Resource Management

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Introduction

The function of resource management whether it is performed at the technical or the management level, in a company or a Government institution is indeed a complex task involving a multitude of considerations and uncertainties. The choices that are available to the decision maker depend on a number of pre-requisites and constraints, ranging from global to local and from technical to social. They vary in time and space as well as in the vantage point of the decision maker.

Because of the infinite number of variables involved, it is perhaps dangerous to simplify the basic ingredients of resource management. Yet, there are some elements which are more fundamental than others in the resource management process. At the risk of over-simplifying, there seem to be three major elements in resource management. These are :

1. The resource base
2. The market
3. The enterprising capacity

These three elements seem to play a decisive role in defining the boundaries within which we may have a freedom of choice. It is important to realize however that these cardinal elements are constantly changing, and are interacting with each other to produce that change. Moreover, the sum total of our various individual actions at all levels is exerting a definite influence on these cardinal elements, and is therefore changing the boundaries for our freedom of choice. It is this complex interaction of the various processes at the different levels of societal organization and stages of operations that is the subject of this presentation. The aim is to understand the fundamental mechanisms of the resource cycle, all the way from locating the resources to managing their impact on the society. For this purpose it is necessary to simplify, knowing fully well that the issues are always complicated in real life. With this in mind, I shall proceed to comment on all three cardinal elements

The cardinal elements of resource management

The natural resource base

The first pre-requisite for any petroleum activity is a justified hope for finding petroleum. This applies equally well to a company or a Government. At the time we decide on an exploration policy, our judgment is definitely influenced by the current perception of the resource-base. Depending on the information available, the perception could be based on wishful dreams as in the case of a virgin area, or it could be based on years of exploration as in the case of a mature basin.

The term petroleum resource-base will always imply a certain measure of subjectivity. We must therefore recognize that an exaggerated expectation of the resource base can be economically dangerous to the host-country. The different actors in the operations can have various strategic interests. Consequently they would put different emphasis on either positive or negative factors in the resource estimation process according to their particular preference. For the benefit of the society as a whole however, it is necessary to assess the potential as objectively and early as possible.

The attractiveness of the resource-base will set one of the most significant boundaries for the choice of resource management policies. A country with proven resources has better policy options than a country where the discovery of petroleum is still a dream. It follows therefore that the objectives and terms of licensing policy should by definition change both according to place and time. What is good policy in one part of a province need not be correct in another part. Similarly what used to be good in one and the same geographical location may be a dangerous policy to cling to if the resource potential had changed dramatically in the meantime.

The petroleum market

The true volume of the resource base in the underground is an endowment from Mother Nature which we human beings can not change. Our challenge in the different stages of exploration is to create the optimum environment for mapping this resource base.

In order to sustain exploration however, we need to have a reasonable hope for developing our discoveries. For this we need the appropriate market conditions. Petroleum markets represent therefore the second cardinal boundary within which we have to operate. As we all know, the changes that are likely to take place in the petroleum market are sometimes very dramatic and difficult to forecast. Although some countries may have some means of exerting an influence over the market, the majority of nations have only a theoretical possibility in that direction. In any case there is hardly a nation in the world that can actually determine the conditions of the international petroleum market.

But local markets also exist and can provide some room for maneuvering. The use of national taxes on the import or use of oil and other forms of energy can change the price differentials in such a way as to change the supply and demand patterns in the desired direction. Local markets can in turn exert influence on the global markets, especially if the country represents a substantial share of the world consumption.

It is also possible to create new markets, particularly for gas, when external market outlets are not available. But this option is usually restricted, and depends in the final analysis on a real growth in demand, or an explicit desire to substitute energy sources or products. One example is the introduction of natural gas for burner-tip consumption. Another example is the use of methanol in connection with transportation fuels. Both these products will decrease the demand on other products unless the total consumption in the particular sector increases. In many cases this could be an advantage, but in other cases it could be a distinct disadvantage depending on the circumstances of the country in question.

The decision to develop newly discovered resources is usually taken on the basis of our perception of how petroleum markets and price opportunities will be some 5 to 10 years later. The prevailing unpredictability in oil price development is certainly a great handicap to all decision makers. It is particularly severe to those who lack access to capital and have in addition economically marginal resources to develop.

The enterprising capacity

The resource base and market conditions will together define the constraints within which a choice of policy can be made, in as far as they constitute boundary conditions that can not be changed substantially or quickly. But the capability of a given country or organization to mobilize human, economic and technological resources to make the best out of a given set of resource and market expectations can still provide ample room for positive actions. It is within this scope for action that the resource manager can exert tangible influence. I would like to call this third cardinal element the *"Enterprising Capacity"*.

The enterprising capacity of a nation in resource management can be simply defined as the capability to mobilize the necessary human endeavors in order to transform natural resources, or administer their use, in a manner which is of benefit to the nation in the long term.

The concept embraces several aspects of social resources. Most significant among these are the relevant skills available in the country, the technological development in general, the working environment, the institutional framework, the social incentives, the availability of an infrastructure, the level of education, the state of the economy and so on.

To some countries, some aspects of the enterprising capacity may represent a serious constraint. Seen in the spirit of mutual co-operation among nations however, there should still be hope for recruiting the desired support from other parts of the world, provided the two other constraints, namely the resource and market conditions, are encouraging.

The availability of human resources with the necessary skills and managerial expertise can for many countries be an important constraint. In addition, absence of adequate legislation to control petroleum activities is a frequent problem at the beginning. Together these disadvantages make it very difficult to obtain agreements with the multinational oil industry without giving away a substantial part of the potential oil- rent (net gain) and even more significantly giving away much of the control on direction and pace in the planned petroleum activity.

The level of industrialization and technological development determines to a large extent, how the petroleum industry will be assimilated in the economy of the host-country and to what extent the new industry will create potentials for growth within the existing industries. The ring-effects on the economy will be large if the demand for goods and services can be met by national suppliers.

The political stability and financial strength of the country are the last elements that I will mention as major components of the enterprising capacity. I need hardly elaborate on these components.

Collectively, these components of the enterprising capacity define the ***initial*** freedom the nation has in setting objectives for the management of its resources and meeting these objectives. It is important however to stress the word ***initial*** in this context, because many countries can choose to increase their enterprising capacity before venturing into serious obligations with the international petroleum industry. It may come as a surprise to some of you that oil companies, to a certain extent prefer to operate in an environment that is prepared for the basic requirements of the industry. The efficiency of such an environment is normally to everybody's advantage.

For countries without any upstream aspirations, the enterprising capacity is equally important in planning and implementing the country's strategies for energy supplies and consumption. Having lived through two oil shocks, we all know the damages that can be inflicted by rapidly changing oil prices, particularly in developing countries. It is therefore important in the prevailing period of relatively soft oil prices to adopt policies that minimize the effect of a new price oil shock on the national economy. Similarly, it ought to be the objective of all nations to actively seek the efficient use of energy sources in order to minimize hazards to the environment as well as to avoid waste.

With reference to differences in cultural backgrounds it is important to keep in mind that energy is not just a commodity, but also the basis for many aspects of human behavior. In their historical development, established societies have had to attain some balance with their natural environment. Their approach to energy requirement is a central element in this balance, which in turn becomes part of their cultural attitudes. Every time a society is adjusting to substantial change, whether in its energy consumption pattern or in its exploitation of natural resources, the changes involved will often go far beyond the immediate sphere of the operations themselves. If the scope and scale of change is sufficiently large, it may affect not only the organizational fabric of the society, but also its very way of life.

In trying to develop our enterprising capacity as part of maximizing the benefit to our societies, we must therefore very carefully consider the intricate social aspects that interact with this development. The differentiation between short-term gains and unwanted long-term destabilization of the points of strength is essential in this respect.

This is however an area where every country can and indeed must exert positive influence that may substantially improve its chances of success. Its strategy must however, be carefully anchored in the country's own cultural heritage. Only on this basis would the interplay between nations of varying enterprising capacities be a major key in enhancing each other's growth.

The dynamic aspects of resource management

The three fundamental elements of resource management, namely the natural resource base, the petroleum markets and the enterprising capacity are constantly changing with time as a consequence of our cumulative actions. Moreover, as we make our decisions in a particular phase, for example in the exploration phase, we are in fact altering the boundaries for options in the other phases of the petroleum cycle and vice versa.

In order to illustrate the dynamic nature of resource management, it is necessary to discuss the time aspect, the interactive aspect and the global aspect.

The time aspect of resource management

As already mentioned, the objective of resource management is to select the optimal way of converting a natural resource into financial, material or social benefits to serve the interest of the entity which is being served. In exploiting a non renewable resource such as petroleum, we should furthermore ascertain that the strategies we select are optimal not only in the short term but also in the long term. An important objective should be to transform a substantial part of the petroleum rent into long-term benefits to future generations as opposed to consuming the rent immediately.

Consider a country with low enterprising capacity. Until the existence of petroleum has been established by successful drilling, the prospectivity will normally be considered as low by potential licensees. As exploration proceeds however, the country's expectations may or may not materialize. If petroleum is discovered, the prospectivity will improve, thereby making it progressively easier to attract interest in further exploration. As the resources are being developed and ultimately produced, the society may gain valuable experience and will hopefully build up an infrastructure and a capital-base that will further facilitate an optimal utilization of the remaining resources.

The gradual improvement in the country's enterprising capacity may also benefit the country in other industrial or social endeavors. An important aspect of resource management in this process is to make sure that the pace of development is well tuned to promoting a smooth and unstrained growth in the enterprising capacity. A well considered rate of acceleration in the level of petroleum activity is a key objective in this respect.

As exploitation approaches a mature stage, prospectivity will eventually decline. If we had been managing the activities correctly, the inertia of a long cash- generating production phase should continue to add to the enterprising capacity, and leave the country far better prepared for new industrial and social development.

But success in exploration is not always possible. Hydrocarbons can not be discovered in commercial quantities at will. Prospectivity is therefore likely to remain low or decrease. Even in this case the enterprising capacity could still have grown. The manner of organizing the activity could leave the country with knowledge and experience that may be valuable in other enterprises outside the petroleum sector.

If this is not achieved however, particularly if the financial risk is carried mainly by the nation, the petroleum venture could turn out to be a traumatic experience, substantially reducing the country's enterprising capacity.

On the other hand, even successful exploration and production, if badly managed, can leave the host-country worse off than before, Mismanagement, rapid rise in consumption or a massive drain of the oil rent on consumer imports could lead to such results.

The interactive dimension

It is also important to be fully aware of the interaction among the three cardinal elements of resource management. In the charting of resource management strategies, it is imperative to adopt co-ordinated action plans embracing all three elements simultaneously. Otherwise, we will soon learn that by introducing changes in one element we are faced with new and unexpected problems or challenges from the other elements.

A given country's freedom of action is at a maximum when it is still considering its licensing policy. This is simply because its commitments to actors from abroad are still undefined. For a country of low resource potential and enterprising capacity, a liberal licensing policy may be desirable in order to encourage actors from abroad. The challenge is, however, to leave sufficient leeway for national participation and steering so that national competence can grow in the event of a discovery and subsequent production. The degree of optimism among potential applicants for licenses will of course be a decisive factor in determining the licensing terms.

Once a discovery is made however, the country's dependence on external support in terms of technology and financial resources will normally make it difficult to introduce conditions which are not already legislated or stipulated in the license agreement. When production starts, the petroleum market will add new restrictions to the country's ability to put emphasis on its own priorities and desires.

Whenever big changes occur in the oil and gas markets, or in the available technology, the magnitude of the economic reserves also changes. These two factors combined can also lead to important changes in the pricing of essential goods and services globally or regionally. The unit cost of carrying operations is therefore likely to change accordingly.

Similarly, changes in the markets or in the natural resource-base will influence the enterprising capacity that can be made available at any one time. Positive market changes, or the sudden appearance of a very attractive petroleum province elsewhere are likely to make it more difficult to attract technical or financial support.

Since we can not influence the market in a direct and effective manner, it is necessary that we adopt flexible policies that will tolerate a fair margin of uncertainty, for example in oil prices. Planning on the basis of different scenarios is therefore an important defensive mechanism in resource management.

The global dimension

So far we have been discussing the issues of resource management from the point of view of a nation. It is important to underline that the same principles apply also to a company, a corporation or a regional institution. The cardinal elements are still the same, but the scope and content of these elements, at the various levels of resource management decisions, will of course be different.

If we visualize an inverted pyramid (Figure 1), the three sides of this pyramid could graphically represent the resource-base, the market conditions and the enterprising capacity

respectively. If we on each side draw horizontal lines parallel to the inverted base, these lines would illustrate the different levels of decisions. The lowest line would represent the project level, the one above it the national level, then the corporate or regional level and finally the global level at the inverted base level at the top.

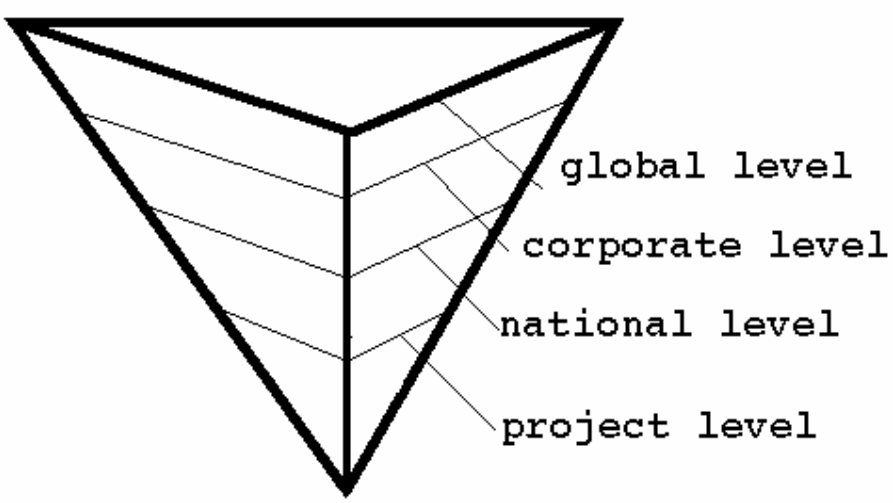

Figure 1: The various levels of judgment in integrated resource management

The scope and content of each cardinal element are different at the different levels. In a project decision for example we would be dealing with the resource base of a license, his perception of the market conditions and his own technical expertise. At the corporate or regional level, the resource-base is much wider, the market is perhaps represented by several scenarios and the enterprising capacity could be the corporate capacity extended if necessary by research and collaboration with other interested parties. At the inverted top of the pyramid, the resource base is that of the whole world, the market is that of the whole energy spectrum and the enterprising capacity is that which can be mustered within the limits of international politics.

An individual sitting at any one of these tiers of decisions will by definition exert different judgments than he would at the next tier. What is more, it can be even dangerous for a project manager to base his judgment on the benefit of the human race rather than the specific perceptions at the company or division level where he sits.

Each decision maker sitting at his or her particular level on the inverted pyramid is constantly exerting a partial influence on the system as a whole. The company actions influence the corporate attitude which influences other industrial activities which in turn influence the policies adopted by governments and finally by the world community. This intricate cob-web of interaction among the actors makes it exceedingly difficult to predict the outcome of any single action or event. It also waters down the responsibility towards the total system. The issue of planning and controlling the behavior of the global system as a whole is therefore one of the greatest challenges that faces the world today.

If all decisions completely ignored compatibility with the global interest, there can be no hope for managing the global concerns on energy supplies, damage to the environment, or bridging the technological gap among nations. At the end of the day, it is the sum total of all actions at the lower levels of decision that constitutes the cardinal elements at the global level.

The exploitation of oil and gas is most important in an energy-political context. At present the use of energy is dramatically different in different parts of the world. These differences are quite frequently reflected in the economic and political policies of the different countries. The different energy markets are in some kind of balance at the moment, but major changes in either the demand or supply side can easily trigger dramatic price changes. Any rapid change can be detrimental to the objective of planned and orderly development both on a national an global scale.

There is no doubt that the environmental consequences arising from the continued burning of fossil fuels are of major concern throughout the world. No country can disassociate itself from its responsibility to the international community in this respect. In practical terms however, the solution of this problem involves at least four fundamental challenges. Firstly, the accessibility to energy in the various countries of the world. Secondly, effective measures for preserving plant life on the globe. Thirdly, the availability of technologies for more effective use of energy sources and for reducing harmful gasses in the exhaust fumes. Fourthly, the availability in time of safe substitutes to fossil fuels.

The petroleum business also carries with it an intrinsic danger for oil spills or blow-outs from high pressure reservoirs which can result in disastrous consequences to the environment. The Exxon Valdes accident is a reminder that as long as the human element is involved, errors are likely to occur. Improved technology will never eliminate this source of uncertainty.

There is therefore a progressively increasing awareness of having to deal with these global issues on the basis of wider and more effective co-operation among nations.

Concluding remarks

In conclusion, allow me to make it clear that I do not advocate the need for all managers to think in terms of all the complicated facets of resource assessment all the time. Life is far too short and complicated to permit that. What I am trying to say is that we would all be better resource-managers if we were aware of the consequences of our actions to the totality of the resource management pyramid.

We all happen to sit at a particular level of judgment, in a particular phase of activity at a certain geographical location. We are required and advised to put emphasis on our own situation to promote our own primary interests. In the long-term however, our interest should also lie in understanding and ultimately serving the challenges at the higher levels of resource management.