

## Building a New Equilibrium

*Measuring Externalities to Demonstrate the Value of Investment in Oil & Gas Projects*



Hydrocarbons continue to be the world's most economical, prevalent and reliable energy source. However global tensions occur when the economic, social and environmental impact of exploration and production activities are combined with market, geopolitical and technical risks. In fact, resource owners, Oil & Gas managers, regulators, investors, environmentalists and communities, frequently find themselves in opposing camps as they debate strategies to safeguard the reliable and sustainable supply of this fundamental resource (In previous analyses<sup>1</sup> Arthur D. Little focused on the changing relationship between International Oil Companies (IOCs), National Oil Companies (NOCs) and host countries).

<sup>1</sup> Prism1/06 "The Resurgence of Petro-Nationalism" and Prism 1/10 "New business models for the international oil company"

### Building a new equilibrium

NOCs are rapidly becoming more sophisticated global players, representing the interests of their countries, investing internationally and competing for talent. IOCs are taking steps to nurture their competencies and technologies while improving their market value. In this environment of increased petronationalism a key challenge remains – how IOCs manage relationships with host countries while mitigating risks. In our view this challenge can be overcome by creating a new equilibrium built on greater cooperation and development.

The first step to building this equilibrium is recognizing that certain trends are here to stay.

Firstly, both NOCs have developed sufficient competencies to manage most of their resources themselves. By developing their R&D capabilities, partnering with Oil Service Companies (OSCs) and through global investments in exploration and production, they increasingly compete with IOCs, even for access to resources outside their own countries. However, they still rely on IOC's combination of technology leadership and superior operational knowledge (in areas such as heavy oil or deep/ultra-deep offshore) to access and develop their most challenging resources.

Secondly, for their own growth, IOCs need to maintain their current mainstream production position in existing host countries. To achieve this, they need to gain access to new resources on the

most favorable terms possible, using contractual propositions such as Production Sharing Agreements (PSAs) or Service Agreements (SAs). In the meantime, OSCs still have to compete to secure their position in an increasingly competitive service market.

The attitudes of host countries towards IOCs and OSCs are often contradictory. For example:

- An increase in petronationalism that sees ever growing amounts of production and reserves being managed directly by NOCs. IOCs and OSCs consequently need to demonstrate the value that they are delivering if they wish to remain involved in mainstream production.
- However, host countries and NOCs (such as in Iraq, Venezuela, West Africa, FSU countries, more recently Mexico, etc), require the involvement of IOCs to increase their efficiency and to provide scalable execution capabilities, often at short notice, when their own capital budgets become constrained.

### Sharing value

This changing landscape requires new thinking on how IOCs and OSCs participate, meeting the goals of host countries and helping their NOCs develop their own competencies. This situation spurs three main questions:

- Are we moving towards a new confrontational period between IOCs and NOCs – as the rise of petronationalism suggests – with OSCs working with both to provide technologies?
- How can the short-term financial objectives of IOCs/OSCs and their shareholders be balanced with the longer-term developmental goals of the NOCs and host countries?
- What types of companies should host countries involve – IOCs or other Global NOCs?

Arthur D. Little believes that these questions can be answered by building a new equilibrium that benefits all parties – with host countries capturing increased shares of the value created by exploration and production, IOCs and OSCs maintaining their activities and access to key resources, and NOCs developing their competencies to become IOC-like companies.

### Managing value for host countries

How do we attain this balance? An oil and gas industry leader recently stated that his company's goal is to move from 'vision and commitment' to 'measurement of results.' IOCs consequently need to look beyond the frequently short-sighted emphasis on 'reputation' and 'license to operate', and to focus also at increasing measurable value for their hosts and NOCs alike.

Thought leaders across many industries<sup>1</sup> have recognized that a win-win strategy of increased value creation arises when productivity improvements accompany solutions to specific societal needs and challenges. Research shows that strategic actions and investments have significant effects on local communities well beyond pure direct spending. However, conflicts often arise when there is no clarity or objectivity around the effects that these initiatives may have on the business and society.

While IOCs' risk management already considers a number of factors beyond materiality and fiscal terms when committing capital resources, measuring the value and impact of that spending has not always been rigorous. Consequently, they have not been able to demonstrate to all stakeholders (especially to host countries and NOCs) how they benefit the communities they operate in. Companies without a holistic view of the value they are generating debilitate themselves in negotiations over the terms and conditions of their engagement with host countries.

From the point of view of NOCs and host countries, more clarity on how shared value is generated allows them to select the practices that will deliver short and long-term benefit (e.g. maximize local content, effective technology transfer, etc.). Operationally, they lack the information needed to make decisions on areas of collaboration (e.g. joint developments) or operational activities to insource or outsource.

<sup>1</sup> Porter, Michael E., Kramer, Mark R., Creating Shared Value, Harvard Business Review, January-February 2011

<sup>2</sup> Building a New Equilibrium

Figure 1. The Impact of Externalities

Category of impacts	What is measured	Methodology
Economic output	<ul style="list-style-type: none"> <li>■ Direct and indirect (supply chain) purchasing expenditure for local goods and services</li> <li>■ Direct and indirect (supply chain) wages paid to local employees</li> <li>■ Household consumption</li> <li>■ Taxes paid to the Government</li> </ul>	<ul style="list-style-type: none"> <li>■ Indirect and induced impacts are estimated through economic multipliers (supply linkage multiplier, income multiplier and spending multiplier) derived from:                             <ul style="list-style-type: none"> <li>– Econometric based approaches: input-output model (Leontief matrix), social accounting matrix, etc.</li> <li>– Business case based approaches: costs-benefits analysis, survey on local businesses, social return on investments</li> </ul> </li> </ul>
Employment	<ul style="list-style-type: none"> <li>■ Local direct jobs</li> <li>■ Local indirect jobs (supply chain)</li> <li>■ Local induced jobs (private and public sectors)</li> </ul>	<ul style="list-style-type: none"> <li>■ Indirect employment, as a result of purchasing expenditure, is estimated by using the revenues/employees ratio of each industry that supply inputs and services to the company</li> <li>■ Induced employment is estimated by using specific ratios that derive from the additional income spent locally and the additional tax revenues flowing into the Government fiscal budget</li> </ul>
Human Capital Development	<ul style="list-style-type: none"> <li>■ Training expenditure</li> <li>■ Differential lifetime earnings expectancy</li> <li>■ Household consumption and government revenues generated by differential lifetime earnings expectancy</li> </ul>	<ul style="list-style-type: none"> <li>■ Human capital development is estimated by calculating the net present value of differential earnings expectancy between trained and untrained workers along with the entire work life</li> </ul>

**By applying 'multipliers' the approach allows us to calculate the indirect and induced effects that an initial round of expenditure (i.e. direct impact) generates throughout the economy**

Source: Arthur D. Little

### Understanding Externalities

Central to measuring the value that these impacts deliver is an understanding of the 'externalities' that every direct spending (either investments or operational expenditure) generates. As defined by Joseph Stiglitz, Nobel Prize Winner, "externalities" have been defined by the "actions/benefits that an individual or firm may have on another individual or firm for which the latter does not pay (in case of positive impact) or is not paid (in case of negative impact)." Today, these impacts can be quantified.

Economists have recognized externalities for a long time; measuring them has proven elusive from a practical point of view due to its complexity and the data intensity of traditional (macro) approaches. In many cases, managers have been content to adopt scorecards that include socio-economic impacts. However, scorecards (perpetuated by emerging "standards") are generally lagging indicators and limited to develop a win-win scenario for all stakeholders.

At Arthur D. Little, we have created a flexible and tested approach that can be tailored to the specifics of each project. Rather than advocating formulas that macroeconomists rely upon, the aim is to create management tools to facilitate positive negotiations and action.

This begins with a two-pronged approach. Firstly, building a comprehensive understanding of the specific local and global value chains and their interconnections, and secondly, understanding the assets lifecycle. This approach measures the externalities, for each action, whether capital investments, operational expenses to secure supply, investments in human resources, infrastructure development, social projects, etc.

### Understanding the value chain

These externalities span three types of impact – direct (e.g. wages, purchasing local goods and services, taxes), indirect (e.g. backward expenditure for goods and services along the supply chain) and induced (including additional jobs created by the greater income within the economy).

To measure the financial value of these impacts stakeholders need a detailed, yet flexible methodology (see figure 1).

The impacts of externalities vary significantly according to key factors such as the company's position in the value chain and the project lifecycle. Therefore, this requires a thorough understanding of the network of players and contractors and their relative capacity to influence and deliver on these externalities.

### The changing asset lifecycle

Externalities also change depending on the stage of the asset lifecycle. Understanding this provides the ability for NOCs and host countries to choose when in the lifecycle to involve IOCs and OSCs to deliver the greatest value. It is important to note that while externalities generated during field operations are at their strongest, they are driven by decisions taken much earlier in the lifecycle, such as at the appraisal stage (see figure 2).

### Externalities in practice

It is useful to show how this framework has been successfully implemented, both in the Oil & Gas sector and other fields.

### Sub-Saharan Oil Producing Country

A leading OSC has been strongly committed to sustainability for many years, particularly through designing, launching and implementing local content programs in the countries where it operates.

When shifting its strategy from one based around vision and commitment to a culture focused on measurement of results, it

wanted to calculate the social and economic impacts of its local content program in order to support the decision making process on further investments, support business development, and understand how the strategy could be improved moving forward.

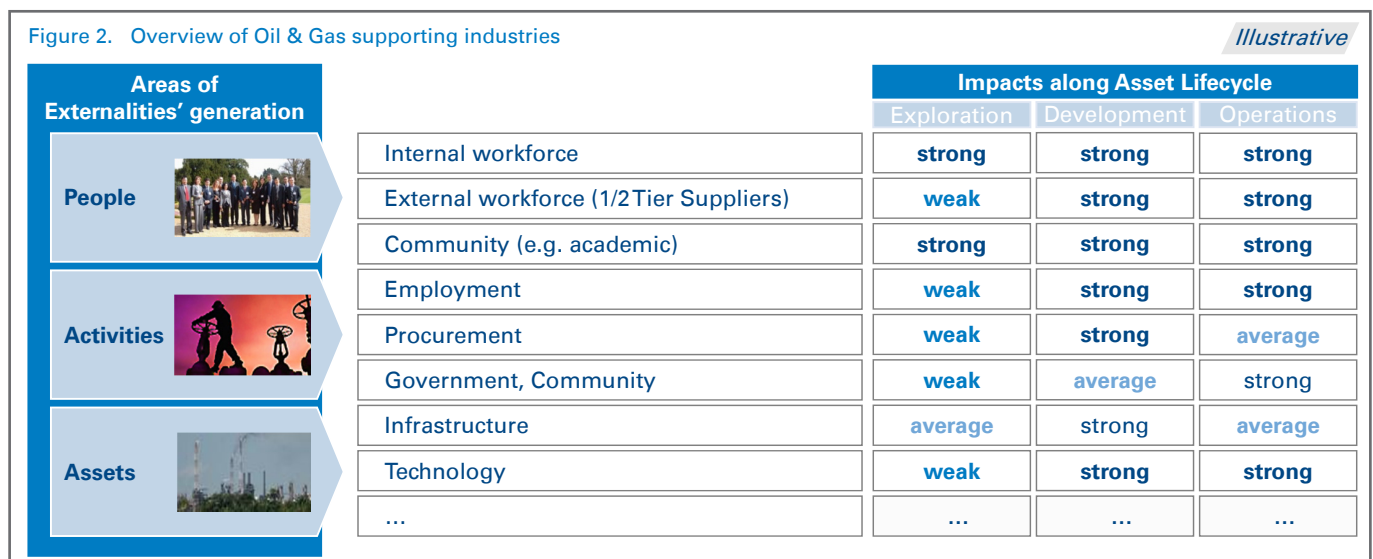
The externalities approach introduced was based upon the calculation of specific multipliers and ratios aimed at deriving indirect and induced impacts. This was done by surveying local businesses and employees about the local content of their purchases. Indirect and induced impacts were calculated, such as higher employment, based upon surveys and previous research. By estimating the differential in value between qualified and non-qualified workers, a specific business case around human capital development was created.

Taken together these factors were used to provide a cohesive report, presented to management, which outlined the significant economic and social benefits brought about by the OSC's operations. Increases of between 0.4-0.6% in GDP were outlined, along with higher employment. The research also highlighted that significant investment was necessary to further develop the country's industrial base.

### Alumina Refinery

Following the granting of a bauxite mining concession by an African government, the client wanted to assess the impact of building a large alumina refinery. Firstly, an analysis of the refinery market and operations in a global context was conducted, looking at variables such as international pricing and competition to provide an estimate of refinery capacity and project economics.

Secondly, refinery financial impact on the economy was estimated based on capital and operational expenses and the tax revenue provided to the government. Arthur D. Little then analyzed the employment opportunities for local labor, and finally looked at the qualitative effects of the refinery. These included new transport infrastructure, improved education and health systems and the creation of indirect employment within the area.



The study identified significant positive effects for the host country, its citizens and government. These included a procurement of around US\$150 million in goods and services during project execution, followed by up to US\$40 million per year during the operational phase. The project would bring US\$5-12.5 million per annum in taxes to the government for the first 15 years and had the potential to develop up to 5,000 new jobs for local citizens based on this increased government revenue. Overall the potential impact on GDP would pass US\$466 million by 2030, making up around 4-12% of the host country's annual GDP.

This information provided a framework to enable all stakeholders to find a common ground to support the project, monitor its development and prepare all external parties to ensure the potential benefits. For the investor it provided confidence in the permitting processes, timely development of infrastructure and deployment of the required human resources; all critical variables for the overall project.

### Conclusion

Ensuring a reliable and sustainable supply of energy resources remains a challenging task. Factors such as the market uncertainty from the global economic downturn of 2008-2009, the current turmoil about sovereign states' debt, the complicated geopolitics of oil and conflicts in producing areas, increased access to technologically challenging resources and more stringent requirements on safety and environmental performance, all add to the challenges. Creating a stable equilibrium, rather than conflict, is consequently vital to maintain sustainable energy supplies.

Overcoming these issues is therefore only achievable through strong cooperation among the key industry participants – NOCs, IOCs, OSCs and host countries; requiring transparency which in turn requires verifiable information trusted by all parties.

Given that the industry operates under each host country's specific legal and regulatory systems, this new equilibrium can only be sustained if the cooperative dynamic is built at a local level. All parties involved have to recognize the long-term value of the investment in concrete and measurable gains – whether in economic output, employment or infrastructure (for host countries), skills transfer and capability development (for NOCs) or access to mainstream energy resources (for IOCs).

The framework described here identifies and measures externalities and societal value generation taking into account the key factors of the specific asset life cycle and value chain integration. Using a data driven approach, it uncovers the specific mechanisms by which large investments in the Oil & Gas sector generate societal benefits and impacts (externalities) for all involved. Clarifying and quantifying these externalities provides management at the IOC and NOC, and host country, with the information needed to manage and direct the delivery of value for all stakeholders.

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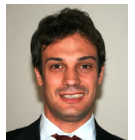
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Arthur D. Little's experience suggests this type of framework may be extended with success to other industries beyond Oil & Gas, such as mining, chemicals and nuclear power.

### Arthur D. Little

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