Negative Secondary Impacts from Oil and Gas Development

The Energy & Biodiversity Initiative

Oil and gas exploration and production activities can have a wide range of impacts on biodiversity, both positive and negative. These impacts, which can be defined as changes in the quality and quantity of biodiversity in a physical environment, will vary in scale and significance, depending on the activities and environmental conditions involved. Impacts to biodiversity can be broadly divided into two types: primary and secondary (see Box 1). This document focuses on the specific challenge of negative secondary impacts, beginning with a discussion of how secondary impacts differ from primary impacts and then examining the difficulties of understanding and addressing the negative effects of secondary impacts.

1. PRIMARY VS. SECONDARY IMPACTS

Ultimately, both primary and secondary negative impacts to biodiversity may mean habitat conversion, degradation and fragmentation; wildlife disturbance and loss of species; air, water and soil pollution; deforestation; soil erosion and sedimentation of waterways; soil compaction; contamination from improper waste disposal or oil spills; and loss of productive capacity and degradation of ecosystem functions – both onshore and offshore. Where the two types of impacts differ is in cause, scope, scale, intensity and boundaries of responsibilities. This can sometimes make it difficult to definitively label environmental degradation as either primary or secondary (see Box 2 for an example of one cause of both primary and secondary negative impacts). In general, primary impacts are changes to biodiversity that result specifically from project activities. These impacts, which will be most familiar to project managers, are normally associated with the geographic area relatively near to project activities. Primary impacts usually become apparent within the lifetime of a project, and often their effect is immediate. For example, clearing areas of a dense-canopy forest to build project infrastructure will result in immediate deforestation and loss of habitat, and may lead to soil erosion over the longer term that will contaminate a waterway.

Most primary impacts can be relatively easily predicted with a standard Environmental and Social Impact Assessment (ESIA) process, based on the proposed activity and an understanding of the surrounding ecosystem. Primary impacts can usually be minimized or avoided by incorporating sound biodiversity conservation objectives, impact mitigation and operational management practices into company Environmental Management Systems and project-level assessment, design and execution, from the very start of an operation.

BOX 1. USE OF THE TERM SECONDARY

This document uses the terms primary and secondary to describe the different causes and scales of potential impacts to biodiversity from oil and gas development. There are a number of other terms that can and have been used to describe similar concepts. Primary impacts are often called *direct* impacts, while secondary impacts are referred to as *indirect* or *induced* impacts. Although we have chosen to use the term secondary in this document and throughout related products of the EBI, it is not meant to imply secondary importance or secondary significance as an issue for the oil and gas industry. Rather, secondary refers to timing and scope of these impacts. In fact, in many cases, the effects on biodiversity from secondary impacts are much more significant than those of primary impacts and represent an important priority for the industry to understand and effectively address.

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BOX 2. INTRODUCTION OF NON-NATIVE SPECIES

The introduction of non-native species to an area, through oil and gas operations and other development, is a major and growing concern for scientists and conservation organizations. In some cases, species that are moved to areas outside their natural distribution may establish viable populations in a short period of time, consuming or displacing populations of native species in the new habitat. While the majority of non-native species introduced to an area will not become invasive or aggressive, those that do may proliferate and can have devastating consequences. This can be a significant problem on islands, where species may have evolved or thrived because of a lack of predators or competitor species.

The effects of non-native species can be considered both a primary and secondary impact of oil and gas operations. Non-native soil, seeds, insects and other animals may be directly introduced to an area through the transportation of equipment, materials and supplies for the project and its associated services, or through revegetation programs. Similarly, people who move into a project area, either for employment related to the project or to pursue their own economic activities, may bring with them non-native plants and animals.

In addition, the problem of "edge effects" can arise when land-clearing allows plant species to spread into and colonize areas that were previously inaccessible to them. Weeds, grasses and other aggressive species, even if native to the region, can begin to crowd out other plant species that had been previously protected by forest cover, bringing with them certain native insect and animal species that could not thrive in the forested area.

Non-native species are often introduced along pipeline corridors, either through poor selection of reseeding programs for erosion control or reforestation, or through human activity and disturbances. In the Northwest Territories of Canada, the 869-km (540-mile) Norman Wells Pipeline, which was constructed about 20 years ago, has caused major disturbance to its surrounding boreal forests. Although the pipeline was buried and revegetation was attempted with native species, follow-up surveys have shown that 34 non-native plant species have established themselves in the area as a direct result of pipeline construction and reseeding activities. The replanting program also heavily contaminated the soils with head smut fungus *(Ustilago Bullata Beck)*, which was previously uncommon in the area.

The potential for these forest impacts can be minimized by using native species that are forest colonizers in revegetation programs, keeping equipment clean and free of unwanted plant and animal species, and implementing quarantine and monitoring programs to reduce the transport of non-native species. Companies that are likely to face problems of invasive non-native species should develop a quick response capacity to eradicate or remove potentially invasive species as soon as they appear, as it becomes increasingly expensive to deal with the problem as the population of the non-native species increases.

ChevronTexaco has been producing oil on Barrow Island, off Western Australia, for more than 35 years. The island, which is designated as a Class A reserve for the protection of flora and fauna is home to 227 native plants, 15 mammal species, including eight rare marsupials, 110 types of birds and 54 species of reptiles, including the world's second-largest lizard. Although many of these species are rare or extinct on the mainland, they have all survived on Barrow Island because of the absence of introduced predators and competitor species. This is in part due to ChevronTexaco's Quarantine Procedure, a living policy that is incorporated within the company's formal Health, Safety and Environment Management System (HSEMS) and routinely reviewed and revised. The procedure involves control of access to the island and rigorous monitoring of all cargo landings to minimize the risk of pests being inadvertently transferred to the island along with materials, machinery and personnel, and to maximize the likelihood of detecting and eradicating any pests in the event that they do arrive. In nearly four decades of oil exploration and production, which has included more than 10,000 cargo shipments, the company has ensured that no exotic species have successfully colonized the island.

In contrast, secondary impacts, rather than resulting directly from project activities, are usually triggered by the operations, but may reach outside project or even concession boundaries and may begin before or extend beyond a project's life cycle. Although secondary impacts may be predicted with a thorough ESIA process that includes biodiversity issues and explicitly links environmental and social issues, in some cases, the potential for such impacts may not be identified or realized until much later in the project cycle, or even after the project has been decommissioned.

One of the most important distinctions is that, while primary impacts result from operational decisions and the activities of project personnel, secondary impacts tend to result from government decisions and the actions and practices of nearby communities or immigrants, in response to the presence of the project. Thus, the responsibility for predicting, preventing and mitigating secondary impacts is not at all clear-cut. While these decisions and activities may occur because of the presence of the project, they are often the actions of organizations and individuals unrelated to the energy company.

Although the company will often be held responsible by the public for any negative effects, because of the shared spheres of responsibility involved, secondary impacts tend to be the most controversial and difficult to manage types of impacts from oil and gas development. They may also cause the most problems for a project or company. It is thus vital that companies seeking to work in areas of high biodiversity value – where secondary impacts have the potential to be extensive – understand the factors that may lead to such impacts, the key challenges in addressing them, and ways to avoid or minimize such impacts.

Further information on managing primary and secondary impacts can be found in **Good Practice in the Prevention and Mitigation of Primary and Secondary Biodiversity Impacts.**

2. FACTORS THAT MAY LEAD TO SECONDARY IMPACTS

The most common causes of secondary impacts relate to population changes in an area and new or additional economic activities resulting from the large investments in potentially permanent infrastructure, such as roads, ports and towns, that may accompany an energy project, or any other major industrial development.

2.1 Immigration and new settlements

Oil and gas operations usually require skilled labor, and are thus magnets for people hoping to find employment with the company or its contractors. New projects also typically stimulate the provision of goods and services both to the project and/or affected local communities, creating additional employment opportunities and attracting more people to the area. Even unfounded rumors that project activities will occur may be sufficient to cause people to migrate to an area in search of employment. In some cases, in-migration is encouraged or even supported by local or national governments, making this a particularly sensitive political issue.

For example, in Gabon, Shell's operations have been the catalyst for the establishment and development of Gamba, a town of currently about 6,000-7,000 people, many of whom work directly or indirectly for Shell. The presence of these workers, some of whom are second generation, has had an impact on the surrounding biodiversity through limited agricultural activities and hunting of bushmeat (recognizing that this is allowed within the local law as long as it is for local consumption and not trade). Shell has no direct control over Gamba, as it is a town with its own governance, but where Shell does have direct control, such as the Gamba terminal or the infield Rabi oilfield, it has put strict management controls in place, including controlling development, prohibiting hunting, limiting driving speeds and times, and managing emissions to minimize its impacts on biodiversity.

As the local population increases, the need for housing, food and other goods and services will also grow, often through totally unplanned and uncontrolled new settlements. This is particularly the case in previously undeveloped areas. This increased demand will put additional pressure on natural resources, including:

- Deforestation from clearing of land for agriculture, building housing and other infrastructure, and collection of wood for construction, cooking and heating;

- Increased demands on water resources and generation of wastes and other pollution;

- Increased demand for public services such as schools, law enforcement and health care, that reduces the resources available to address biodiversity concerns;
- Commercial and illegal logging;
- Extraction of non-timber forest products, such as fibers, medicinal plants and wild food sources;
- Increased hunting and fishing, for subsistence or trade in bushmeat; and
- Poaching for skins, exotic pet trade or other uses, such as folk remedies.

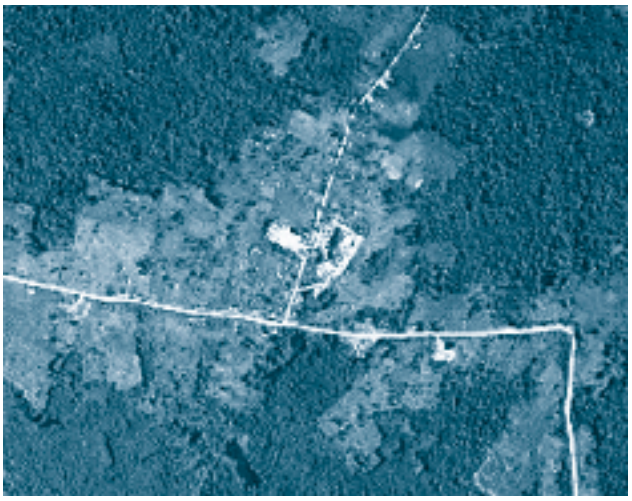
People who have settled in an area either for employment with a project or to provide additional services usually remain after their jobs are finished and often well after the operation has ended and moves out of the area. When the economic activity generated by the company disappears, people often depend even more on natural resource extraction, such as increased clearing of land for agricultural activities, timber and hunting. For example, at the peak of project labor demand, during the construction phase, thousands of workers may be needed. However, this need for labor will rapidly diminish in the operational phase, leaving many people who have moved to the area without a ready source of income.

2.2 Increased access to undeveloped areas

In addition to attracting people looking for work related to the project, an oil and gas operation can also provide access to an undeveloped area for people who are interested in using previously inaccessible land or resources for other purposes. This access is usually facilitated by the building or upgrading of linear infrastructure, such as roads and pipelines, into such environments.

One of the most dramatic results of a new or improved road or pipeline route is the extensive deforestation that results when the access route penetrates a remote and inaccessible forested area. In some cases, this deforestation is largely for agricultural or ranching activities that generate little long-term employment and are often unsustainable due to poor quality soils. Increased access can also lead to logging, hunting and other pressures on biodiversity. As forests are cleared, all the plants and animals that live there either move to a new area, if they can, or die. Changes in surface hydrology, declines in forest cover and similar changes in the environment can have associated negative effects on biodiversity. A pipeline and road built through previously undeveloped forest and wetlands in the northern Guatemalan department of Petén in the mid-1990s facilitated access that led to extensive deforestation and agricultural colonization along the route. These impacts can clearly be seen in aerial photos of the forest in the years following the pipeline's construction (see Figure 1).

FIGURE 1. DEFORESTATION ALONG AN OIL ROAD AND PIPELINE PATH IN GUATEMALA



(Source: Sader, S.A., et al. Time-series tropical forest change detection for The Maya Biosphere Reserve: Updated Estimates for 1995 to 1997. Maine Image Analysis Laboratory, University of Maine, Department of Forest Management.)

3. KEY CHALLENGES IN UNDERSTANDING AND ADDRESSING SECONDARY IMPACTS

Because secondary impacts typically arise from complex interactions between social, economic and environmental factors and players, they can be difficult for a company to fully predict and equally difficult or impossible for a company to effectively manage alone. Anticipating and managing secondary impacts is further complicated by the potential of activities not associated with the project to have their own impacts, thus adding to the severity or intensity of secondary impacts.

Secondary impacts will sometimes result from company activities that contribute positively to economic development, such as road-building or local employment. There can be significant tension between conservation and development goals in an area, and a company may find itself caught in the middle of that debate. For example, a company's commitment to contribute to local economic development and skills

transfer through training and hiring of local labor and suppliers may encourage immigration to an area, leading to secondary impacts from population growth. Or, a road that local communities or government agencies support because it will increase economic activity in an area may be strongly opposed by conservation organizations concerned that the road will open access to a pristine ecosystem.

As with any form of development, when an oil and gas operation enters an area, there will be inevitable trade-offs between long- and short-term costs or benefits and conservation and economic development priorities. It is beyond the ability of a company alone to fully address or prevent secondary impacts or make decisions about how to balance those trade-offs in order to achieve the most sustainable development possible for the area.

While a company can make a significant contribution to protecting biodiversity in the area or preventing some level of secondary impact, the authority and expertise for necessary actions to influence secondary impacts may more appropriately belong with others, notably government representatives and communities themselves. For example, a company may be able to unilaterally reduce or avoid immigration along roads or pipelines through careful planning of routes to avoid critical natural habitats, use of existing infrastructure and access routes, reducing the size of the right-of-way area or burying the pipelines. But, if the company wants to control access along the route, support from government authorities and local communities will be a critical factor in their success.

Nevertheless, a company's critics may argue that the company is fully responsible for any negative impacts that result from secondary economic activities or population increases and will expect the company to do as much as it practicably can to address those impacts. Although it may be difficult or impossible – and ultimately undesirable – for the company on its own to do everything that would be needed to meet stakeholder expectations, failure to manage secondary impacts can have significant negative consequences for the company's project success and corporate reputation, both locally and internationally. It is also typically very difficult to avoid or even effectively manage secondary impacts once the conditions that cause them have been created. Therefore, it is in a company's interest to identify, as early as possible, the potential for a project to give rise to secondary impacts during any part of the project lifecycle. The key tool for a company to predict potential impacts and determine effective mitigation strategies is a broad-based ESIA that explicitly includes biodiversity considerations and carefully examines the complex interrelationships between social and environmental issues.

Further information on ESIAs can be found in **Integrating Biodiversity into Environmental and Social Impact Assessment Processes.**

Early impact assessment will enable a company to have maximum flexibility to alter design and implementation plans, build effective partnerships to address potential challenges, and even make decisions about whether or not to proceed with a project. Just as the potential for significant and unacceptable primary impacts may stop a project, there may be times that secondary impacts that are difficult or impossible to avoid or mitigate will be so significant, in terms of risks to the project and company investment as well as risks to biodiversity, that a company will decide not to proceed with the investment. It is best to make this decision before decisions involving the deployment of major resources are made.

Further information on decision-making in the pre-bid stage can be found in **Framework for Integrating Biodiversity into the Site Selection Process.**

4. APPROACHES FOR AVOIDING OR MANAGING SECONDARY IMPACTS AND THEIR CAUSES

Just as negative secondary impacts to biodiversity may be caused by a wide range of stakeholders, their solutions will usually require cooperation among many parties, in particular national, regional and local government officials, and also including local communities, national and international conservation organizations, companies and financial institutions that may provide funding for the project (see Boxes 3 and 4). Early and continuous engagement with all relevant stakeholders will be critical for identifying potential conflicts, building trust, defining boundaries of responsibility and promoting cooperation and partnership in addressing secondary impacts. This may be particularly true in some developing countries, where biodiversity conservation might not be a priority or high-profile issue.

Where it is determined that responsibilities for addressing negative secondary impacts most

appropriately rest with other organizations, the company may want to help facilitate processes or build capacity to enable those organizations to more effectively carry out those responsibilities. Highly creative solutions may be needed, and companies will be expected and challenged to help find them. For example, it may be possible to address access and immigration concerns by working in partnership with government agencies and conservation organizations to establish some form of protected area around or along a road or pipeline. Or, in some areas, it may be possible to find innovative ways of providing resources and supplies to local communities. In 1985, Petroleum Development Oman set up an experimental desert farm near some of its operations in southern Oman, in order to test the agricultural potential of desert farming. The farm was such a technical success that it more than doubled in size two years later and now offers a wide range of high-quality fruits and vegetables to local people, lessening the pressure of the local population on the area's ecological resources.

A stakeholder engagement plan should be an integral part of any new business development process. An effective stakeholder engagement plan will enable a company to identify the most active stakeholders and likely partners for future collaboration, build trust and increase the chances of public support for their project. While stakeholder engagement does not eliminate the possibility of conflict or guarantee agreement, it vastly increases the chances of success. The engagement plan, which ideally will begin in modified form at the pre-bid stage, should detail a process of information sharing, soliciting concerns and listening to the wants and needs of relevant interested parties to guide project design and implementation. Companies should remain transparent and responsive to concerns and demonstrate commitment and leadership from top project managers. Government representatives will be key participants in a process of engagement with local communities and other stakeholders. In addition, conservation organizations and economic and social development organizations may have knowledge, expertise and experience to help the company anticipate and address the social or economic conditions that might lead to secondary impacts.

Further information on stakeholder engagement can be found in **Integrating Biodiversity Conservation into Oil and Gas Development**, Box 11.

One of the most important ways that companies can work with stakeholders to resolve conflicts and prevent secondary impacts is by encouraging and participating very early on in regional planning exercises in the areas where they work or plan to work. These exercises, which should be led by governments, will ideally involve all relevant stakeholders. Based on the interests of the authorities, the general public and the private sector, regional plans can help establish priorities and conditions for resource development, other economic activities, community development and biodiversity conservation.

A company may find significant business value in actively participating in regional planning processes,

BOX 3. AVOIDING AND MANAGING SECONDARY IMPACTS: BP'S TANGGUH PROJECT

BP is developing its Tangguh LNG project in Berau-Bintuni Bay in Papua, Indonesia. Although the construction phase of the project will employ 3,000-5,000 workers at peak, the ongoing operation will only employ about 500. With the development of the project, there are concerns that the area, which is a delicate ecosystem with high levels of endemic species, cannot environmentally or economically support large levels of in-migration. To understand and prevent potential secondary impacts from in-migration, BP has been conducting consultations with host communities and other stakeholders since the earliest stages of project planning, incorporating feedback from these consultations into both the Environmental Impact Assessment and the Tangguh Project's Integrated Social Strategy (ISS). The ISS includes training, education, health, enterprise development, cultural preservation, economic resource management and conflict prevention, founded on five key principles of consultation, empowerment, participation, partnership and sustainability. BP is also working with local government and other stakeholders to implement a Distributed Growth Strategy through capacity-building partnerships. The strategy is built upon the recognition that the urbanization of the immediate project area is neither sustainable nor desirable. Thus, the strategy promotes project-related and other economic activities in major towns throughout the local area that already have sufficient supporting infrastructure. These "Regional Growth Centers" will serve as the project's transit gateways, recruitment centers and payroll sites.

and potentially even in helping governments initiate and/or conduct such efforts. Designing a project in the context of an existing general plan for development on a regional scale will help a company ensure that its field development is managed strategically, to promote sustainable development and conservation in the area and to avoid the potential for unforeseen access and immigration issues that might lead to extensive secondary impacts. It is also important to work with local government, NGOs and community representatives to promote long-term sustainable economic development within new and existing communities surrounding the operation. Ensuring that new economic activity resulting from an operation will be sustainable or can be adapted for long-term viability once the operation ends can help to prevent collapse of communities or economic problems that might lead to increased pressure on, and exploitation of, natural resources.

Further information on regional planning processes can be found in **Framework for Integrating Biodiversity into the Site Selection Process.**

The importance of government participation in stakeholder engagement, regional planning and sustainable community development should not be underestimated. It has been shown that the more government officials are interested and involved in regional planning and engagement with stakeholders, the more likely it will be that efforts by the company and other actors to predict, prevent and mitigate secondary impacts will succeed.

5. CONCLUSION

The potential for major energy projects to trigger negative secondary impacts to biodiversity is typically one of the biggest concerns and causes for NGO and community opposition to such projects. While effective techniques for avoiding and managing most potential primary impacts of energy projects on biodiversity are generally well-established, technically feasible and documented in available literature, this is not the case for secondary impacts. There is clearly a need for more companies, as well as conservation and other organizations, to document and share information about where specific approaches for avoiding and/or managing secondary impacts associated with energy projects have succeeded and where they have not. While it must be recognized that the complexities and challenges of predicting and addressing secondary impacts are very location-, project- and context-specific, there is significant value for all stakeholders, especially companies and governments, in broad dissemination of relevant "lessons learned" and creative solutions to allow broader application to other projects in the field.

BOX 4. AVOIDING AND MANAGING SECONDARY IMPACTS: SHELL'S MUSKEG RIVER MINE PROJECT

In Northern Alberta, Canada, Shell has made local economic development a focus of its strategy at the Muskeg River Mine Project, part of the wider Athabasca Oil Sands Development. About 55,000 people live in the vicinity of the project, 15% of whom are aboriginal. An extensive stakeholder consultation and engagement process revealed that economic development and employment were two of the biggest concerns for local people. The company has taken a number of proactive steps to increase local employment and supply chain opportunities, and thus limit the need for in-migration or unsustainable economic development that might lead to secondary impacts in the area. Shell's local employment strategy has included development of a regional business strategy, baseline capability studies and a long-term commitment to building local capacity through programs such as apprentice schemes for young people. The company has said that it will not compromise its competitive or HSE standards but that it is committed to investing in efforts to bring local contractors up to those standards. Long-term sustainable economic opportunities are a key focus of the program, to avoid local suppliers becoming dependent on the operation. So far, the response among local people has been mostly positive, and more than US$110 million in contracts has gone to businesses in the local region.