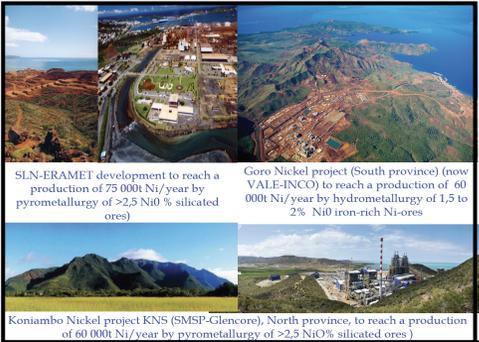


**Global context: Conjugating mining production and biodiversity preservation: a world development issue**



Tropical metal-rich laterites have developed for 80 Myears mostly at the expenses of primary rocks from Precambrian shields. These resources are future reserves for South countries developments.

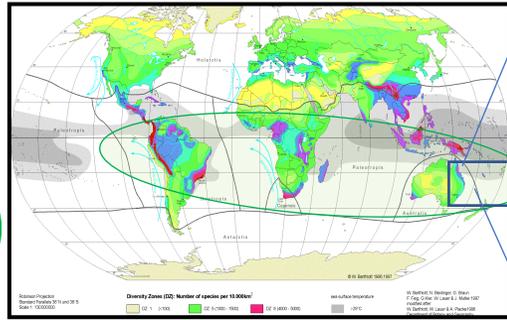
**Mining production objectives**



The objectives of the 3 main mining projects is to reach a production of 200 000 Nit/year in 2020.

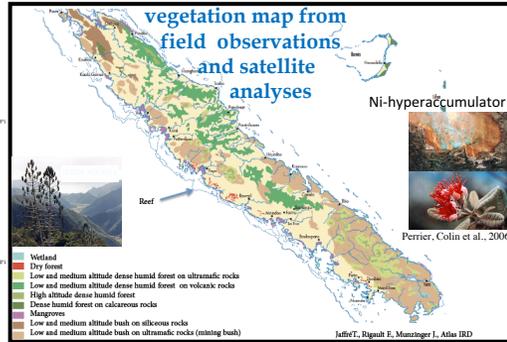
**R&D contributions**

- Innovative exploration methods (ERT, field portable spectrometers, airborne and satellite data)
- Ore genesis, geomorphology, nickel speciation in order to improve exploitation and metallurgical processes
- Initial global ecosystem reference status, detailed species study and ecosystem functioning
- Positive and negative mining externalities (population's health and well being, society development, soils- water, air, ecosystems damages and threats)
- Spatio-temporal analysis of data from satellite to field scales, data interoperability and open source database built
- Survey of impacts through indicators monitoring (observatory)
- Restoration, and preservation of degraded land and biodiversity
- Value of land and usage conflicts
- Dissemination of scientific knowledge (population, public stakeholders, private operators)
- Mining and environmental public law evolution: contribution to the elaboration of the governmental mining code (2009), environmental provincial code (North,2008) and (South,2009)



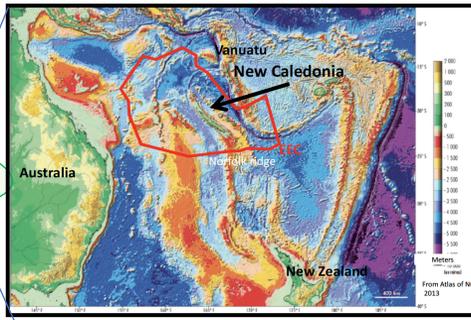
The tropical belt contains a wealth of biodiversity that is the humanity's sustainable reserve for the future. The biodiversity loss is increasing and inscribed these areas as biodiversity hot spots to be protected and preserved.

**Exceptional terrestrial biodiversity**



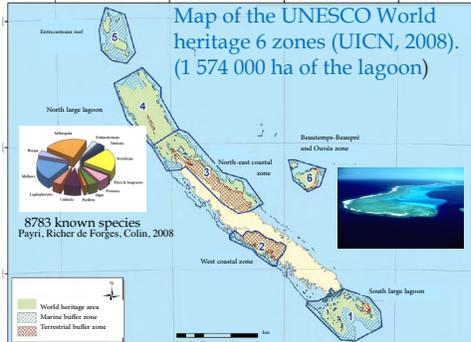
80% of the terrestrial ecosystems species are endemic and mainly develop within ultramafic mining areas.

**Geography, geology, and Ni-deposits of New Caledonia**



The Main NC Island set at the northern tip of the Norfolk ridge, both were rifted from the Australian margin during late Cretaceous. The ophiolitic units were obducted onto the Norfolk ridge 34 Myears ago.

**Exceptional marine biodiversity**



The marine and terrestrial buffer zone adjacent to the Goro-Vale mining project is included (zone 1)

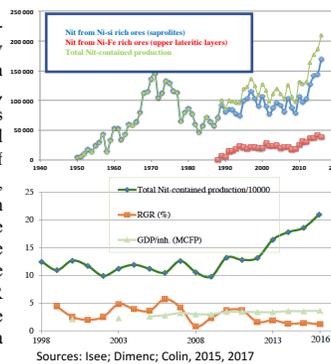


New Caledonia owns 25% of the world's nickel resources, around 9% of the world's reserves, distributed over 300,000 hectares of concessions allocated to date (18% of the surface of the main island). 1744 mining titles are attributed, 99% of the total produced Ni-ores has been extracted from concessions attributed before 1960 (4% of the NC surface). Low temperature alteration and supergene weathering of ultramafic rocks have led to the genesis of heterogeneous lateritic nickel-rich ores of i) green garnierite type (NiO > 1.5%) at depth and / or ii) surficial iron oxy- hydroxide type (NiO < 1.5%). These conditions have shaped the NC landscapes (dissected plateau and lowlands), offering 30m deep Ni-rich regoliths easy to exploit by open pit mining. Since 1880, nickel has been so far used as an economic and a societal driver. In addition to SLN activities, 2 new worldwide projects (\*) have been developed since 1998, as a result of the political "Accord de Nouméa" between pluriethnic groups and to balance the economic development between Provinces, using pyrometallurgy (Ni-Si-ores) and hydrometallurgy (Ni-Fe-ores) processes.

**Environmental and societal on going impacts**



Within the lateritic regolith, the circulation of waters is mainly controlled by two systems: 1) a surficial one, just under the iron crust, that feed locally the water springs, and 2) the water table at the weathering front of the parent rocks, that feed the rivers systems. The lateritic surficial formations are erosion-sensitive under natural climatic tropical events (lavakas, collapses, creepings), and anthropic disturbances (fires, urban development, mining activities) may accelerate the erosions rates as well (>1000 t/an/hectare (Maurizot et al., in press). The water cycle can then be very rapidly affected. Mining activities may induce land and forest degradations and biodiversity losses, accelerate erosion of regoliths, provoke hypersedimentation in downslope rivers and lagoon, and disseminate metal trace elements through biosphere, hydrosphere and low atmosphere. At the present day 10,000 hectares of orphaned mines (0,6% of the total NC surface area) and 20000 hectares of degraded soils in active mine areas have to be restored, with a cost of 20,000 euros/ha. Populations leaving nearby may be positively impacted by employment, and negatively by land degradation, water quality decrease, rivers and lagoon contamination, that could affect directly their sustainable natural resources and their way of life in the future, while nickel ores are non renewable resource: **mining activities have to be lead responsibly.**



Since the year 1990, poorly surficial Ni-Fe ores are increasingly exploited (hydrometallurgy) and because these minerals are very extensive on the surface, its may induce very significant damages to ecosystems and disrupt the functioning of hydrosystems. In addition, from 2008 (world economic crisis) to present time, even if the GDP/inhab. remains constant, for the first time in its history, New Caledonia's real growth rate is inversely correlated to its nickel increasing production, to reach a very low rate of 2,5%. The Ni weight of nickel income in the total NC GDP reaches its lowest value of 4,5%. In addition, the production of CO<sub>2</sub> increase from 2008 at a annual rate of 4,5% due to the use of coal-fired power plants to produce the energy required for metallurgical power plants (8 MtCO<sub>2</sub>eq./y emitted = 30t of CO<sub>2</sub> eq./inhab./y.) As a consequence, based on the knowledge intangible capital issued from research, we promote a new virtuous spiral model of mining activity, that will simultaneously permits to develop a sustainable diversified economy from natural renewable resources and to value the skills acquired ([www.amedee-network.science](http://www.amedee-network.science)).

