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Aboriginal Human Resource Professional and Skill Development Needs in the Bioeconomy and Environmental Servicing

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1.0 INTRODUCTION

Canada's forests, home to 80% of all First Nation communities, is one of the world's largest carbon storehouses and will figure large in Canada's approach to climate change. Carbon management, as a key component of climate change mitigation initiatives, is moving rapidly from concept to practice in virtually all sectors of the economy, and will guide all objective setting in major forest sector policy for the foreseeable future.

The forest sector is not what it used to be. Climate change and the decline in the traditional forest industries is driving the call for forest conservation and technological innovation in forest product development, and expediting the emergence of the bio-economy. In turn, change in forest tenure systems, and other institutional reforms, is being considered in many jurisdictions. Integrated forest land management is becoming a priority recognizing the ecological goods and services provided by forests, and the increasing demands on forests as the source of timber, energy, and mineral resources, and other forest land uses.

The transformation occurring in the forest sector will have a huge impact on the development plans of First Nations and on the aspirations of First Nation leaders that seek to regain a significant role as "Stewards of the Land" for their communities, with respect to their traditional territories. Engaging in the bioeconomy and in the provision of ecological goods and services is fundamental to forest stewardship in today's terms. For Aboriginal communities this will mean building capacity within existing governance arrangements and developing strategies for human resource development (HRD) through which Aboriginal youth are channelled towards education and training in natural resource management and conservation, wood and biomaterial science, and various technologies, i.e. biotechnology. The forest sector emerging will require a combination of science and business expertise, and for Aboriginal communities, the utilization of traditional knowledge will help safeguard Aboriginal forest values and the focus on long term forest sustainability.

The bioeconomy and the protection of ecological/environmental goods and services (EGS), often referred to as the conservation economy, provide significant opportunity for First Nations. The purpose of this paper is to

discuss the Aboriginal human resource professional and skill development needs in these two emerging sub sectors of the forest economy.

2.0 THE FOREST BIOECONOMY

Canada's potential bioeconomy is based on the use of renewable biological resources and biotechnology processes for more sustainable and ecoefficient manufacturing of goods. These goods are referred to as bio-products and considerable research and development in Canada is currently underway to grow the sector as a means of economic diversification. The bioeconomy also holds promise to help wean the Canadian economy from its dependence on fossil fuels as a primary source of energy thereby reducing greenhouse gas (GHG) emissions.

Forests are Canada's greatest source of biomass – the raw materials for most bioproducts. Biomass can originate from timber productive forests, non-timber productive forests, managed stocks (plantations or intensively managed forests), logging wastes, mill wastes, agroforestry or urban forests. When harvested directly from a forest, bio-mass would include "tree tops, culled trees or portions of trees, individual and stands of unmerchantable trees, and trees that may be salvaged as a result of a natural disturbance", (Ontario biofibre policy, 2009).

It is estimated that up to 500 forest bioproducts are in commercial use today. They include textiles, fibres, polymers, adhesives, bioinsecticides, antibiotics, plant-derived pharmaceuticals, nutraceuticals, biochemicals and biofuels. By its definition, the bioeconomy also includes non-timber forest products. Almost all Aboriginal communities in Canada now harvest materials in some form from forested lands for personal and household use. Given the development of acceptable arrangements for recognizing the intellectual property of Aboriginal communities, considerable potential exists for new forest plant-derived products, including drugs and other medicinal and natural health products. The production of functional foods and nutraceuticals, wild crafting, arts and crafts materials, essential oils, all hold added promise for Aboriginal communities, considering the emphasis on the bioeconomy and growing markets.

Most attention of governments and industry has been focussed on the potential of forest biomass to serve as a feedstock in the production of renewable energy. Forest biomass can be converted into many different forms of energy either as heat, electricity or biofuel. Direct combustion produces heat and indirectly steam, which can be used to produce electricity. Biological, thermal and chemical conversion processes can convert biomass into fuels such as ethanol and methanol that can be used in vehicles and equipment.

The forest industry itself is one of the biggest producers and users of forest biofuels. Currently, 60% of forest industry energy needs are derived from biomass energy systems. The concept of cogeneration is particularly suited to mills as they already gather and process biomass and can produce energy in a manner that is designed to meet their specific internal needs. At a certain level it is expected that the forest industry will adapt and play a key role in the future bioeconomy. On behalf of its industry members, the Forest Products Association has launched (February 2010) The Biopathways Project which entails a strategy to create a range of bioenergy, biochemical and other bioproducts to complement the current product line and to make full use of the forest resources harvested.

Of particular note has been the growth of the wood pellet industry in Canada. Wood pellets are made from wood waste and salvage materials and compressed through pelletization processes. They are primarily used in heating systems – industrial, institutional and residential. However, some jurisdictions, i.e. Ontario, are considering their use in producing electricity as a substitute for coal. BC is the centre of wood pellet production in North America and roughly 90% of BC's wood pellets are exported, including more than 500,000 tonnes to Europe. The BC wood pellet industry has grown by 20% each year over the last five years. More than 11,500 biomass installations in the European Union (E.U.) have generated over 260 million tons valued at over C5 billion. The E.U. has produced 4% of its electricity from biomass sources and intends to double its output by later this year through the initiatives outlined in the E.U. Biomass Action Plan.

2.1 First Nations and the Bioeconomy

The bioeconomy has the potential to stimulate employment and generate wealth in First Nation communities. As with forest resources generally, First Nation communities are located within or in close proximity to forested areas and often their Aboriginal and treaty rights give them some priority access to forest biomass. Further, most First Nation communities are currently engaged in some form of forest resource harvesting, timber and non-timber, making a focus on the bioeconomy an attitudinal shift in use, and an orientation towards marketing.

First Nations can view the bioeconomy as both a means to meet their own needs, i.e. greater energy self-sufficiency, as with the district heating model, or as a supplier of forest bioproducts to various markets. In Canada today, numerous First Nations are developing business plans to manufacture/produce bioproducts and bioenergy.

2.2 Human Resources and the Bioeconomy

In reality, the forest bioeconomy has existed from time immemorial. Humans have no doubt used forest resources products for fuel, food and medicine for their personal use and for trading at least since the discovery of fire.

Biotechnology is what makes today's bioeconomy different. Biotechnology is the application of science and technology to living organisms as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services. The bioeconomy includes the research, development, manufacturing and commercialization of technologies and products in many areas: agriculture, aquaculture, bioenergy, bioinformatics, bioproducts, biosciences, environment, food processing, forestry, genomics, human health, industrial applications, life sciences, medical devices, natural resources, nanotechnology, nutraceuticals and pharmaceuticals.

Within the forest sector, all major players today are fixated on the bioeconomy. The existing forest industry, hard hit by the drastic decline in demand for forest commodities, is relying on an expansion into areas such as bioenergy, biochemicals, and other bioproducts. The industry is backed by the forest research community and government support programs. A major concern for industry is to transition current forest workers to a working environment more related to biotechnology. Traditionally the industry has offered a wide range of opportunities for labourers, skilled tradespeople, professionals, and those interested in the natural and applied sciences, or in business, finance, administration and management. Specific forest sector occupations have included:

- Forestry professionals: forest ecologists, researchers, compliance and enforcement coordinators, integrated resource management officers
- Forestry technologists and technicians: forestry crew, silviculture, environmental or harvesting technologists
- Machine operators and control operators: logging machinery, chain-saw or skidder operators, pulping control, papermaking or coating control operators
- Other: logging and forestry supervisors and labourers, silviculture and forestry workers, lumber and wood inspectors and graders, labourers in wood, pulp and paper processing

A combination of traditional industry skills and biotechnology will shape the bioeconomy. For the forest industry, **forest biomaterial science** will be an integral feature in producing materials and energy from forest biomass. At the level of R&D and new product development, the industry has a need for molecular biologists, chemists and process engineers. Other biotechnology related subjects include biology, mathematics and physics. In Canada at the

present time, universities and community colleges are developing curricula for biotechnology programs which will span several scientific disciplines including biology, chemistry, physics, genetics and bioinformatics.

The forest based bioeconomy will encompass a vast range of biotechnology activity beyond that of the established forest industry. Most new biotechnology companies in Canada are small to medium-sized, with fewer than 50 full-time employees. Companies may be involved in various stages of development of products, such as R&D, clinical/field trials and regulatory trials, production/manufacturing, and commercialization/marketing. The bioeconomy will to some extent result in a merging of sectors, and of the inherent technologies commonly used. Forest related foods, health products and pharmaceuticals are areas of market growth in the bioeconomy.

A pool of skilled and qualified human resources is critical to success in the bioeconomy. Yet in many regions of Canada today, demand for biotechnology talent outstrips its availability. To date, there has been no comprehensive body of biotechnology-specific labour-market information to help guide human resource strategies and the decisions of policymakers. BioTalent Canada (a Sector Council) was established in 1997 to provide a range of human resources intelligence services to the bioeconomy. BioTalent Canada is currently developing specific recommendations relative to the bioeconomy and to the participation of Aboriginal people in it, (see www.biotalent.ca).

2.3 Aboriginal Skill Needs in the Bioeconomy

Aboriginal communities have significant opportunity in forest bioproduct manufacturing and in the production of bioenergy given their proximity to forests and often priority rights to harvest forest biomass. The existing forest industry and new established forest biotechnology firms view Aboriginal communities as key partners in the bioeconomy based on Aboriginal and treaty rights recognition in natural resource management and forest tenure regimes. The labour force in many Aboriginal communities faces the need for transition and re-training, as do forest workers throughout the sector. To a large extent, Aboriginal skill needs in the bioeconomy mirror those of the general population, though the gap is wider because of low educational attainment levels particularly in the sciences.

According to BioTalent Canada, a ready supply of skilled, qualified talent is essential for success in the bioeconomy. "The Aboriginal Peoples of Canada could be an important part of that supply but to become so, they must have stronger encouragement to enter into the sciences, and be provided with a greater number of educational and occupational opportunities within their chosen fields."

3.0 ECOLOGICAL/ENVIRONMENT GOODS AND SERVICES (EGS)

EGS are generally defined as the economic and social benefits derived from the ecological functioning of healthy ecosystems. Often referred to as natural capital, and considered gifts from Mother Earth by Indigenous peoples, they include clean air, water quality and quantity, biodiversity, carbon sequestration and landscape aesthetics. Activities that people can undertake to protect, enhance or restore EGS in a forest management context include:

- Forest carbon sequestration projects
- Water quality conservation
- Watershed management and restoration
- Wildlife management and habitat enhancement
- Biodiversity preservation

Forest conservation is the best option in ensuring that EGS from forests are maintained and in some cases enhanced. There are two basic approaches to forest conservation. First, governments in Canada are committing to establishing forest protected areas to maintain the health of ecosystems and wildlife species, and to mitigate climate change. Forest policy such as that announced by the Quebec and Ontario governments in 2009 that 50% of the boreal forest within their respective jurisdictions will be protected is indicative of this broad direction.

Secondly, market-based conservation is now a feature of forest management in Canada. Eco-tourism, forest certification and biodiversity offset projects, all now play a part in linking forest conservation to the marketplace. More significant will be the establishment of a compliance based (regulated) carbon market for the trading of carbon offset credits once Canada and the USA are able to harmonize their overall approaches to climate change. In place now are several voluntary markets, e.g. Pacific Carbon Trust in BC and the Chicago Climate Exchange, through which carbon offset credits generated through specific initiatives, e.g. forest carbon sequestration projects, are bought and sold.

Forest carbon sequestration projects are widely acclaimed as a primary means of reducing GHG thereby mitigating climate change. For this reason, projects that increase storage of carbon either in existing or new (afforestation) forests provide a service which has economic value. The carbon credit has value to business entities (the buyers), such as power companies and manufacturers that burn fossil fuels, who are seeking to offset their carbon dioxide emissions. Carbon credits in these projects are gained by actions taken by the project proponent (the sellers) that help store carbon dioxide thereby reducing emissions into the atmosphere. These actions can be the result of

forest conservation practises related to reforestation, afforestation and avoided deforestation.

3.1 First Nations, EGS, and Conservation

First Nations have always held the position that keeping lands intact is vitally important and that the value of land is beyond the financial returns derived from resource extraction. Aboriginal forest values pertain largely to conservation and to ensuring gifts from Mother Earth are maintained. Ecological goods and services should be in an area of particular interest to Aboriginal communities because they achieve a variety of social, economic and ecological benefits in addition to providing a means of cultural strengthening. New or better managed forests provide numerous ecological services including new habitat for wildlife, biological diversity, protection of ground and surface water quality and quantity, erosion control, as well as the sequestration of carbon to mitigate climate change.

Markets for the goods and services that are provided to protect, restore and enhance the ecological functioning of ecosystems are emerging and are referred to as the conservation economy. Engaging in conservation has to be a key component of First Nations' forest land stewardship initiatives. It offers opportunity to strengthen the relationship with the land and to advance Aboriginal and treaty rights recognition. It requires however, the negotiation of long term tenure arrangements with other levels of government to define relationships and determine the nature of revenue generation, either in the form of carbon credits or public payment mechanisms for EGS or protected areas management.

3.2 Human Resources and EGS

Forest conservation is the broad discipline most relevant to the provision of EGS in a forest management context. Forest conservation is based on sound knowledge of forest ecology, but it also requires understanding of complex social, communal, political and economic issues. There is an increasing need in all forest and resource management fields for graduates, like those of forest conservation programs, who combine broad literacy in related disciplines with specialized expertise in selected areas such as forest ecology, wildlife management, Aboriginal land tenure issues or economics.

Practicing foresters will play a key role in EGS development and delivery. Foresters are expected to consider non-timber values including water, fish, wildlife, recreation, wilderness on top of forest management planning and timber harvesting. There are numerous sub-disciplines in forestry, the most relevant to EGS would include ecology, hydrology (study of water), pedology (study of soils) and silviculture (care and cultivation of forest trees). A forest

conservation focus integrates these areas of study. Foresters, biologists and other natural resource management and environmental science specialists may wish to augment their professional training by enrolling in advanced programs such as environmental resource management and forest/natural resource restoration, which are more tailored to conservation and EGS.

The provision of EGS at the project level, is labour intensive and technologically oriented. Skilled workers suited to an outdoor environment and technologists; GIS, watershed technicians, soils, water quality and reclamation technologists bring relevant skills to forest conservation and activities intended to enhance EGS within ecosystems.

3.3 Aboriginal Skill Needs in EGS

Aboriginal communities, enterprises and organizations are now engaged in the provision of EGS and it is expected that their level of activity will increase significantly over time. Elements of traditional land use and occupancy studies and other land use planning initiatives, that address forest conservation, are providing the direction for implementation. In BC, 47 First Nations have completed or have land use plans in progress, and in other parts of the country, a similar number have been initiated, most notably the Whitefeather Forest Initiative in Ontario. In the view of organizations such as the Canadian Boreal Initiative, traditional knowledge will be an essential element in ecosystem stewardship and conservation planning, and in addressing biodiversity preservation and climate change mitigation and adaptation.

NAFA estimates that there are approximately 80 Aboriginal professional foresters, 40 Aboriginal people with other natural science degrees, and approximately 200 Aboriginal natural resource technicians. A rough estimate across the country is that 75% of these individuals work on behalf of their communities or with Aboriginal enterprises and organizations. These individuals will play key roles as EGS becomes a more prominent economic driver. However, there remains a fundamental need for Aboriginal natural resource managers at community and regional levels. Although the Aboriginal need is not necessarily different from that of the forest sector in general, the different land ethics and value system will need to be reflected in Aboriginal approaches to EGS. Bachelors of Science in Natural Resources Conservation and other degree programs that integrate social science and ecology with business and economics would align best with community needs. Aboriginal communities seeking a land stewardship role would do well to become familiar with the concept of ecopreneurship and use it as a guiding principle in land stewardship.

4.0 SUMMARY STATEMENT

Aboriginal people have tremendous potential to contribute to the growth and diversification of the Canadian forest-based economy. The forest sector has transformed over the past ten years and it is expected that this transformation will continue. The bioeconomy and the provision of ecological goods and services (the conservation economy) are two sub-sectors which will grow in relative importance as Canada shifts to a low carbon future. Aboriginal engagement in these two sub-sectors is key to the goal of First Nation forest land stewardship.

Both the bioeconomy and EGS will have higher skill level requirements than does the traditional forest industry and they will be based on science, biotechnology and integrated natural resources management. Currently, educational institutions are adapting curricula in these fields to better prepare for emerging occupations in this future workforce. The emergence of the bioeconomy and EGS highlights the importance of science education for Aboriginal students. Accordingly, Aboriginal communities/organizations need to strategically develop their human resources in a manner consistent with broad goals pertaining to land stewardship.