

6 PREDICTION OF CUMULATIVE IMPACT

6.1 The 5 Year Scenario

If we were to gaze into a crystal ball, what would the NT2 Project intervention area, as well as adjacent geographical regions, look like in 2010? Would traffic be flowing across the two new Mekong River bridges connecting Savannakhet and Mukdahan as well as Thakhek and Nakorn Phanom? Would large and small factories, restaurants, petroleum stations, entertainment venues and small businesses be blossoming on both sides of the 30 kilometer-long Special Economic Zone, extending from the Mekong River Bridge at Savannakhet to the junction with Route 13 at Seno? Would the East-West Corridor become, in effect, one long stretch of small shops, guest-houses, restaurants, bars, markets, and perhaps new communities providing goods and services to long-distance truck drivers, businessmen, and tourists traveling between Thailand, the Lao PDR and Vietnam? Would the expanded and modernized airport in Savannakhet facilitate a dramatic boom in local and regional tourism, as well as serve as a major outlet for Lao exports? Would Savannakhet, in fact, have started to challenge Vientiane Municipality as the nation's commercial and economic center?

Would the waterfront area of Thakhek have been transformed into a major tourist attraction featuring French colonial architecture? Would the district towns of Nongbok, Xebanfai, Hinboun, Mahaxay, Nhommalat, Nakai, and Kamkeut [in Bolikhamxay] have grown from large villages or tiny towns into true urban areas serving their respective hinterlands as outlets for agricultural and local handicraft

products, small and large-scale manufacturing centers, and take-off points for nearby eco-tourism? Would the limestone quarry near Mahaxay have been transformed into the nation's largest producer of cement? Would the reservoir and power station created by the NT2 Project begun to produce electricity for domestic consumption as well as for export to Thailand? And would the new lake created by the NT2 Project have already started to attract international and domestic tourists?

Do we need to clean our crystal ball? Are any, or all, of these scenarios likely to take place within the next 5-year period? If the pace and scope of economic developments in other parts of the Lao PDR, such as Luang Prabang, Oudomxay, Xieng Khouang, and Muong Sing (Luang Namtha), can serve as a realistic gauge, then much of what has been conjured up by our crystal ball can easily exist by 2010. Such dramatic changes, however, will have both positive and negative aspects, which can impact on the physical, mental, and environmental health of communities and individuals. Who, for example, will serve as the labor force to construct the roads, bridges, factories, hotels, restaurants, and other infrastructural inputs outlined above? From which locales, or even countries, will these workers originate? Once construction is completed, who will operate and maintain these facilities or sites? Will migrant workers opt to return to their "original" homes or remain in their new places of residence? Will those who decide to remain, frequently or periodically travel to their original homes to spend time with their families, spouses, and community members? Will these new urban centers attract a continual stream of migrants from the rural hinterlands to serve as an ever-expanding labor-force?

How will the pace of urbanization, in the district centers of Nakai, Nhommalat, Mahaxay, Xebangfai, and Nongbok proceed? Will it be gradual or quite abrupt? Will there be any town planning? Will homes be neatly spaced along lanes lined with fruit or shade trees, or merely constructed and laid-out in any haphazard manner, one on top of the other? Will crowded and new living conditions promote the transmission of vector-borne diseases such as dengue fever [and DHF]? Will municipal authorities have the resources to construct appropriate and adequate water supply and human-commercial-industrial waste disposal systems? Which agencies will be responsible for monitoring environmental and industrial sanitation conditions? Which agencies or individuals will oversee food safety issues in the local markets? Similarly who will monitor pharmaceutical and medical safety issues in private pharmacies, drug shops, and clinics?

Which agencies will promote traffic safety and enforce traffic regulations? Will there be any traffic lights or traffic signs in these new urban areas, or will large trucks, cars, vans, motorcycles, and bicycles simply compete for available space on the roads and individually determine their own speed levels? Will municipal authorities have adequate resources to maintain roads? Vehicular accidents, causing death, disability, and injury have already reached epidemic proportions in many parts of southeast Asia, and are rapidly becoming a leading cause of morbidity and mortality in the Lao PDR. By the year 2020 WHO estimates that there will be 2.3 million vehicular accidents occurring annually. This would rank as the third most important cause of death globally. Are local health facilities prepared to treat victims of serious vehicular accidents, and are local authorities ready to establish vehicular accident safety programmes?

The above-mentioned scenarios also indicate that within a very short period of time, many communities in what were relatively isolated areas in the Central Region of the Lao PDR, may be in close proximity to cross-border transportation

networks. In addition to the East-West Corridor in Savannakhet, new road networks in or adjacent to the NT2 Project intervention area [i.e. Routes 8A, 8B, and 12] will link villages in Mahaxay, Nhommalat, Nakai, Hinboun, Boualapha and Khamkeut districts with Vietnam and Thailand in a matter of hours. With new roads being constructed across the border in Vietnam [the Ho Chi Minh Trail], and the proposed bridge crossings at Savannakhet and Thakhek, there is a grave danger that improved cross-border transportation can escalate the momentum and flow in trafficking local women and children, especially from ethnic minority communities. Cross-border transportation networks, and the movement of large numbers of people, can also serve as a convenient means of increasing communicable disease transmission. This is especially relevant for HIV/AIDS and STIs, but can include SARS as well as many other illnesses.

How will the GOL, the NT2 Project, international assistance agencies, and the private sector deal with the provision of health services over the next 5-year period? Will factories, hotels, and other sites establish their own network of clinical and counseling services, or will they decide to provide or subsidize workers with various health insurance schemes? Will there be a mushrooming of private clinics, pharmacies, and drug shops serving the needs of workers, local residents, and those passing through the region? Who will monitor and regulate these facilities? Will government funds be made available for the expansion, renovation, and/or new construction of provincial and district hospitals? At the present time residents of the NT2 Project intervention area are primarily served by a health care delivery system that consists of district hospitals and health dispensaries. These facilities generally have limited supplies of medical supplies and equipment, and existing manpower do not have the pre-requisite competency-based skills to address many current health issues and problems. As such monthly in-patient and out-patient caseloads are low. The district hospitals do not have operating theaters, making it impossible to treat any serious accident or injury, or to provide emergency obstetrical care. These facilities also contain very few highly trained clinicians, laboratory technicians, and public health specialists needed to address existing and/or new health problems that can result from the influx of large numbers of construction workers and migrant laborers settling in and around the NT2 Project intervention.

The Ministry of Health-World Bank "Health Services Improvement Project" (HSIP) will try to address some of these issues, during the period 2004-2009, but the project mandate covers only 30 of the poorest districts in the 8 southern-most provinces extending from the Xaysomboun Special Region down to Attapeu. It includes Khamkeut and Nakai Districts. The HSIP is viewed as a means to foster an integrated district health development approach, assisting district health teams to better plan, manage, and monitor health care delivery in their respective geographical areas. The HSIP will focus efforts on capacity building, development of human resources, health planning and management, and sustainable health sector financing. Some funds will be available for civil works renovations and improvements at selected district hospitals, to allow for a wider range of comprehensive health services. The HSIP, and other routine inputs from the MOH, will not necessarily dramatically increase the number of health dispensaries in the NT2 Project intervention area, nor increase the number of local health personnel.

A key issue is not necessarily who will provide health care to residents, construction workers, or migrant workers in the NT2 Project intervention area, as well as at various locales in the East-West Corridor, the Sunset Corridor, and the new urban centers. It is rather who will closely work with and teach new *vulnerable*

groups basic life-skills that can promote good health and prevent unnecessary illness and death. Maps included in the “Labour Migration Survey in Khammouane, Savannakhet, and Champassack 2003” illustrate that sample villages included ethnic minority communities located in the NBCA, on the Nakai Plain, in the Nam Theun-Nam Kading-Nam Hinboun Basin areas, as well as sections of Nhommalat, Boualapha, and Mahaxay districts. These maps also pinpointed sample lowland communities in Thakhek, Hinboun, Nongbok, Xebangfai, and other geographic areas of the province included in the study. As mentioned above, the survey found that almost 40% of the migrant workers [i.e. 38.4%] were 20 years of age or younger. How many individuals in this cohort understand the importance of following good personal hygiene practices to prevent illness, or the risks associated with certain behavior that can lead to serious vehicular accidents or the transmission of STIs and HIV/AIDS? Do they know what precautions to take to minimize potential health problems or where to receive information, counseling, and appropriate medical services? What percentage of young women in this cohort, for example, could successfully negotiate safe sex skills including consistent use of condoms with casual or regular partners and/or clients? [i.e. in the case of commercial sex workers]?

The Lao PDR is considered a *low prevalence* HIV/AIDS country. But is this the actual situation? As of March 2004 of the 98,016 blood samples tested, only 1,212 (1.2%) were HIV positive. Of this number 670 individuals were diagnosed as having AIDS, while 486 individuals died from AIDS. The distribution of HIV positive cases, between 1999-2003, has remained relatively constant, annually fluctuating between 152 and 170 cases. The distribution of HIV cases progressing to AIDS has also remained constant between the years 1999-2003, fluctuating between 93-110 cases per year; while the distribution of AIDS deaths has remained constant between the years 1997-2003, with 62-67 annual mortalities. But what is the source of this data, and does it possibly conceal a much more explosive HIV/AIDS situation lying below the surface?

Although the National Committee for the Control of AIDS (NCCA) has conducted a series of first generation “biological” sentinel surveillance surveys, and more recently launched a second generation of “biological” and “behavioral” sentinel surveillance surveys, there is not any active surveillance mechanism to regularly test “high-risk” and “normal” populations to better gauge the prevalence and incidence of HIV/AIDS. Prevalence meaning the actual number of HIV/AIDS cases existing at a particular point in time, while incidence pertains to the number of newly discovered HIV/AIDS over a finite point in time [e.g. one year]. Most of the existing data derives from “passive surveillance” which are reports sent to the NCCA by provincial health offices. This includes blood samples tested as part of the screening procedures to determine whether donated blood is contaminated with certain pathogens [e.g. HIV/AIDS, certain STIs, Hepatitis B, C, E, etc.]. The data also includes special investigative blood tests of patients who do not recover from prescribed clinical treatment. Blood is collected and examined anonymously, and unless an individual specifically requests the results of the blood test, nobody is informed or counseled about their HIV status.

Anecdotally it appears that the vast majority HIV positive cases, or those progressing to or succumbing to AIDS, had previously worked in Thailand or were spouses of people who worked in Thailand. Thus it is not surprising that the largest number of known HIV positive cases come from Savannakhet (535), Vientiane Municipality (325), Khammouane (95), Champassack (94), and Bokeo (77). Provinces located along the Mekong River adjacent to Thailand. The age distribution of HIV positive cases, between 1990-2003, is principally concentrated in

young adults; with the age cohort 25-29 years having the highest levels, followed by those in the age groups 30-34 years, 20-24 years, and 35-39 years. Precisely the age cohorts that tend to seek employment opportunities in Thailand, and who may decide to return home once they became ill. The gender distribution of known HIV/AIDS cases, during this same time period, is 62% male and 38% female. Heterosexual interactions (82%) is the most prevalent means of transmission, followed by mother-to-child-transmission (2.5%), bisexual interactions (0.8%), blood transfusion (0.4%) and injection (0.3%).

It should be noted that none of the district hospitals in Khammoune have the reagents or the technical training needed to perform HIV serological tests. Health staff have not been trained to counsel HIV positive or AIDS patients, and/or their spouses and immediate family members. Nor have they been trained in the clinical management of AIDS related opportunistic infections, or the provision of HAART (highly active anti-retroviral therapy). These are specific interventions that not only prolong and improve the quality of life for AIDS patients, but also prevent AIDS patients from dying. HAART has dramatically reduced the morbidity and mortality rates for HIV/AIDS in all “developed countries” over the past 7-8 year period. HAART has recently been introduced, on a much more limited basis, in many “developing countries” where it has demonstrated the same impressive results in reducing morbidity and mortality rates associated with HIV infected individuals.

The NCCA included Khammouane, along with Savannakhet and Oudomxay in the ADB sponsored “Community Action for Preventing HIV/AIDS Project” in order to prepare national and local authorities for a potentially explosive HIV/AIDS situation once the NT2 Project commenced. In addition to these three provinces in the Lao PDR, the project also included selected geographical areas of Cambodia and Vietnam.

The project’s main objectives consisted of the following:

- to support a comprehensive set of HIV/AIDS prevention activities in strategically important areas [i.e. “hot spots”] for the transmission of HIV in the region, and
- to strengthen the capacity of national and local HIV authorities and selected NGOs to develop community based prevention and care programmes.

Within provinces the project focused on (1) sites and areas that receive many transient mobile populations or long-term migrants, (2) large construction sites, and (3) source communities for migrants. The project had three components: (1) community-based HIV prevention activities, (2) behavior change communication, and (3) condom promotion. There was also a component to provide care and management of Sexually Transmitted Infections (STIs).

The preceding section has focused on potential cumulative impacts on health caused by economic development, especially urbanization, industrialization and migration. Other cumulative health impacts, directly resulting from NT2 Project interventions affecting irrigation and water supply and sanitation, will be described and dealt with during the review of the specific impact zones.

Rather than discuss all of the potential scenarios, the CIA will make two assumptions. The first is that the “Health Action Plan” included in the recently completed

“Health Impact Assessment” (Chapter 18 of the Nam Theun 2 Hydroelectric Social Development Plan) will be implemented wherever feasible and practical. The second assumption is that the specific environmental management measures outlined in the “Environmental Assessment for Construction Phase Activities, Information Prepared by Turnkey Contractor” dealing with runoff-control, noise control, dust control, waste control, and rehabilitation will also be implemented wherever feasible and practical.

6.1.1 *Nakai Plateau and Nakai – Nam Theun NBCA*

The Nakai Plateau and NBCA contains at least five distinct, but interacting, populations that will be directly affected by the NT2 Project. They include the following:

1. The approximately 5,500 ethnic minority inhabitants of the NBCA who reside in 30 scattered villages situated along the tributaries and source of the Nam Theun River.
2. The approximately 5,700 ethnic minorities whose homes will be inundated by the reservoir and who will be resettled in 13 new communities on the Nakai Plateau. A small number of the original group will be relocated to Khamkeut District (Bolikhamsay) near the district center of Lak Sao.
3. The approximately 1,500-2,000 present inhabitants of the Nakai district center, whose numbers can potentially multiply several-fold as camp followers and other migrants converge on this locality to provide goods and services for construction workers, government officials, and others during the five-year construction period.
4. The approximately 4,200 construction workers who will work in the following 12 camps: the Nakai Dam Area Construction Camp (1), the Oudoumsouk Work Camp Zone (2), the Power Station Work Camp Zone (4), and the Downstream Work Camp Zone (5). Most of these camps are actually located below the Nakai Plateau, but it is more appropriate to include them in this geographical section than in that designated as the “Xebangfai Basin and Surrounding Districts Zone”.
5. The present inhabitants of the Nhommalat district center, whose numbers can also multiply several-fold as camp followers and other migrants converge on this locality to provide good and service for construction workers, government officials, and others during the five-year construction period. Being located at the junction of Routes 8B and 12, the district center will also be affected by cross-border commerce and tourism between the Lao PDR and Vietnam, and perhaps Thailand as well. The Nhommalat district center is actually located below the Nakai Plateau, but it is more appropriate to include in this geographical section than in that designated as the “Xebangfai Basin and Surrounding Districts Zone”.

The NCBA: This area stretches from the foothills adjacent to the Nakai Plateau up through the mountainous forests bordering Vietnam. These communities are generally considered outside the range of actual or potential effects of the NT2 Project, as they are situated above the plateau, and far away from the various construction sites, worker camps, and resettlement villages. This does not mean, however, that health conditions in these communities will not be affected during the initial five-year construction phase or at different periods during the operation of the NT2 Hydropower Project. A great deal will depend upon to what extent community members voluntarily decide, or are forced by external circumstances,

to interact with populations living, and developments taking place, on the Nakai Plateau. The NBCA represents one of the more isolated geographical areas in Khammouane. It has few health dispensaries, and villagers have limited access to appropriate health care services during times of emergency or serious illness. It is a geographical area where women and young children are most vulnerable to potential life-threatening illnesses or conditions.

There are several realistic scenarios that will take place with respect to the NBCA. The first is that its ethnic minority inhabitants will have minimal interaction with other populations and events taking place on the Nakai Plateau. Villagers will continue to visit relatives and co-tribesmen in communities scheduled for resettlement, and occasionally visit the district center to sell forest products and to buy essential household commodities. Very few members, however, will actually migrate to the Nakai Plateau or to other geographic areas participating in macro and micro-economic developments [e.g. the East-West Corridor]. This will mean that the NT2 Project, and other external developments, should exert a limited impact on health in the NBCA. Health status can improve if more and better trained health personnel are deployed to existing health dispensaries, or if district hospital and health office personnel make more frequent outreach visits, and/or conduct regular in-service training opportunities for health dispensary workers, TBAs, VHV's, and village malaria workers. There is a greater chance, however, that the district health team will soon become pre-occupied addressing new health issues and problems caused by a burgeoning population in and around the district center, as well as by providing increased supervisory and outreach services to the communities scheduled for resettlement. Under this scenario the precarious health situation for women of reproductive age and young children in the NBCA may actually deteriorate.

The second scenario is that inhabitants of the NBCA will have medium level interaction with other populations, and events taking place on the Nakai Plateau. This may include families wishing to move closer to their co-tribesmen once they observe the newly constructed resettlement communities and other social services associated with this development. Others, perhaps including adolescents and young adults, may be attracted to the district center or to ad-hoc settlements springing up near construction camp sites, where they can be employed in a wide range of occupational pursuits. Those finding employment will be able to financially support their families, and this may bring about improvements in health. On the other hand some of these new migrants may be lured into activities which put their health at-risk. Some may be forced to work long-hours and not fed properly, while others may be induced to engage in sexual activities that put them at risk for STIs and HIV/AIDS. For those who cannot successfully find employment locally, there is the chance that they may be encouraged to seek work further from their homes; in one of the nearby district towns, in factories/establishments in the SEZ or the East-West Corridor or in Thailand. The further one moves from home, the greater the chance of being caught in the web of trafficking activities which can have serious consequences on physical and mental health. There is, of course, a plus side to moving to the district center. Migrant workers from the NBCA may have access to more food as well as more nutritious meals. They may also be less exposed to certain communicable diseases and adverse health conditions. And they may have better access to emergency and/or routine health care provided by the district hospital, private clinics, pharmacies or drug shops.

The third scenario is that by 2010 a large number of people inhabiting the NBCA have decided to migrate elsewhere. This may include entire communities, individual households, but more than likely it would consist of specific age groups.

This exodus would probably include many adolescents and young adults, who are not as spiritually or emotionally tied to their communities. Many may also feel that it is easier to earn a living in some urban setting than to eke out a very difficult existence on upland paddy fields or gathering forest products near their homes. Most of this cohort would probably initially try to find work in and around Nakai, but their numbers may be too high to absorb, or they may have learned from co-villagers that better opportunities exist in the lowlands along the East-West Corridor or across the Mekong River in Thailand. Not having acquired many “life skills” outside of their remote villages, these young men and women will be particularly vulnerable to becoming part of an “under-class” of workers surrounded by poor working and living conditions, or being trafficked for illegal purposes that will put their health at risk. Many migrant workers will obviously find their new lives a great improvement over what they previously experienced in remote villages. Some will find life-partners, settle down, and establish families. Others will become disoriented and alienated in unfamiliar or hostile environments. This may lead to depression, alcohol or drug abuse, or other destructive anti-social behavioral problems. Depending on individual circumstances a certain percentage of this migrating cohort will be exposed to STIs and HIV/AIDS. Lacking proper understanding about the nature of these illnesses, or how they can be treated or prevented, may inadvertently lead to horizontal or vertical transmission of HIV/AIDS to one’s spouse or newborn infant. For those remaining in the NBCA life will become more difficult. There will be less adolescents and young adults able to share the burdens associated with subsistence farming and gathering. Many of the elderly, who may also be responsible for taking care of young children, will be under physical and emotional stress. This may be exacerbated by the fact that some of their grown children do not send home any news about their new lives and/or any remittances necessary for the family’s daily survival. Accordingly a certain percentage of those remaining in the village may become depressed.

The Resettlement Communities: Seventeen ethnic minority communities, currently residing on the site of the proposed reservoir, will during the 5-year construction phase be resettled. For many of these communities resettlement involves a relocation of less than 5 kms from their present homes. This move, however, may represent quite a momentous change in their daily life-styles. On the surface the health status of ethnic minorities, participating in the resettlement scheme, should substantially improve if the pilot village of Nong Boua is a representative “model” of what will eventually take place. New housing design should have a positive impact on general health conditions. All households will be resettled into a relatively spacious home, containing separate living and cooking areas. The homes are designed to reduce rain and cold weather from entering the premises, as well as to promote better cross ventilation. Each home is elevated off the ground; which will reduce direct or close human contact with many types of insects, rodents, reptiles, and other animals that can potentially cause illness. Water and environmental sanitation conditions will dramatically improve. Each home will have its own source of safe potable water for drinking and household use, as well as a water-seal latrine. The latrine site is large enough to use as an enclosed bathing area, and this should promote a higher level of personal hygiene. These two innovations, if used and maintained properly, should dramatically reduce the prevalence and incidence of water-borne diseases and intestinal parasitic infections, one of the leading causes of morbidity and mortality on the Nakai Plateau. Each household will also be provided with insecticide treated bednets which, if properly maintained, used and re-impregnated, will reduce the prevalence and incidence of malaria as well as infestations and illnesses caused by mosquitoes, lice, bedbugs, and fleas.

The project will support the construction of approximately 3 new health dispensaries to cater to the health needs of the resettlement communities. Each health dispensary will serve 3-5 communities, depending upon the population size of the “catchment area” and traveling distance to the health facility. A system of regular mobile supervisory teams, from the district hospital and district health office, will provide technical and logistical support to the new health dispensaries as well as specific health services to the target population. As each resettlement village will be connected to Route 8B, by a small feeder road, villagers will be able to more conveniently travel to the district hospital in times of emergency. The project will also provide support for the establishment of irrigated rice-fields, horticulture production, and other occupational training and extension services to residents of the resettlement communities. These interventions should increase food production and allow families, especially women of reproductive age and young children, to have access to more nutritious and well-balanced diets. The project anticipates that resettlement communities will be able to market their horticultural products in the Nakai district center as local demand increases with the influx of construction workers, camp followers, and other migrants settling in and around the Nakai Plateau.

The resettlement of communities rarely materializes as originally planned. There are usually many unforeseen forces that can interfere or disrupt this process. A major issue, raised in several of the NT2 Project documents, concerns the quality of the soil in the resettlement area. Will it, even with irrigation, produce the expected rice and horticultural yields? Will insects, rodents, and other pests destroy part of the crop? Will farmers, even against the advice and support of agricultural experts and extension workers, decide within a relatively short time to use pesticides and herbicides to maintain or increase production levels, which at the same time put producers and consumers at risk to a number of serious health problems? Will these pesticides and herbicides be properly stored, or will they be indiscriminately kept in and around the house, in easy reach of young children? Will the runoff from pesticide use eventually reach nearby streams and other waterways used by people outside the resettlement communities?

Another issue of potential concern, is the extent to which people in the resettlement communities will interact with other populations, and developments taking place on the Nakai Plateau. Although they have been considerably less isolated than many of the communities in the NBCA, villagers will now be in greater proximity to the district center, as well as ad hoc settlements that may emerge near camp sites. Will this development encourage a significant number of resettlement community members, or perhaps specific age groups such as adolescents and young adults, to seek employment outside their villages? What is the NT2 Project’s policy on hiring “local people” for unskilled tasks as construction workers, cleaners and sweepers of dormitories, kitchens, canteens, etc.? Will more and more adolescents and young adults venture on into town during the agricultural off-seasons and eventually find employment in restaurants, market places, shops, or entertainment venues serving a large work and migrant labor force? Will some of these individuals, originating from the resettlement communities, eventually decide to seek their fortunes in the Nhommalat or Mahaxay district centers, and/or gradually further away along the East-West Corridor or in Thailand? The “Labour Migration Survey in Khammoune, Savannakhet, and Champassack 2003” indicated that survey villages included communities from the Nakai Plateau and NBCA. Is migration already an aspiration of many adolescents and young adults, and if so to what extent will urbanization and the NT2 Project accelerate this process?

The Nakai district center, as well as ad hoc settlements that may spring up near camp sites, may potentially become major focal points for the transmission of STIs and HIV/AIDS. The district hospital has, over the past year, begun to see and treat more STI cases, but these relatively small numbers may only represent the tip of the iceberg, as local people are embarrassed and accordingly seek treatment at private pharmacies or tiny drug shops. Knowledge and understanding of the dynamics involved in transmitting and preventing STIs, and HIV/AIDS, still remains low amongst many at risk individuals. Will adolescents and young adults from the resettlement communities on the Nakai Plateau represent one of the high-risk groups for these new afflictions? Who will provide on-going health education and/or counseling concerning STIs and HIV/AIDS to potential migrants or seemingly “low risk” groups who remain in the resettlement communities?

The current STI and HIV/AIDS prevention strategies focus on providing information to perceived high-risk groups, such as long-distance truck drivers and women working in the entertainment industry, as well as encouraging these individuals to use condoms. However there may soon be thousands of people at risk to STIs and HIV/AIDS in and around the Nakai district center. Who will provide the information and/or supply the condoms? Who will provide pre- and post-counseling as the situation begins to warrant the routine serological testing of blood for suspected HIV/AIDS cases? Who will provide out-patient, in-patient, or home-care services to people starting to exhibit signs and symptoms indicative of opportunistic infections associated with AIDS? Will treatment strategies eventually include the provision of HAART (highly active anti-retroviral therapy) and long-term follow-up care? Who will take care of HIV/AIDS patients once they become ill, and start returning to their homes from other districts, other provinces, or neighboring countries? It should be noted that the raging HIV/AIDS epidemic in Thailand began in the northern region. It was, to a great extent, sparked by rural migrant laborers descending upon construction camps in and around the provincial center. Rapidly changing socio-economic conditions and behavioral practices at these sites, amongst young men and women, established the foundation upon which the epidemic was fueled. A large percentage of the young men and women working and living at these sites soon became infected with HIV/AIDS. In a very short period of time the infection was subsequently transmitted to new partners or to spouses in their home communities. The entire time frame involving the initial HIV infection, progression to clinical AIDS, and finally to death frequently took considerably less time than that which is designated as the NT2 Project “construction phase”. Complacency should not be a practical or ethical option.

The influx of workers and other migrants, as well as the work schedule for the construction of the resettlement communities, reservoir, power station, and other infra-structural inputs will dramatically increase the number of vehicles, of all types and sizes, on the roads in and around the Nakai Plateau. As such the frequency and severity of vehicular accidents will dramatically increase. Resettlement villagers will comprise an especially vulnerable high-risk group for these types of injuries. In the past most villagers did not live near any roads. Even during journeys to the district center, they probably encountered few, if any, motorized vehicles on the road or in town. Most of those scheduled to be resettled, regardless of age, have no idea about traffic rules and regulations and can easily be severely injured or killed by the increased volume of road traffic that will include vehicles traveling at high speeds. Living closer to the district center, some resettlement villagers may eventually buy bicycles or even motor scooters to transport products they wish to sell in the markets or to commute to jobs in town on a daily basis. Unless a widespread traffic education campaign is enacted,

complemented by rigid enforcement of traffic laws, traffic accidents may become one of the leading causes of morbidity and mortality for certain age-groups living in resettlement communities, as well as for the Nakai Plateau in general. The district hospital will need to be renovated, and appropriate health personnel trained, to take care of trauma, orthopedic, and head injuries.

As the ethnic minority communities, included in the resettlement scheme, begin to have greater contact with the Nakai district center, and the outside world, the incidence of stressed-related and other mental health problems will undoubtedly rise. Many of these potential problems will become more pronounced only after 2010, when all resettlement communities have moved to their new homes. There will nevertheless be a moderate level of anxiety in many families as “generation gaps” develop between older members of households and adolescents and young adults attracted to the manners and “alien” lifestyles found in the district center, and ad hoc settlements near camp sites. A rise in mental health problems may also come about if migrants from the resettlement communities start returning to their home villages after becoming ill with HIV/AIDS. Families of afflicted individuals may become ostracized and excluded from traditional and cultural events. Daily social intercourse amongst neighbors may be disrupted, and some families may suddenly find themselves faced with overwhelming burdens for which they are not prepared. The social development component of the NT2 Project needs to be take pro-active measures, rather than wait until serious problems arise, if they are to address these and other issues, that can potentially create new divisions or social tension within communities as well as within individual households. Health education will not be sufficient. Specific ameliorative mechanisms will have to be put into place to establish creative emotional support networks aimed at dealing with an entirely new set of circumstances. A major challenge will be to enlist the support of traditional leaders and practitioners, rather than merely relying upon the perceived strategies, advice and support of public and private sector agencies.

The Nakai District Center: The Nakai district center is presently a small town consisting of government offices, the district hospital-health center complex, some schools, a Buddhist temple, shops, restaurants, and a market place. The district center contains about 1,500-2,000 residents. By 2010, however, this tiny town, which in many ways resembles a large village, may become a substantial urban center. A great deal will depend upon the size and composition of the new migrants. Will, for example, this primarily consist of small entrepreneurs from provincial and district centers in Khammouane, or neighboring provinces, hoping to earn a decent living by providing basic goods and services needed by the influx of a large labor force? Or will it include a much more diverse group of individuals, including those involved in both small and large-scale entertainment venues? Will local authorities allow these enterprises to expand within the present boundaries of the district center, or will they be encouraged or required to be located away from the municipal center? Will certain types of establishments be discouraged or prohibited by law? Will family members be allowed to accompany the construction workers? Will some or most of them settle in and around the district town, or will they establish ad hoc settlements closer to the work camps? Will workers be discouraged or prohibited from making frequent trips, during their free time, to the district center? Will there be a large influx of women to work in entertainment venues frequented by construction workers, government officials, and others? Will these women gradually come from some of the ethnic communities in Nakai and neighboring districts?

Rapid and unplanned population growth can exert a negative impact on health. Over-crowded living and working conditions are ideal foci for the spread of a wide range of communicable diseases. Lack of safe and clean sources of potable water and the proper disposal of human waste serve as potential “hot spots” for outbreaks, or simply an increased incidence and prevalence, of water-borne diseases. These same living conditions are also conducive for the spread of respiratory illnesses, and a number of serious vector-borne diseases. Public health authorities will need to devote considerably more time and effort to monitor food safety issues in an environment that includes many restaurants, markets, and small food stalls. This will include rodent and insect control as well as garbage disposal. A similar approach has to be undertaken to ensure the safety and quality of medication sold in pharmacies and drug shops.

Unlike the construction workers, those migrating to the Nakai district center will not have to undergo any physical examinations prior to their arrival. As such they may inadvertently introduce new, or perhaps re-introduce communicable diseases previously brought under control. This is especially relevant for malaria, as Nakai district is truly one of the showcases in the National Malaria Control Project. With the distribution of insecticide treated bednets to nearly all households in every community in the district, as well as the training of village health workers and volunteers, to provide early diagnosis and treatment for suspected/confirmed malaria cases, malaria has ceased to be a leading cause of illness and death. The district cannot afford to drop its guard, and continued efforts need to be implemented to ensure that this deadly killer does not return and re-emerge as a major health problem. However some of the new migrants to the district center may originate from geographic areas where malaria was never a health problem. As such they may have no experience with, or appreciation for the importance of, using bed nets and/or ensuring that these items are properly maintained, replaced, and re-impregnated. The *Anopheles* mosquitoes capable of transmitting malaria live in a number of environmental niches not far from the district center. Planned irrigation schemes may to some extent actually increase the number of these mosquito vectors of disease. Hence it is essential that the main components of the malaria control programme in Nakai continue for the immediate future. Who will take the responsibility to educate these newcomers to the district center about the dangers of malaria? Who will ensure that they purchase and properly use insecticide treated bed nets? Who will monitor their use?

Dengue fever (and DHF) is potentially a more serious problem than malaria. This mosquito-borne disease is usually found in urban, and semi-urban, rather than in rural areas. The mosquito vectors usually breed in stagnant water collecting in various receptacles and containers, such as water storage jars, discarded automobile tires, flower pots, etc. Crowded living conditions, with poor environmental sanitation, can lead to explosive epidemics. For those infected with DHF, the onset of serious complications leading to death can take place in a very short period of time. DHF generally affects young children. Are Nakai district hospital staff presently capable of clinically managing DHF cases? Are Nakai district health officials prepared to implement DHF epidemic prevention and control measures, including the use of chemical larvicides?

The rapid growth of the district center is bound to lead to conditions which promote increased casual use of alcoholic beverages and perhaps “recreational drugs” that will alter perceptions and lead to high-risk behavior. The two most dangerous at-risk behaviors will be “driving” and “casual sexual encounters”, while under the influence of alcohol or drugs. The first situation will undoubtedly

lead to an increase in the frequency and severity of vehicular accidents, including death, for drivers, passengers, pedestrians and others on the road. The second situation will lead to a greatly increased risk of contracting STIs and HIV/AIDS as those under the influence of alcohol and drugs often do not take necessary preventive precautions, such as using condoms. As mentioned above, health education campaigns and the promotion of condoms, are insufficient measures to reduce high-risk behavior. A much more comprehensive and pro-active approach needs to be undertaken. This will be discussed in further detail in the sections dealing with “*business as usual*” and “*best practices*”.

Worker Camp Sites: During the 5-year construction phase a series of 12 campsites will be established, for 4,200 workers, at various localities in Nakai and Nhommalat districts. Lao workers will probably comprise the largest contingent in the work force, but professional and skilled workers will also be employed from other countries. With respect to health, a great deal will depend upon whether or not large numbers of camp followers move close to the camp sites. Will this group include spouses and children of the construction workers, or will it primarily be those individuals servicing the various needs of the work force? Either category will create additional demands upon the existing health manpower stationed at the district hospital and district health office. Comprehensive preventive [e.g. immunizations], promotive [e.g. ante-natal care], and curative services will have to be provided for these people. This situation, as mentioned earlier, could indirectly have a negative effect on the health status of ethnic minority communities in the resettlement area or in the NBCA.

Crowded living conditions will, as indicated above, promote the transmission of communicable diseases and serve as potential focal points for the outbreak of explosive epidemics. Unlike the NT2 Project labor force, who are required to undergo physical examinations and perhaps treatment prior to actual employment, camp followers will not follow such procedures. As such it is conceivable that new health problems can be introduced in and around the district center and perhaps onto the Nakai Plateau; depending upon the level of interaction between the various populations. Will it be practical to restrict or prohibit camp followers from establishing ad hoc settlements near camp sites? For those camp sites located in remote areas or on inhospitable terrain, this may be a possibility. But whatever the eventual outcome, it is unrealistic to expect a large work force, receiving regular salary payments, to spend all or much of its free time in project dormitories or canteens. Traveling to and from the district town on a motorcycle, under the influence of alcohol, may in fact be more hazardous than frequenting a small food stall, selling liquor, and then walking back to the work camp dormitory. A key challenge will be how to encourage the work force to relax, when off duty, but at the same time avoid unnecessary excesses that includes high-risk behavior.

The Nhommalat District Center: Although technically located below the Nakai Plateau, it makes more programmatic sense to include the Nhommalat district center in this section as the potential cumulative impacts on health, as well as “*business as usual*” and “*best practices*” strategies, are quite similar to that of the Nakai District Center. The Nhommalat district center is located close to the large work camps near the power station and downstream channel. It is also situated at the confluence of a newly expanded road junction, of Route 8B and Route 12, connecting Thakhek with Vietnam. This will put the district center within two hours traveling time of the Vietnamese border, linking it to cross border trade as well as possible international trafficking activities. In addition the Nhommalat district center is also situated closer to the proposed cement factory scheduled to

open in Mahaxay district. As such Nhommalat town may attract a larger migrant population than the one envisioned for Nakai. Hence the same basic scenarios, concerning crowded living conditions, increased risk of vehicular accidents, the introduction or re-introduction of potentially dangerous vector-borne diseases, and the creation of a serious STI and HIV/AIDS situation propelled by urbanization, migration, and at risk behavioral practices apply here as well.

On a positive note, the MOH has recently indicated that external funding may soon be available to construct a new spacious district hospital just outside the Nhommalat district center, along Route 12. This facility would serve as an inter-district facility, supporting the health care delivery network in both Nakai and Mahaxay districts. This development has obvious health implications for the NT2 Project intervention area.

6.1.2 *Xebangfai Basin and Surrounding Districts*

The potential cumulative impacts on health in the Xebangfai Basin and surrounding districts is expected to be considerably different than that of the Nakai Plateau and the NBCA. Most of the direct impacts will be felt only after the Commercial Operation Date (COD) in 2010, when water is released from the reservoir, passing through the power station, regulating and holding ponds, and downstream channel on its way to the Mekong River. The "Nam Theun 2 Project Xe Bang Fai Strategy Paper" indicates that 89 villages, located along four different sections of the Xebangfai Basin, will be affected by the NT2 Project. This will include 7,096 households containing approximately 40,000 people.

There are several potential impacts of the increased water-flow, in the Xebangfai Basin, which can impact on the health status of local residents. The first, and probably the most important, from a purely health perspective is the increased amount of sediment in water caused by bank erosion in the early stretches of the river. This may reduce the quality of potable water used for drinking, bathing, and other household purposes, causing gastro-intestinal illnesses as well as skin problems. Increased water-flows, especially during the dry season, will undoubtedly improve irrigation potentials and annual rice yields, but they may adversely affect fisheries and gardens in the river and along the riverbanks. This obviously can affect household income and nutritional levels.

The changes in water levels, in and around riparian communities, may influence the prevalence and incidence of rodent and vector-borne diseases such as leptospirosis, malaria, dengue fever, and opisthorchiasis. This concern is most relevant for dengue fever (and DHF), where standing water serves as an excellent breeding ground for the mosquito species capable of transmitting this potentially life-threatening disease. During 2002-2003 large outbreaks of dengue fever occurred in Xebangfai and Nongbok districts. Will the promotion of an additional dry season rice crop, aided by NT2 Project irrigation schemes, cause dengue fever to proliferate and become an endemic health problem to this region? Another potential health issue is the use of pesticides and herbicides in rice-fields and vegetable gardens. Will improved road networks stimulate the production and sale of agricultural products for expanding markets in nearby district and provincial urban centers? What will be the health impacts on producers and consumers? Increased water levels will also probably cause more drowning accidents, especially among young children playing or bathing in the rivers, as well as people simply attempting to cross the river.

The potential direct impacts on the health of the people living in the Xebangfai Basin and surrounding districts are considerably less dramatic than what is predicted for the Nakai Plain and NBCA. There will not be a tremendous influx of workers and other migrants, possible numbering as high as 5,000-10,000 people, inundating the small district towns or surrounding areas in a relatively short time frame. On the other hand, being located closer to the macro and micro-economic developments prophesized by our “crystal ball”, the district centers of Mahaxay, Xebangfai, and Nongbok may experience substantial growth. These districts may witness a massive external exodus of rural adolescents and young adults to the East-West Corridor, the Savannakhet SEZ, nearby Thailand, or even to the work camps and district centers on the Nakai Plateau. Will these migrations be on a temporary or permanent basis? What potential demographic impact will these migration patterns have for “home communities” by the year 2025? Will there in fact be a “next” generation of farmers?

Some of the same scenarios, listed above for the Nakai Plateau and NBCA, are also relevant to the Xebangfai Basin and surrounding districts. By 2010, as the valves on the Nam Theun 2 Reservoir are being opened, a number of cumulative impacts on health may already be in progress. These may include increased exposure to STIs and HIV/AIDS, vehicular accidents, anxiety and other forms of mental illness, and specific communicable diseases caused by new environmental and demographic conditions. By 2010 our crystal ball has predicted that Mahaxay may become a manufacturing center, with perhaps the largest cement factory complex in the nation. Will the dust from this factory become a major environmental health issue locally or for the region? Mahaxay will also be located on the cross-roads of thoroughfares leading from Thailand to Vietnam, as well as linking the central part of Khammouane to the East-West Corridor. The Xebangfai district center, presently situated on Route 13, is already directly linked to Thakhek and the Savannakhet provincial center, will undoubtedly grow in size by 2010. The Nongbok district center, sitting on the banks of the Mekong River just across from Thailand, is connected to Thakhek by a grated unpaved road. But this small district town, and the surrounding area, could easily become a major tourist center if some of the current economic development plans are put into operation. Will local authorities be prepared and capable of dealing with an entirely new series of public health issues caused by economic development, urbanization, and migration?

6.1.3 *Nam Theun, Nam Kading and Nam Hinboun Basins and Surrounding Districts*

The direct, as well as cumulative, impacts in the areas referred to as Zone 4 (Nam-Theun Downstream to Theun-Hinboun Headpond), Zone 5 (Theun Hinboun Dam to the Mekong) and Zone 6 (Road 8B “Lak Sao Road” and “Phou Phako Quarry”) are expected to be minimal. This is especially true with respect to health. At the present time there are no established villages or settlements in Zone 4, due to topography and difficult access. The impacts from the reduced flows in the Nam Theun between the reservoir site and the Theun Hinboun Dam will primarily be limited to riparian vegetation, wildlife, and fish. This may mean that the livelihood of a small number of fishermen and hunters, using this area, is affected. Downstream of the Theun-Hinboun Dam (Zone 5) the NT2 Project has no effect on minimum water flows. Flows downstream of the Theun-Hinboun are predominantly dependent upon the operation of the Theun-Hinboun power station. It is expected that the impact on individuals living along the Kading River, to its confluence with the Mekong, will be negligible. Zone 6 presently has few inhabitants. However a large work camp near the quarry at Phou Phako, will be established for construction of the dam site and Road 8B north to its junction with

8A near Lak Sao in Khamkeut district in Bolikhamxay. This work camp, and possible ad hoc camp follower settlements that may spring up here, are already included in the generic issue of *camp-sites* presented in the section dealing with the Nakai Plateau and NBCA. In brief, except for camp-sites and possible camp follower settlements, there will not be any important cumulative health impacts in the Nam Theun, Nam Kading and Nam Hinboun Basins and Surrounding Districts by the year 2010.

6.1.4 *Mekong River Basins*

There are not expected to be any immediate or cumulative impacts on health originating in the NT2 Project intervention or adjacent areas that will affect the Mekong River Basins. Even if the increased use of pesticides and herbicides cause local health problems in selected communities or sections of the NT2 Project intervention area, this development should not directly influence the health of humans and other living organisms along the greater Mekong River Basin. Similarly hydrological or macro and micro-economic developments taking place in the Mekong River Basin should exert no cumulative impact on health in the NT2 Project intervention area.

6.1.5 *Neighbouring Areas in Vietnam and Thailand*

The most logical potential cumulative impacts on health, concerning the NT2 Project intervention area and adjacent districts with neighbouring areas in Vietnam and Thailand, primarily concern cross border commerce, tourism, labour migration patterns, and perhaps the trafficking of women and children. The construction, and expansion, of new roads and bridges linking Thailand and Vietnam, will pass through and around the NT2 Project intervention area. Workers, businessmen, tourists, and a large transient mobile population of rural adolescents and young adults may be inter-acting in greater numbers and with increased frequency. Will any Thai and Vietnamese adolescents, young adults, or even women and children become part of the “entertainment industry” near the work camps of the NT2 Project or in the Savannakhet SEZ or East-West Corridor in Khammouane and Savannakhet? Will lowland and ethnic minority Lao adolescents, young adults, or women and children find themselves in the “commercial sex” industry in Thailand and Vietnam? How will the increasing number of Thai and Vietnam tourists and businessmen, stopping off in the district centers in the NT2 Project intervention area and neighboring districts, stimulate the growth of local “entertainment venues”? How will these developments influence the incidence and prevalence of HIV/AIDS & STIs in the Lao PDR and neighbouring countries? What will be the effect of large trucks, zooming along Routes 8A, 8B, 9, and/or 12 at high speeds, between Thailand and Vietnam, on the frequency and severity of vehicular accidents and deaths in local communities? Will the economic opportunities caused by the opening of the East-West Corridor, and new road links between Thailand-Thakhek-Vietnam, encourage families, and/or entire communities, to relocate to sites along roadsides, providing various goods and services to truck drivers, tourists, businessmen, and whoever else passing through their community? How will this unplanned village growth affect the transmission of communicable diseases as well as local health status?

The NT2 Project infra-structural components themselves, that is the construction of the reservoir, power stations, and downstream channel, should not have any direct impact on the health of people living in neighbouring Thailand or Vietnam.

6.2 The 20 Year Scenario

If we were to once again gaze into our crystal ball, what would we see in the Year 2025? An intrinsic problem with our crystal ball, is that although it is capable of making amazingly accurate predictions, it only has a 10-year warranty! It will, however, come as no surprise that the Lao PDR of 2025 does not resemble that of 2004 or even 2010. Momentous physical and spiritual changes may have taken place across the length and breadth of the nation. A majority of the population may live in urban or semi-urban areas, rather than in the rural countryside. An intricate network of roads will crisscross the country from north to south and from east to west. There will more international cross-border checkpoints with Thailand, Vietnam, China, Cambodia, and Myanmar. The tourism sector of the economy will have grown tremendously. The same could be true for manufacturing and industry. Many former visitors and residents, who have not returned to the Lao PDR since 2010 may truthfully claim that they can no longer recognize the place. Some of this group will be markedly impressed by what has taken place in the last 15 years. Others may bemoan the scope and pace of modernization, and its apparent affects on how the Lao treat one another or visitors to their country.

But our main concern is what has taken place in the NT2 Project intervention area, and adjacent districts that underwent macro and micro-economic developments between the years 2010 and 2025?

6.2.1 *Nakai Plateau and Nakai – Nam Theun NBCA*

Nakai district may have changed dramatically. Although the size of the district center may have remained relatively the same, a spectacular real estate and development boom may have occurred along the shores of the Nam Theun 2 Dam. Dozens of hotels, guesthouses, and even houseboats may have been constructed to accommodate the thousands of tourists who annually visit this 70-kilometer long recreation area. The facilities range from low-scale inexpensive guesthouses for “back-packers” to exclusive five-star luxury hotels and spas for the wealthy. Restaurants, bars, gift-shops, and karaoke establishments are sparsely situated along certain sections of the shoreline, but in general zoning laws have kept their numbers in check, and local authorities make sure that illegal activities do not take place in this area. The government, as well as the private sector, has successfully promoted eco-tourism in the NBCA, to the north of the reservoir. Registered companies take small groups of tourists to visit the mountains and forests of the NBCA. Most tours consist of short 1-3 day treks, with overnight stops at specially designated camp-sites. Other tours allow tourists to spend up to a week visiting and observing daily life in selected ethnic minority villages. These tours allow villagers to earn a decent income selling handicrafts and forest products. Residents of the resettlement villages have also benefited from the economic opportunities created in Nakai. Some have prospered producing fresh poultry, livestock, fish, and fruits and vegetables consumed in the district center, and for the hotels and restaurants along the reservoir. Many young people from these communities, as well as from the district town, are employed in the tourist industry along the lakefront. Some ethnic minority villagers, from both the resettlement communities as well as from the NBCA, have been hired to perform traditional dances and rituals for tourists. At the same time some of the smaller remote ethnic minority villages in the NBCA may have merged with neighboring communities, as a result of large-scale migration of younger community members or due to the high numbers AIDS related deaths described below.

Health conditions throughout Nakai district may have dramatically improved. Malaria cases are rare events. Dengue fever occasionally breaks out in epidemic waves every couple of years, but the hospital can deal with all cases, and there have not been any deaths in several years. The improvement in public water supply systems and the use of latrines have dramatically reduced the number of illness caused by water or food-borne illnesses. There has not been a death from diarrhea in more than 5 years!

A major development may be that HIV/AIDS is no longer a serious health problem. The discovery of a clinical “cure” for AIDS, during the period after 2010, has meant that this one-time dreaded plague has been transformed into simply another communicable disease. However approximately 10-15 years ago the HIV/AIDS epidemic swept through many ethnic minority communities, as well as the district center, killing hundreds of individuals in its path and destroying the social and economic fabric of many families. The epidemic killed many young adults, as well as children under the age of five years who were originally infected by their HIV positive mothers during pregnancy or shortly after delivery. For several years it seemed as if there was an AIDS-related funeral every week. Many young children became orphans, and elderly grandparents were often the only relatives left to take care of these youngsters. In addition to the intense emotional stress caused by the epidemic, many families lost their economic base of support when their breadwinner died from AIDS. A recent worrisome trend, however, is that many adolescents and young adults feel that since STIs & AIDS are now curable ailments, there is little incentive to use condoms. Another trend is that poor treatment compliance has resulted in new strains of certain STIs becoming resistant to antibiotics.

The high level of vehicular accidents has not declined on the Nakai Plateau. During the past 10-years it has consistently been the leading cause of morbidity and mortality. Traffic safety campaigns have been ineffective. High levels of alcohol consumption, and an apparent disregard to follow traffic rules, cause many preventable deaths or crippling disabilities each year.

Changing diets, and lifestyles, have also begun to alter the picture of morbidity and mortality. Communicable diseases have become relatively unimportant compared to non-communicable diseases associated with chronic ailments, aging, and new behavioral patterns. Diabetes, circulatory diseases and heart ailments, cancers, psychological problems including depression and suicide, and even obesity are becoming more prominent in Nakai. Many health workers at dispensaries and hospitals, however, have not been re-trained to deal with these “new” health issues. Another important recent development is that private clinics and pharmacies have sprung up throughout the district town as well as along the reservoir. The private sector has now replaced the public sector as the key provider of health care. This is especially true for “tourists” and those working in the hospitality industry.

The Nhommalat district center has also undergone a profound metamorphosis. The town has extended its physical boundaries south to the junction between Route 8B and 12. It has become a major stop-off point for long-distance trucks plying goods between Thailand and Vietnam as well as for international and domestic tourists. Unlike Nakai, however, there are no five-star hotels or fancy guesthouses or houseboats. Instead there are many “entertainment venues” located on the outskirts of town.

The pattern of morbidity and mortality is quite similar to Nakai. Complications or deaths from communicable diseases, such as malaria, diarrhea and respiratory illnesses have become exceeding rare. Dengue fever, however, continues to be a sporadic problem near the district center, although deaths are not common. Although there is a large inter-district hospital, many people nevertheless choose to visit the growing number of private clinics and pharmacies. They feel more confident in the treatment, especially for non-communicable diseases which often require long-term care and follow-up.

The incidence of HIV/AIDS and STIs remains high, due to the large number of transients, especially truck drivers, businessmen, sex workers, and tourists passing through Nhommalat. Like Nakai, resistant strains of certain STIs have been detected recently, and the fact that most males still do not prefer to use condoms means that there is always a low-grade epidemic quivering below the surface.

Nhommalat district continues to encounter a large number of vehicular accidents and deaths due long-distance trucks speeding along the highways. Most injuries and deaths involve pedestrians or drivers of passing vehicles. Vehicular accidents have become the leading cause of morbidity and mortality.

6.2.2 *Xebangfai Basin and Surrounding Districts:*

Some of the health problems that were witnessed during the early years after the completion of the Nam Theun 2 Dam are no longer relevant. This primarily concerned poor water quality due to increased sediment from riverbanks. Within a short period of time the situation returned to normal, either due to a natural reduction in sediment or the mitigation measures implemented by the NT2 Project. This consisted of constructing new wells as sources of safe and clean potable water in affected communities. With the increased use of latrines, water-borne illnesses and intestinal parasitic infestations have practically disappeared. The use of latrines has also interrupted the lifecycle of opisthorchiasis, although older villagers still prefer eating raw or undercooked fish [*laab, goi*]. Malaria is no longer a problem in this region, although dengue fever continues to break out every couple of years. Some outbreaks are quite large, but deaths are exceedingly uncommon.

The district centers of Mahaxay, Xebangfai, and Nongbok, as predicted, have become important urban centers. Mahaxay still holds the distinction of being a major producer of cement, although the discovery of new quarries elsewhere may soon alter this picture. For many years dust pollution, along the road from the quarry to the factory, was a major health concern. During the dry season there was always an increased number of respiratory illnesses especially amongst villagers living close to the roadside. HIV/AIDS and STIs remain important communicable disease problems, but there are now very few deaths associated with AIDS. The leading cause of morbidity and mortality continues to be vehicular accidents. The high volume of large long-distance trucks and other vehicles plying the roads between Mahaxay, Thakhek, the East-West Corridor, and Thailand and Vietnam makes this a very dangerous junction for pedestrians and anybody else on the road.

Xebangfay has grown, but at a much slower pace than Mahaxay and Nongbok. Since it is located less than one-hour away from either Thakhek or Savannakhet, it has never developed into a major commercial or tourist stopover point. It has primarily remained an agricultural production site for domestic markets in the

nearby provincial centers. For many years local farmers substantially increased their use of pesticides and herbicides to stimulate food production. The situation only returned to normal when merchants, in the provincial towns, refused to purchase rice or vegetables grown under these conditions. In the meantime the large number of “unexplained” mortalities in farming communities suggest that pesticides may have been a contributing factor for the high number kidney and liver failures.

HIV/AIDS and STIs continues to remain an important health issue, but many of the patients are actually individuals who work along the East-West Corridor, Savannakhet SEZ, or near Mahaxay. A large percentage of young adults from many farming and fishing communities in Xebangfay district have permanently migrated to these destinations to find full-time employment. During visits home, they frequently seek care at the Xebangfay District Hospital, or at one of the small private clinics or pharmacies in the district town.

Malaria, opisthorchiasis, diarrhea, respiratory ailments, and other communicable diseases are no longer significant health problems. There are, however, regular outbreaks of dengue fever, with an occasional death occurring in a remote community. Vehicular accidents represent the leading cause of morbidity and mortality. The number of accidents, however, is much lower than that seen in Mahaxay or Nongbok. Long-distance trucks and speeding vehicles, at times under the influence of alcohol, cause most accidents.

The general health situation in Nongbok district is similar to that found in Xebangfay district. Serious illness or death, from communicable diseases, have become rare events. STIs & HIV/AIDS remain a problem, but there are a number of private clinics and pharmacies that specialize in syndromic treatment and counseling services. Vehicular accidents are probably the number one cause of death.

6.2.3 *Nam Theun, Nam Kading and Nam Hinboun Basins and Surrounding Districts*

This geographic area has basically not been affected by the Nam Theun 2 Project, except for tourists who decide to continue from the reservoir on up to Lak Sao, Khamkeut District (Bolikhamxay), and proceed on over the border into Vietnam. Initially there were a large number of Thai tourists from the northeastern provinces of Sakhorn Nakorn, Nakorn Phanom, and even Udon Thani, of Vietnamese descent, who crossed the Mekong River Bridge into Thakhek and subsequently traveled along this route. This was the shortest and quickest way to their ancestral villages in northern and central Vietnam. The younger generation, however, does not exhibit these same emotional attachments, and simply prefer to visit the reservoir at Nakai or other destinations in the Lao PDR and neighboring Vietnam. This cohort of tourists has at times been the cause, as well as the recipients, of some of the vehicular accidents. They have also played a role in the transmission cycle of STIs and HIV/AIDS.

6.2.4 *Mekong River Basins*

This geographic area has not contributed to any of the cumulative impacts on health in the NT2 Project intervention, nor has it been the direct recipients of health problems originating in Khammouane or adjacent areas.

6.2.5 *Neighbouring Areas in Vietnam and Thailand*

As earlier predicted the new and expanded road and bridge infrastructure connecting Thailand and Vietnam, through the Central Region of the Lao PDR has

by 2025 stimulated the economies in all three countries. The Savannakhet SEZ has attracted direct foreign investments from Thailand, Vietnam and elsewhere. It has also served as a magnet for a large pool of unemployed or under-employed rural and urban lowland and ethnic minority Lao. Tourism has boomed throughout the region, with the Lao PDR becoming an important destination for international travelers interested in eco-tourism. The establishment of a large “service industry” to accommodate tourists, investors, businessmen, and truck drivers has unfortunately also promoted the growth of “entertainment venues” which have from 2010-2025 put large numbers of adolescents and young adults, as well as other age cohorts, at high-risk for STIs and HIV/AIDS. Increased cross-border traffic has, at times, facilitated the trafficking of women and children to certain factories and “entertainment venues” where their mental and physical well-being has been put into jeopardy.

Economic development in this region has propelled the pace of urbanization, and dramatically altered the demographic composition of the rural countryside. Urbanization, migration, and rapid modernization have created new economic opportunities for many individuals, but these forces have also taken a heavy toll on others. Life is lived at a faster pace, which often brings about higher levels of anxiety, depression, and self-destructive behavior. The health picture in all three neighboring countries, in 2025, has dramatically changed from the turn of the 21st century. Non-communicable diseases have evolved as the predominant health issues. Hypertension and heart ailments, along with cancers perhaps caused by exposure to pesticides, dust, and industrial by-products, have become important causes of morbidity and mortality. These chronic health problems are much more difficult to address than communicable diseases, which are of an acute nature. Vehicular, and occupation-related, accidents have emerged as the leading cause of death and illness/disability. But these cumulative impacts on health derive from all macro and micro-economic developments permeating the country and not just the ones put into place by the NT2 Project, the East-West Corridor, the Savannakhet SEZ, the bridge and road construction, and other initiatives.