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A Case Study of New Caledonia

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# Globalization and Its Effects on Forest Diversity: A Case Study of New Caledonia

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**Abstract**

In the scientific litterature pertaining to the world's loss of biodiversity, an extensive amount of research has been undertaken to describe the local biological processes involved in the loss of endangered habitats. However, the social mechanisms that infringe upon these habtitats and perpetuate human activities that destroy rare and endangered species has largely been ignored. This thesis is an attempt to discover the social, political and economic causes of habitat loss in the particular case of New Caledonia. Specifically, the extraction of nickel in New Caledonia was examined as a resource that has been central to the island's development history and which has been the cause of the most forest damage. Globalization theory and World-Systems theory have been used in a complementary way to provide a framework for how the integration of New Caledonia into the global economic system over the past 150 years has impacted the island's rare forest systems. Periods of globalization prior to the 1970's were found to have had the most destructive impact on forest habitat than the years following 1975. Greater ecological protections implemented as a result of pressures on France from both global and local environmental groups were found to have increased protection measures for the various forest habitats. However, the destruction of the forests of New Caledonia continues and strong ecological protections that would guarantee the forest's long-term health are still missing.

Dans la littérature scientifique qui s'adresse a la perte de biodiversité dans le monde, une grande part de recherche se centre sur la description des processus biologique locaux impliqués dans la perte d'habitats en danger. Les méchanismes sociaux qui s'imposent sur ses habitats et qui génerent des activites humaines détruisant des especes rares et en danger, ont été largement ignorés. Cette these tente de découvrir les cause sociales, politiques et économiques qui sont a l'origine des pertes d'habitat de la Nouvelle-Calédonie. Plus specifiquement, l'extraction du nickel en Nouvelle Calédonie, qui est la ressource central a l'origine du developpement de l'ile, est aussi la cause de la majorité des dommages causes aux forets. Utilisés de facon complementaire, la théorie de la globalisation et la théorie des systemes mondiaux (world-systems theory) nous donnent un cadre pour comprendre l'impact qu'ont eues les 150 dernieres années d'intégration de la Nouvelle-Calédonie dans le systeme économique global, sur les systeme endémiques forestiers. Les periodes de globalisation précédent les annees 1970's ont démontrées avoir eues plus d'impact négatif sur l'habitat forestier que les années suivent 1975. Les pressions globales et locales exercées sur la France par des groupes environmentaux locaux et internationaux, ont eus comme resultat la mise en place d'une plus grande protection écologique des habitats forestiers. Parcontre, la destruction des forets de la Nouvelle-Calédonie continue et les structures solides de protections écologique qui guarantieraient sa santé a long terme ne sont toujours pas instaurées.

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# Chapter 1

## Introduction

Since the 1970's, a great deal of work has been undertaken to understand why the planet has been losing its biodiversity. Much of this work, coming from the disciplines of conservation biology and environmental geography, has focused primarily on understanding the biological and geophysical processes that occur as a result of human activities. The direct effect of activities such as resource extraction, mining, clear cutting, hunting, and agriculture has been well documented in the scientific literature (Stedman-Edwards 2000: 7). This work has given us an invaluable understanding of the direct impacts of such activities at the local level. However, despite this knowledge most indications suggest that the extinction of species at a global level is occurring with increasing frequency. A recent WWF report estimates that "the world has lost 30 per cent of its natural wealth in the span of one generation from 1970-1995" (WWF 2002). Even though this figure is contentious, there is a growing consensus among scientists that impending rates of biodiversity loss are at least four times faster than the background rates seen in fossil records (Mittermeier 1999: 14).

Although the natural sciences provides us with valuable knowledge specifying the various physical processes that are at play in threatened areas at the local level, they do not provide a broader context for understanding the social processes that impel people to destroy or infringe upon endangered habitat. This broader social context is imperative to examine as the root cause of species extinction is largely human in origin.

If species are to be conserved in any long-term fashion, a theoretical approach must be taken that can understand the political, economic and cultural pressures that lead to large-scale habitat modification, degradation, and destruction. Rather than strictly focusing on the local causes of biodiversity loss, this approach needs to incorporate an analysis of how global social processes interact with local social processes to produce conditions that impel people to destroy habitat. Equally as important as comprehending these destructive social processes, it is imperative that we also understand how global and local processes can interact to preserve biologically endangered areas. By doing so, we can acquire a broader and more nuanced comprehension of the complex dynamics resulting in the loss of biodiversity loss and/or preservation.

One objective of this thesis is to examine the theoretical frameworks capable of elucidating the local effects of global social dynamics, and then applying those theories to the issue of biodiversity loss in a local region. Wallerstein's world-system theory is a particularly important framework for the study of globalization and it will be examined here. Another important theory is what could be called contemporary globalization theory by authors such as Giddens (2000), Beck (1992) and Mol (2001). There are, however, disagreements between these two currents of thought. Contemporary globalization theorists advance the hypothesis that contemporary globalization is qualitatively different than previous variants of globalization. They emphasize discontinuity, hence their perspective could be called the discontinuist approach. World-systems theorists argue that globalization has been occurring for some time and that

continuity outweigh differences. There have been rather loud disagreements between these two camps. The first purpose of this thesis is to ascertain whether such disagreements are well-founded or whether the two approaches can be reconciled. Is it possible to correct the weaknesses of one approach with the strengths of the other? Can it be that there is more complementarity than the proponents of each has admitted to date? The goal of this thesis on the level of theory is to probe these questions further.

On an empirical level, a second objective of this thesis is to apply the framework of globalization theory to the specific case study of New Caledonia and the depletion of its forest habitat. Located in the South Pacific at the southern extremity of the Melanesian region, New Caledonia is 1,500 kilometers east of Australia and 1,700 kilometers northeast of New Zealand. The region's 18,576 square kilometers consist of the main island of Grande Terre and the smaller Loyalty Islands to the east. A 1,600 kilometer-long coral reef, the second largest in the world, encircles the Grand Terre (Mittermeier 1999: 367). Still under the direct control of France, New Caledonia is France's largest oversea territory in the South Pacific.

New Caledonia has been chosen as the site for a case study since its forests contain some of the world's most biologically diverse plant life in the world and some of the most threatened with extinction. Currently on Conservation International's list of the world's 25 richest reservoirs of plant and animal life (Conservation International 2002), this relatively small island archipelago has one of the world's highest rates endemic plant species containing over 3 322 plants of which 77% are endemic. The area also has 5

endemic plant families, a level of endemism per unit area unparalleled in the world (Conservation International 2002). Only Australia, South Africa, and Madagascar have more endemic plant families, but they are also 400, 65, and 31 times larger, respectively, than New Caledonia (Mittermeier 1999: 363).

The territory's ecosystems include several natural vegetation types. Evergreen rain forests, which once covered about 70 percent of the area, are now confined to a few scattered pockets in the central mountains. In drier areas on the western coast, there are a few small patches of sclerophyllous forest. Maquis shrubland dominates the southern third of the island, at both high and low altitudes. Today, only 5,200 square kilometers, 28 percent of the original vegetation, remains in more or less pristine condition (Jaffre 1998: 110).

The geological history that has resulted in such unique forests has also created the world's largest known deposits of nickel (Mittermeier 1999: 2003). Nickel mining poses the most serious threat to the islands unique forest species as it strips the tops of New Caledonia's mountains resulting in massive soil erosion that destroys forest habitat both directly and indirectly through sedimentation and fragmentation. Although the conservation of the forests of New Caledonia have been a priority of several influential international environmental organizations such as Conservation International, the World Wildlife Fund and IUCN, conservation of the forest areas remains sparse. Only 2.8% of the forests in the area are protected. This sparse protection means that 83% of all the

endangered plant species remain without any protection from the effects of mining or other human activities (Jaffré 1998: 109).

New Caledonia, therefore, provides a rich research opportunity to apply the theoretical framework to a specific case study for several reasons. New Caledonia's forests contain a unique array of plant species that exist nowhere else in the world and that have been considerable development pressure. As the territory is in the South Pacific, it is geographically isolated from both surrounding territories as well as from Europe. This isolation has meant that contact with the modern world system has occurred relatively recently. Thus, it provides a chance to view how quickly globalization can affect local economics, politics and culture and how these changes affect the health of its forest systems.

Prior to entering the global nickel market, New Caledonia was essentially self-sufficient due to traditional agricultural practices by the Kanak, the island's native population (Connell 1987: 87). Since the 1950's, nickel has become the foundation of New Caledonia's economy, accounting for 90% of its foreign exchange (Winslow 1993: 32). As a result of economic and environmental changes due to nickel mining, New Caledonia must now import over 70% of all its food creating a feedback loop of dependence upon nickel, and large-scale habitat modification, for basic survival (Winslow 1993: 32). In this way, New Caledonia provides for us an excellent site to carry out a case study to examine the social dynamics involved in the shift from a rural, small-scale agricultural economy to one based almost exclusively on international trade.

By examining the social changes that have occurred in order to facilitate this unprecedented shift, we can discern the economic, political and cultural changes that have occurred as a result. It also allows the researcher to examine the effects that the resulting dependency has had on the health of the areas unique forest ecosystems.

New Caledonia's unique land ecosystems have recently become a priority for conservation by a number of influential international environmental groups including the World Wildlife Fund, Conservation International and IUCN. Recently, New Caledonia was placed on Conservation International prominent list of 'hotspots'. This list places New Caledonia as a global priority for conservation with the likes of Madagascar and the rainforests of Brazil. As a result, it has increasingly been the target of many international campaigns to conserve its threatened forest population. Thus, New Caledonia provides for us an interesting view into how the globalization of environmental causes effects local areas both socially and environmentally.

As a result of New Caledonia's political status as a French overseas territory, it has only been over the past 10 years that trade barriers have been lifted to allow companies not incorporated in France to exploit the areas massive nickel deposits in any large scale fashion. For example, INCO Ltd., one of the world's largest nickel company, launched a $1.4 billion mining operation in the south of New Caledonia's Grande Terre. With this new operation, INCO is importing new modern technologies that it has developed in Canada and other areas. Thus, this provides for us an opportunity to test Mol's ecological modernization hypothesis that modern development is increasingly

concerned with environmental problems and as a result incorporates techniques to help stem the destructive effects of economic development.

Finally, New Caledonia can act as a microcosm for understanding the environmental effects of globalization in other areas of the world. Around the planet, globalization is ushering in new economic, political and cultural changes that have important implications for the health of the world's ecosystems. By examining the specific case of New Caledonia, it is hoped that insight into how globalization interacts with local social processes to produce conditions that impel the destruction of local habitat.

## Chapter 2

## Theoretical Framework and Methodology

In order to conserve species in any long-term fashion, it is imperative that we understand the underlying global processes that precipitate the destruction of forest habitat and those that encourage its preservation. Therefore, it is important to map out a theoretical view that can be utilized to identify how these pressures function. In order to do so, I will combine two approaches that have been portrayed by their proponents as being opposed to each other: world-systems theory and globalization theory.

### World Systems vs. Globalization Theory

In order to begin our discussion of the effects of globalization on the forest diversity in New Caledonia, it is important to first outline what is meant by globalization. The word 'globalization' has become a buzzword of sorts over the past decade and, like many other buzzwords, its meaning is often unclear and contentious.

Perhaps the most often used definition of globalization in the social sciences comes from Giddens. He defines globalization as "the intensification of worldwide relations which link distant localities in such a way that local happenings are shaped by events occurring many miles away and vice versa" (Giddens 2000, 93). Local transformations, he argues, are influenced by factors such as money markets and political decisions operating at a distance from the local area itself. These changes, however, are

far from unidirectional. As Gallopin (2001) shows, changes in local systems can also contribute to political, social, cultural or economic change at the global level thus making the relationship multidirectional. In this way, time and space are "liberated" (Giddens 2000, 94) in that social relations are lifted out of local contexts of interaction and recombined across time and space.

According to Mol, within the globalization debate there are two main camps; the "discontinuists and the continuists" (Mol 2001: 43). The continuists argue that globalization is a continuous process that has been occurring for centuries and thus is not new. The discontinuist or contemporary approach to globalization, on the other hand, argues that new telecommunications and information technologies, new global transportation networks and the exponential growth of science and economic trade are accelerating the dissolution of time and space and compressing it in a manner completely foreign from the past.

The most cited example of the continuist view belongs to Wallerstein and his world systems theory in which he argues that the development of globalization mirrors the development of capitalism and has been occurring since the 15$^{th}$ and 16$^{th}$ centuries. The world systems approach maintains that an identifiable social system exists beyond the boundaries of individual societies or nations. The world's nations are organized into a single, global division of labour that unifies the multiple cultural systems of the world's people into a single economic system (Shannon 1996: 23-24). Furthermore, this economic relationship is driven by an inherently exploitative capitalist system for

organizing economic activities whereby "peripheral" areas are dominated by "core" states. Core regions are defined as those that have the most powerful military, administration techniques, utilize the most sophisticated technologies and mechanized methods of production, and pose the "ability to make policies prevail against internal resistance and external opposition" (Wallerstein 1982b: 61). Peripheral areas are those that are relatively less technologically sophisticated, have little military strength and whose economic activities are more labour intensive than in the core (Shannon 1996: 31). Areas that exhibit characteristics of both core and periphery are considered to be 'semi-peripheral'.

The relationship between the capitalist class and the political state in the core is reciprocal in that a strong state allows a core government to dominate peripheral areas in ways that allow the capitalist class to extract resources from the periphery. The capitalist class in turn provides the necessary economic resources for state activities (Shannon 1996: 39). The economic relationship between core and periphery also requires a particular political relationship between them in that the periphery has to be forced to participate in the world-economy on terms favorable to the capitalists.

For Wallerstein, the capitalist world economy originated in sixteenth-century Europe, and has expanded since to include almost every area of the globe (Peet 1999: 113). Globalization today, he argues, is simply an expansion of these forces and processes that have been occurring over the past 500 years.

The discontinuists, on the other hand, argue that the past 30 years have seen a marked shift from past development programs. McMichael (2000) contends that global markets have been significantly restructured as a result of a shift from self-regulating markets based on gold standards to one that is based on market rule advanced by political and economic elites via institutional coercion. The concept of globalization, he argues, implies a different kind of institutional organization in which stateless money can pursue efficient, low-cost production and/or speculation in active financial markets. A financially borderless world is thus sought through institutionalizing free trade agreements and global agencies such as the WTO to manage the world market (McMichael 2000: 45).

Giddens, another discontinuist, emphasizes the significance of the new telecommunication and information technologies which allow acceleration in the compression of time and space and thus "contribute to a qualitative change in globalization" (Giddens 2000: 20). The technological innovations and related institutional shifts, he argues, have altered the scope and the speed of economic decision making, thereby enhancing the capacity of the economic system to respond to economic, political and social fluctuations. Giddens points to the more that $2 trillion that are turned over every day in world currency markets as an example of this shift (Giddens 2000: 12).

Along similar lines, Hoogvelt observes that the contraction of space and time that results from the increased speed by which financial resources and information flow have essentially re-ordered economic activities. This new order, he contends, creates a "real-

time economy where distance and location are no longer relevant" (Hoogvelt 1997: 121) permitting an unprecedented degree of global mobility such that "the structure of core-periphery becomes a social division, rather than a geographic one" (Hoogvelt 1997: 121, 129).

The discontinuist globalization approach also differentiates itself from the world systems theorists by taking issue with the central concepts of core-periphery. According to many globalization theorists, the core-periphery concept is too constraining as it implies that the hegemonic control of the periphery by the core is absolute and therefore does not acknowledge the ability of those in the periphery to negotiate their positions vis-à-vis the world system (Noah and Eckstein 1998: 311). Rather, many globalization theorists argue such as Roberston (1994) have adopted a multi-faceted approach referred to glocalization. "A term popularized by Robertson to describe how global pressures and demands are made to conform to local conditions. Whereas powerful companies might 'customize' their product to local markets, glocalization operates in the opposite direction. Local actors select and modify elements from an array of global possibilities, thereby initiating some democratic and creative engagement between the local and the global" (Cohen and Kennedy 2000: 23). Thus, the contemporary view allows for the ability of local actors to react and shape the way global systems affect their specific locality.

**Environmental Effects**

How does globalization effect the environment? Just as there is a diversity of views regarding the nature of globalization, the environmental consequences of these global changes are equally contentious. Both the continuist and discontinuist camps provide distinct accounts of the effects of globalization on the environment.

From its inception, the world-systems perspective has been preoccupied with the study of long term global transformations. "For the world-systems perspective, the motor force of the world-system is the process of the ceaseless accumulation of capital (Chew 1997: 382). A few social scientists working with world-systems theory have begun doing formal research on the historical continuity between global capital accumulation and changes in the biosphere. Chew states: "The existence and periodicity of ecological cycles are linked with the economic cycles of expansion and stagnation because as world history has shown, the materialistic reproduction of capital engenders ecological degradation" (Chew 1997: 385). According to this view, core exploitation of the periphery and periphery exploitation of its own environment for economic growth has led to depletion of natural resources that has diminished and degraded habitat and species diversity.

In this account, the destruction of habitat, including forest cover, in a peripheral area can be traced to its increased integration into the world-system. As the driving force for this integration is capital accumulation that results from the overexploitation of

natural resources, then the sum effect is the destruction of habitat. Furthermore, once the resources have been extracted and the habitats transformed, then core forces relocate production. Open-cast mining practices are a good example in that once the forest is cleared and the mineral are extracted, continued production necessitates expansion into a new forest frontier. According to Chew, this type of incessant production has led to further ecological crises for those places where production has been shifted (Chew 1997: 385-386).

The discontinuists, on the other hand, focus their analysis on the environmental effects of globalization over the past 30 years. They argue that the impacts of new communication networks, information technologies and financial flows which have condensed time and space have resulted in an altogether different effect on the environment. Where the world-systems approach only focuses on the effects of capital accumulation and peripheral resource depletion, the discontinuist approach takes on a more nuanced approach. Proponents such as Giddens and Beck point to a reflexivity in modern structures that causes environmental destruction but also allows for decisions to be taken to protect it. They argue that we are living in an "age of side effects" that undercuts modernization with unintended and unconscious threats of self-dissolution and self-endangerment (Beck 1992: 175). Developing states, Giddens maintains, when faced with the integration of modern technologies are substantially altered in their relation to the environment. This has created "one world in a more negative and threatening sense than that just mentioned, a world in which there are actual or potential ecological changes of a harmful sort that affect everyone on the planet" (Giddens 2000: 97). However,

rather than only focusing on the negative aspects of globalization, these authors point to the possibility of thoughtful, reflexive decisions to deal with hazards and insecurities introduced by modernization (Beck 1992: 21). Our ability to discern global threats provide the potential by which we can change our course and develop in a more environmentally sensitive way. Thus these authors emphasize both the risks of globalization and potentials that exists as a result of it. This less pessimistic view can also be found in the theories of ecological modernization whose central premise is that "ecological ideas, interests and considerations involved in social practices" (Mol 2001: 47) are resulting in a continuing restructuring of the central institutions of modern society. Environmental issues are viewed as increasingly important triggers for institutional transformations that attempt to redirect modern development towards environmentally sustainable practices (Mol 2001: 47).

The discontinuist view of globalization and its effects on the environment differs from the continuist approach in that the perceived relations between the global and the local are not economically determined but instead are a result of more complex economic, political and cultural changes resulting from the interaction between local and global actors. Thus an importance is placed on the interaction of economic, political and cultural spheres in a way that the world-systems analysis can not. In keeping with Beck and Mol's assertion that globalization has both potentially destructive and beneficial impacts on the environment, these economic, political and cultural spheres are each viewed in this thesis as having both potentials.

In the economic sphere, Hoogvelt (1997) views several important transformations as a result of globalization. The processes of liberalization, economic rationalization, privatization, deregulation and economic restructuring, he argues, fundamentally change manufacturing. These translate into the emergence of one global market place with set standards for price, efficiency and quality. These standards direct international and domestic trade, the production of goods and services as well as the extraction of raw materials. A second consequence includes the delocalization of the production of goods and services. As the cost of communication and transportation drops, the production process itself becomes globalized from resource extraction to the completion of the product. Countries are compelled to concentrate their resources on a single part of the production process rather than producing an entire product within its borders. Thus, countries with economies based on raw resources are pressured to focus their attention on the extraction of these resources and sell them on international markets in order to purchase finished goods. Third, the free flow of capital as a result of telecommunications and computer technology has "dissembeded" (Mol 2001: 36) capital from national boundaries in exchange for a deterritorialized market. This allows capital investors to freely move capital at rates and speeds previously not available, thus undermining national economic solidarity (Mol 2001: 37).

These economic changes potentially have both environmentally beneficial and destructive effects. On the beneficial side, the internationalization of production and capital provides a potential means for creating and enforcing international environmental standards and practices. This would be an especially positive effect in countries with

little or no national environmental regulation. On the negative side, national environmental standards can be undermined by capital flows and pro-economic international environmental regulation. The internationalization of production can force countries to overexploit resources past their ecological thresholds and become dependent on overexploitation in order to purchase commodities to satisfy basic needs on international markets (Mol 2001: 34). This, I will show, is especially true in the case of New Caledonia.

In the political sphere globalization has several effects including, as Castells argues, declining national sovereignty. By trying to involve themselves within the global sphere of relations, the state increasingly loses the capacity to set environmental regulation (Castells 1997: 4). Held argues: "Sovereignty is undermined by international law, the internationalization of decision making via regimes and organizations, hegemonic owners and international security structures, national identities, the globalization of culture and economic globalization" (Held 2000: 34). Thus, the nation states role in determining policy is significantly altered as the state is less able to dictate or control national developments in economic, environmental or other spheres. Mol concurs stating that "nation states tailor their economies to fit the requirements of global competitiveness because they are forced to do so by the transnational business culture and ideology, by the structural adjustment programs of the IMF, and by transnational and international institutions and actors. This results in nation states gearing their national economies toward further privatization of the state sector, deregulation of monetary and

social policies" and the recreation of environmental strategies (Mol 2001: 43-44). In this way, national and in turn local governments are affected.

These political developments may have beneficial and destructive potentials as well. Countries with lax environmental regulations could be forced to adapt stronger environmental policies given the proper international pressures (Mol 2001: 45). Environmental groups and local organizations can appeal to global organizations such as the United Nations or international treaties to force unwilling countries to adopt environmental regulations or conservation practices. The political effects, however, can also have a number of potentially negative effects. As a result of being incorporated into international economic organizations, nation states and local areas may be forced to accept less strict environmental protections. This not only results from the adherence to formal international agreements such as the WTO and NAFTA but also from the real and perceived pressures to compete with other countries whose lesser environmental controls allow for the cheaper production of goods. As a consequence, environmental regulation, monitoring and adherence to legal constraints may be lessened (Mol 2001: 45).

In the cultural sphere, much work has been done to document how culture is affected by globalization. Albrow focuses on three main areas of culture that are pertinent to our discussion. The first centers on global values that are "drawn from the world and made to apply locally such as eating habits, freedom of religion and environmental consciousness" (Albrow 1997: 32). A second line focuses on how traditional cultures are affected by events occurring at far off distances. A third line

looks at how local cultures are affected by direct interactions with international institutions such as environmental NGO's and transnational businesses. Here too, beneficially and destructive potentials can be found. The integration of environmental ideals into nations where none before existed is an environmentally beneficial cultural development. However, the replacement of traditional modes of living including subsistence farming and other relatively low-impact activities by cultural ideals of mass consumption and mass production may have severely detrimental effects.

**The Theoretical Approach to the Case of New Caledonia**

Although the conceptual differences between these two views have been a point of focus for the various proponents of both views, the approaches are not as irreconcilable as would appear from the debate between them. Rather than dichotomizing the two perspectives, both can be strengthened through connection with the other. Analysis of the environmental effects of globalization from a world systems perspective can be made stronger by incorporating data documenting the major changes that have occurred over the past 30 years. The transformation in transportation, communication and finance allows companies to extract resources in places and speeds that otherwise were impossible only several decades ago. At the same time, these new technologies and their effects have given birth to international environmental movements such as Greenpeace, Conservation International, The World Wildlife Fund and others that have had an important impact in the preservation of important forest habitats (WWF 2003). Thus, it is important to understand contemporary globalization as something

qualitatively different from the past in order to discern the nuances and effects of these new changes. The world-systems approach can also be further nuanced by borrowing the concept of glocalization from the contemporary globalization. That is, it is important to acknowledge the ability that local actors have in shaping their positions in relation to the world-system. It can also be further nuanced by affirming that both environmentally beneficial and destructive potentials exist as a result of economic, political and cultural shifts resulting from globalization.

Discontinuist or contemporary globalization theory can in tern be strengthened through the incorporation of studies that examine historically the development of our current world system. In the discussion of the environmental effects of globalization, the discontinuist approach focuses almost exclusively on the effects of developments from the past few decades. However, it is vitally important to understand the historical roots of large-scale environmental destruction caused by global trade as their effects still persist today and may be compounded by more current activities. For example, habitat fragmentation of the past can greatly effect plant and animal populations today as a result of severing contact between communities and limiting the exchange of genetic materials (De Santo and Smith 1993: 111). It is also generally thought that fragmentation leads to a reduction in the number of species and can drive them to extinction as smaller habitats created may not be able to support all species, especially large one that require a lot of space. Small spaces may only support a small population of animals that are subject to genetic inbreeding. Small populations are more at risk from catastrophes such as fire or disease, which can wipe them out (Andren 1994: 356). In this way, it is important to

examine the historical factors that have led to fragmented habitats as their effects may still persist today and show a considerable impact on the general health of a particular species or family of species.

The contemporary approach can also be made stronger by acknowledging that although local actors do have power in defining and negotiating their position within the global-local dynamic, those with power in the center have considerably more power in defining the terms and contexts of these interactions than do local actors. Although I agree with the discontinuist view that local actors can negotiate their economic, political and cultural positions in relation to the global system, their ability to do so is limited by those in power. New Caledonia provides a good example of this as the history of the Kanak relationship to France and multi-national mining companies is one of constant renegotiation within constraints imposed by the French economic and political system.

In this way, an openness to learning from these two usually competing views will be adopted for this study. Although it is clear that differences exist between past and present phases of globalization, it is equally clear that various elements of continuity persist. Thus, rather than accepting that the past 30 years has seen a complete schism with the past in the strong sense that many of the discontinuists advocate, I will retain a middle ground. This position acknowledges the historical continuity of the world-systems approach while maintaining that the exponential growth in technology, science and trade has lifted the previous world-system to a qualitatively different level.

**Methodology**

In order to gauge the effects of this incorporation of New Caledonia into the world system on the forest habitat, attention will be paid to the different phases in New Caledonia's relations with the outside world. First will be studied pre-European land use patterns (prior to the 1830's) and their impact on the forest structure. Next the thesis will carry out a documentation of the local economic, political and cultural shifts that have followed the integration of New Caledonia into the world economic system in different political-economic periods and the resulting changes in land use patterns that have degraded or destroyed the original forest cover. Bibliographical research will be done to examine the incorporation of New Caledonia into the world economic system, dating from the 1830's.The investigations of New Caledonia by anthropologists, sociologists, geographers, historians and biologists will be examined to develop a coherent documentation of the themes described above.

Thus, the present thesis is based on a review of existing documentation concerning New Caledonia over the past 170 years. Gaps in the literature that will be detected during the course of this investigation will be left for future study at the doctoral level, where more time and resources for primary data collection through interviews will be available.

## Chapter 3

## New Caledonia from the Pre-1830's to the 1970's

### New Caledonia before European Contact

Little is known about the exact sequence by which New Caledonia first became inhabited. "Almost certainly the first settlement of New Caledonia was from the Melanesian islands north but the date and form of that settlement will never be know" (Connell 1987: 1). According to anthropologists and archeologists, the settlement of New Caledonia occurred later than New Guinea and Australia but much earlier than the smaller Polynesian islands to the east. The estimated time of settlement is between 4000 and 6000 years ago (Connell 1987: 2). Although the time of settlement is not widely established, it is generally accepted that it occurred quite rapidly.

The landscape the first settlers found themselves was heavily wooded with an extraordinary diversity of flora. Despite this, however, native fauna was extremely rare and suitable land for agriculture sparse. The large mountain ranges that extend from the one end of the Grande Terre to the other made movement across the island difficult. This forced the Melanesians to live in relative isolation from one another. The small tribes each had their own language with an effective structure of government and a very close relationship to a particular land area (Connell 1987: 10). The tribes themselves were very small with no more than a few hundred members living in clusters of homes and villages (Thompson and Adloff 1971: 234). Despite the geographical boundaries that

separated the tribes, the various tribes and their settlements were spread relatively evenly throughout the Grande Terre and Loyalty Islands expect in the South-Eastern corner of the Grande Terre and in the

Tribes were divided based on their geographical location and their social territory coincided with natural boundaries created by the mountains, ridges, and rivers. Tribes were each headed by a chief whose authority spanned temporal and religious spheres. Chiefs were generally viewed as symbols of tribal unity and the repository of cultural knowledge and thus were expected by other member of the tribe to act in the general interest of the whole (Guiart 1963, cited from Connell 1987: 11). The religious sphere that the chief controlled was important in the economic activities that held the societies together. "The environment was shaped by the gods and spirits of different kinds;" from those ruling the entire natural surroundings to ancestors controlling specific areas (Connell 1987: 13).

Hunting was limited by the absence of large animals and useable fauna. Agriculture was thus the dominant form of subsistence. The cultivation of two principal root crops, taro and yams, was done through a complex series of terraces and irrigation systems constructed on the hillsides of New Caledonia. The extent of these terraces was limited to river valleys and coastal sites as there were few settlements at higher altitudes (Connell 1987: 16-17). Livestock was relatively absent from the subsistence agricultural economy and therefore clearings for large pasture areas was not needed.

The traditional Melanesian economy is characteristic of what Wallerstein calls a "mini-system" (Shannon 1996: 196). A mini-system has within it a complete division of labor and a single cultural framework. In the mini-system, exchange among tribal hunter-gatherers and simple agriculturists takes the form of sharing and occasional barter and is characterized by the production of basic subsistence goods within a single cultural community (Wallerstein 1984: 12). Trade between tribes in New Caledonia was indeed limited in this way due to geographical and linguistic separations. However, localized trade was a part of the Melanesian economy. These trade networks complemented the subsistence economy of individual tribes. Fish and manufactured goods such as pottery played important roles in these networks although evidence suggests that their function was more to cement socio-political ties rather than physical need (Howe 1977: 8).

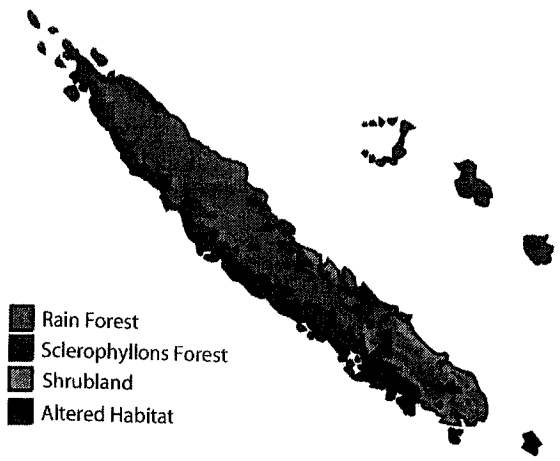
As a result of this type of communal property structure and the relative isolation of the tribes from one another both physically and linguistically (an estimated 24 languages existed on the island prior to French colonization) (Howe 1977:7-9), tribes were relatively self-sufficient economic units. Each had to produce the majority of their own food and physical necessities through small-scale agriculture, fishing and hunting (Winslow 1984: 5). Networks of exchange existed between the main land and the loyalty island's however "most of the materials needed for housing, clothing, and utensils was locally available or could be procured by short-distance trade" (Aldrich 1997: 108).

The environmental effect of this type of organization is not well documented. However, there is some evidence to suggest that the pre-European Melanesians societies

had a relatively light impact on the biodiversity of the area. This is not to say the Melanesians were ecological saints in the sense that traditional peoples are generally depicted. The "landscape's aesthetic value was important in terms of its use. They did not cherish the notion of a wilderness untouched by humans; instead, spaces and species were unequivocally resources to be utilized by people, who could in fact create or enhance the worth of natural places" (Horowitz 2002). However, the Melanesians view of "the islands as store houses of food that needed to be maintained for their continuing survival" (Winslow 1984: 15) points to their general understanding of the need to manage their lands without overexploiting it. This manifested itself in their agricultural practices that included rotating crop cycles every three to four years (Winslow 1984: 13) allowing farmed soil and vegetation to regenerate.

The relative paucity of fauna and the geophysical properties of the islands also served to limit the impact of Melanesian colonization on the island's biodiversity. As large mammals did not inhabit the island, hunting was limited. There are only five species of mammals on the various island's that make up New Caledonia and all of them are bats (Mittermeier 1999: 367). This forced these early settlers to develop agriculturally based social systems. The effects of these systems where thus localized to the settlement areas. As these settlements themselves were small, about 200 to 300 people, the Melanesian small-scale agricultural systems had a relatively low impact on local flora. This despite the fact that the settlements were scattered throughout New Caledonia except the south-eastern area (Orstrom 1981: 112).

*Map 1. New Caledonia's Forests Pre-European Contact*




*(Source: Mittermeier 1999: 367)*

As the map above demonstrates, the forest habitat in New Caledonia prior to European contact was mainly made up of rainforest on the east coast and its center, sclerophyllous forest on the west side of the island and some shrub land towards the south. The loyalty islands were predominantly sclerophyllous forest. The main tracts of rainforest and scelrophyllous forest were not fragmented despite habitation throughout the area by Melanesian settlements. The rainforest covered over 70% of the territory, or more than 13 000 $km^2$. Some 2011 plant species were found in these rain forests of which 82.4% are endemic to the island (Jaffré et al. 1998). The sclerophyllous forest once covered 24% of the island or more than 4 400 $km^2$. The third major vegetation type is shrubland or maquis. A specialized plant formation with over 200 endemic species, the maquis live in very poor soil that are generally nutrient poor and have high concentrations of magnesium, nickel, manganese and chrominium (Mittermeier 1999: 368). Prior to European contact, this shrubland covered just over 5% of the land.

**Integration into the World-System: New Caledonia from 1830-1870**

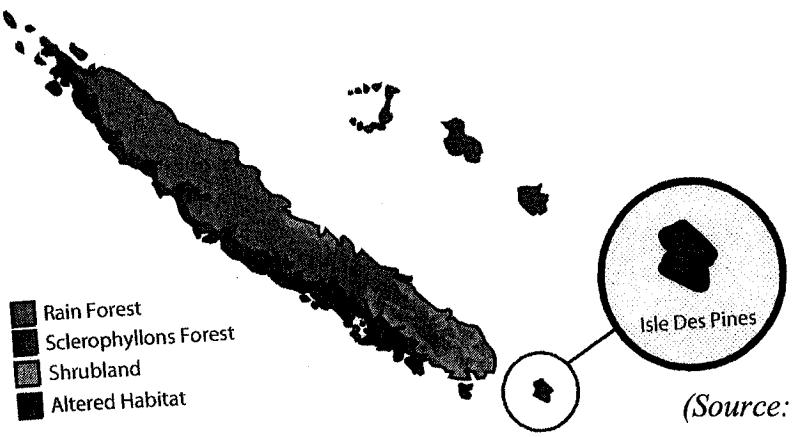
According to world-systems theory, a capitalist world-economy and a system of competitive nation-states began to emerge in the sixteenth century (Shannon 1996: 82). Driven by the need for raw materials and labour, the powerful European countries expanded their geographical reach in order to control resources in less powerful areas. By the early 1800's, much of the territory east and south of Europe had been claimed and expansion into the South Pacific began by the French, Dutch, and English.

The integration of New Caledonia into the world-system first began during the early 1830s. New Caledonia at the time had large stands of sandalwood trees within some of its sclerophyllous forest, especially on the Isle des Pines south of the Grande Terre. The tree contains oil that is extracted to make incense and perfumes. Sandalwood was in great demand in China where it was used in Chinese ritual ceremonies. Trade between the Europeans and the Chinese in this resource had already wiped out sandalwood in Fiji, the Marqueses and Hawaii (Hughes 1977: 12) and as a result traders became interested in New Caledonia as source of sandalwood. By 1832, sandalwood trading with European, American and Chinese became a staple of the Melanesian economy on the Isle of Pines off the coast of New Caledonia's Grande Terre.

Melanesians on the Isle of Pines and the Grande Terre were recruited to work in the forest. Ships in the South Pacific would take the felled sandalwood trees, supplemented with cargo of a sea-slug considered a delicacy in China, and exchanged the

goods with Chinese markets for Oriental luxuries for Export to North America (Aldrich 1997:109). Although the volume of sandalwood was small in comparison to the large global markets at the time, its impact on the island was tremendous. "Sandalwood was the first product that the islands could trade on a large scale, and the exchange marked the first systematic contact with a modern capitalist economy" (Aldrich 1997: 109). Melanesians enthusiastically turned to working for traders, especially through traveling as crews for various ships (Connell 1987: 27). This trading system, however, soon collapsed in the late 1850's as the forests became entirely depleted.

*Map 2. New Caledonia- Isle Des Pines*




*(Source: Mittermeier 1999: 367)*

First contact was patchy in that some areas received regular European visitors and established patterns of trade that became integrated into their daily lives. The villages existing closest to trading posts and sheltered bays where ships anchored consolidated to create larger villages. Other areas, however, remained closed off to trade and had no direct contact for several decades.

A larger proportion of the Melanesian economy and culture was affected when the Grande Terre was annexed in the name of the king of France in 1853. Connell argues that the dynamics of capitalism propelled French overseas expansion in search of markets, raw materials, places for the settlement of surplus population and the investment of surplus capital (Connell 1987: 38). Aldrich concurs. "Economic interests enjoyed a prominent position in the colonization of New Caledonia by the French" (Aldrich 1997: 25). Jules Ferry, the architect of France's late-nineteenth century expansion stated: "Colonial policy is the daughter of industrial policy. For rich states, where capital abounds and accumulates rapidly and where manufacturing systems are continually expanding, export is an essential factor of public prosperity" (Ferry as quoted by Aldrich 1997:45).

Continual French economic development depended on adequate supplies of raw materials, capital and labor. Raw materials in New Caledonia were abundant, from wood to various ores. The tropical conditions promised to make possible harvesting of a large variety of coveted agricultural commodities, especially beef. Most colonial lobbyists believed that with sufficient government support "the treasures of the Pacific could be brought to market" (Aldrich 1997: 125). Although the French government supplied needed financial resources for colonists, much of the capital came from private sources such as entrepreneurs, industrialists and bankers of metropolitan France. "French finance in the 1850's and 1860's was at a stage of expansion, and banks, shipping companies, and manufactures could invest capital and set up companies in Oceania (Aldrich 1997: 106). The only perceived impediment to financial and colonial success in New Caledonia was

labor. The colonies attracted few settlers and not all the willing were interested in doing the hard work of farming and mining (Aldrich 1997: 106). Most entrepreneurs regarded the Melanesians as lazy and unreliable thus the solution was to import foreign workers as well as creating labor-based penitentiaries. Some of these workers were imported from nearby islands and also from such diverse places as Japan, China, Indonesia, Vietnam and Tahiti, a trend that would have important political and environmental consequences in the future. At the end of the 19th century, French migrants were offered 25 hectares of land to any immigrant, provided he was French, came from a farming background and had a capital of 5000 gold francs (Orstrom 1981: 38).

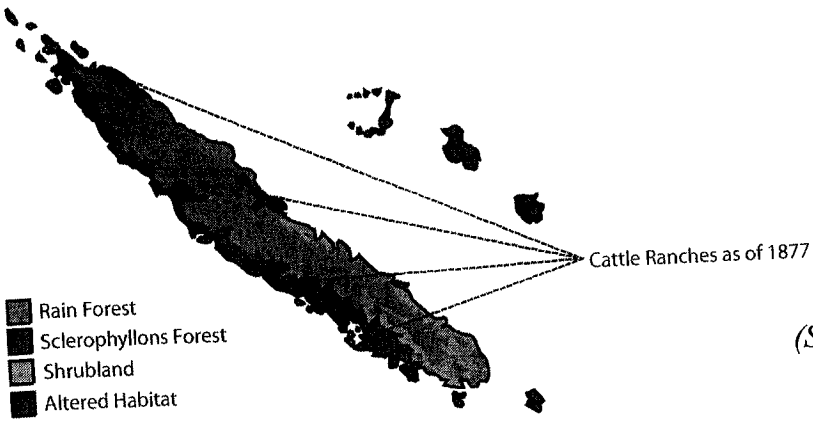
In order to facilitate the exploit of this new territory, New Caledonia was divided into arondissements to facilitate administration, land appropriation and, in turn, labor recruitment from France and other Asian areas. As Wallerstein states, the economic relationship between core and periphery requires a particular relationship between them that forces the periphery to participate in the world-economy on terms favorable to the capitalists (Wallerstein 1984: 23). This new division of land, facilitated by a strong French military, allowed for French capital interests to encroach on lands with the most perceived value. The French foreign minister of the Navy and Colonies in 1854 stated: "The uncivilized inhabitants of a country have over that country only a limited right of domination, a sort of right of occupation. A civilized power on establishing a colony in such a country, acquires a decisive power over the soil, or, in other terms, she acquires the right to extinguish the primitive title" (Minister of the Navy and Colonies to Foreign Minister, February 1854, cited by Douglas 1972: 369). This principle was transferred

into legal practice by the state of France in 1855 that stated that Melanesians no longer had legal right to their lands. "By taking the fallow and empty land, the viable agricultural economy of the local communities was snuffed out in one brief moment. Without compensation the Melanesian groups were reduced to a situation of significant food shortages" (Doumenge 1982: 94). The decree also ordered every settler to own one head of cattle per hectare they claimed even though each head of cattle needed 5 hectares of grazing land to survive in New Caledonia. This in effect destroyed the traditional clan based property organization of the Melanesians (Winslow 1984: 12).

During the governorship of Charles Guillian from 1862-1870, the French administration began to make a much more deliberate attempt to colonize New Caledonia through larger agricultural settlements. Here too, economic considerations dominated these actions. The French government gave free license to all French settlers to occupy land. All unoccupied land could be claimed. The definition of 'occupied' did not take into account any land used by the Melanesians in their agricultural cycles (Winslow 1984: 12). Many French farmers took the most fertile lands and cattle began consuming major cultivation areas. Revolts and insurrections were frequent and the French military was regularly used in order to quell violent opposition to agricultural settlers. This was especially prevalent on the West Coast of the Grande Terre that provided the most suitable grazing land for cattle. Cattle was exported to European markets as well as Australia and Asia. By 1878 there were 80,000 head of cattle grazing a large potion of the island's wild areas (Winslow 1984: 21). Large expanses of land on the West Coast of the Grande Terre, where Sclerophyllous forest dominated, became fields for cattle. In

order to clear this ancient forest type, slash and burn techniques were utilized not only destroying the forest but also causing erosion problems in the area (United Nations 2002). As a result slash and burn and the direct effects of grazing cattle, much of the forest area used for cattle ranching was permanently altered.

*Map 3. New Caledonia's Cattle Ranching Clearings as of 1877*




*(Source: Orstrom 1981: 28)*

Consistent with Roberston's theory of 'glocalization' (1994) the Melanesians were not passive spectators of these radical changes imposed on them by outside powers but rather reacted in order to protect their interests. In 1878, the Melanesians organized a revolt against French control of these lands and the devastating effects the cattle were having on their agricultural practices (Dousset 1970: 70). The revolt differed from other insurrections in that it was a "concerted effort by many tribes acting together (Winslow 1984: 5) to overthrow the French colonists. This stand, however, failed at the hands of a brutal repression by the French military showing for the first time the strength by which the power center of France could restrict the abilities of local people to negotiate their proper position. As a result of the repression, traditionally separated Melanesian clans

were bundled together into reserves and were brought into the French economic system through head taxes levied on each person in the clan between the ages of 21 and 55 (Brou 1980). This forced the Melanesian's to earn money within the French economic system if not for food but simply to pay for this tax.

Another important shift resulted from the change in attitudes towards land use that once dominated the Melanesian population prior to colonial contact. Prior to this period, land in the Melanesian world view was not "simply a material necessity for raising crops and a place for habitation but a the basic source of identity. Islanders drew their sense of tribal or clan unity from the belonging to particular areas of land which possessed ancestral meaning" (Aldrich 1993: 131). The forest surrounding the native held an intrinsic value that ensured its protection (Winslow 1995: 1). Appropriation and use of land depended upon ancestral rights and agreement by chiefs and members of the clan. Thus, land held a sacred value and care of the land took on a guardianship like quality that ensured long-term sustainability. With the dispossession of the land by European settlers, a crucial feature of the Melanesian identity and the ensuing careful land practices were destroyed (Aldrich 1993: 131).

The sum environmental effects of the first 30 years of contact and the associated shift in land use had significant consequences for the island's forest habitat in a relatively short period of time. The sandalwood trade had devastated the Iles des Pines. In a brief 30 years, the small island that was home to some of the largest tracts of remaining sandalwood in the South Pacific was destroyed. Cattle farming on the island became a

growing business and staple for French settlers and an employment opportunity for foreign migrant workers. Large expanses of land were cut down and burned and the direct effect of the cattle had an incredible impact on the fragile Sclerophyllous forest. Settlers also began to build roads to facilitate trade, beginning the fragmentation process of both the rain forest and the sclerophyllous forest. More importantly, however, was the change in land ownership and the subsequent destruction of the Melanesian subsistence based small-scale agriculture. This change would not only serve to destroy the social relationships between the various tribes on the island but also to dissolve the stewardship practices they utilized. This shift in land use also set an ominous precedent for the overexploitation of the land and the destruction of habitat that would come in the next hundred years.

**Nickel Mining in New Caledonia: 1870 to 1940**

Gold rushes in California and Australia sparked interest in the Pacific with the hopes of discovering precious metals. More than cattle ranching, the search for and extraction of mineral resources has dominated New Caledonia's integration into the world-system.

In 1870, gold was discovered in the vicinity of the Diahot river. John, Higginson, a French patriot residing in Nouméa, opened a mine that ran for two years with little success. The real mining boom came when the French engineer Joseph Garnier alerted the French authorities to large deposits of nickel in the eastern region of the Grand Terre

in 1863 (Aldrich 1997: 116). Mining of nickel began in the Houaílou and Canala regions. In the early stages, nickel ore was mined by hand in tunnels or trenches that followed the richest seams. These initial mines left relatively little impact. "Much of this mineral exploitation had been very localized, and many of the mines have now been long abandoned; they have left almost no impact on the landscape of New Caledonia" (Bird et al. 1984: 1). This was particularly the case with the copper, lead, and zinc mines in the region of Ouégoa, which were worked by shafts and hillside tunnels rather than opencast pits (Bird et al. 1984: 5).

Nickel was not mined in any great quantities until the 1870's. In 1873, the German government decided to use nickel in the production of its currency that created new demand and drove prices up threefold for the material. By 1875, production of nickel jumped from 327 tons to over 3400 tons. Nickel was exported from New Caledonia to France, Germany, parts of Asia and other global markets (Aldrich 1990: 116). The flood of this new nickel onto the European markets, however, drove prices down by over 75 percent and crashed the largest bank on New Caledonia, the Banque de la Nouvelle-Calédonie (Aldrich 1990: 116). Due to this collapse, many of the mines were abandoned. Productivity dropped from 4377 tons of nickel a year in 1877 to 155 tons in 1878 to nothing in 1879 (Connell 1987: 45).

In 1880, French patriot John Higginson went to Paris in order to consolidate those with stakes in the mining business in New Caledonia including Hanckar, Garnier, and other French investors. They began the Societe le Nickel (SNL), the company which has

dominated the economic history of New Caledonia to the present. By 1882, SNL was producing close to 9000 tons of nickel a year despite low demand on the world market and almost bankrupting the company. In 1882 the Rothschilds invested $2 million into the company, saving the business interests, taking control of the company and consolidating power in the center of France (Aldrich 1990: 118).

The nickel markets recovered as a result of the discovery in Britain of a process to alloy nickel with steel to make military armor. This new discovery resulted in the growth of industries making arms and armored ships and provided a new global market for New Caledonia's nickel. Nickel was shipped to Germany, France, and England (Aldrich 1990: 118).

In 1904, mining in New Caledonia had reached an incredible height. In thirty short years of nickel mining, eight major mines were developed and producing over 200 000 tones of nickel. The mines at Mt. Doré, Paita, Canala and Thio had all produced over 10 000 tones each. Koné, Ouca, and Koala Karebe each produced over 5 000 tones and Bourail produced over 2 000 tones by 1904. The ownership of these mines varied and a mix of owners included SLN along with various so called *petite mineurs,* French patriots with sole proprietorship of individual mines.

By 1912, SLN had obtained an "inestimable advantage of a privileged position in the nickel market" (Bouvier 1967: 257) and was a perfect example of late-nineteenth century growth industry. It had a complete international cartel and the participation of a

major financial institution (The Rothschilds) in its direction and funding (Aldrich 1990: 118). Under this new structure and with global markets thirsty for more nickel, SLN built a port in Thio as well as fusion plant and short rail line to take the ore from the interior to the coast. This new fusion plant positioned Thio to become the largest nickel mining center in New Caledonia and one of the most environmentally devastated areas on the island.

Sales of nickel continued throughout the war and the SNL monopoly flourished. Nickel was in great demand to create ships, vessels and weaponry for American, French and English forces. The end of the war, however, saw a decreased demand for nickel and a serious financial blow to SNL. The company also began to see competition from the English Mond Nickel Co. and Canada's International Nickel Company (Aldrich 1990: 290). SLN responded by closing several of its mines and concentrating production and administration in Thio.

This financially tight period forced SNL to sell shares of the company to foreign investors in Germany, Japan, Australia and America becoming a truly multi-national company. With this new capital, SNL opened up new export routes including ones to Kobe and Yokohama in Japan. The SNL also expanded its activities by acquiring more ships to transport nickel ore to Europe, improving wharf facilities, and enlarging its factory in Daniambo (Aldrich 1990: 291). "This rationalization of the export markets bore fruit" states Aldrich (1990: 291) and the capital of the company grew from 93.5 million francs in 1937 to 224 million francs in 1939, a three and half times increase.

Whereas earlier mining techniques caused little damage (Bird et. al 1984: 2), mining during this period had become increasingly harmful as a result of the development of opencast mining techniques imported from French companies and miners. Generally the cheapest form of mining, it is generally the most damaging as well (Brown and Stocks 1977: 24). "Many environmental impacts are at a maximum in opencast mining, including visual intrusion, noise and airblast, vibration, air and water pollution and dereliction (Brown and Stocks 1977: 24). The techniques used in opencast mining included the use of large machinery capable of digging into the sides of mountains to extract ore. Using these machines, miners were able to extract large amounts of material from the mine location and extract the desired nickel. All waste materials were then dumped down the side of the mountains (Bird et al. 1984: 12). This waste material outnumbered any usable ore by a factor of 5 to 1 (Bird et al. 1984: 12) and contained toxic minerals that ensured that no vegetative regrowth could occur (McCoy et al. 2002: 2). This method is only applicable to stratified deposits close to the surface and the yield per unit area of land is relatively low. Therefore, large areas are often worked in order to have a profitable yield (Brown and Stocks 1977: 24)

With the increased modernization of the mining process and development of new shipping routes came the construction of roads and larger settlement areas. These roads fractured habitat that had otherwise not been disturbed and allowed for increased human access to the forest.

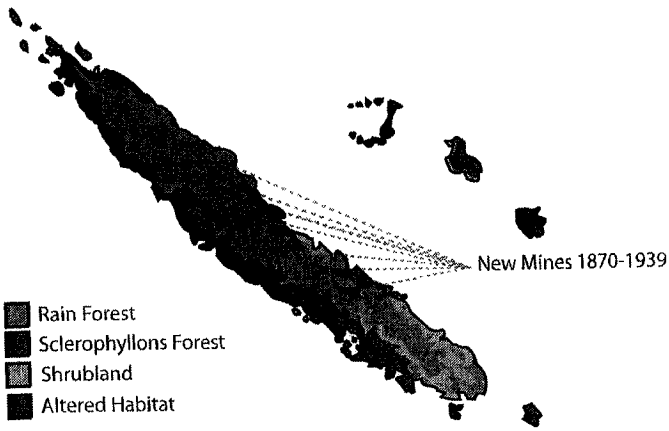
Prospectors, in their search for new ore, utilized these new roads to access virgin areas of the island. The process used by these prospectors included burning away the vegetation on the mountains to give them better access to the countryside causing massive forest fires. These fires were aggravated by the introduction of locomotives to transport ores from mountains to shipping ports. The locomotives burned wood and sparks caused many fires along the tracks. The fires eventually caused such widespread environmental damage to the flora and fauna of southern New Caledonia that the impact is still evident (United Nations 2002).

The erosion caused by these mines, roads, and fires interacted with weather systems of the area to worsen the original damage. New Caledonia is located within the path of cyclones during the summer months. These cyclones and the heavy rains that accompany them create mudslides and increase the erosion of the highly metallic and toxic soils. These soils contaminate rivers and eventually end up in the coastal waters at the bottom of the various mined massifs (United Nations 2002).

In this way, the nickel mining of this period not only directly destroyed the forest area that was mined but it also led to collateral damage, degradation and fragmentation of the forest area that surrounded it. Both rain forest and sclerophyllous forest were destroyed as the residual effect of new roads allowing more prospectors deeper into the forest to burn down prospective mining sites. The sediment that resulted from opencast mining severally degraded surrounding forest as a result of both the quantity of the waste thrown down the sides of the mountains where these mines were located but also as a

result of the waste's toxicity. To this day, these mining pits and the rejected waste do not have any vegetative growth. Also, new roads were established that would guarantee this cycle of destruction in the decades to follow.

*Map 4. The Effects of New Caledonia's Mines 1870-1939*




*(Source: Mittermeier 1999: 367)*

The above map shows the specific mines that began to be exploited during this period. The areas that became severally altered include not only the direct mining sites but also the surrounding areas that became degraded as a result of sediment waste, erosion, fires, roads and settlements. Although many of these mines have since shut down, they are still having an effect on the surrounding forest biodiversity as silt and erosion continue to degrade habit, rivers and tributaries (Bird et al. 1984: 10).

Although nickel became the main economic staple of the time, the early 1900's also saw attempts to establish various agricultural based economies. These new ventures included the purchase of land for planting coffee, sugar and to accommodate more cattle farms. From its heights in the late 1880's of 80 000 head of cattle, by the mid 1900's, the

number of cattle were down to 50 000 despite increases in the population of New Caledonia and the development of a larger potential market for locally raised meat. Despite the downturn, by 1910 global markets for beef were increasing and investors in France regained an appetite for investing in cattle production. In 1910, a slaughterhouse was built in Ouaco to increase production for global markets (Orstrom 1981: 38). Another was built in 1917 in Muro and in Néméaru in 1920. By this time, cattle production had increased to 150 000 head, taking over larger pastoral lands and former forest area. This success was short lived and in 1922, prices for beef slumped and cattle head fell by almost 60 000 over the next five years. This level remained fairly consistent throughout the next 20 years (Orstrom 1981: 32).

The creation of a sugar cane economy was also attempted during this period of time although without any success. In the late 19$^{th}$ century, sugar can was planted on over 500 hectares of newly cleared land. Two production facilities were built capable of refining between 1000-1500 tones of sugar per year. However, production never lived up to expectations and by the end of the century, New Caledonia was producing less than 8 tones per year (Orstrom 1981: 32).

In 1900, over 2000 hectares of coffee were planted throughout New Caledonia. By 1910, after a collapse of the global coffee market, demand rose for New Caledonian coffee from France and production was increased to over 2000 tones per year by planting another 2000 hectares. In 1930, this was increased again by an added 2800 hectares.

New clearings for these lands came directly from the sclerophyllous forests on the west coast.

**Further Integration into the World-System: 1940-1970**

World War II brought with it an economic boom unseen in New Caledonia's history that facilitated the territory's full entry into the economic world-system. Pre-war nickel prices rose steadily as demand from Japan increased. By 1941, the United States was ready to buy as much as it could get from New Caledonia (Lawrey 1982: 58). This demand created a boom in the mining industry and increased nickel output.

However, even more so than the rising nickel prices, the presence of foreign military troops, especially American troops on the island had an important impact during the war years. Between 1942-1944, New Caledonia became home to more than 100,000 American and New Zealand troops (Lawrey 1982: 58). Of these 100,000 troops, 22 000 of them were permanently stationed there and between half a million to a million GI's passed through on their way to other destinations (Aldrich 1993: 17).

The American presence injected a large amount of money into the local economy. The Banque de L'Indochine in New Caledonia handled over $20 million US dollars during this period (Aldrich 1993: 19). The GI's were relatively well paid and had little else to spend their surplus money on in New Caledonia except for food and other staple goods produced on the island. This in turn stimulated agricultural production as the

demand for produce and beef boomed (Connell 1987: 123). The US military itself was also a source of dollars and development. The military constructed roads and airstrips especially around Nouméa where the American constructed aerodrome is still the territories principal airport (Aldrich 1993: 19). It also left behind buildings, tractors, jeeps and other equipment which remained in long use after the war (Aldrich 1993: 27). Estimates are that the American military left behind over $3 million (USD) worth of roads, airfields and other equipment (Laigret 1943: 163). Many of these airfields and roads cut into previously pristine rain forest on the northern tip as well as forest on the West coast. These new developments also brought with them new settlements into otherwise untouched forest along the west and northern coasts (Orstrom 1981: 45).

The American occupancy also brought with it a new level of mechanization and modernization of New Caledonia's food production process. By 1944, the "Army planted a total of 521 acres, producing over 229 tons of vegetables for American troops; on these farms, the techniques, including artificial fertilizer and machinery supplied by the American army, were generally much more sophisticated and on a larger scale than those available elsewhere in the islands" (Aldrich 1993: 20). Although the impact of clearing 521 acres of land on the island's biodiversity is minimal, these agricultural areas proved that New Caledonia could feasibly meet its own food needs and thus does not necessarily need to be as dependent on the foreign export of nickel for subsistence (Connell 1987: 123).

The economic boom brought about by the American presence and the associated development and modernization that came along with it provided many job opportunities for the Melanesians. The mines and agricultural areas were in full production and the demand for labour drove wages two to three times higher than before (Connell 1987: 123). With new wages and a substantially higher percentage of wage earners among the Melanesian population came new consumption patterns. Melanesians enjoyed a consumption level "barely dreamed of in pre-war austerity" (Connell 1987: 123). Many of the "products of American consumerism found their way into local hands" (Aldrich 1993: 19).

The effects of the American tenancy of New Caledonia during this brief period cannot be overstated. With their presence and accompanying financial resources, many cultural changes took place. Governor Laigret, the then governor of New Caledonia stated: "The hiring of Melanesians and other local laborers will be the future ruin of New Caledonia, because they will lose the taste for work and their morals are completely upset" (Laigret 1944 as quoted by Aldrich 1993: 19).

Melanesians received good pay, food and treatment and gained a favorable impression of the work that they now performed. Formerly, they were excluded from all political and economic activities except in areas where they were forced to work by the French government. As Coultier states: "The Melanesians now came to intend to choose their employers. In return for their manual labour they will expect to earn enough to

enable them to buy living necessities, and they will want the same wages as are paid to white workers for similar work (Coultier 1944: 410). Thus, the constraints put upon the Melanesian people that limited their ability to negotiate their proper position within the externally imposed French political and economic system began to change. The local people who had been forcibly removed from their lands almost a century before had experienced a relatively positive kind of contact with foreigners. They had now had connection with and been integrated into a wage labour based economic system in which work was exchanged for relatively sizeable sums of money to purchase consumer products.

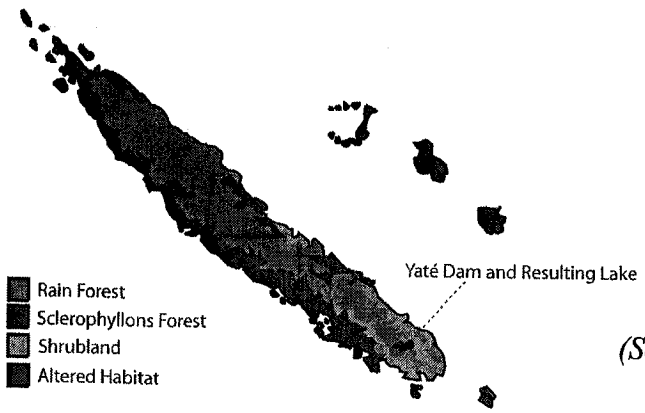
Prior to the war, France held a monopoly of power on the island. "Paris could mould the shape of politics in the overseas territories: the French parliament legislated law codes, established institutions and decided on the franchise: the President of the Republic appointed local officials, especially the chief administrator; Paris retained control of defense, law and order, foreign policy, currency, education, and immigration. The French state could grant or withdraw powers and privileges from local officials" (Aldrich 1993: 159). In this way, the periphery was ruled by French agents existing in the 'Metropole' (Aldrich 1993: 159).

This political structure began to change as a result of the war. Paris had lost contact with those in power in New Caledonia for several years during German occupation. Without control over the island and with new enfranchisement by the local people, post war New Caledonia saw many important political shifts. At the time, only a

few Melanesians were able to cast a ballot. The French enfranchised a larger number of them in 1951 and in 1957 all indigenous groups on the island were given the right to vote. France set up a local assembly of elected officials to govern the island, although final authority was still legally in the hands of the French governor and France. Also, France allowed New Caledonia to elect two representatives to both the French legislature and senate (Aldrich 1993: 159-160).

Although French political domination had been somewhat weakened, its economic interests became stronger following the war. Fuelled by demand created by the Korean war, the nickel market boomed in the early 1950's and New Caledonia's mining operations underwent a period of sweeping modernization. "New mines opened, the metropolitan and territorial administration granted concessions for prospecting and production and the nickel industry built a large hydroelectric dam at Yaté" (Aldrich 1993: 100).

*Map 5. Yaté Dam*




*(Source: Orstrom 1981: 45)*

With the introduction of the Yaté dam, a major portion of rainforest on the bottom portion of the island was flooded. As a result, SLN's output of nickel ore more than quadrupled from 6000 tons to 26 000 tons and its share of the non-Communist world's nickel production rose from 10 to 18 percent (Aldrich 1993: 100).

As part of the modernization process, administration within the nickel industry and of the new political structure centralized themselves in Nouméa. As a result, a large part of the island began to urbanize around this center. "The boom in mining contributed to the parallel expansion of commerce and public service, in large part funded directly form France, as the colonial economy became increasingly part of the French economy and the cycles of global capitalism" (Connell 1987: 123).

The agricultural economy slowly faded after American military personnel left the island. Markets for beef, cotton and other food collapsed and former farm settlers began to move to the city. "After exposure to higher living standards during the war, many settlers who were unwilling to return to an agricultural economy that was little more than a subsistence economy, began to abandon uneconomic holdings and move into town" (Connell 1987: 134). By the mid-1960's landlords found it hard to get tenant-farmers in many of the former farming areas especially for agriculture requiring intensive labour (Saussol 1967: 296-7). The disappearance of the labour force had become the 'main stumbling block of Caledonian agriculture (Roux 1977: 28 as quoted by Connell 1987: 135).

This agricultural decline was further exacerbated by the nickel boom. With new funds coming from nickel production and French subsidies into the administration of the island came higher wages for workers in urban areas. Increasing export of nickel also meant new relationships with other countries that began to export their agricultural products into New Caledonia, competing with local producers on price.

The SLN at this point grew to almost completely monopolize the mining industry having bought out many of the smaller companies on the island and purchasing over 2/3 of the island's richest concessions. The SLN also built the only smelter on the island in Nouméa thereby controlling the entire production process on the island (Thompson and Adloff 1971: 401). "New Caledonia had become a company colony" (Connell 1987: 124). The number of employees doubled between 1954-1964 to reach a total of more than 3000 (Thompson and Adloff 1971: 405). By 1970, New Caledonia's nickel production reached 120 000 tones (Connell 1987: 125). This economic revolution set in motion the development of many new mines across the island resulting in the "expansion of power supplies and refinery capacity, extensive public works programs, the expansion of the bureaucracy, growth of the construction and commercial sectors and a massive increase in the demand for labour, resulting in a new wave of migration to New Caledonia" (Connell 1987: 125).

The effects of this period on the island's forest diversity are substantial. By 1970, over 21 000 hectares of land were being actively mined, much of which occurred on the east coast of the island between Houailou and Thio. Areas such as Kouaoua, Poro and

Nepoui were also mined in great quantities. The mining in each of these areas remained opencast and was executed "with no interest in conservation or management transformed the landscape of the Grande Terre" (Connell 1987: 128). The effects were most pronounced in Thio, "where mountainsides were seared by opencast terraces, little forest is left, navigation and fishing in the Thio river are no longer possible and infertile masses of sediment have slumped own the hillside (Connell 1987: 128).

The new mining industry of this period brought with it technically efficiencies that increased output as well its environmental damage. By 1969, nine major mines were in operation that had extracted more than 50 000 tones of nickel. These include Kaala Karembe with 50 000 tones, LaLune with 50 000 tones, Thio with over 300 000 tones, Canal with over 250 000 tones, Bourail with over 100 000 tones, Poya with 100 000 tones, Nepari with 100 000 tones, Paita with 100 000 tones and Poum with 50 000 tones. Considering that opencast mining has a find ratio of waste to nickel ore of 5 to 1, these 9 mines are responsible for over 5 550 000 tones of waste sediment (Orstrom 1981: 41). No environmental safeguards were implemented during this period nor was any environmental legislation protecting the area's forests. The industry was directed solely "towards obtaining adequate mineral supplies for rich nations" (Connell 1987: 130) and the loss of original forest cover was not yet of interest to this international community.

This new dominance of nickel also led New Caledonia to a position of dependence upon France not known in previous times. With agricultural production being all but destroyed, food and other subsistence needs were increasingly being purchased on global markets forcing Melanesians to rely upon mining work or French

government subsidies to survive. The massive increases in nickel mining without safeguards to protect the island's forests has, according to Connell "left what is likely to remain a permanent wasteland" (Connell 1987: 128) in the former forests surrounding the main mining areas.

## Chapter 4

### New Caledonia from the 1970's to the Present

It is the contention of this thesis that although differences exist between past and present phases of globalization, various elements of continuity persist. For example, New Caledonia remains the property of France; the mining of its resources continue to benefit French interests and it is still economically and politically dependent upon the métropole of Paris. The relationship for organizing the economic activities of New Caledonia, thus, continues to show elements of continuity from the past that supports the world-systems approach. This is not to say, however, that changes have not occurred. In the case of New Caledonia, there have been some very important shifts resulting from the exponential growth in science, technologies and the development of transnational organizations. However, to show that there is a definitive split that ushered in the new era of globalization in New Caledonia is not possible. Rather, the changes in technology, science and organization that have occurred over the past several decades have occurred as a result of a cumulative process with ties to the past. These changes, however, have important consequences as they have lifted New Caledonia's integration into the world system to a new, qualitatively different level that have a variety of distinct environmental effects.

The point of departure, then, for our discussion of contemporary globalization begins with the early 1970's as this time period witnessed the increased use of high technology and the integration of transnational organizations into the fabric of New

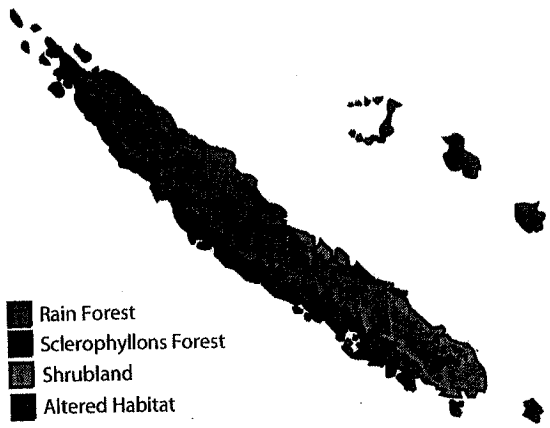
Caledonia's political, social and economic structures. The 70's also saw the increased use of techniques to limit the devastating impact of opencast mining on the forests of New Caledonia. The integration of these environmental concerns into the technologies and processes of mining resulted from an increased awareness by the local and international community of the effects of mining in New Caledonia.

**The Opening Phase of Contemporary Globalization in the 1970's**

The dawn of the 70's opened with one of the largest nickel booms in the history of New Caledonia mining. Production of nickel in the early 70's reached an all-time high due to unusually high prices of nickel on the world market and new technological efficiencies in the nickel mining process (Bird et. all 1984: 23). These new techniques relied upon increased mechanization, size and sophistication of the machinery used in extracting nickel. Powerful mechanical shovels that cut into cliffs quarried nickel ore. This kind of mining necessitated the removal of huge masses of overburden from the various plateaus of New Caledonia's mountain ranges and by spilling and slumping the waste materials down hillsides into neighboring valleys. "It is... impossible to extract the nickel ores, which occur at the base of weathering mantels up to 30 meters deep on these summit plains without conspicuous devastation" (Bird et al. 1984: 49). By 1971, mining of nickel reached a record of 8 million tonnes (Bird, et al. 1984: 12). As a result of rising nickel prices, France's administrative offices in New Caledonia issued a record number of concessions. Mining titles were issued for 380 000 hectares, equivalent to over 22 per cent of the island's land surface (Bird, et al. 1984: 12).

This period saw the most conspicuous devastation on the island in the history of French occupation and control. In 1971, 330 nickel mines were in full operation. "They can be grouped within about 40 centers of exploitation, generally corresponding with the distribution of ultrabasic massifs" on the Grande Terre (Bird et al. 1984: 14). The following map illustrates the direct effect of the new mines on the surrounding forest.

*Map 6. New Mines in operation by 1971*




*(Source: Bird et al 1984: 14)*

Although representative of the direct effects of the mines, the above map does not account for the indirect effects the disposal of ore without nickel content that was discarded down the sides of the massifs. As nearly 8 million tones of nickel was being extracted per year during this boom period, the waste of material far outnumbered the amount extracted. Further exacerbating the negative indirect effects on the surrounding forest area was the substantial increase in the ratio of waste material per unit of nickel extracted. Nickel content decreased from over 10.5 percent in the late 19$^{th}$ century to a mere 3 percent by 1971. Thus, the effects of the mining on the island were compounded

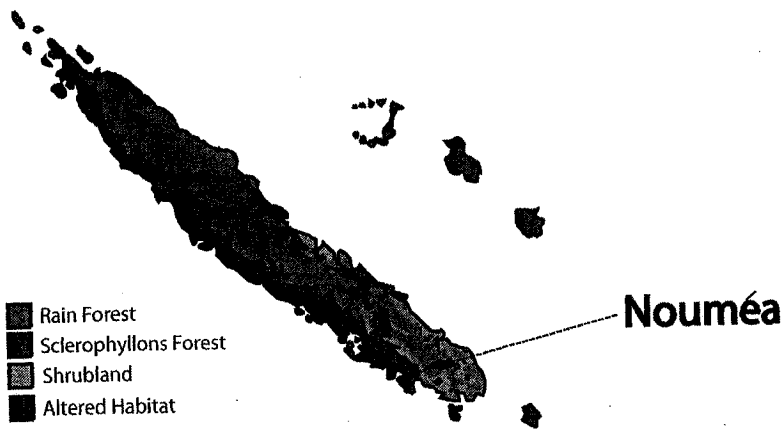
as a result of the high extraction rate due to high demand in global nickel markets and the increased waste produced by the mines as a result of diminishing nickel content in the extracted ore. Therefore, since the indirect effects of this boom on the forest area have not been shown in the above map, we should expect that the overall effects of mining in the early 70's were much greater than represented.

An example of this type of indirect effect was documented in Népoui, the most productive region in New Caledonia during the boom. "As a result of mining, vast masses of overburden have flowed and slumped down the slopes bordering hilltop mines in the Massif de Kopéto-Boulinda, and the river channels of Népoui have been greatly modified, widening to accommodate large quantities of sediment ranging from red clay through sand and gravel to cobbles and boulders (Bird et al. 1984: 28-29). Mining has removed much of the summit top of the Massif and hillside waste fans down the sides, blocking many of the rivers and destroying much of the surrounding forest.

Compounding the negative direct and indirect effects of the mining on the forest was a massive population shift that resulted from the mining boom. The territory had become the second largest producer of nickel in the world (Aldrich 1993: 101) and the promise of high paying jobs in the mining industry propelled impelled massive immigration to urban areas, especially to Nouméa and Papeete (Aldrich 1993: 119). Between 1969 and 1975, the population of Nouméa grew by 34%. The outlying area of Dumbea grew at an unprecedented 286% during this period as a result of new construction techniques imported from the west that allowed for the rapid development of

new suburban living areas. Mont Doré also grew by 122 percent (Connell 1987: 227). "Nouméa spread outwards; second homes were converted into full-time residences and unused land were filled with speculative housing" (Connell 1987: 227). These new urban areas could only grow by infringing upon untouched forest areas to the north-east and south-west of Nouméa causing these forest areas to be cleared for use in construction and destroyed for the use of space.

*Map 7. Nouméa in 1976*




*(Source: Orstrom 1981: 49)*

This boom, however, was short lived. A crisis in the world nickel market occurred as a result of the world energy crisis, the recession in the Western world and the winding-down of the Vietnam war. All of this diminished the global demand for nickel. Production of nickel had reached 150 000 tones in 1972 but fell by sharply just two years later (Aldrich 1993: 101). The steady fall in nickel prices that accompanied this initial collapse led to the cessation of mining activities in many areas. "Abandoned, the hilltop mines stood in stark, derelict, unvegetated landscapes, and the waste products spilling

down their bordering slopes were easily mobilized, especially by the heavy downpours that accompany the passage of tropical cyclones" (Bird et. al 1984: 49).

The slow-down in nickel mining left local authorities with a major problem. The massive population shifts into urban areas had left many of the farm and agricultural areas empty. Many of the former nickel workers were without wages although had now been integrated into a wage-based economy and were not willing to return to an agricultural life that simply met their subsistence needs. At the same time, as a result of the loss of agriculture production, New Caledonia had become heavily reliant upon importing food to meet its basic needs. During the nickel boom, foreign exchange was easily generated in order to cover the costs of importing food from abroad but the collapse in global nickel markets meant a lack of the financial means to purchase what was needed.

This crisis prompted local authorities to target alternative economic development. They were particularly interested in developing New Caledonia's tourist trade and agricultural production. "New Caledonia's hotels, though few in number, did good business during the nickel boom as migrants, technicians and business people passed through the territory. No real effort had yet been made to develop the tourist potential of the Grande Terre and the outlying islands" (Aldrich 1993: 104). Advancement in aerospace technology and the modernization of Nouméa's airport prompted Australia, New Zealand and France to begin regular air service with jumbo jets. A new tourist board was created and Club Méditerranée, a French based holiday company, refurbished

an old hotel and opened up a Club Med in 1979 (Aldrich 1993: 104). Another major tourist development located itself on the Anse Vata beach on the outskirts of Nouméa built with capital from mining interests. These tourist initiatives were successful in attracting foreign visitors and providing some employment for local people. Between 1975 and 1980, the numbers of tourists rose three-fold, from 30 000 per year to over 90 000 (Aldrich 1993: 105). Although the impact of the tourist industry on the surrounding forest area was minimal, the numbers of tourists were relatively low and localized to the capital and a 50km radius surrounding it (Orstrom 1981: 42), it is important to acknowledge. Compared to cattle farming and nickel mining that necessitate a high rate of deforestation, for the first time since French occupation a relatively low-impact means of development was introduced successfully in New Caledonia.

Attempts to increase agricultural production to meet its own basic needs were not as successful. "Efforts to stimulate agriculture in the 1970's were intended to decrease New Caledonia's reliance on imports, develop sources of export revenue, promote Melanesian farming and provide jobs in the wake of the downturn in mining" (Aldrich 1993:105). Coffee had been cultivated in New Caledonia since the nineteenth century but largely disappeared during the nickel boom. In an attempt to revitalize coffee production, 500-2000 hectares of land were planted with coffee using new modern farming techniques and technologies. Production increased from 300 tons in 1978 to 600 tons in 1979 but then dropped off substantially as a result of low export income. In another attempt, reforestation of the Tango plateau of the Grande Terre and the Isle of Pines was undertaken. This endeavor was also unsuccessful as non-local trees were

replanted that could not survive the local soil conditions (McCoy et al. 2002: 1). As agricultural attempts to bring the island to some kind of self-suffiency failed, the costs of living rose as a result of having to import larger amounts of food. Between 1972 and 1980, the volume of food imports went from 36,700 tones to over 44,000 tones per year.

The increased cost of living, the disappointment felt as a result of the failed economic prosperity that the nickel boom promised to bring and the devastated mining areas that stood empty and unproductive served to ignite a new independence movement among the local Melanesian people. "Caledonian individuality resurfaced in opposition to France and the tightening of belts in New Caledonia encouraged new separatist feelings (Brou 1979: 45). This manifested itself in new calls for independence from France and a new militancy among the Melanesians not seen since the late 19th century. "The French government maintained its position that the TOM's (Territoire Outre Mer) should enjoy only very limited self-government" (Aldrich 1993: 185) in order to retain land rights to mining areas and control environmental legislation that would interfere with profiting from the ownership of concessions. Many radical groups developed to counter this desire and to renegotiate their position vis-à-vis the global economy. In 1974, the Front Uni de Libération Kanak or FULKS called for complete immediate independence from France. "The major developments in the political history of New Caledonia in the 1970's were a revaluation of Melanesian cultural identity and renewal of islander land claims combined with the first demands for independence from French rule" (Aldrich 1993: 190).

The implications for the island's forest diversity of these new political developments are important. The conspicuous devastation of the various Massifs mined during the height of the nickel boom served to antagonize the Melanesians at the time who saw little profit or compensation from the destruction of their traditional lands as most of the money gained from the activities were expatriated back to France. The various protests in New Caledonia began to gain the attention of the international press, especially that of Australia and New Zealand who were sympathetic to the Melanesian cause (Aldrich 1993). In so doing, the devastation of the island's forest diversity began to surface as an issue for international environmental groups as well as local tribal groups and sympathetic French patriots.

As a result, new initiatives were put in place by the French government to curb the effects of the sedimentation of the mines. Various sediment dams were built in the most devastated areas in order to keep toxic soils from falling down the mountainsides into the ocean reefs and tributaries (Bird et al. 1984: 49). Prior to the mid 1970's, New Caledonia was "remote from centers of conservation activism and the impacts of opencast hilltop mining attracted much less criticism that they would have done in Europe, North America or Africa" (Bird et al. 1984: 50). However, as a result of the international attention the island was beginning to receive, a territorial commission for the prevention of damage by mining was established in New Caledonia, composed of representatives from public authorities, local agencies, mining companies and international scientific organizations. "Thereafter, new mining necessitated an authorization from the Service des Mines following consultation with the commission,

which is required to make a field inspection of the area to be mined, assessing the risks of erosion on and around the site and compiling a botanical inventory to check if there are rare species or communities requiring site preservation" (Bird et al. 1984: 51). Controlling pollution at sites which were abandoned before 1975 is more of a problem as these new measures do not prevent fine sediment from being washed down to the sea from higher levels. It is therefore likely that both direct and secondary impacts of mining will continue to affect the environment for some time from mines opened prior to 1975 than after the creation of the new mining assessment organization (Jaffré 1994: 1).

In this way, New Caledonia exhibits many of the initial characteristics of globalization as described by the discontinuist theorists. The 70's began with some of the worst mining damage that led to what has been called the worst erosion problems in the world (See Mittermeier 1999, Bird et al 1984). However, by the mid 70's, the beginning of the integration of conservation measures were introduced into New Caledonia through the Service des Mines made up of both local and international groups. Thus, we can see elements of what Mol describes as ecological modernization beginning to occur as environmental concerns became increasingly important in the development of the island. International environmental organizations began to be concerned with the island's forest situation and aligned themselves with local people whose interests lay in conserving these areas.

We also see the ushering in of new period of dependency upon nickel mining and global nickel markets. By the end of the decade, "nickel ore and derived metallurgical

products represented about 97 percent of the total value of exports from New Caledonia" (Bird et al. 1984: 18). As a result of the demographic shift to urban centers and the loss of agricultural production, New Caledonia began to import large portions of its food and subsistence needs. Although just a preview of the levels of dependency upon nickel export revenues that we shall see in the latter twentieth century, the 70's showed a strong move towards New Caledonia becoming a single commodity economy. This is consistent with Hoogvelt's argument that globalization forces peripheral areas to focus on one particular aspect of the production process. Beginning in the 70's we can see New Caledonia's growing economic need to focus their economy on the production of nickel in order to generate export revenue on international markets to purchase subsistence needs and food.

**New Caledonia in the 1980's**

By the early 1980's, the nickel market recovered to some degree. The SLN had signed a contract with Japan to provide half of all their nickel needs for the next three years as a result of new strikes at Canada's INCO mines which limited SLN's competition. The subsequent mini boom that occurred, however, was short lived. Another downturn in the international nickel market occurred in 1983 and 1984. With the contract with Japan finished and the prices for nickel on global markets slumping, nickel ore exports from New Caledonia plummeted. "Total production in 1983 and 1984 was less than half that of 1980 and the real value of nickel ore exports fell to less than half that of 1970" (Aldrich 1993: 102).

The boom and bust cycle by this time had become entrenched in New Caledonia's economy. "D'une année sur l'autre une mine importante peut ouvrir ou fermer, en fonction de la conjoncture internationale qui pése sure le seuil de rentabilité d'une exploitation" (Orstrom 1993: 135). Nickel production rose and fell with the rise and fall of nickel prices on the global markets. During the mid-80's, nickel production dropped forcing many formerly important mines to close, including the Népoui mine that was the most productive center during the 70's. "Le centre le plus important, Népoui, disparait. Seuls les centres Kouaoua et Thio gardent une certaine importance" (Orstrom 1993: 137). However, production in Thio remained constant at over 500 000 tones a year and mining in Kouaoua actually grew to 1 500 000 tones by 1988. The majority of the damage to the rainforest of New Caledonia during this period, therefore, remained largely localized to this area on the east-coast of the Grande Terre.

The effects of this relative slow-down in the demand for nickel combined with new environmental measures to reduce the effects of sedimentation on the forest areas neighboring the new mines. This is not to say that the Thio and Kouaoua mines did not destroy forest area. Indeed, mining remained opencast and, as such, necessitated the entry into new forest cover in order to extract nickel. However, as production slowed and new tailing dams were erected to stop the flow of mining waste down the various hillsides adjoining the mines, the effects were less in relation to the mining boom in the 1970's. For example, the mine in Thio contains the largest nickel deposit in the world has been mined continuously since 1901 and has yielded over 20 million tones of ore

(Bird et al. 1984: 35). The outcome of this has been "massive generation of mining waste. Substantial masses of sediment have slumped down the hillsides" (Bird et al. 1984: 38). Although new mining in the 80's still contributed to this devastation, rock dams and interception basins were built to reduce the amount of sediment yield from new mining activities in the area of Thio, thereby reducing the effects of sedimentation on the surrounding forests (Bird et al. 1984: 25).

Although mining production did remain low compared to the boom in the early 70's, the mid-80's saw an important development in the internationalization of New Caledonia's economy. The mines in Tiebaghi that closed in 1967 was reopened by a large international consortium including a French bank and Canada's INCO. This new mine, while small in comparison to INCO's other mining projects around the world and SLN's mines throughout New Caledonia, represented the first major international mining company outside of France to mine in the area. INCO brought with it new mining techniques that allowed for greater extraction than previously known. The Tiebaghi mine was rich in chromium and "new techniques pioneered by INCO enabled a much higher level of efficiency" (Connell 1987: 129). Chromium exports rose from nothing in 1980 to 18 000 tones in 1982 and 64 000 tones in 1984 (Connell 1987: 129).

Other economic activities fared less well, further solidifying mining as the sole revenue producer on the island. Production of chrome declined, harvests of coffee stagnated and commercial export of copra fell from nominal values in the 1987 to nothing in 1989. Timber yields were less than half of what they had been in the previous four

years (Alrdich 1993: 107). Although the demand for beef stagnated and production lowered during the decade as well, the amount of land converted into pasture saw an increase. By 1988, over 150 000 hectares had become pasture land since cattle was first introduced on the island. Much of the pastureland cut into the sclerophyllous forest on the west coast that by this point became critically endangered. As a result of the combination of conversion to pasture lands and the direct and indirect effects of nickel mining, the sclerophyllous forest which once covered over 24% of the island, by this point covered only 2% of the island, a reduction of over 4 300 $km^2$ (Mittermeier 1999: 368).

The decline in agricultural output again increased the dependence upon nickel as a source of export capital by New Caledonia. This increasing dependence is essential to point out in the analysis of the health of the endemic forests of New Caledonia as mining continues to present the greatest threat to the health of these biological systems (Mittermeier 1999: 323). Although tailing dams can limit the impact of sedimentation on the surrounding forest, they cannot reduce the impact to zero nor can they protect the vegetative growth that is directly displaced by the process of opencast exploitation. Thus the more economically dependent New Caledonia is on nickel mining, the less safe the endemic forest species are. By the 1980's, this dependence had reached new heights. In the late 80's the production of food such as meat, fruit and vegetables for the first time failed to cover local demand (Aldrich 1993: 107). A nickel boom in the late 80's further exasperated this problem. Prior to the boom, the commercial agricultural economy contributed 10 per cent of the gross national product (GNP). By the late 80's, it

represented less than 2 per cent (Connell 1987: 143). "The nickel boom continued to offer better economic options than agriculture and only a fraction of the island's land was reverted to Melanesian tenure" (Connell 1987: 143) creating a disincentive for local people to begin new agricultural projects.

New political uncertainty in New Caledonia also had the perverse effect of increasing the island's dependence on nickel markets. This despite the fact that much of the political unrest stemmed from Melanesian objections to the dependence they had developed upon France and international nickel markets, and the destruction of tribal customs and lands that had ensued. In the early 80's, various Melanesian political groups began to come together in their call for a free, independent state. The demands became increasingly vocal and militant leading up to the territorial elections in 1984. The elections provided the opportunity for the previously fractured Melanesian political authorities that were pro-independence to come together under that banner of the Front de Libération Nationale Kanak et Socialiste (FLNKS) (Aldrich 1993: 224). The charter of the organization affirmed that the Melanesian people, or Kanak as they began to call themselves, had the rights to "recognition, dignity and liberty, self-determination and exercise of sovereignty, the return of land and the means to pursue economic development" (Aldrich 1993: 245). The fight for independence became violent in early December when anti-independist European and Melanesian groups ambushed sixteen FLNKS supporters. Ten men, including two brothers of the president of the FLNKS, were killed and the others were seriously injured. Violent retribution followed. On April 22nd, four Kanak attacked the gendarmerie in Fayaoué, a village on the loyalty island of

Ouvéa. The Kanak took twenty-seven gendarmes hostages, killing another three in the attempt. The French government responded by flying several hundred paramilitary forces into Ouvéa. The operation ended with the safe release of all the gendarmes but the death of nineteen Kanak (Aldrich 1993: 251).

The violence and political insecurity that resulted from these events served to exacerbate the declines in the agriculture economy as it threatened the ownership of pasture land that had been in the control of European settlers. As land rights remained in question, farmers became less inclined to invest money and labour into new field production or technological improvements. The violence gained international attention and all but destroyed the tourist industry as well. "Of all the industries tourism has been the most dramatically affected, and almost destroyed by political unrest" (Connell 1987: 148). From 1984, there was no tourism outside of Nouméa and the Ilse des Pines. Three hotels were destroyed in riots during the decade and others on the Grande Terre were filled with riot police from France. From January 1985 until the end of the decade, Australia and New Zealand advised residents not to travel to New Caledonia. Cruise liners stopped visiting Nouméa and only a fraction of Japanese tourists remained. All of the hotels existing in rural areas were destroyed (Connell 1987: 148). Following this violence and the collapse of the agricultural and tourist industries, the sole economically productive sector to remain was nickel mining thus creating even higher levels of dependency.

With the signing of the Matignon Accord in 1988, peace as once again restored to New Caledonia. It called for the direct rule of New Caledonia by the French High Commissioner for one year from the 14th of July 1988 and promised to hold a territory wide vote on independence. However, the accord came too late to save many of the previously troubled industries and as a result of the political unrest, the one remaining economic constant on the island remained the mining industry (Aldrich 1993: 254). As such, the means of acquiring basic needs became increasingly dependent upon a robust nickel industry.

**New Caledonia and the Turn of the Century**

The signing of the Matignon Accord helped solidify New Caledonia's continued dependence on France's political system although it paved the way for greater levels of autonomy. Financial resources supplied by the French government under the terms of the Matignon Accord were spent on indigenous cultural activities. This began to renew faith in the Kanak communities that the French government was serious about preserving their culture (Thompson 2001: 305). Although hardliner's in the indépendantistes and anti-indépendantistes ranks continued to criticize the Matignon Accord and lack of greater government action to achieve their objectives, there seemed to be a consensus that the French state and the various parties in New Caledonia would work out an arrangement before the 1998 vote on independence (Aldrich 1993: 284). Independence, however, seemed increasingly unlikely as augmented European migration into the territory followed increasing peace on the island. The proportion of Kanak in the colony's

population declined by 1% from 44.8 per cent in 1988 to 43.9 percent in 1998 despite a higher Kanak birth rate (Thompson 2001: 305). "FLNKS leaders began to appreciate that independence would not be achieved in the referendum promised in the Matignon Accord for 1998" (Thompson 2001: 305). As such, Kanak leaders began to negotiate for lesser deals. The result was the Nouméa Accord signed by the French government and Kanak leaders in May 1998. The agreement gave a new status to New Caledonia within the French Republic. It was no longer an 'overseas territory' but rather became a 'shared sovereignty state' with a new citizenship based on ten year residency. "There would be an irreversible transfer of local administrative powers to a new elected congress and local authorities" (Thompson 2001: 305). France, nevertheless, retained powers over justice, public order, defense, finance and currency.

These political changes also paved the way for a new internationalization of the mining industry. A number of multinational mining corporations that had been vying for the exploitation rights to New Caledonia's various mineral Massifs were given the go ahead to begin production (MiningWatch Canada 2002). These companies included some of the largest nickel mining companies in the world including Canadian based INCO and Falconbridge.

Falconbridge began the Koniambo Project. The project involves the exploitation of the Koniambo massif, located between the towns of Koné and Voh in the Northern Province as well as the construction of a pyromettalurig refinery and a small dam (Horowitz 2002: 2). The INCO Goro nickel mine is larger in scale, scope and potential

economic, social and environmental impact on the island. Located in the South Province of New Caledonia, "Goro is the best undeveloped laterite orebody in the world, with excellent average grades, 54 million tones of proven and probable reserves, and a very large resource base" (INCO 2002).

In 1999, INCO launched a US $50 million pilot plant program to test and refine its new technology and to train future plant operators and technicians. "In spring 2001, Inco announced that it was proceeding with development of a commercial scale complex at Goro with a planned capacity of about 55,000 tones of nickel and 4,500 tones of cobalt annually" (INCO 2002). The total investment in this stage of development is estimated to be over $1.4 billion (MiningWatch Canada 2002).

Ownership of the mine is also unprecedented in its international constituency. Inco Limited currently owns 85% of Goro Nickel, while a French government agency - the Bureau de Recherches Géologiques et Minières (BRGM) - owns 15%. In July 2002, Inco reached an agreement in principle covering the acquisition of a 25% interest in Goro by a consortium of Japanese companies led by Sumitomo Metal Mining Co. (INCO 2002). This represents the largest nickel extraction project to occur in New Caledonia that is not led by a company incorporated in France.

The effects on the endemic forest areas of these new mines and the increased internationalization of the companies allowed to exploit New Caledonia is contentious. There are a number of groups that have been largely critical of the move including

industry watchdogs such as MiningWatch Canada. They state: ``Mining by INCO is expected to threaten terrestrial bio-diversity in a number of ways. Some non-native plant species can establish themselves more readily on mine waste than can native species leading to a reduction of endemic and unique species. There is also a threat to diversity of species as mining destroys distinct habitats and creates large areas with similar features'' (Roche 2001:38 as quoted by MiningWatch 2002). Other groups including the mining companies themselves claim that this new internationalization provides new measures for ensuring the safe exploitation of the various massifs in New Caledonia.

One of the claimed positive impacts is that with the internationalization of the mining industries has come an equal internationalization of environmental groups concerned with maintaining the rainforest and hardwood forests of New Caledonia. As the international mining community has gained more access to the various resources of New Caledonia, a spotlight on the area's incredible forest diversity has been created by environmentally based industry watchdogs. "La mondialisation des problèmes environnementaux... et l'évolution des normes et des responsabilités incitent de plus en plus les acteurs de la Nouvelle Calédonie et à prévoir les conséquences environnementales de leurs projets" (Jaffré et al. 2001: 1). International environmental groups taking a greater interest in New Caledonia include the World Wildlife Fund, Conservation International, and MiningWatch Canada. Conservation International has also been recently involved in trying to preserve the island's forest diversity by placing it on its influential list of biodivesity hotspots (see Mittermeier 1999: 323). This listing has been used by environmental groups in New Caledonia and abroad to petition France to

designate New Caledonia a world heritage area. Other groups include the Chicago based MacArthur Foundation, Birdlife International through the French Lique pour la Protection des Oiseaux and the UK-based Royal Society for the Protection of Birds (Mittermeier 1999: 376).

Another argument for the positive environmental impact of the presence of international mining companies is the stated claim that these companies show a greater propensity to protect the environment and have more technical experience to do so. According to INCO, the "Goro project would exert minimal impact on the environment. Instead of marine tailings disposal, it would use a more expensive but environmentally preferable land disposal system. An on-site experimental nursery has been developed to ensure that all revegetation of mining areas is compatible with indigenous species" (INCO 2002). The vegetation found on the Goro Nickel project area is regarded as a complex mosaic of different endemic vegetation (Jaffre 1980: 12). In the late 1970's and early 1980's, revegetation programs were developed to regenerate devastated mining areas near the Goro massif. All of these programs failed because of the poor soil conditions in the area and the relative toxicity of the ground (Jaffre 1997: 7). In an attempt to minimize the impact of the Goro mine, Inco has proposed a regeneration system using native species (McCovey et. al 2002: 9).

Other mining techniques were also introduced to abate the environmental impact of the mines. Although still open-cast, the Goro mine project includes state of the art sedimentation barriers built to hold the mine overburden. These new techniques also

include sculpting settlement basins and terraces to lessen or prevent sedimentation of the waterways and coastal areas. The policy also limits road building into the mine sites to a minimum, and orders the mining companies to maintain the surrounding vegetation as an organic buffer zone around the mines and roads. Prospecting is done by satellite remote sensing and helicopter to eliminate the many small prospecting roads. After mining is complete, efforts must be made to revegetate the sites although this is difficult as the soil often contains toxic levels of minerals. As a result of these new technologies, the newer mines apparently cause far fewer problems than the older mines (RFO TV, August 1997). Erosion caused by rain-water runoff has been substantially reduced with the introduction of basin-scale management and appropriately-sized water retention and sedimentation tanks.

New mining technologies and practices such as better tailing dams and new plant regeneration programs do seem to minimize the impact of mining on the forest area (see. Bird et al. 1984: 27, and McCoy et al. 2002: 1), however open-cast mining will always have negative effects (Bird et al 1984: 12). As this type of mining necessitates the removal of forest vegetation in order to access new ores, it produces an enormous amount of soil waste and sedimentation that can only be minimized through the creation of dams but cannot be completely eliminated. Also, this process destroys forest area directly and although regeneration programs may be successful at regrowing some portions of the forest, the primary makeup and diversity of the original forest can not be duplicated. Furthermore, according to Mining Watch, the hydrometallurgical process that has been proposed by INCO is experimental and involves the use of large amounts of sulfuric acid,

the vapors of which can produce acid rain thus putting all of New Caledonia's forests at greater risk (Mining Watch 2002).

The increased internationalization of the nickel industry in New Caledonia also brings with it larger scale projects and the potential for the development of larger concession areas. As of 1993, over 25% of the island's land mass is under concession to be mined (Orstrom 1993: 43). If the INCO Goro nickel mine is any indication of the magnitude of the mining operations to come within these concessions, the development of these concession areas could occur at a much more rapid pace than previously known thus creating a larger impact even with the use of new technologies.

The augmented internationalization also caused even further dependence upon the boom and bust cycles of the global nickel markets. By the end of the 1990's, 90% of New Caledonia's exports were in nickel and over 70% of all the food consumed in the territory was imported from abroad (CIA 2002). This level of dependency has several consequences for the endemic forests of New Caledonia.

First, as nickel remains the one meaningful export of the island and control of the nickel concessions and the distribution of the mines remain in the hands of the French government, then New Caledonia has little chance of becoming an independent state baring France becoming disinterested in the commodity. The signing of the Nouméa Accord guaranteed this control into the mid-21$^{st}$ century. As such, New Caledonia is considered part of France and a G-7 country. This means that getting financial resources

to secure more protected forest areas remains difficult as areas considered part of the G-7 community are not eligible for global financial resources earmarked for forest conservation projects. As such, multinational and bilateral aid agencies such as the World Bank, the European Union, the Global Environmental Facility, the Canadian International Development Agency, among others cannot financially support conservation programs in New Caledonia (Mittermeier 1999: 373).

Second, this continued dependence on France has ensured that New Caledonia has no unified forest conservation body. Although environmental protection became a strictly territorial matter with the signing of the Nouméa Accord, the division of various other powers affecting the environment between the French state, the territory and the provinces complicates the issues involved in managing and protecting the environment. As a result, many laws that were designed originally for metropolitan France are often outdated and unsuited to New Caledonia (Orfila, 1992). This complexification of forest protection minimizes the ability to created new parks, conservation areas as well as implementing functional monitoring programs.

An example of the effects of this complication over protected areas manifested itself in January 2002 with the French Minister of Environment withdrew a request for UNESCO World Heritage Site protection for the New Caledonia/Kanaky reef ecosystem. The process for application of World Heritage status necessitates that the country who controls the area under consideration provide its full support during the nomination period. Without the official consent of the controlling country, the application for World

Heritage status is not valid. The application was originally approved by the French government in early 2001 but was later withdrawn by Roseline Bachelot, the new French Minister of the Environment (Mining Watch, 2002). If New Caledonia's reef systems had been approved for World Heritage status, mining on the land areas would be under considerable constraint as legally there could be no impact on the reef. Thus, although the application was intended to save the reef ecosystem, it also would have saved terrestrial forest area as a result of the restrictions and stringent monitoring that would have been placed on mining activities. However, as New Caledonia was not independent, the legal authority to achieve this international protection measure could not be implemented.

Thus, the consequences of the increased globalization of nickel mining in New Caledonia and the effects of contemporary globalization over the past decades on the forest cover remain contestable. While innovative uses of technology to protect the forest area have been implemented and new international environmental groups and measures have been introduced in the fight for the protection of forest habitat in the area, there still remains several substantial risks. Open-cast mining, regardless of the technologies used to manage its pollution can never achieve zero impact on surrounding areas. The very nature of the process of digging into the sides of the various massifs in New Caledonia modifies the forest habitat with important consequences. Although new technologies and protection systems have been implemented and have shown some measures of success, the long term effects are not known.

At the local level, several important changes occurred during this period as well. The signing of the Matignon and Nouméa Accords that lowered the barriers to entry for mining companies not originating from France also granted new powers for locally elected officials to impose their proper environmental regulations. Regulations on the use and protection of forest species became under provincial authority. "Depuis les accords de Matignon, les compétences en matière d'environnement sont essentiellement dévolues aux trois provinces. Selon l'article 20 de la loi organique du 19 mars 1999, chaque province est compétente dans toutes les matières qui ne sont pas dévolues à l'État ou à la Nouvelle-Calédonie par la présente loi, ou aux communes par la législation applicable en Nouvelle-Calédonie" (United Nations 2002). Although local authorities were given the power to implement new environmental policies, the jurisdictional complexity remained. "De ce fait, compte tenu de la confusion dans les compétences entre l'État, la Nouvelle-Calédonie, les Provinces et les Communes, il est nécessaire d'harmoniser et de réactualiser l'outil réglementaire`` (United Nations 2002).

The result of this new mix of powers is a number of protected terrestrial areas whose success in protecting endangered forest areas is disputed (See Jaffré 1998). Terrestrially, reserves created during the 90's cover just under 53 000 hectares, or 2.8% of the land (Mittermeier 1999: 373). Development and mining are prohibited in only 53% of these areas making just under 25 000 hectares of so-called protected areas eligible for exploitation (Jaffré et al. 1998: 1). Jaffré estimates that only 11% of all plant species facing the risk of extinction are protected within these conservation areas.

In this way, the turn of the century has witnessed the most discernible transformations from past periods of globalization. As a consequence of the internationalization of the nickel industry, the internationalization of the environmental movement as well as changes to the political system instigated by local indigenous people, New Caledonia's forest system is facing both new threats and new potentials safeguards.

Foreign mining companies were for the first time allowed to exploit the territory in a large scale fashion not previously allowable bringing with them not only new technologies to lessen the impact of open-cast mining but also new risks. These new technologies include revegetation programs, new sedimentation barriers as well as new basin sculpting techniques. At the same time, these new internationalized economic endeavors also presents new risks in the scope and size of the new proposed mines and in the number of new companies seeking to exploit New Caledonia's rich mineral reserves.

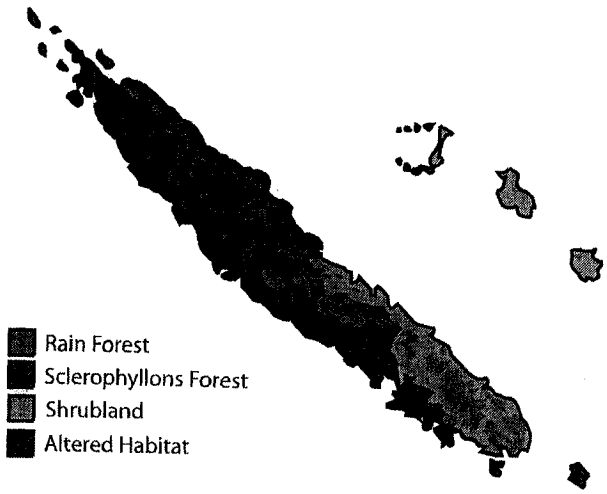
Consistent with the concept of glocalization, local indigenous people have reacted to these changes by attempting to negotiate a political and economic position to benefit their interests. This manifested itself in the Nouméa Accord granting them new political autonomy from France. However, this is not to say that the locus of power has shifted completely to the periphery of New Caledonia. The colonial French power remains largely in control of the territory and continues to dictate important political decisions as evidenced by the 2002 withdrawal from the UNESCO world heritage program. Thus, although local people have had an active role in shaping the economic, political and

environmental agenda of the past decade, they are still constrained in large part by the historical French powers.

The resulting condition of the forest cover in New Caledonia as a result of both past and present phases of globalization is critical. Most of the hardwood forests of New Caledonia have been destroyed. Of the sclerophyllous forest, under 2% of the original forest cover remains in severally fragmented form. Of this 2%, Jaffré states that only 100 hectares squared remains as a single stand of forest and none of the 2% exist within a protected area (Jaffé et al. 1998: 109). The rainforest has fared somewhat better although it is only a fraction of its original cover and remains only in fragmented form in the mountainous regions of Northern Grande Terre (Mittermeier 1999: 367). Under the new IUCN Red List categories, 25% of the endemic plants are at risk (Conservation Dependent, Vulnerable, Endangered, Critically Endangered), and five species are already extinct. "A review of their distribution demonstrates that 83% of the threatened species do not occur at all in a conservation area, and only 11% have their conservation status improved by a protected area" (Jaffré et al. 1998: 109). The protected area network is geographically and floristically very unbalanced, with the rainforest and high altitude maquis in the south concentrating most of the conservation effort. Conversely, the middle and northern segments of the island, as well as all of the dry west coast, are left without adequate conservation area. The sclerophyllous forest and the unique low/middle altitude maquis, are virtually totally unprotected (Jaffré et al. 1998: 109)

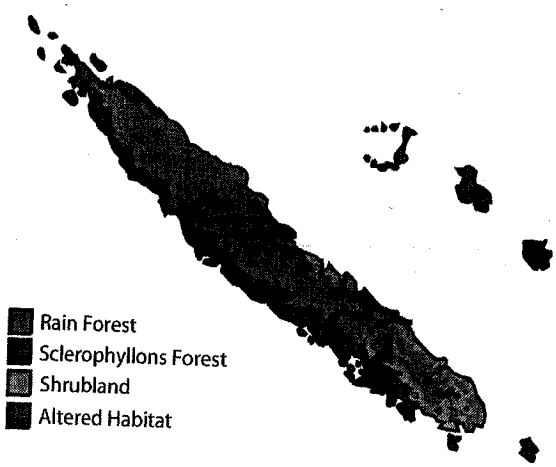
In this way, Map 8 depicts current forest cover in New Caledonia. As is evident, much of the forest either destroyed, fragmented or considerably altered from its original state prior to european colonization in Map 9.

*Map 8. Current Forest Cover in New Caledonia*




*(Source: Mittermeier 1999: 367)*

*Map 9. New Caledonia's Forests Pre-European Contact*




*(Source: Mittermeier 1999: 367)*

# Chapter 5

## Conclusion

The purpose of this thesis has been two-fold. On an environmental level, this thesis was an attempt to track and describe the effects of globalization on the forest diversity of New Caledonia. Such effects have occurred in many parts of the world. New Caledonia was chosen as a microcosm of processes that are also occurring elsewhere in small-island states as well as large countries. In order to capture the specific as well as the more general dynamics, this thesis carried out the above case study. This was done by linking historical data with forest cover data to pinpoint how globalization over the past 150 years has directly impacted the forests. Secondly, from a theoretical perspective, this thesis was an attempt to take into account the strengths and respective weaknesses of two previously opposed theoretical frameworks to understanding globalization: world-systems theory and contemporary globalization theory. This approach was adopted in order to take into account the historical context of contemporary globalization as well as the contemporary transformation of the world system, thereby transcending the disputes between the proponents of world systems theory and discontinuist globalization theory.

Globalization has been affecting New Caledonia over the past 170 years. It began in the 1830's but has accelerated exponentially over the past 30 years and has had an overall negative impact on the forests of New Caledonia. Since its first contact with the European world, the economic, political and cultural history of New Caledonia is one

dominated by exploitation of its vast mineral resources. This exploitation has resulted in some of the most conspicuous forest damage and soil erosion in the world. The forest habitat in New Caledonia prior to European contact was mainly made up of rainforest on the east coast and its center, Sclerophyllous Forest on the west side of the island and some shrub land towards the south. The Loyalty Islands were predominantly sclerophyllous forest. The main tracts of rainforest and sclerophyllous forest were not fragmented despite habitation throughout the area by Melanesian settlements since the latter remained relatively small.

As elsewhere in the South Pacific, a large portion of this former forest cover is now gone. Over 50% of the original forest cover has been destroyed and the remainder of the island's forest habitat has been severely modified through its relatively recent integration with the economic and political structures of the Western world. The rainforest and sclerophyllous forest have suffered from clearing, fires, the direct impact of mining and the indirect impacts of mining activity such as soil erosion, habitat fragmentation, and demographic changes.

In this way, the effects of globalization on the islands of New Caledonia and their unique forest habitat have been devastating. However, this is not to say that the effects have been uniform throughout this 170 year history. Rather, the impact of globalization on the forests has changed over this period with a distinctive shift over the past 30 years.

As the world-systems approach predicts, the first 140 years of colonization by France of New Caledonia was dominated by concerns for economic gain. The economic relationship between France and New Caledonia was driven by an inherently exploitative capitalist system that in effect reorganized traditional economic, political and cultural practices in exchange for ones more easily managed by the French power centers. These changes, backed by strong French political support in the form of bureaucratic and military power, facilitated the exploitation of the island's natural wealth. This first occurred through the sandalwood trade that destroyed the sandalwood forests of the Isles des Pines and the Grande Terre in no more than 20 years. This was followed several decades later by the creation of reserve systems that forced otherwise isolated tribal communities together onto lands to make possible the appropriation of land for cattle farming. These cattle farms have since spread across most of the west coast of the island and are responsible for much of the fragmentation, burning and cutting of the now critically endangered sclerophyllous dry forest. Through this land appropriation technique and the use of military power to subvert Melanesian revolts, the French government dispossessed the indigenous people of their land and much of the cultural heritage and ancestral connections that the land was imbued with by the Melanesian people. It also served to destroy much of the subsistence farming techniques that had been developed over 4000 years of cohabitation with the land.

Military power and political control by the French government were also crucial in creating a context within which the extraction of nickel and other mineral resources from the main island could occur. This was the result of the land appropriation and

reserve system implemented by the French government in the late 19th century and also because of direct French financial support as the French government became a major investor in SLN. Whereas the early mining techniques caused little damage, the scale and scope of this type of mining that this support allowed caused massive damages that are still felt today. Opencast mining techniques were used with little concern for the preservation or conservation of the unique forest habitats that were being destroyed as a result. By extracting large amounts of soil materials and dumping them down the sides of the various massifs that were mined, the forests were impacted not only by the direct destruction resulting from the removal of soil but also from the massive erosion that resulted. This erosion to this day has an enormous impact on the health of the forest.

The integration of New Caledonia into the world economic system continually increased over the decades that followed. By the 1940's, New Caledonia's economy had become one based on the boom and bust cycles of the international nickel markets. Between 1940 and 1970, new mines were opened and closed depending on the level of market demand, especially during war periods as nickel had become an important material in the production of weapons and armor. New power dams were built to generate power to run the mines and the processing plants as well as for the growing urban populations that increasingly infringed upon the forest frontier. Rural lands once used for agriculture became empty as rural labor forces immigrated to urban areas in the hopes of finding higher paying work in the nickel mines. Although it would appear that an urban population shift would take development pressures off rural areas, this urban shift was accompanied by increasing mining activities, thereby intensifying direct

destruction of mining on the forest system. This increased mining activity in rural areas also served to augment the levels of waste and sedimentation that indirectly destroyed and degraded many forests areas surrounding the mines.

By the early 1970's the economic relationship between New Caledonia and France began to intensify as the effects of contemporary globalization began to take hold. Whereas the previous 140 years had seen a relative diversity in the attempts to develop economically with products such as cattle, sugar cane, coffee, copra, mining, etc., the early 1970's witnessed the nearly complete economic dependence of the island's economy on nickel mining. The decline in agricultural production for the first time meant that New Caledonia could not meet its own agricultural needs. Thus, food had to be imported from abroad in order to meet basic subsistence needs of the island's population. In this way, a new period of dependence upon nickel mining arose as a result of the necessity to generate foreign exchange to meet these basic needs. By doing so, the economic relationship between core states and New Caledonia intensified as did the economic output of this single commodity. This supports Hoogvelt's theory that the emergence of a global market produces fundamental changes of the economy in that countries become compelled to concentrate their resources on a single part of the production process (Hoogvelt 1997: 23). Thus, as New Caledonia's principle resource is nickel, the territory became pressured to focus its attention solely on the extraction of this resource in order to sell it on international markets to obtain subsistence goods. This trend towards increasing dependency upon nickel mining and international nickel market

to provide for subsistence needs would continue throughout the next 30 years to the present.

The impacts on the forests in New Caledonia of this new intensification of nickel mining are immeasurable. No environmental safeguards were implemented during this period nor was any legislation in place to protect the forest's diversity. Tailing dams were not built to contain waste or soil sedimentation and management of the vegetation within and surrounding the mines was not a priority. New Caledonia as a biological hotspot was not yet a priority within the international environmental community. Thus, Bird concludes that the worst damage to the island's forest was inflicted during this period and the most severe environmental dangers remain these areas where sedimentation and erosion continue to occur with devastating effects.

As New Caledonia's economy began to intensify around this one single commodity and the economy was becoming ever more reliant upon global nickel markets to meet subsistence needs, environmental concerns started to gain prominence by the mid 70's within the development plan of the island. Environmental protection measures originated from both local authorities as well as from increased attention paid by international environmental organizations. Several international environmental groups including the World Wildlife Fund began to work to monitor and help stem damage inflicted by mining. The creation of tailing dams and other sedimentation controls became mandatory for the development of new mining operations on the island. Rock

dams and interception basins were built to reduce the amount of sedimentation from new mining activities.

As trade barriers came down in New Caledonia during the 80's, new international nickel mining companies began to have a presence in the area that had once been the monopoly of French owned companies. The signing of the Matignon and Noumea accords that lowered the barriers to entry for INCO also granted new local authorities power to implement environmental regulation. Thus, regulation for the use and protection of the forests of New Caledonia came under provincial authority. As a result of this new authority and pressure from the various international environmental groups mentioned above, a small reserve system has been set up. However, the historical legal and political connection to France has ensured that no unified forest conservation body has been created. Although environmental protection became a strictly territorial matter the division of various other powers affecting the environment between the French state, the territory and the provinces created a great deal of complexity when implementing protected areas and environmental legislation and protecting areas. Thus, the continuing political relationship of New Caledonia as a French territory minimizes local capacity to create new park and conservation areas as well as implementing functional monitoring programs.

There has been a marked change over time in the effects of globalization although many elements of continuity from the past persist. This has important consequences for its forest diversity. Although the initial integration of New Caledonia was based on

economic exploitation, contemporary globalization has ushered in new relationships based on environmental concerns from both local authorities and international environmental groups. Thus, while prior periods of development occurred without environmental safeguards, legislation or conservation, current mining practices have attempted to integrate processes that limit the impact of mining on the forest cover, although with limited success.

The continuing control of France has limited local capacity to implement new preservation areas and monitor existing ones. As a French overseas territory, New Caledonia is also limited in its ability to access financial resources from agencies that other countries with independent governments have been able to approach such as the World Bank and the Global Environmental Fund. The effectiveness of new technologies implemented to limit the impact of opencast mining is also contentious. New sedimentation dams cannot completely minimize the impact as the process obligates the removal of large expanses of vegetation. The revegetation programs have also met with mixed results putting into question the long-term viability of modern biological controls as well.

**Theoretical Implications**

There are several important implications that come from these empirical conclusions. The linking of the world-systems approach to discontinuist globalization

theory helps us develop a stronger overall view of the impacts of globalization on forest systems for several reasons.

One objective of this thesis was to develop a theoretical framework that can allow us to examine the social causes of biodiversity loss at both the local and global levels. To accomplish this, sociological theory concerning the history and effects of globalization including Wallerstein's world-systems theory and the discontinuist approach to globalization was used. The argument of this thesis, at a theoretical level, is that world-systems theory (Wallerstein 1979, 1980) and the discontinuist approach to globalization theory (Giddens 2000, Beck 1992, Mol 2001) are not as irreconcilably opposed as would seem from debate between their supporters. Both can be strengthened through contact with the other and in doing so provides us with a framework that can account for a larger range of social processes that cause habitat destruction. World systems theory can be bolstered through the incorporation of studies documenting the changes that the exponential growth in science, technology and transnational organizations have had over the past 30 years. It can also be strengthened by acknowledging the power that local people have in renegotiating their positions vis-à-vis the world system. Discontinuist globalization theory can be refined through the incorporation of studies documenting earlier forms of globalization. The originality of this thesis from a theoretical point of view is that it provides the basis for a combination of the two theories and demonstrates its usefulness in a case study.

By using a historical approach to understanding the environmental impacts of globalization, we can include the ongoing effects of past degradation into our analysis. By strictly focusing on the degradation of the past 30 years as many contemporary globalization theorist do, the explanation of the causes of loss of forest diversity would be limited to recent events. However, as the case of New Caledonia suggests, the impacts of activities from decades and perhaps even centuries past continue to affect the health of forests today. For example, the sedimentation that resulted from mining activities before the mid-70's continues to have destructive effects on the areas endangered forests. Changes in the various social processes that have occurred as a result of past periods of globalization also continue to have a profound effect on the health of the forest system. Such things as the destruction of the local small-scale agricultural economies as well as the increased dependence upon foreign food markets to meet basic needs both resulted from social changes that have their roots in the past. Thus, by using a historical approach we can account for a broader range of phenomena in our understanding of the current predicament of endangered forests.

Furthermore, the connection between the two theoretical approaches, while providing a historical context, allows us to also acknowledge the major changes that have occurred over the past 30 years as a result of the exponential growth of science, technology and trade. In addition to these technological and economical changes, an increased prominence of environmental concerns at the global and local level has developed. Again, the case of New Caledonia is very instructive in this area. It has only been over the past twenty-five years that any environmental regulations have been

implemented on the island. Many of the regulations that have been put in place have resulted from an interaction between local and global actors. This interaction has been facilitated by increased communications technologies and economic integration of New Caledonia as a result of lowered trade barriers. Thus, global environmental organizations have been able to bring to the attention of the world community the devastating consequences of mining in New Caledonia as well as the biological importance of the flora and fauna that exist in the area. Local government officials have been granted unprecedented power over environmental controls as well. With the granting of mining rights to multi-national corporations such as INCO and others, new mining techniques have been brought to the island in the attempt to limit the destructive powers of opencast mining.

Other important changes that can be perceived as a result of acknowledging the major changes of the past 30 years includes the intensification of the sole commodity economy and the resulting increased dependence upon international markets that result. In small states such as New Caledonia, comprehending this intensification is imperative to understanding the current threats to environmentally sensitive areas such as the forests of New Caledonia. Although environmental concerns have been integrated into the development plans of the territory, the requirement to generate export income in order to meet subsistence needs means a greater necessity of mining the area. As opencast mining can not be accomplished without significant alteration of the surrounding terrain, major threats to the forest area remain.

Third, by utilizing both the world-systems and the discontinuist approaches, we can understand the power differences that exist between local and global actors. As has been shown above, local actors have some power to negotiate their economic, political and cultural positions in relation to global economic pressures. However, the spectrum of available actions is limited by the power differentials that exist within this relationship. Again, New Caledonia provides a good example of these constraints. The history of the relationship between the Kanak and the French is one of constant renegotiation. Since the area first came under direct control of France, the Melanesian people have been attempting to gain independence from the power center of Paris with limited success. The most recent example of this occurred in the mid 80's when a strong independence movement calling for local control of mining activities and environmental management was quashed by the military and political power of France. Although contemporary globalization theorists such as Robertson who support the 'glocalization' view are correct in assuming that local actors actively engage in the process of globalization to negotiate the most favorable position for their interests, the ability to do is limited. These limits come from the power differences that exist as a result of the dynamics of the world-system as described by Wallerstein. Thus, by utilizing both approaches, we can create a more nuanced view that acknowledges the capability of local actors while conceding that these capabilities are limited as a result of power differences that exist as a result of the global economic system.

Another important theoretical implication comes out the New Caledonia case study. The rise in the importance of the environment in the development plan of the

territory has occurred in tandem with the increased intensification of the nickel mining industry. According to both Beck's theory of reflexive modernization and Mol's theory of ecological modernization, the increased knowledge of environmental problems allows us to limit the impact of environmentally degrading activities. Indeed, empirical evidence in the case of New Caledonia does support the view that environmental problems have come to the forefront in the area. However, how the success of converting these concerns into practical means for conserving New Caledonia's remaining forest system is debatable. The effectiveness of many of the environmental reforms that INCO and other multi-nationals have implemented has not been tested and those that have, such as its revegetation programs, have had only mixed results. Although dams, barriers, and the sculpting of quarries to minimize sedimentation may indeed limit some negative impacts, these methods cannot reduce it to zero as the process is still opencast and requires the massive displacement of land, vegetation and soil. Thus, although evidence does support Mol's contention that environmental issues are increasingly important factors in public debate, in practice the increased dependence of biologically important areas such as New Caledonia on destructive industries such as mining still pose an incredible threat to the environments health.

**Questions for Further Research**

Although the bibliographic research used in the case study provides a rich source of information for understanding the relationship between globalization and its impact on the forest systems of New Caledonia, several unanswered questions remain.

First, this case study has examined the impact of globalization on the forest system. Although forest cover provides a good indicator of biological diversity on land, it is not the only indicator of biodiversity. In order to gain a full appreciation of the current status of biological health on the island and the impacts of the integration of the area into the world economic system, a more inclusive approach would be necessary. Thus, future research should include the use of more precise indicators of species diversity such as the number of animal and plant species as well as including the health of the coral reef system that surrounds the island. For the purpose of this short thesis, these indicators of biological health were left out due to space and time constraints.

Secondly, in order to generalize the conclusions about the impacts of globalization on the forest health of New Caledonia to other global environmental phenomena, cross-cultural research would be profitable. New Caledonia's history is unique in that it remains under the colonial authority of France. It would be useful to compare New Caledonia to other small island nations with differing histories such as Fiji, the Federated States of Micronesia and the Samoan islands. It would also be of interest to compare New Caledonia to other small island nations outside the South Pacific.

Specifically in relation to New Caledonia, several unanswered questions remain that would benefit from field research. No studies have been done on the economic, political and cultural ramifications of the creation of major forest conservation areas. As these areas are meaningful potential solutions to help mitigate the effects of destructive

mining practices, the social feasibility of such an action is important to determine. Equally important to study is both the sustainability of current indigenous land use as well as the willingness of local people to develop environmentally sustainable economic practices. With only 2% of New Caledonia's landmass set aside for conservation areas and the majority of endangered forest existing on private land, a shift towards more environmentally sustainable land use patterns would legally and pragmatically require the support of local and indigenous land owners. No studies have been done to determine the willingness of local people to use long-term environmentally sustainable practices.

Finally, in relation to our investigation of the interaction between global and local actors, further research is necessary to examine the direct impact and effectiveness of the interaction between global environmental organizations and local people. As the prominence of New Caledonia increases as a priority for conservation by groups such as the WWF, Conservation International, IUCN, and MiningWatch Canada, the acceptance of the respective initiatives of these global organizations by local environmental groups, indigenous groups and land owners is significant in the creation of practical and meaningful solutions. This is especially crucial for attempts to conserve the sclerophyllous forest as all of the remaining stands exist on private property. Studying the impact of the interaction of local groups with global environmental groups may also provide insight into how local people can benefit from the increased focus of these groups on New Caledonia's forest systems. This would also be important in determining the effectiveness of the global conservation strategies and their ability to communicate the potential benefits of their programs to the people who will ultimately determine their

success. A combination of observational research and interviews with both employees of international environmental groups concerned with New Caledonia as well the local people affected by these programs would be needed in order to carry out this research project in the future.

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