

Table 21: Estimated power demand Central 2,1 grid (Meritec/Lahmeyer International, 2004)

Point Loads Items	Power Requirement	Commencement
Cement factory	20 MW	2005
Quarry	5 MW	2008
Gypsum & lead mine	5 MW	2006
Copper/gold mine	40 MW	2005
NT2 construction	4-8 MW	2006-2010
Irrigation schemes	10 MW	2003-2020

8 MINING

8.1 Regional Perspective

All the countries in the region have identified rich mineral resources, and more may be found, as many areas have not yet been surveyed. At present the economic exploitation of the resources is not very high.

In Cambodia, mineral investigations began in the 1950s when significant deposits of sapphires, rubies, alluvial gold, alluvial cassiterite, silica, bauxite, manganese and coal were found. The only significant exploitation carried out has been gemstone mining in the Battambang province. At these mines the gems are exploited by artisanal methods and more or less outside governmental control.

In the Dak Lak province of the Vietnam Central Highlands large reserves of kaolin and bauxite have been found. The bauxite reserve is estimated to be 5 billion tons. The prospect for exploitation seems remote due to the weak infrastructure, lack of water and lack of electricity for smelting.

Northeast Thailand is rich in salt and potash. Several large mining companies are now considering exploitation of a major potash deposit.

8.2 Lao Perspective

Lao PDR has significant mineral resources that are not yet exploited. The mining sector might develop to become an important element of the national economy in the future. Commercial mining of tin, gypsum, coal, salt, gemstones and construction materials has so far been carried out on a small scale.

The mining sector contributed 0.48% of the country's GDP in 2002, and is dominated by the production of gypsum and tin. Other mineral commodities produced in Laos include barite, coal, construction materials, gemstones, gold, limestone, and zinc. Undiscovered mineral resources of iron ore, potash, and rock salt are believed to be substantial. None of Laos' mineral resources, however, are considered of world significance.

At the Kaiso deposit in the Vang Vieng area, zinc ore is being mined and exported to Thailand for smelting and refining. The measured resources at the

Kaiso deposit were estimated to contain 23,000 tons of zinc. Gemstones are mined in Bokeo Province close to the provincial capital of Huayxai.

Cement is produced at two factories located at Vang Vieng in Vientiane Province. Cement production was estimated to be 92,000 tons in 2001. Coal is produced by the State Coal Mining Enterprise (SCME) from the Chakeui Mine (anthracite) in Salavan Province, the Hongsa Mine (lignite) in Sayaboury Province, and the Vieng Poukha Mine (lignite) in Luangnamtha Province. Most coal output is for domestic consumption mainly by the cement plants while the output from the Vieng Poukha is exported to Thailand. SCME produces barite for export to Thailand from the Na Ang (Nalang) Mine in the Muong Feuang Valley in Vientiane Province.

The Australian Company, Pan Australian Resources NL, are planning to start mining gold at Phu Bia, located north of Vientiane, in March 2005

8.3 Local Perspective

Located on the Nam Pathen tributary to the Nam Hinboun there are mines producing heavy metals like tin, lead and zinc. Some of the mines have been in operation for decades, but it is difficult to get any precise information about the level of activity and the processes used. Recent observations, however, indicate that the settling pond systems and pollution control is of a very low standard. There is presently high activity at the mines, which contributes significantly to pollution problems in Nam Pathen and the lower part of Nam Hinboun. High levels of turbidity can be observed. Regular monitoring is not carried out but one sample from July 1995 shows high levels of several heavy metals including lead, zinc, tin and cadmium. The content of iron was extreme (18,700 µg/l compared to the WHO and Lao PDR standard of 300 µg/l). In the same period the iron concentration in the lower Nam Hinboun also exceeded the water quality standards (NORPLAN 1997). There is a concern that the mining activity leads to high concentrations of heavy metals in fish and other aquatic organisms.

Alluvial gold is found in Nam Kata a tributary to Nam Phao downstream Lax Xao. Prospects exist for commercial exploitation. At present gold is extracted by artisanal means, which includes the use of mercury. No monitoring of the potential water pollution seems to have taken place.

Gypsum is produced by the State Gypsum Mining Enterprise from the Dong Hene mine in Savannakhet Province. Proven ore reserves at the mine are estimated to be 18 million tons. Gypsum production has increased steadily in the past 4 years because of increased demand by the domestic cement industry and increased exports to Vietnam. Several limestone quarries are presently under operation in Khammouane and Bolikhamxai.

Further developments are foreseen in Savannakhet Province in a long-term perspective. The province has deposits of lead and zinc in the eastern part near the Vietnamese border that might be economically attractive to mine.

The only large-scale mining project within the three provinces that surround the NT2 project area, are the gold and copper mines in Xepon District in Savannakhet. The concession holder and operator of the mines is Oxiana Limited acting through its subsidiary in Lao PDR, Lane Xang Minerals Limited. The gold mine produced 73,247 ounces (2,076 kg) of gold and 35,622 ounces (1,010 kg) of silver the first half of 2004. Gold production is targeted to increase

to 200,000 ounces in 2005 and to nearly 400,000 in 2007. Total reserves of gold are estimated at 2.09 million ounces.

Production of copper from their Khanong mine located in Xepon District is expected to start in the first quarter of 2005. A production plant with a capacity of 60,000 tons per year is currently being build at the site. The Khanong mine is estimated to contain 1.21 tons of copper. The Power System Development Plan from 2004 has included the production plant's energy need in their in their demand forecast, amounting to 40 MW from 2005.

The social and environmental impacts of the copper mine and the production plant are expected to be considerable. The Environmental Impact Assessment for this project is presently under review by STEA.

9 CONSERVATION

9.1 Regional Perspective

9.1.1 *Biodiversity values*

The Lower Mekong region is uniquely rich in biodiversity due to its position as a "bridge" between the Asian continent and the Indo-Malayan bio-geographical regions and the rather isolated and sparsely populated areas in Cambodia, Lao PDR and Vietnam. According to the International Union for the Conservation of Nature (IUCN) Cambodia and Lao PDR have the highest species density in Southeast Asia, whereas Thailand, Myanmar, and Vietnam are highest in species endemism.

For example, 10 percent of the world's mammal, bird, and fish species are found in Vietnam and 40% percent of the 12,000 local plant species are endemic. Vietnam's forests contain the highest bird and primate diversity in mainland Southeast Asia. The recent discovery of new species of large mammals in the border area between Lao PDR and Vietnam (including Nakai Nam Theun NBCA) reinforce the global significance of the country's rich biodiversity. The most prominent species discovered in the 1990ties are the ungulates Saola and Giant Muntjac. Other new mammals have also been observed but their validity as new species are still to be confirmed.

The rate of species and habitat loss is however, high in the region. In particular in Thailand and Vietnam there have been large changes in land use causing significant loss in natural vegetation and consequently of biodiversity. In addition there are severe problems with logging and illegal hunting and wildlife trade in the region.

The fish biodiversity is also unique. It is estimated that about 1300 different fish species are found in the Mekong Basin. Several of these are endemic and globally threatened.

9.1.2 *Nature protection*

Lao PDR

Lao PDR biodiversity is protected through the establishment of 20 protected areas, called National Biodiversity Conservation Areas (NBCAs), comprising 12-14 percent of the total land area.