REPORT
OF
FIELD SURVEY OF RESETTLEMENT POTENTIAL AREAS

I. General

This report is prepared on based on the Scope of Work for The Nam Ngiep-1 Hydroelectric Power Project (Phase II) agreed upon between the NIPPON KOEI.,LTD and STS CONSULTANTS in July, 2002.

1. Objective of the Study

According to the Terms of References, the objective of the study is to conduct a second phase survey resettlement potential areas . The field survey was to confirm the suitability for two resettlement areas and small possibility area. There are located in Bolikhanh district of Bolikhamsay Province.

2. Study Area

The STS consultant's team have divided two teams;

The first team visited Bolikhanh District and conducted survey in ,**Xiengxian-XiengLeu and Hatkham** potential resettlement areas;

The second team went to **Phabuak** area , it located along Nam Sun valley,

The both areas are the focal development sites of Bolikhanh district, Bolikhamsay Province.

The first resettlement area, **Xiengxiane-XiengLeu** is stretched from B. Thasi along Nam Lat Valley to B. XiengLeu, about 54 km, to the Bolikhanh district Administrative Office. It is bordered by;

the northern side is Nam Mang river, in the North
ThaThom Xaisomboun Special Region , in the East
Viengthong district in the South and
Pou Had and Pou Phathao Mountains in the west.

This area has a flat terrain along Nam Lat . The altitude varies approximately from 188 to 210 MSL. (The area is shown on ***Figure. 04/01 & 04/02***).

The second resettlement area, **Pakbuak area** is located Ban Pakbuak along the Nam Sun in the Bolikhanh district , Borikhamxai province, distance about 37 km to the Bolikhanh district Administrative Office. The area located between Talabat and Pousiat mountains. This area has a flat terrain along the Nam Sun and Nam Poy rivers. It is bordered by;

the northern side is Nam Sun , in the North
Pou siet , in the East
Pou Meuy in the South and
Talabat Mountain in the west.

3. **The following main features of the potential resettlement areas are assessed :**

- Land use and forest cover
- Land suitability for rice cultivation and other crops
- Soil type
- Irrigation possibility
- Land suitability for livestock
- Water source availability for domestic consumption
- Accessibility
- Electrification possibility

4. **The Study Schedule**

The field survey of resettlement areas was carried out in July,19, 2002 and finished in beginning of August , 2002.

The available information on the potential resettlement areas was collected at Provincial and district levels. The main information that is available in related to:

- Planning for focal development sites of district
- Information of Socio-economic data

To carry out the field survey, STS Consultants has collaborated with Lao expert of many specialists. There are involved to following :

- Department of Electricity (D O E)
- Land Survey
- Department of irrigation
- Department of forestry

5. **The field survey were conducted with the following schedule:**

July,19, 2002 : Meeting with Bolikhanh district authority.
Mr. Thongma SISOUVANNASAN chief Cabinet of BoLikhanh district.
Interview and inspection of the rural development at resettlement area in the Bolikhanh district, there are at present two areas **Xiengxiane-XiengLeu** and **Pakbuak** areas *(See Figure 01)*.

July,20-30,2002:The survey team visited the two major resettlement **Xiengxiane-XiengLeu** and **Pakbuak**, and the small site at **Hatkham** area.

- Collected Socio-economic data with head of villages located within in the resettlement areas
- Take photography of main physical features of each site.
- Soil survey, forestry ,land use and water source were investigated.
- Checked location of resettlement areas by GPS

July,31,2002: Meeting with Bolikhamsay province.
Mr. Vongsi Vice Cabinet of BoLikhamsay Province.

- Collected information on rural development planning in the Bolikhamsay Province

Meet with Lao-Luxembourg office Mr. Sitpaseuth Project manager of Lao-Luxembourg Project at Bolikhamsay province.

- Collected information on going and planned development of Lao-Luxembourg projects in the Xiengxiane-XiengLeu and Pakbuak areas.

II. Result of Field Survey

1. Xiengxian-XiengLeu area

The total number of Households is 419 with 478 families and the total population is living 2,158 pers. There are 7 villages, divided into two major ethnic groups ; LaoTheung 1,575 persons accounts for 73 % of population and Lao Lum 582 persons accounts for 27%, There are only few Lao Soung households in the area.

Education facilities are limited with Primary school available in each villages, for the small village is class-through-(P1-P3), and for the large village is class-through-(P1-P5) .

Road loading to the area can only used in the dry season in the rainy season the communication between villages within the area is either by boat or walking tracks.

Dispensary and hospital are not available. The main diseases in this area are malaria , diarrhea.

The average annual rice production in the areas was 1,308 tons of which, lowland rice production is 1,235 tons, while the 55 tons is upland rice production.

Besides the rice production, the cultivated areas of sugar cane, cassava and vegetable are about 15 hectares.

a.) Land use forest cover:

a.1 Rained Paddy Rice (RP)
These areas have been used for rice cultivation under rained conditions and mainly located along Nam Lat and Nam Hat river, as flood plain, with slope of 0-2% and valley with slope of 2-8%. These area of about 357 ha and 13% of total areas.

a.2. Agriculture Plantation (AP)
Agricultural plantation areas are located in nearest to villages. These area of about55 ha and 2% of total areas. These areas are planted to various and of fruit trees.

a.3. Temporarily Unstocked Forest (T)
Temporarily unstocked forest. These area of about 996 ha and 42% of total studied areas. They used to be a forest areas, in which crown density has been reduced to less than 20% due to human dishazards.

a.4. Scrub forest (Sh)
Scrub forest. These area of about 276 ha and 12% of total studied areas. They used to be a forest areas, in which crown density has been reduced to less than 20% due to human dishazards

a.5 Mixed Deciduous Forest (MD)

Mixed deciduous forest ,these area of about136 ha and 6% of total studied areas , and locates in undulating low terrace and hill areas. Tree species, which are founded in the area are pterocarpus dalbergioides, Terminalia Dialata, largerstroemia, shorea robusta, Diospyrosmelanoxylon, pterocarpus marsupium, Acacia Laucoplola, Bridelia rebusa and etc...

a.6 Ray/ Shifting cultivation (Ra)

Ray/shifting cultivation, these area of about 547 ha and 25% of total studied areas. The forest in the areas was at and burnt for temporarily cultivation of rice and other upland crops. The areas where farmers practice shifting cultivation were founded in undulating terraces and rolling hill areas.

(***Detail see on the Figure: L 01***)

b.) Land suitability for rice cultivation and other crops

LSR-01:

S2(Ba,,Cor,Gar,Mb,Sb,Tob,Upr)/S3(Cas,Cit;,Cot,Low-rice,Man,Sugar,Sw-potato,Teak,Chi).

The land is medium suited (S2)for banana, corn , garlic , mung bean , soybean , tobacco, and upland rice. Because of have any limited factors for each specific crops, these limitations are nutrients availability(s), temperature regime(t), moisture availability(m), nutrients retention(n).

And is marginally suited (S3)for cassava, citrus, cotton,, low land rice, mango, sugarcane , sweet potato, teak and chili. Also have limitations are temperature regime(t); moisture availability(m); nutrients availability(s). These area of about 435ha and 19% of total areas.

LSR-02:

S2(Upr)/S3(Ba,Cas,Cit,Cor,Cot,Gar,Lor,Man,Mb,Sb,Sugar,Swp,Teak,Tob)

The land is moderately suited (S2) for upland rice . Because of have any limited factors for those crops are nutrients availability(s), temperature regimes(t).And is marginally suited (S3)for banana, cassava, citrus, corn, cotton , garlic, low land rice, mango, mung bean, soy bean , sweet potatoes , teak and tobacco. Also have limitations are nutrients availability(s); temperature regime(t);and moisture availability(m).
These area of about 1223 ha and 51% of total areas.

LSR-03:

S3(Ba,Cas,Cit,Cor,Cot,Gar, Lowr,Man,Mb,Sb,Sugar ,Swp,Teak,Tob, Upl-rice).

The land is marginally suited (S3) for banana, cassava, citrus, corn, cotton, garlic, low land rice, mango, mung bean, soy bean, sweet potatoes, teak ,tobacco and upland rice; also have any limitations are Nutrients availability(s); temperature regime(t); moisture availability(m) and rooting condition(r). These area of about 709ha and 30% of total Areas.

(***Detail see on the Figure: L03***).

c.) Soil type

c.1. Cambisols (CM)

Soils having a cambic B horizon and no diagnostic horizons other than an ochric or an umbric A horizon or a mollic A horizon, overlying a cambic B horizon with a base saturation (by NH4OAc at pH= 7.0) of less than 50

percent; lacking salic properties, lacking the characteristics diagnostic for Vertisols and Andosols .
this soils covered an extent of about 435 ha that equal to 19% of total area. Soil subgroups primarily distinguished by diagnostic properties that influences soil genesis and they are important to plant growth; such properties are Gleyic subgroups distinguished as Gleyic Cambisols :

c.1.1 Gleyic Cambisols (CMg).
Cambisols showing gleyic properties within 100 cm of the surface.
Soil unit code No.1 CMg-D-La(M)) :
These soil unit represents to all Gleyic Cambisols developed on flat plain with slopes ranging from 0to 2%. They are characterized by deep and imperfectly drained soils, this soil has topsoil texture loam, they are rated as medium in soil fertility. Soil reaction is strongly acid to moderately acid. They have a low cation exchange capacity 6.00 me/100g soil; Base saturation is low 32.5%.
These soil are mainly under paddy rice, they classified as class2 for rice and non suitable for upland crop and Tree crop these soils are recomented for rice.

c.2. Acrisols (AC).
Soil with an argic B horizon, has a cation exchange capacity of less than 24 $(+)kg^{-1}$ clay and a base saturation (by NH_4OAc) of less 50 percent, at least some part of the B horizon within 125cm of the surface; lacking the E horizon, abruptly overlying a slowly permeable horizon, the distribution pathern of the clay and the tonguiny cohichare diagnostic for Planosols, Nitisols and Podozoluvisols, respectively.
Soil subgroups primarily distinguished by diagnostic properties that influences soil genesis and they are important for plant growth; such properties are haplic. subgroups distinguished as Haplic Acrisols and described as fallow.

C2.1.Haplic Acrisols (ACh).
Acrisols are not strongly humic; lacking Ferric properties; lacking plinthite within 125 cm of the surface , lacking of gleyic properties within 100 cm of the surface.
A key to soil classification of XiengXian-XiengLeu zone provided in table below. The soil map shown the distribution and extent of each soil mapping unit; altogether soil mapping units (mapping codes) are distinguished. Each soil mapping unit established within soil groups basing on physical and chemical properties and other characteristic that effect soil management: particle size class, soil depth, physiographic features and slopes, and status of mineral content (soil fertility); each soil unit described as fallows:
Soil unit code No.2 ACh-D-SL-b(M)
This soil map unit represents to Haplic Acrisols that are developed on undulating terrace with slopes ranging 2-8%. These soils covered an extent of about 618 ha which makes 26% of the total area; medium soil texture (sandy loam); these soils have a deep root zone more than 100 cm; typically, the topsoil layer have yellowish brown in colour, about 8 to 20 cm thick, the subsoil layer is yellowish brown; having common colour; structure, compactness, available water capacity and bulk density. Soil reaction is strongly acid (pH 5.00). Medium in organic matter content (OM%=2.00%); low in available phosphorous content (P= <1.8 ppm), high available potassium (30.00 mg/100g of soils). The soil fertility status rated as medium.

Soil unit code No.3 ACh-M-CL-b(M)

This soil map unit represents to Haplic Acrisols that are developed on undulating terrace with slopes ranging 2-8%. These soils covered an extent of about 709 ha which makes 30% of the total area; medium soil texture (clay loam); these soils have a moderate deep root zone 70 - 100 cm; typically, the topsoil layer have yellowish brown in colour, about 8 to 20 cm thick, the subsoil layer is yellowish brown; having common colour; structure, compactness, available water capacity and bulk density. Soil reaction is strongly acid (pH 4.7-5.00). Medium in organic matter content (OM%=2.0-3.0%); low in available phosphorous content (P= <1.8 ppm), high available potassium (30.00 mg/100g of soils). The soil fertility status rated as medium.

Soil unit code No.4 ACh-T-CL-c(M)

This soil map unit represents to Haplic Acrisols that are developed on rolling with slopes 8-16%. These soils covered an extent of about 605 ha which makes 25% of the total area; medium soil texture (clay loam); these soils have a thin root zone 50-75cm; typically, the topsoil layer have yellowish brown in colour, about 8 to 20 cm thick, the subsoil layer is yellowish brown; having common colour; structure, compactness, available water capacity and bulk density. Soil reaction is strongly acid (pH 4.5-5.00). Medium in organic matter content (OM%=2.0-3.0%); low in available phosphorous content (P= <1.8 ppm), high available potassium (30.00 mg/100g of soils). The soil fertility status rated as medium.

(***Detail see on the Figure: L02***).

d.) Irrigation possibility

Water sources for irrigation project in the area , there are Nam Lat, Nam Mang , Houay Mo , Houay Joy , Houay Mouang and Houay Poung can use for agriculture area, more than 3,000 ha. The flows through of the area . ***(See Figure 03)***

e.) Water source availability for domestic consumption:

Water use for domestic in the area are spring and wells small river within closed villages

f.) Accessibility;

The road conditions are very poor because of the lack of regular maintenance. The provincial road networks are being improved to link between other provinces and districts as well as with markets. However, access to some subproject areas is generally difficult.

To the **XiengXiane-XiengLeu** area can be travel by boat. The present road(about 50 km) from Kinyong to Thasi-Xiengxiane-XiengLeu area condition is poor and now improvement by UNDP and Luxxembourg funds. But now there can be travel in dry season only.

g.) Electrification possibility

The rural electrification networks are being gradually developed under the Ministry of Industry and Handicraft and Electricite,du Laos (EDL). Branch of EDL Bolikhamxai province planned transmission line to MuangBo area and connect to Thasi area.(plan for 10 years)

Small scale hydroelectrict power source :
Nam Mang Hydroelectrict project installed capacity 4.8 MW.(Desk study by D o E)

2 Hatkham area (*Sec Figure 04*)

Only one village, is located in the **Hatkham** area with households 85, 115 families and the total population is living 495 Persons in **Hatkham** village. There are divided into two major ethnic groups ; Lao Lum 373 persons accounted for 77% of population and LaoSung 122 persons accounted for 23% of people.

Education facilities are Primary school available in villages, the school is class-through class- through-(P1-P5) .

Road loading to the area can only used in the dry season in the rainy season the communication between villages within the area is either by boat or walking tracks.

Dispensary and hospital are not available. The main diseases in this area are malaria , diarrhea.

The average annual rice production in the areas was 255 tons of which, lowland rice production is 9 tons, while the 246 tons is upland rice production.

Besides the rice production, the cultivated areas of sugar cane, cassava and vegetable are about 15 hectares.

a.) Land use forest cover:

a.1 Rained Paddy Rice (RP)
These areas have been used for rice cultivation under rained conditions, as flood plain, with slope of 0-2% and valley with slope of 2-8%.These area of about43 ha and 11% of total studied areas .

a.2 Agriculture Plantation (AP)
Agricultural plantation areas are located in nearest to villages ,these area of about14 ha and 4% of total studied areas . They are almost deep soil. These areas are planted to various and of fruit trees.

a.3 Temporarily Unstocked Forest (T)
Temporarily unstocked forest, these area of about 236 ha and 61% of total studied areas. They used to be a forest areas, in which crown density has been reduced to less than 20% due to human dishazards.

a.4 Scrub forest (Sh)
Scrub forest these area of about 47 ha and 12% of total studied areas. They used to be a forest areas, in which crown density has been reduced to less than 20% due to human dishazards.

a.5 Ray/ Shifting cultivation (Ra)
Ray/shifting cultivation, these area of about 45 ha and 12% of total studied areas. The forest in the areas was at and burnt for temporarily cultivation of

rice and other upland crops. The areas where farmers practice shifting cultivation were founded in undulating terraces areas.

(*Detail see on the Figure: L04*)

b.) Land suitability for rice cultivation and other crops

LSR-01:
S2(Cor,Low-rice,Mb,Sb,Sug,Tob,Upl-rice,Chi)
S3(Ba,Cas,Cit,Cot,Gar,,Man,Swp,Teak)
The land is medium suited (S2)for corn ,lowland rice, mung bean, soy bean, sugarcane, tobacco, upland rice and chili. Because of have any limited factors for each specific crops, these limitations are nutrients availability(s), temperature regime(t), moisture availability(m), nutrients retention(n) and is marginally suited (S3)for banana; cassava, citrus, cotton, garlic, mango, sweet potato and teak. Also have limitations are temperature regime(t); moisture availability(m); nutrients availability(s).

(*Detail see on the Figure: L06*).

c.) Soil type

Acrisols (AC).
Soil with an argic B horizon, has a cation exchange capacity of less than 24 cmol (+)kg^{-1} clay and a base saturation (by NH_4OAc) of less 50 percent, at least some part of the B horizon within 125cm of the surface; lacking the E horizon, abruptly overlying a slowly permeable horizon, the distribution pathern of the clay and the tonguiny cohichare diagnostic for Planosols, Nitisols and Podozoluvisols, respectively.
Soil subgroups primarily distinguished by diagnostic properties that influences soil genesis and they are important for plant growth; such properties are haplic and gleyic. Two subgroups distinguished as **Gleyic Acrisols and Haplic Acrisols** .
A key to soil classification of Hatkham zone provided in table below. The soil map shown the distribution and extent of each soil mapping unit; altogether soil mapping units (mapping codes) are distinguished. Each soil mapping unit established within soil groups basing on physical and chemical properties and other characteristic that effect soil management: particle size class, soil depth, physiographic features and slopes, and status of mineral content (soil fertility); each soil unit described as fallows:

Soil unit code No.1ACg-D-CL-a(M)
Acrisols showing gleyic properties within 100 cm of the surface. This soil map unit represents to Gleyic Acrisols that are developed on flat or almost flat with 2-8% slope. These soils covered an extent of about 109 ha which makes 28% of the total area; having clayloam top soil texture (CL); these soils have a deep root zone more than 100 cm; typically, the topsoil layer have yellowish brown in colour, 15 cm thick, the subsoil layer is yellowish brown; having common colour; structure, compactness, available water capacity and bulk density. Soil reaction is slightly strongly acid (pH5.7). Low in organic matter content (OM%=.98); medium in available phosphorous content (P= 12.60 ppm), low available potassium (6.40 mg/100g of soils). The soil fertility status rated as medium.

Soil unit code No. 2ACh-D-CL_b(M)

Acrisols are not strongly humic, lacking ferric properties, lacking plinthite within 125 cm of the surface , lacking of gleyic properties within 100 cm of the surface. This soil map unit represents to Haplic Acrisols that are developed on undulating terrace with slopes ranging 2-8%. These soils covered an extent of about 276 ha which makes 72% of the total area; medium soil texture (clay loam); these soils have a deep root zone more than 100 cm; typically, the topsoil layer have yellowish brown in colour, about 20 cm thick, the subsoil layer is yellowish brown; having common colour; structure, compactness, available water capacity and bulk density. Soil reaction is slightly strongly acid (pH 5.7). Low in organic matter content (OM%=.98); medium in available phosphorous content (P= 12.60 ppm), low available potassium (6.40 mg/100g of soils). The soil fertility status rated as medium.

(*Detail see on the Figure: L05*).

d.) Irrigation possibility

The main source for the water supply of the area is Nam Ngiep river , however there is Houay Khinguak, Houay Soup; flows through the middle of area . There can use water for agricultural land and for other proposed, it impossibility

e.) Water source availability for domestic consumption

Water use for domestic in the area is spring and Nam Ngiep river.

f.) Accessibility

The resettlement area can be used local road. The road condition is not so good in the wet season . But the area can be reached by boat on the Nam Ngiep river.

g.) Electrification possibility

The Branch of EDL Bolikhamxai province have planning for electrification in the area . The plan should be connect transmission line 22 kV from Paksan to Pakbuak area (plan for 10 years).

3. Pakbuak area ***(Figure 04/03 & Figure 04/04)***

The total number of household of areas is 319 with 341 families and the total population 1,480 persons in 4 villages. There are divided into two major ethnic groups ; LaoTheung 1,317 persons accounted for 89 % of population and LaoLum 162 persons accounted for 11%. There are few Lao Soung families in the area

Education facilities are Primary school available in each villages, the school is class-through -(P1-P5) .There are new one secondary school at Pakbuak area it just completed construction in this year class-through-(M1-M3).

Road loading to the area can only used in the dry season in the rainy season the communication between villages within the area is either by boat or walking tracks.

Dispensary is available in the Pakbuak village. The main diseases in this area are malaria , diarrhea.

The average annual rice production in the areas was 443 tons of which, lowland rice production is 196 tons, while the 247 tons is upland rice production.

Besides the rice production, the cultivated areas of sugar cane, cassava and vegetable are about 15 hectares.

a.) Land use forest cover:

a.1 Rained Paddy Rice (RP)

These areas have been used for rice cultivation under rainfed conditions , as flood plain, with slope of 0-2% and valley with slope of 2-8%. , these area of about 63 ha and 1% of total studied areas.

a.2 Ray/ Shifting cultivation (Ra)

Ray/shifting cultivation, these area of about 126 ha and 3% of total studied areas. The forest in the areas was at and burnt for temporarily cultivation of rice and other upland crops. The areas where farmers practice shifting cultivation were founded in undulating terraces and rolling hill areas.

a.3 Temporarily Unstocked Forest (T)

Temporarily unstocked forest, these area of about 312 ha and 8% of total studied areas. They used to be a forest areas, in which crown density has been reduced to less than 20% due to human dishazards.

a.4 Scrub forest (Sh) and glass land(Ga).

Scrub forest, these area of about 509 ha and 13% of total studied areas . They used to be a forest areas, in which crown density has been reduced to less than 20%.

a.5 Open Forest (OF)

Open forest , these area of about 2045 ha and 53% of total studied areas , and locates in undulating low terrace and hill areas. Tree species, which are founded in the area are pterocarpus dalbergioides, Terminalia Dialata, largerstroemia, shorea robusta, Diospyrosmelanoxylon, pterocarpus marsupium, Acacia Laucoplola, Bridelia rebusa and etc...

a.6 Mixed Deciduous Forest (MD)

Mixed deciduous forest , these area of about 869ha and 22% of total studied areas , and locates in undulating low terrace and hill areas. Tree species, which are founded in the area are pterocarpus dalbergioides, Terminalia Dialata, largerstroemia, shorea robusta, Diospyrosmelanoxylon, pterocarpus marsupium, Acacia Laucoplola, Bridelia rebusa and etc...

(Detail see on the Figure:L03)

b.) Land suitability for rice cultivation and other crops

LSR-01: S2(Ba,Cit,,Cor,Cot,Gar,Mb,Sb, Sugar, Tob,Upr,Chi)/S3(Cas,Low-rice,Man,Sw-potato,Teak).
The land is medium suited (S2)for banana, citrus , corn , cotton, garlic , mung bean , soybean , sugarcane, tobacco, upland rice and chili. Because of have any limited factors for each specific crops, these limitations are nutrients availability(s), temperature regime(t), moisture availability(m), nutrients retention(n).
And is marginally suited (S3)for cassava, low land rice, mango, sweet potato and teak . Also have limitations are temperature regime(t); moisture availability(m); nutrients availability(s). These area of about 1086ha and 28% of total areas.

LSR-02: S2(Cor,Cot,Gar,Mb,Sb, Sugar, Tob,Upr)/S3(Ba,Cas,Cit,Low-rice,Man,Sw-potato,Teak ,Chi).
The land is medium suited (S2)for corn , cotton, garlic , mung bean , soybean ,sugarcane, tobacco and upland rice. Because of have any limited factors for each specific crops, these limitations are nutrients availability(s), temperature regime(t), moisture availability(m), nutrients retention(n).
And is marginally suited (S3)for banana , cassava, citrus, low land rice, mango, sweet potato , teak and chili . Also have limitations are temperature regime(t); moisture availability(m); nutrients availability(s). These area of about 670ha and 17% of total areas.

LSR-03: S3(Ba,Cas,Cit, Cot, Gar, Low-rice, Man , Mb, Sb, Sugar, Sw-potato, Teak , tob, Upl-rice, Chi).
The land is marginally suited (S3)for banana , cassava, citrus, cotton, garlic, low land rice, mango, mung bean ,soybean, sugarcane, sweet potato , teak, tobacco, upland rice and chili . Because of have any limited factors for each specific crops, these limitations are nutrients availability(s), temperature regime(t), moisture availability(m), nutrients retention(n). Also have limitations are temperature regime(t); moisture availability(m); nutrients availability(s). These area of about 1370ha and 35% of total areas.

LSR- 04 : S3(Ba,Cas,Cit,Cot, Gar, Low-rice, Man, Mb, Sb, Sugar, Sw-potato,Teak ,Tob, Upr).
The land is marginally suited (S3)for banana , cassava, citrus, cotton, garlic, low land rice, mango, mung bean ,soybean, sugarcane, sweet potato , teak, tobacco, and upland rice. Because of have any limited factors for each specific crops, these limitations are nutrients availability(s), temperature regime(t), moisture availability(m), nutrients retention(n). Also have limitations are temperature regime(t); moisture availability(m); nutrients availability(s). These area of about 796ha and 20% of total areas.

(***Detail see on the Figure: L 09***).

c.) Soil type

c1. Cambisols (CM)
Soils having a cambic B horizon and no diagnostic horizons other than an ochric or an umbric A horizon or a mollic A horizon, overlying a cambic B horizon with a base saturation (by NH4OAc at pH= 7.0) of less than 50 percent; lacking salic properties, lacking the characteristics diagnostic for Vertisols and Andosols
this soils covered an extent of about 798 ha that equal to 20% of total area. Soil subgroups primarily distinguished by diagnostic properties that

influences soil genesis and they are important to plant growth; such properties

c.1.2 Gleyic Cambisols (CMg).

Cambisols showing gleyic properties within 100 cm of the surface.

Soil unit code No.1 CMg-D-La(M)) :

These soil unit represents to all Gleyic Cambisols developed on flat plain with slopes ranging from 1to 2%. They are characterized by deep and imperfectly drained soils, this soil has topsoil texture loam, they are rated as medium in soil fertility. Soil reaction is strongly acid to moderately acid. They have a low cation exchange capacity 2.92 me/100g soil; Base saturation is low 38.36%. These soil are mainly under paddy rice.

c.2 Acrisols (AC).

Soil with an argic B horizon, has a cation exchange capacity of less than 24 cmol (+)kg^{-1} clay and a base saturation (by NH_4OAc) of less 50 percent, at least some part of the B horizon within 125cm of the surface; lacking the E horizon, abruptly overlying a slowly permeable horizon, the distribution pathern of the clay and the tonguiny cohichare diagnostic for Planosols, Nitisols and Podozoluvisols, respectively.

Soil subgroups primarily distinguished by diagnostic properties that influences soil genesis and they are important for plant growth; such properties are haplic. subgroups distinguished as Haplic Acrisols and described as fallow.

c.2.1 Haplic Acrisols (ACh).

Acrisols are not strongly humic; lacking Ferric properties; lacking plinthite within 125 cm of the surface , lacking of gleyic properties within 100 cm of the surface.

A key to soil classification of Phakbuak zone provided in table below. The soil map shown the distribution and extent of each soil mapping unit; altogether soil mapping units (mapping codes) are distinguished. Each soil mapping unit established within soil groups basing on physical and chemical properties and other characteristic that effect soil management: particle size class, soil depth, physiographic features and slopes, and status of mineral content (soil fertility); each soil unit described as fallows:

Soil unit code No.2 ACh-D-L-b(M)

This soil map unit represents to Haplic Acrisols that are developed on undulating terrace with slopes ranging 2-8%. These soils covered an extent of about 1086 ha which makes 28% of the total area; medium soil texture (loam); these soils have a deep root zone more than 100 cm; typically, the topsoil layer have yellowish brown in colour, about 17 cm thick, the subsoil layer is yellowish brown; having common colour; structure, compactness, available water capacity and bulk density. Soil reaction is strongly acid (pH 4.8). Medium in organic matter content (OM%=3.72%); medium in available phosphorous content (P= 16.00 ppm), Medium available potassium (16.00 mg/100g of soils). The soil fertility status rated as medium.

Soil unit code No.3 ACh-M-CL-b(M)

This soil map unit represents to Haplic Acrisols that are developed on undulating terrace with slopes ranging 2-8%. These soils covered an extent of about 1370 ha which makes 35% of the total area; medium soil texture (clay loam); these soils have a moderate deep root zone 70 - 100 cm; typically, the topsoil layer have yellowish brown in colour, about 12 cm thick, the subsoil layer is yellowish brown; having common colour; structure, compactness, available water capacity and bulk density. Soil reaction is strongly acid (pH 5.3). High in organic matter content (OM%=9.96%); medium in available phosphorous content (P= 12.25 ppm), medium available potassium (15.20 mg/100g of soils). The soil fertility status rated as medium.

Soil unit code No.4 ACh-T-SL-c(M)
This soil map unit represents to Haplic Acrisols that are developed on rolling with slopes 8-16%. These soils covered an extent of about 670 ha which makes 17% of the total area; coarse soil texture (sandy loam); these soils have a thin root zone 50-75cm; typically, the topsoil layer have yellowish brown in colour, about 10 cm thick, the subsoil layer is yellowish brown; having common colour; structure, compactness, available water capacity and bulk density. Soil reaction is strongly acid (pH 5.20). Medium in organic matter content (OM%=2.76%); low in available phosphorous content (P= 6.90 ppm), low available potassium (5.60 mg/100g of soils). The soil fertility status rated as medium.

(***Detail see on the Figure L08***).

d.) Irrigation possibility

Water sources for irrigation project in the area , there are Nam Sun and Nam Poy, can use for agriculture area, about 2,000 ha. The flows through of the area . ***(See Figure 03)***

e.) Water source availability for domestic consumption:

Water use for domestic in the area are spring and wells small river within closed villages

f.) Accessibility;

To the **Pakbuak** area can be travel by boat along Nam Sun river. The present road (37 kM) from Bolikhanh district to Phabuak area condition is poor and now improvement by Luxxembourg fund. But now there can be travel in dry season only.

III. Information on going and Planned development in Bolikhamsay province

a.) Lao-Luxembourg, Lao/006 -Support to Bolikhamxay Province (Phase II)
Project Description Summary

The present description concerns the second phase to the LAO/004 project executed by Lux-Development and the regional authorities of the Bolikhamxay Province during 6.1999 and 6.2000. This second phase (LAO/006) has two objectives. Under the first objective, sustainable land use systems will be developed, with the aim of improving food security and market access for the target population. To achieve this, irrigation schemes and their associated access requirements will be put in place. This objective also entails extensive former training in irrigated agriculture and irrigation management. Under the second objective, a multitude of community development activities will be implemented. Community development infrastructure will be provided and training activities aiming at income generation implemented.

b.) Focal sites in the Bolikhamxay Province

There are four focal sites within Bilikhamxay Province:
- Pha Meuang - Muang Bo (PMMB) (Bolikhan District).
- **Phakbuak - Xieng Leu (PXL) (Bolikhan District).**
- Viengthong District (the entire district).
- Nyot nam (Khamkeut District).

Project Target area

The arrival of the Lao Soung and Lao Theung people in this area has resulted in 'mixed' villages, where the newcomers have been allocated land to live in predominantly Lao Loum villages. This follows the GoL's strategy of village consolidation and their desire to integrate the newcomers with the Lao Loum majority.

The strategy has sometimes caused problems due to important cultural differences between the different ethnic groups.

- The Pakbuak-XiengLeu focal site is accessible only in the dry season. It is composed of two valleys: The Nam Lath valley and the Nam Sun valley.

- The situation for these new comers has been particularly difficult, due to the *remoteness of the area and a shortage* of cleared land suitable for paddy cultivation. There is no health infrastructure in these areas yet and the provision of education services is minimal.

SPECIFIC OBJECTIVE No. 1

Specific objective No. 1: To develop sustainable land use systems, increasing food security and improving access to markets in the Bolikhan district focal sites.

This will be achieved by:
- Land use planning throughout the target area;
- Equitable land allocation,
- Construction of irrigation schemes,
- The provision of agricultural extension services to the villages,
- Improvement of village access roads in remote areas.

SPECIFIC OBJECTIVE No. 2

Specific objective No. 2: To develop community facilities and increase the range of productive activities in the Bolikhan District focal sites.

In the rural agricultural communities in the Lao PDR, it is very common to find the following community problems.
- *Food and income insecurity*
- High birth and infant mortality rate, and low life expectancy
- Low labour productivity due to poor health
- Soil and watershed degradation due to deforestation and erosion
- Ecological degradation through over exploitative hunting/gathering and uncontrolled burning for dry rice cultivation.

IV. Comparison and conclusion

According to the soil surveying and soil observation in the field; soil analysis data; FAO UNESSCO soil classification system of 3 projects are; particularly, soil criteria; soil quality and land suitability of the case studies areas as follow:

a.) Comparison land is available for agriculture

Potential areas	Area (ha) 8-16 % slope	Flat area 0-8% Slope		Potential criteria
		ha	ha/Family	
Hatkham		385	3.4	C
XiengXiane-XiengLeu	605	1,762	3.5	B
Pakbuak	670	3,254	9.5	A

Note: Number of areas divided by Number of families = Density of families per land use for agriculture activities.

Potential criteria **A** = Highest score
criteria **B** = Middle score
criteria **C** = Lowest score

b.) Irrigation possibility

Potential areas	Comparison irrigation possibility areas per families		Potential criteria
	(ha)	(ha)/family	
Hatkham	63	0.55	C
Xiengxiane-Xiengleu	3,120	6.5	A
Pakbuak	2,000	5.8	B

Note: The irrigation areas informed by planning irrigation sector of Bolikhamsay province,
The Number of areas divided by Number of families = Density of families per land

Potential criteria **A** = Highest score
criteria **B** = Middle score
criteria **C** = Lowest score

c.) Land suitability for rice cultivation and other crops

Xiengxian – Xiengleu area.
The results of land suitability classification included of 3 LSR as: LSR-01 - LSR-03 which is differentially specific crop cultivation ranging of moderate suitable to marginally suitable (S2-S3-N); generally, the most of lands are moderately to marginally suitable as S2 and S3 .

Hatkham area.
The results of land suitability classification only 1LSR as: LSR-01 which is differentially specific crop cultivation ranging of moderate suitable to marginally suitable and not suitable(S2-S3-N); generally, the most of lands are moderately to marginally suitable as S2 and S3.

Pakbuak area.
The results of land suitability classification included of 4 LSR as: LSR-01 - LSR-04 which is differentially specific crop cultivation ranging of moderate suitable to marginally suitable and not suitable(S2-S3-N); generally, the most of lands are moderately to marginally suitable as S2 and S3.

Potential areas	Land suitability for rice cultivation and other crops							
	LSR-1		LSR-2		LSR-3		LSR-4	
	ha	Ha/Fa Score	ha	Ha/Fa Score	ha	Ha/Fa. Score	ha	Ha/Fa. Score
Hatkham	385	**3.3** **A**						
Xiengxiane-Xiengleu	435	**0.9** **C**	1,223	**2.5** **A**	709	**1.5** **B**		
Pakbuak	1,086	**3.2** **B**	670	**1.9** **B**	1,370	**4** **C**	796	**2.3** **A**

Note: Potential criteria **A** = Highest score
criteria **B** = Middle score
criteria **C** = Lowest score

d.) Soil type

Hatkham:
+ 1 soil groups, 2 soil units, and 2 soil unit codes such as:
- ACg-D-CL-a(M) area of about 109ha and 28% of total areas
- ACh-D-CL-b(M) area of about 276 ha and 72% of total areas
+ Soil depth >100cm (D) from soil surface.
+ Top soil texture: mostly should be clay loam(CL)
+ Topography: The most of areas were flat or almost flat 0-2% of about 109 ha and 28% of total areas and the other should be micro relief on undulating 2-8% slope about276 ha and 72% of total areas
+ Soil fertility: Medium(M).
+ Soil reaction: Slightly acid (pH H_2O≈5.7).

XiengXiane-XiengLeu
+ 2 soil group, 2 soil unit, and 4 soil unit codes such as:
- CMg-D-La(M) area of about 435 ha and 19% of total areas.
- ACh-D-SLb(M) area of about 618 ha and 26% of total areas.

- ACh-M-CLb(M) area of about 709 ha and 30% of total areas.
- ACh-T-CLc(M) area of about 605 ha and 25% of total areas.

+ Soil depth 50 to > 100cm(T-D)from soil surface.
+ Top soil texture : coarse to medium texture(SL-CL).
+ Topography: Flat or almost flat 0-2% slope of about 435 ha and 19% of total areas; undulating 2-8% slope of about 1327 ha and 56% areas and rolling 8-16%slope of about 605 ha and 25% areas .
+ Soil fertility: medium (M).
+ Soil reaction: Strong to Slightly acid (pH H_2O= 5.0-5.5)

Pakbuak

+ 2 soil groups, 2 soil units, and 4 soil unit codes such as:

- CMg-D-La(M) area of about 798ha and 20% of total areas.
- ACh-D-Lb(M) area of about1086 ha and 28% of total areas.
- ACh-M-CLb(M) area of about 1370 ha and 35% of total areas.
- ACh-T-CLc(M) area of about670 ha and 20% of total areas.

+ Soil depth 75 to >100cm (T-D) from soil surface.
+ Top soil texture: sandy loam(SL), loam(L) and clay loam(CL).
+ Topography: undulating 2-8% slope of about 3254 ha and 83% areas and rolling 8-16%slope of about 670ha and 17% areas.
+ Soil fertility: medium(M).
+Soil reaction: Strong to medium acid (pH H_2O=4.6-5.0).

e.) Accessibility:

Potential areas	Condition of access road					
	District road		Provincial road		National road	
	Dry season	Wet season	Dry season	Wet season	Dry season	Wet season
Hatkham	A	C	C	C	C	C
Xiengxian-XiengLeu	A	C	A	C	A	C
Pakbuak	A	C	A	C	C	C

Note: Potential criteria **A** = Highest score
criteria **B** = Middle score
criteria **C** = Lowest score

f.) Electrification possibility

Potential areas	Sources of electrification possibility		
	National grid (Transmission line 22 kV from Paksan)	Small hydroelectric power project	Diesel generator
Hatkham	A	C	C
Xiengxian-XiengLeu	A	A	C
Pakbuak	A	C	C

Note: Potential criteria **A** = Highest score
criteria **B** = Middle score
criteria **C** = Lowest score

Table 01 : Location of Villages in the potential resettlement areas

Areas	Village Name	Location on map scale 1: 100,000 (Measured by Handle GPS)		Village established (year)
		N	E	
Hat Kham area	B. Hatkham	18 39.20'	103 35.30'	70
XiengXian-XiengLeu area	B. Thasi	18 50.64'	103 48.77'	400
	B. Nongdeng	18 48.30'	103 50.97'	3
	B. Kokpho	18 30'	103 53.5'	10
	B. Nakun	18 45.98'	103 54.38'	18
	B. Vha	18 44.22'	103 57.61'	4
	B. Xiengxian	18 43.17'	103 59.76'	11
	B. XienLeu	18 42.10'	104 01.20'	11
Phabuak area	B.Phabuak	18 34.35'	103 59.40'	50
	B.Pakpoy	18 32.30'	103 58.25'	11
	B.HinNgon	18 30.00'	104 00.15'	10
	B. NamLe	18 27.40'	104 01.40'	5

Table 02 Population in the potential resettlement areas

Areas	Village Name	Nb. Of H.H	Nb. Of Fam.	Population(pers.)			Ethnic group(pers.)		
				Total	Male	Female	Lao Lum	Lao Theung	Lao Soung
Hat Kham area	B. Hatkham	85	115	495	260	235	373	0	122
SubTotal		**85**	**115**	**495**	**260**	**235**	**373**	**0**	**122**
XiengXian-XiengLeu area	B. Thasi	82	90	424	208	216	325	99	0
	B. Nongdeng	36	39	178	94	84	0	178	0
	B. Kokpho	77	77	411	211	200	31	380	0
	B. Nakun	86	96	445	228	217	223	222	0
	B. Vha	29	39	133	72	61	1	132	0
	B. Xiengxian	48	65	238	100	138	2	235	1
	B. XienLeu	61	72	329	169	160	0	329	0
SubTotal		**419**	**478**	**2,158**	**1,082**	**1,076**	**582**	**1,575**	**1**
Phabuak area	B.Phabuak	107	113	578	250	328	154	423	1
	B.Pakpoy	47	47	292	149	143	3	289	0
	B.HinNgon	115	115	300	338	-38	5	295	0
	B. NamLe	50	66	310	147	163	0	310	0
SubTotal		319	341	1,480	884	596	162	1,317	1

Table 03 Infrastructure in the resettlement areas

Area	Village Name	Education level			Health services				Shops	Market	Water supply	Access road
		School	Students	Teachers	Hospital	Dispensary	Clinic	Pharmacy				
Hat Kham area	B. Hatkham	Primary(P1-P5)	125	7				2	3		Nam Ngiep River	Dry season only
SubTotal			**125**	**7**	**0**	**0**	**0**	**2**	**3**	**0**		
XiengXian-XiengLeu area	B. Thasi	Primary(P1-P5)	79	4				2	3		Nam Mang	Dry season only
	B. Nongdeng	Primary(P1-P2)	37	2					2		Water pipe	Dry season only
	B. Kokpho	Primary(P1-P3)	50	3					2		Small river	Dry season only
	B. Nakun	Primary(P1-P5)	117	3					7		Small river	Dry season only
	B. Vha	Primary(P1-P3)	58	3					3		Small river	Dry season only
	B. Xiengxian	Primary(P1-P3)	68	2					4		Well pump	Dry season only
	B. XienLeu	Primary(P1-P3)	68	3					3		Small river	Dry season only
SubTotal			**477**	**20**	**0**	**0**	**0**	**2**	**24**	**0**		
Phabuak area	B.Phabuak	Secondary(M1-M3)	Conpletion in April,2002 (have to open 2002-2003 year)									
		Primary(P1-P5)	100	5		1			7		Nam Sun	Dry season only
	B.Pakpoy	Primary(P1-P3)	58	2					1		Nam Sun & HouayPoy	Dry season only
	B.HinNgon	Primary(P1-P5)	121	5							Nam Sun	Dry season only
	B. NamLe	Primary(P1-P3)	50	2					1		Nam Sun	Dry season only
SubTotal			**329**	**14**	**0**	**1**	**0**	**0**	**9**	**0**		

Table 04 Agriculture area in the resettlement sites (Ha)

Areas	Village Name	Paddy Field with irrigation in wet seasion		Paddy Field without irrigation		Shifting Cultivation		Plantation /gardens	
		Area (ha)	Yield (T/ha)	Area (ha)	Yield (T/ha)	Area (ha)	Yield (T/ha)	Area (ha)	Yield (T/ha)
Hat Kham area	B. Hatkham			5	1.8	117	2.1	15(ha) Sucar cane	10
SubTotal		0	0	5		117		15(ha) Sucar cane	10
XiengXian-XiengLeu area	B. Thasi	10	2.5	108	2.8	22	1.8		
	B. Nongdeng	22	2.5	5	2.3	10	1.6		
	B. Kokpho			8	2.4				
	B. Nakun	30	2.6	120	2.6				
	B. Vha	41	3	109	3			10(ha)cassava	8
	B. Xiengxian	30	3	30	3			5(ha) cassava	7
	B. XienLeu			69	2.6				
SubTotal		133		449		32		15(ha) cassava	
Phabuak area	B.Phabuak	20	2.6	35	2.8	17	1.9		
	B.Pakpoy					50	1.7		
	B.HinNgon			22	2	75	1.5		
	B. NamLe	10	2.8	18	3	8	2.1		
SubTotal		30		75		150			

Note: The paddy area with irrigation in wet seasion is covered in the paddy land without irrigation

TABLE 05 : BOLIKHAMXAY PROVINCIAL ROADS DATABASE

Code Number	Road Class I. II. III. IV. V	Road name From	Road name To	Approximate length	Average Width of formation	Road condition
HYW No. 8	IV	Road 13 South	Vietnam Boundary	132	9	5
HYW . 13 S	IV	Vientiane Prefecture Boundary	Khammouan Boundary	185	6.5	2
11.01	V	Muangkao	Muanghuang	27	6.5	7
11.02	V	Muangkao	MuangBo	43	4	10
11.03	V	Pakxan	Muangkao	24	6.5	5
11.04	V	Km 20	Nam Veo	21	6.5	5
11.05	V	Km 20	Sopkhon	17	6.5	10
11.06	V	Pakxan	Nakhaolom	20	6.5	5
11.07	V	Km 20	Khammouan Boundary	40	6.5	5
11.08	V	HYW No.8	Ban Tha si (Xaysomboun boundary)	130	6.5	10
11.01.01	V	Pakxan	Ban Pakpung	5	6.5	5
11.01.02	V	HYW No.13	Xuan Savan Lak 4	5	6.5	5
11.02.01	V	HYW No.13	Ban Houay sayphay	3	6.5	5
11.02.02	V	HYW No.13	Ban Phonsan	3	4.5	5
11.02.03	V	HYW No.13	Ban Thouay	5	6	5
11.02.04	V	Ban Thouay	Ban Hongthong	7	4	7
11.02.05	V	HYW No.13	Ban Nakham	3	6	5
11.01.06	V	HYW No.13	Ban Veunthat	3	7.5	5
11.01.07	V	HYW No.13	Ban Hangxing	2	7.5	5
11.01.08	V	HYW No.13	Ban Kouay	3	6	5
11.01.10	V	HYW No.13	Ban Vangkhoma	5	6	5
11.01.11	V	HYW No.13	Sinxai	3	6	5
11.01.13	V	Ban Nongboua	Bokua-Ban Songkhon	8	5	5
11.01.14	V	HYW No.13	Ban Kengsadoc	3	6	5
11.01.03	V	HYW No.13	Ban Lao (Ban Phonpheng)	7	6	8
11.03.01	V	HYW No.13(Ban Nakhua-Noy)	Ban Nabouay	3	5	10
11.05.02	V	Kengdeng	Ban Nam Veo	20	4	10
11.05.03	V	Ban Houaykeo	Ban Mouan	7	4	5
11.05.04	V	Ban Makhuang	Ban Nahuang	5	5	10
11.05.05	V	Ban Mainamkoua	Ban Thaveng	5	4	10
11.05.07	V	Ban Soppho	Sopkhom	17	5	10
11.06.01	V	Ban Nam Yang	Bopso	15	5	10
11.04.01	V	Ban Muangkao	Na O Pkonkham	5	4	10

The district and provincial urban roads could not be shown on the map at scale 1 : 100,000 because the plotting to establish the map of this scale could not be shown all the roads as the large scale map.

Condition:

5 = *Passable by 2-WD car in all weather*
6 = Passable by 2-WD car in dry weather only
7= Passable by 4-WD car in all weather
8= Passable by 4-WD car in dry weather only
10= Not passable by 4-WD car at all

SOURCE: Ministry of Communication Transport Post and Construction
Communication Department
Technical and Planning Division.

Table P1: Development plan for irrigation in the Resettlement areas

No.	Project Name	Location	Water source	Irrigation area(ha)	Purpose
1	Nam mang project	B. Thasi	Nam Mang	1,000	Small hydroelectric & irrigation
2	Houay Mo project	B. Nakun	Houay Mo	150	Irrigation
3	Houay Mouang project	B. Vha	Houay Mouang	200	Irrigation
4	Houay Leu, Houay Poug project	B. XiengLeu	Houay Poug	200	Irrigation
5	Nam Joy project	PouHeo area	Nam Joy	1,250	Irrigation
6	Nam Lat project	B. XiengLeu	Nam Lat	320	Irrigation
	Total			**3,120**	

Source : Report of Water development planned in the Xiengxian-XiengLeu Area , Borikhan district

Status of projects.: Reconnaissance Study

Table P2 : Development plan for education in the Resettlement areas

No.	Project Name	Location	Period	Class-Through-	Size	Fund by
1	Construction Primary school	B.Xiengxian	2002-2003	P1-P5	8 x 46	Government of Luxembourg
2	Construction Primary school	B.XiengLeu	2002-2003	P1-P5	8 x 46	Government of Luxembourg
3	Construction Secondary school	B.Nakun	2002-2003	M1-M3	8 x 46	Government of Luxembourg

Source : Report of Water development planned in the Xiengxian-XiengLeu Area , Borikhan district

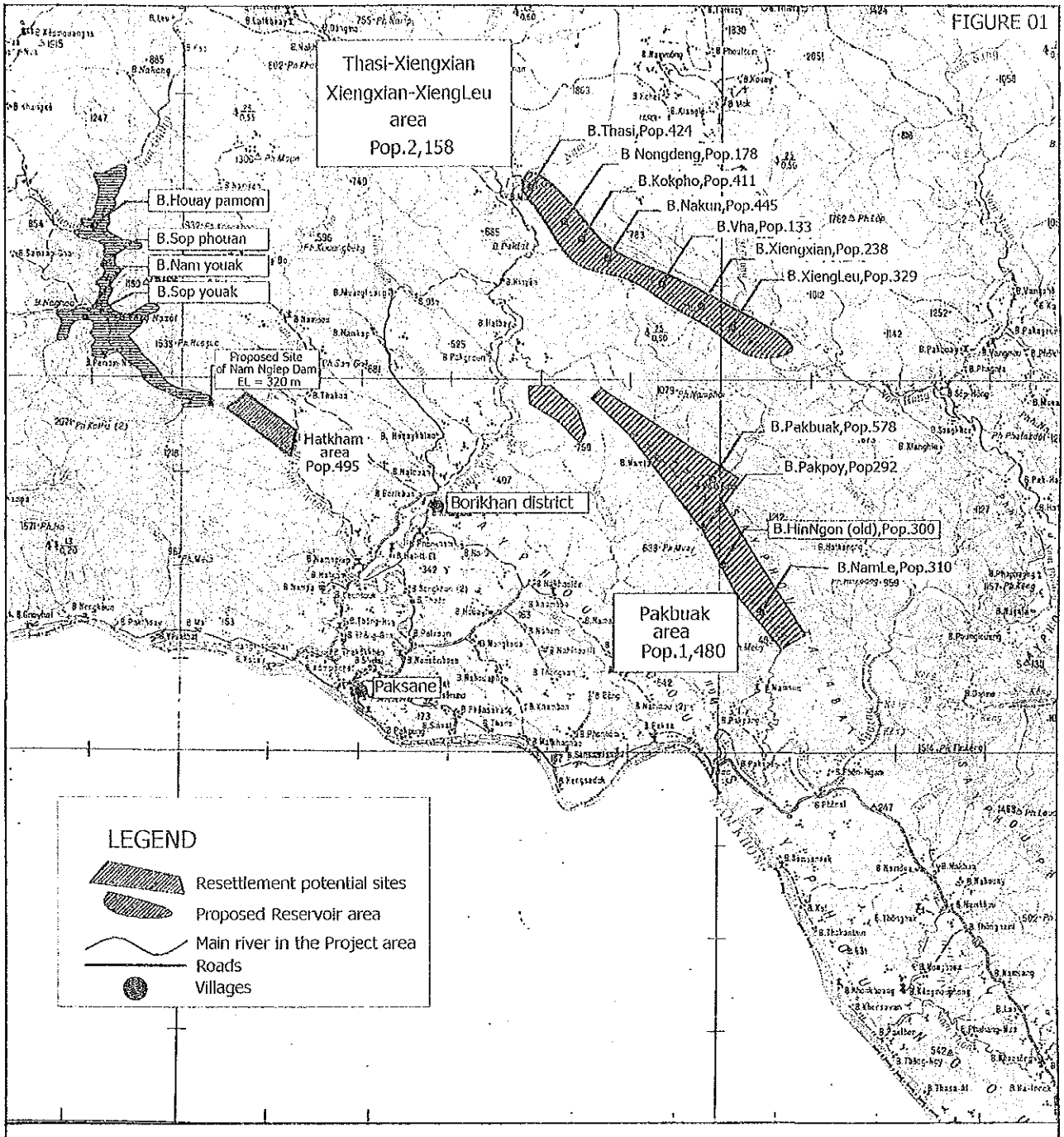
Table P3: Development plan for Public health in the Resettlement areas

No.	Project Name	Location	Planned	Description	Fund by
1	Hospital construction	Xiengxian-XiengLeu area	2002-2003	15 beds	Government of Luxembourg
2	Rural Water Supply (wells)	Xiengxian-XiengLeu	2002-2003	7dugwells with Pumping	Government of Luxembourg
3	Rural Water Supply (Spring)	Xiengxian-XiengLeu	2002-2003	2 places	Government of Luxembourg
4	Rural Water Supply (wells)	Phabuak	2002-2003	5 dugwells with Pumping	Government of Luxembourg
5	Rural Water Supply (Spring)	Phabuak	2002-2003	1 places	Government of Luxembourg

Source : Report of Water development planned in the Xiengxian-XiengLeu Area , Borikhan district

TableP4: Progress of the work end March 2002 of Lao-Luxembourg Integrated Rural Development Project

Project Name	Infrastructure
Large irrigation	Houay Xan scheme (120 ha) completion expected in April 2002 Nam Xao scheme (540 ha) partially constructed by province , to be completed by project-design work to start in May 2002 Nam Huang (63 ha) - design work to start in May 2002
Small irrigation	Construction of two schemes (Houay Kaleuang 16 ha. + Houay Noi Niau 17 ha.) completed 2 schemes under construction (Houay Keun 30 ha., Houay Phung 30 ha.) Completion expected by June 2002
Road construction	Combined labour and machine-based construction for two roads (31 km + 8km) started in march 2002 Survey and design of road from Muaang Kao to Phakbuak (63 km) in progress.
Market construction	Muang Kao market completion in April 2002. Pha Muang Market construction starting April 2002
Water sanitation	Needs assessment for boreholes, dugwells,gravity feed systems and latrines made in 7 villages in Thasi-Xieng Leu area . Designs made for 3 gravity feed systems. Construction planned for April 2002.
School construction	Construction of Phakbuak Village Primary School - completion in April 2002. Construction of Bo Village Secondary School by "training cum construction" started in December 2001 completion May 2002. 3 more school to be constructed before end of Phase II.
Community Development	
Environment	EIAs carried out for each large irrigation scheme construction and each proposed road construction.
Impact	Good results and good villager participation.
Assessments	Many recommendations for waste reduction during construction establishment of watershed protection areas for irrigation schemes. Final EIA of road from Muang Kao to Phakbuak carried out during March 2002 without supervision from consulting company.
Irrigation Management Transfer	Land holding surveys prepared for each sheme and land reallocation where necessary (on going).Participation of students from irrigation college. Water user group establishment and training initiated for H. Kaleuang and H.Xan
Land Use Planning	Land reallocation work now underway in Houay Xan irrigation area and new allocation in 3 villages in Thasi - XiengLeu area now complete
Village forestry	Watershed conseavation activities started in watershed of Houay Xan irrigation scheme(covering7villages) Mappin g and environmental awareness raising now in progress.
Training in agriculture and	.Establishment of mulberry plantations for later silk worm raising started in Ban Bo area planning for handicraft training started
Microfinance	District Microfinance Team establihed and trained in participatory rural appraisal Initial assesments carried out in 4 target villages Activity to start in
Government staff capacity building	Government staff attend seminars on rural development training courses in project management and study tours to othe provinces and countries English language training underway computer training planned



LOCATION MAP OF RESETTLEMENT POTENTIAL SITES

SCALE 1: 500,000

11 BOLIKHAMSAY PROVINCE

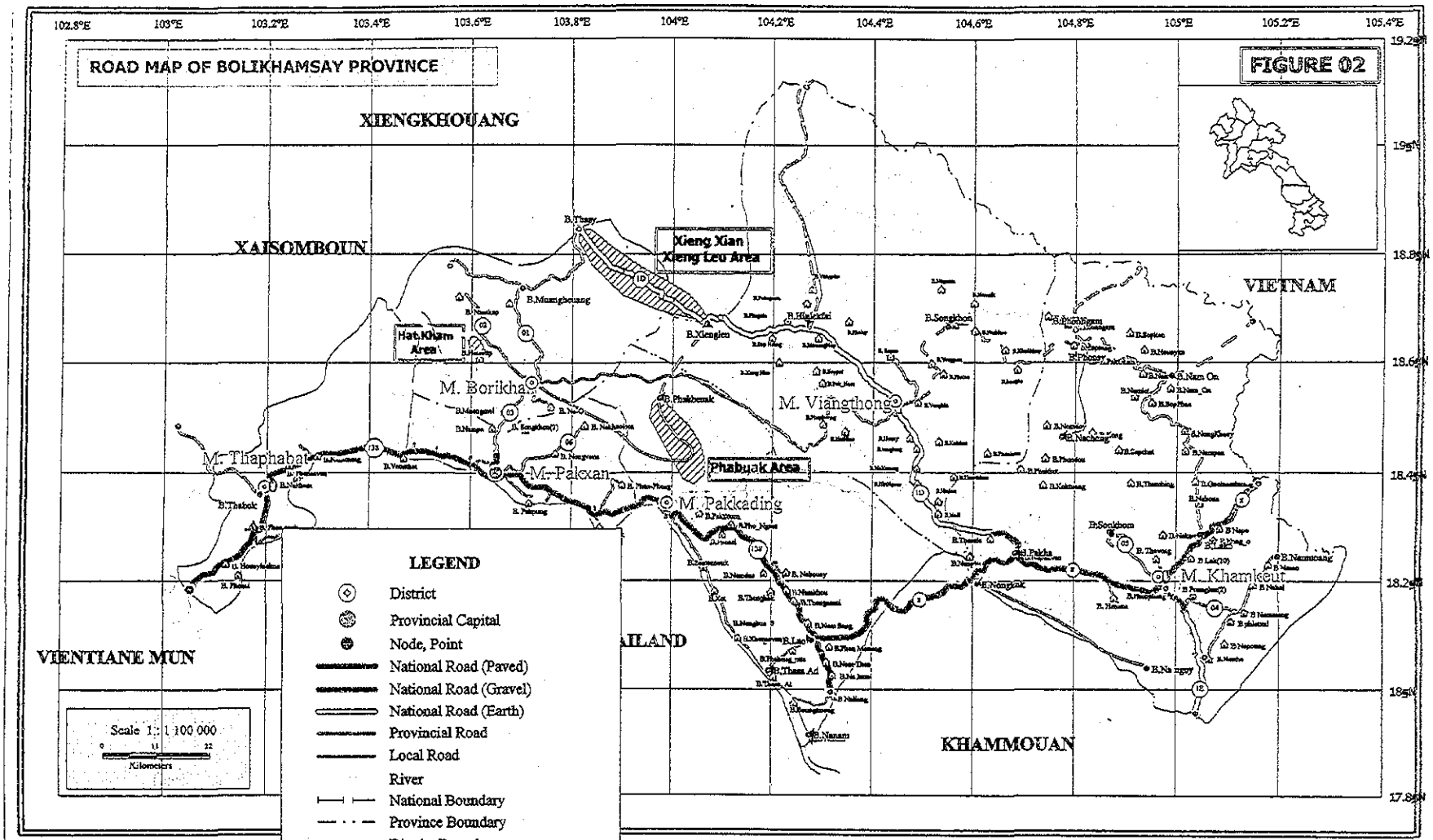
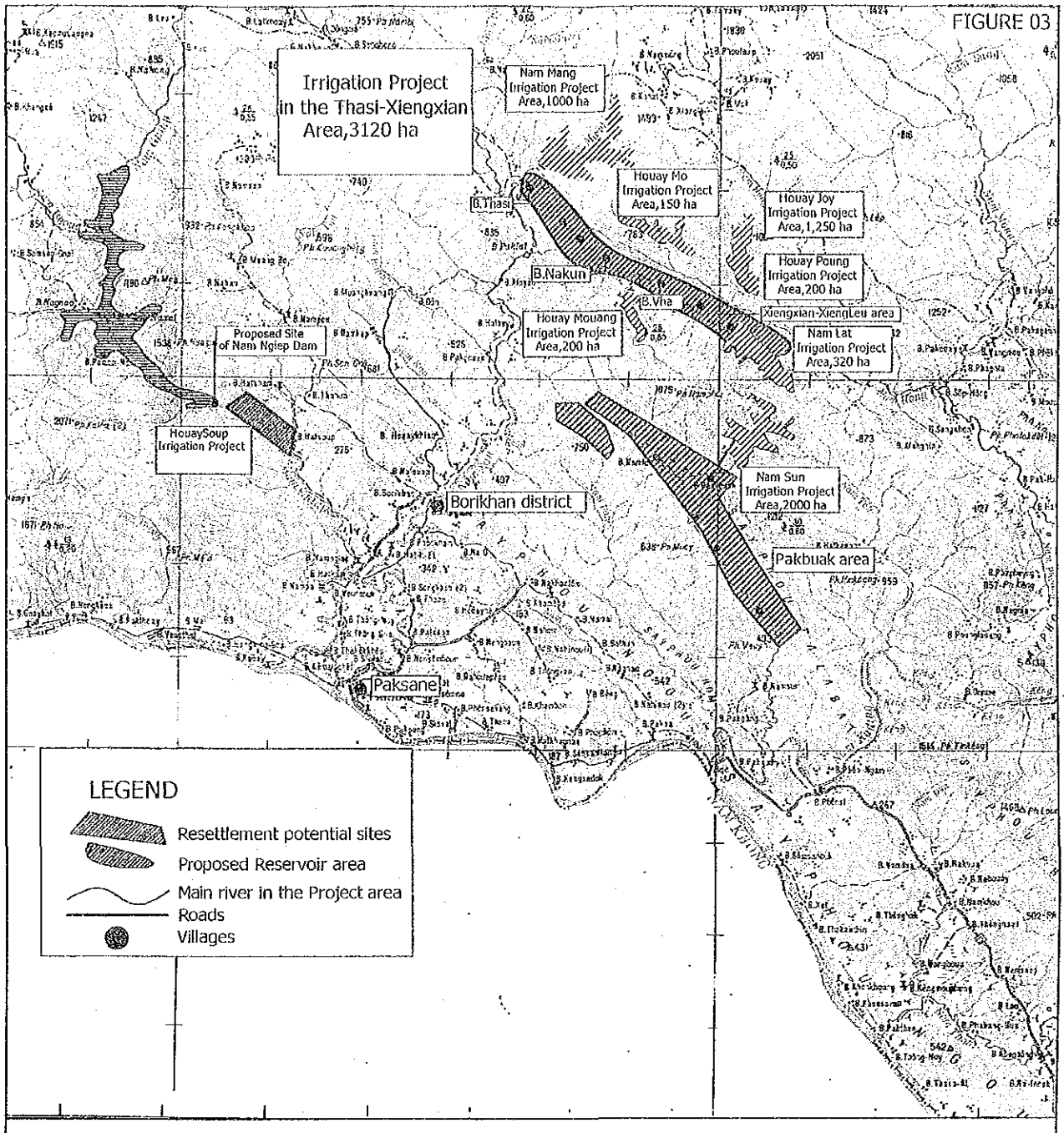


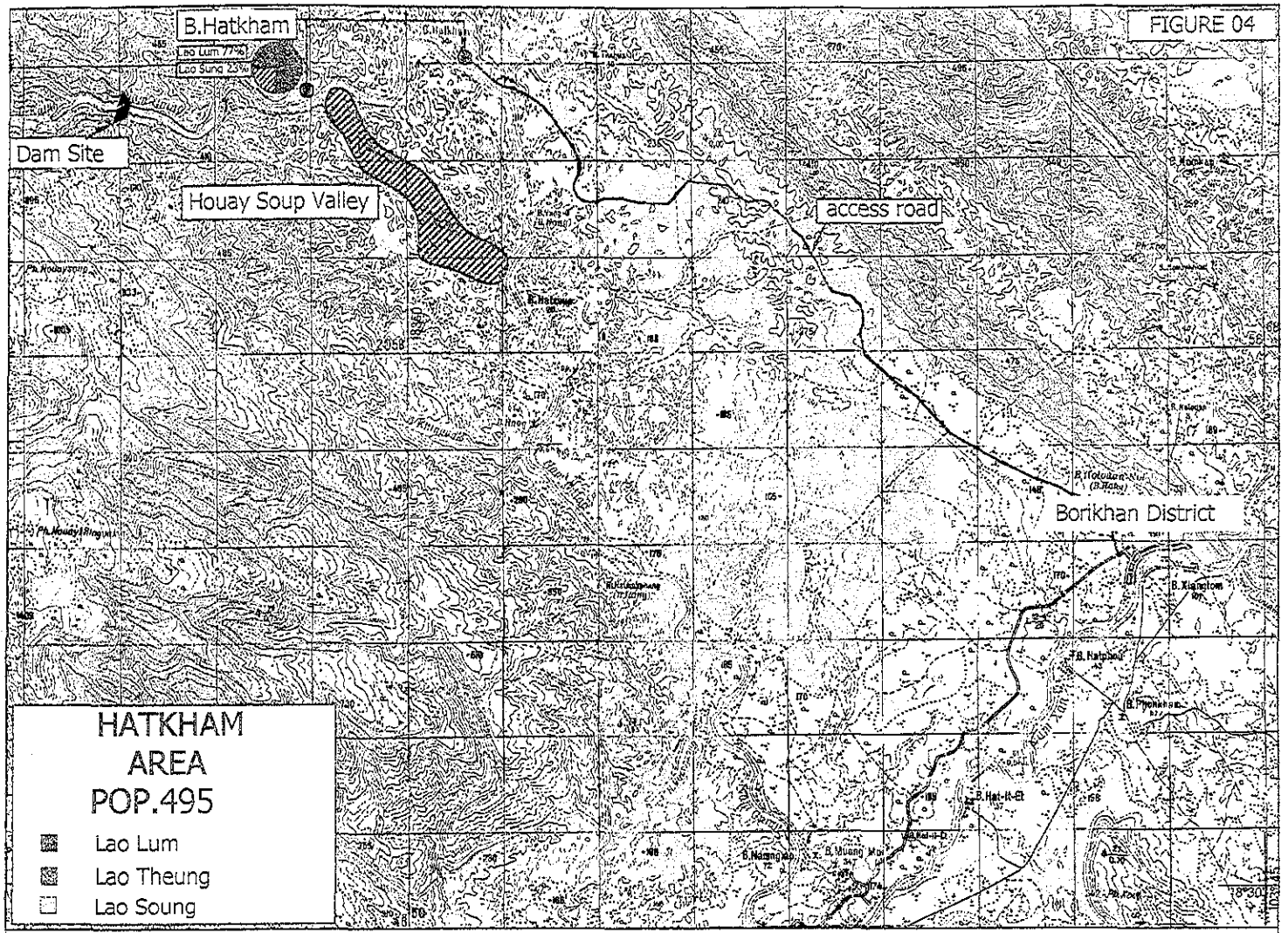
FIGURE 03



LOCATION MAP OF WATER SOURCE IN THE RESETTLEMENT SITES

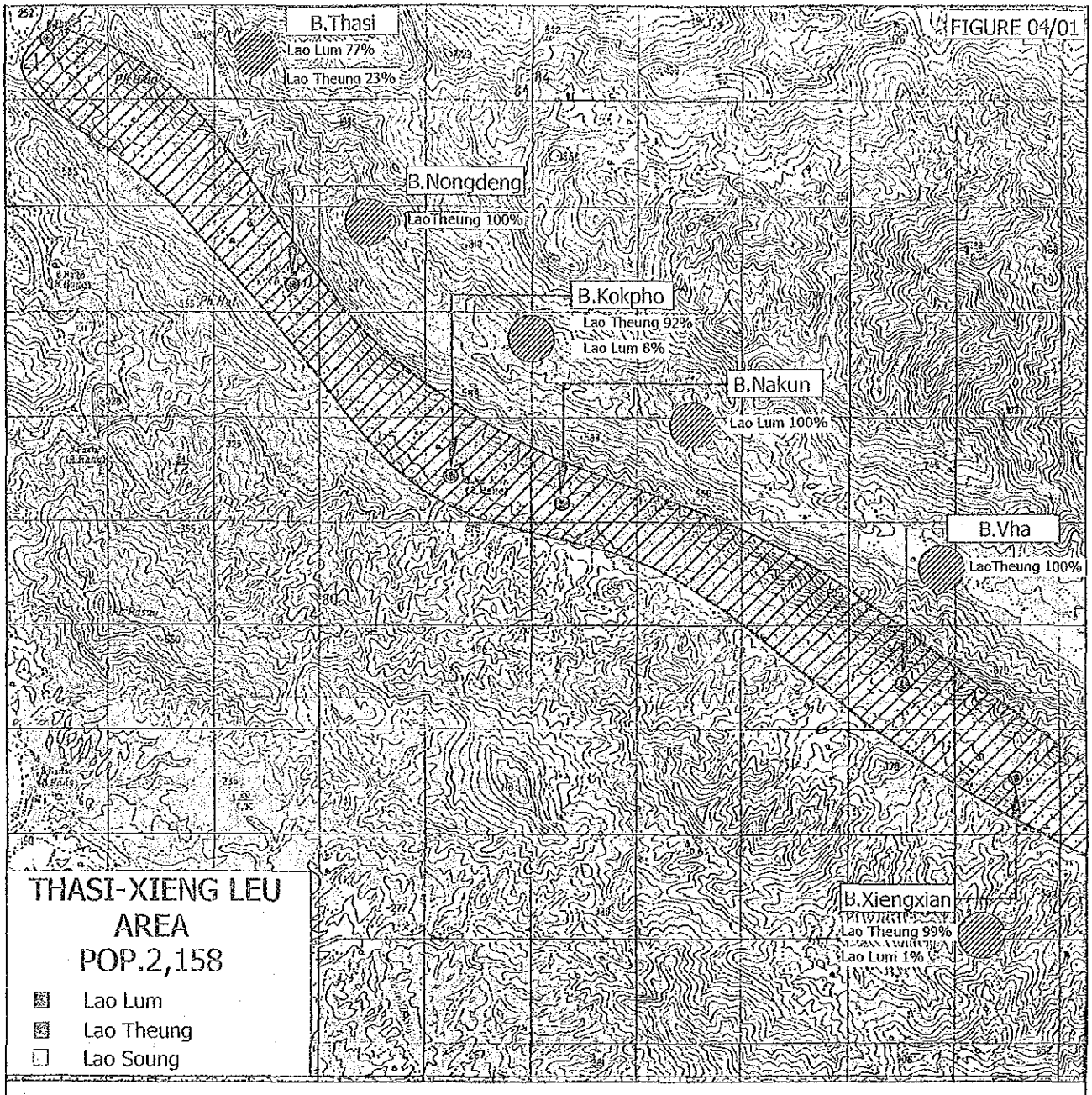
SCALE 1: 500,000

FIGURE 04



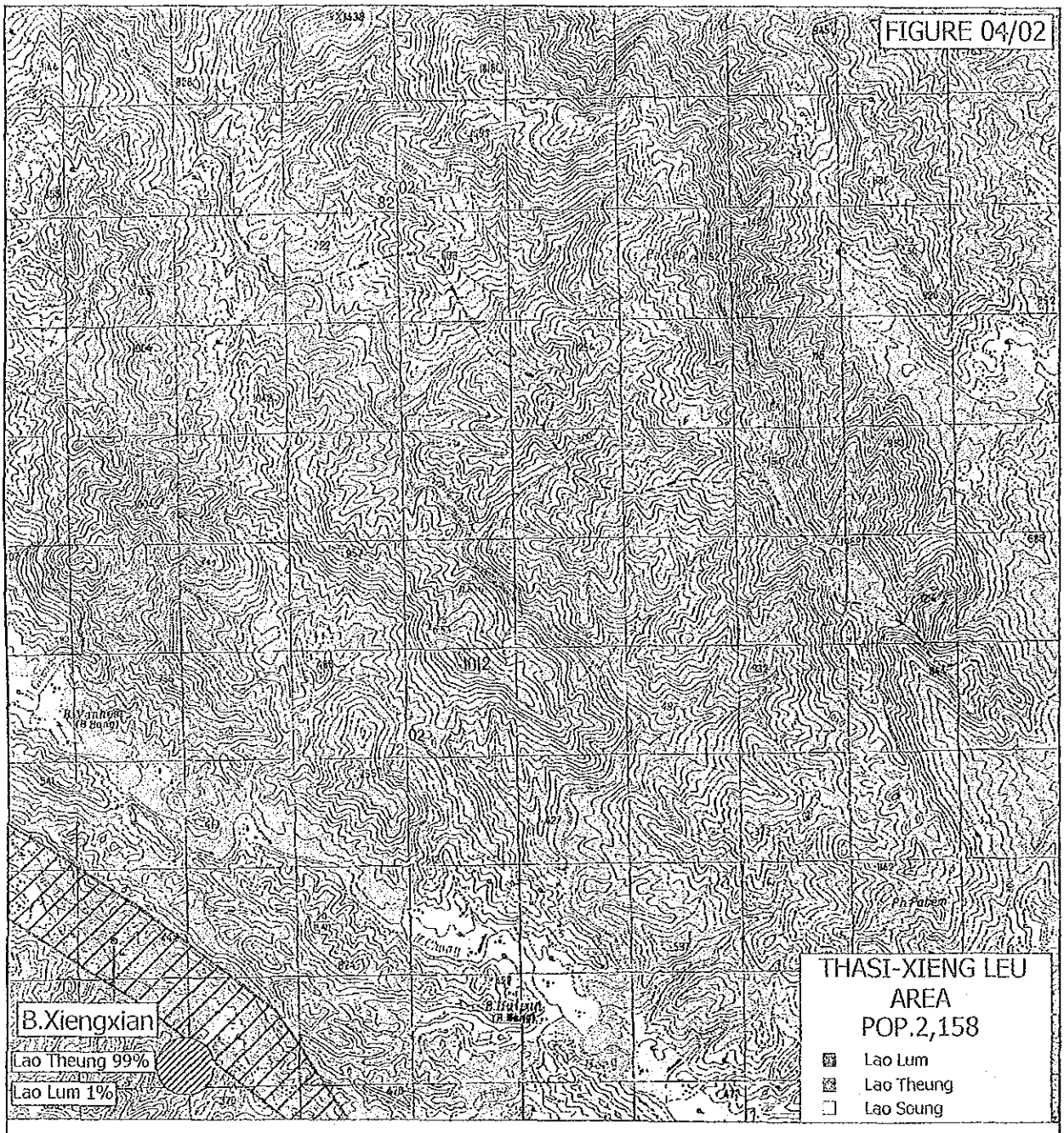
Population by Ethnic groups
in Hatkham area
Scale 1: 100,000

FIGURE 04/01



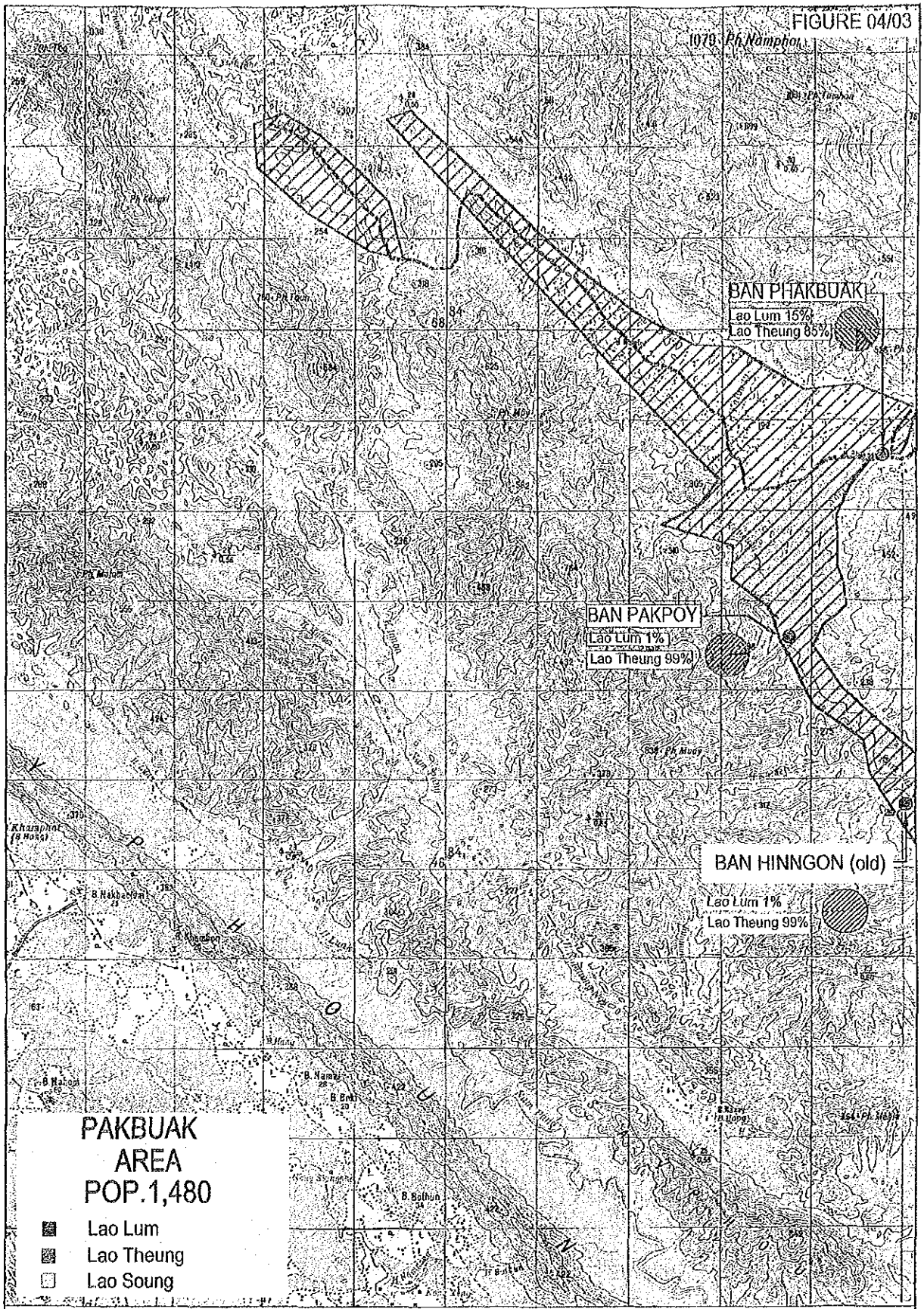
Population by Ethnic groups in Thasi- XiengXiane- XiengLeu area Scale 1: 100,000

FIGURE 04/02



Population by Ethnic groups in
Thasi- XiengXiane- XiengLeu area
Scale 1: 100,000

FIGURE 04/03



Population by Ethnic groups in
Pakbuak area
Scale 1: 100,000