changing the expectations of humanity.(14)

This success has its price, however. The price has been the fragmentation of too much of the renewing environment needed for replenishing resources vital for the planet's life-support systems. A major redress in behavior is now required in the urban-industrial demand structure that may find it impossible to change its fragmenting conduct. If that should prove true, then the consequences of such inability will have to be faced: either a continuing harm to nature until nature loses all sufficient renewability, or investing to counteract the harm economic demands impose.

In a high demand, high-energy society, the options are as stark as these. Either change the demands or assume their costs – or watch society and the renewing environment together come to human catastrophe. But then, as claimed by the economist Joseph Schumpeter, does not every society actually plan for its own general liquidation?(15) If so, catastrophe will be hard to avoid for our society, too.

THE BURDEN OF HIGH-ENERGY DEMAND IN A FRAGMENTED ENVIRONMENT

None would deny that steam power furthered the Industrial Revolution and that the gasoline engine in the private car opened up the growth of cities so that they could spread over the land. But if changes other than these had not been wrought, human consciousness might still be able to ignore the impact of higher energy demands upon nature. These changes were not, however, the only ones.

Energy cascades are now routinely part of all future planning. Even large industrial nations are calm about the planned expansion of their energy supplies by hundreds of percent over the rest of this century. The technology to make such growth possible is present and every effort is being made to achieve energy conversions at that projected pace.(16) And yet where is the reflection upon the ability of the renewing environment to encompass such growth?

The supply, the flow, and the return of energy are part of a continuing process in nature. This is most evident for biological energy. Life forms draw energy from other levels of the life system in the form of calories, expend these calories on their own life needs, and return that energy to the system at the end of the life cycle. In the paleolithic past, much of this living energy became fossilized in the form of coal, oil, and gas. Without human intervention, this energy was no longer part of the biocycle. The same is true for the energy contained within the various elements. This energy did not affect life activity until science released it through splitting atoms. It is energy which would not be converted except for human intervention.(17)

The active energy cycle affecting life systems has in the past two centuries – most particularly within the present century – gone through enormous increases. Energy conversion, with which life forms traditionally had to cope, was suddenly increased by the burning of the paleolithic wealth of coal, oil, and gas and by the employment of radioactive fission. Never before had the increase in energy levels happened so briefly, or brought forth such a surge of newly available energy, or emitted so many and so complex by-products. These last were by-products called waste only in terms of the processes emitting them. But to natural systems, these wastes either had to become an integral part of natural systems, or had to be their destroyers.

Unlike nature, humanity does not operate on a unified energy budget. Society does not regard its energy demands, its output of energy, and its disposal of energy by-products as part of a single, interlocked system. The demand for energy in modern high-energy cultures has an autonomous quality about it, as if meeting that demand can be done without regard for either where the raw materials for energy conversion originate, or where the unused portions of those materials will go. What is not used is merely waste. And as waste, this is seen as without value, to be dumped heedlessly into the sink of nature.

Total energy budgets in urban-industrial society have been infrequently tried and, when tried, have been unsuccessful.(18) In temperate zones, great sums are expended to generate heat. Simultaneously in other energy activities, heat is a waste product to be dissipated at great expense. To bring the two needs together, where each would relieve the other, is not easy because of the seasonal fluctuations in head needs. Also, when the two are kept as separate operations, each seems cheaper. But in nature they are not independent of each other. However convenient for human technology and economics it may be to keep them segregated, in the larger world of natural relationships they are brought together – and the renewing environment absorbs the costs.

This continued separate treatment of different parts of the energy system is reinforced by the manner in which the environmental aspects of energy conversion have been handled. Protection of the renewing environment has too rarely meant considering changing methods of production or altering the patterns of energy demand. Instead, environmental problems have been handled as if they constituted a separate