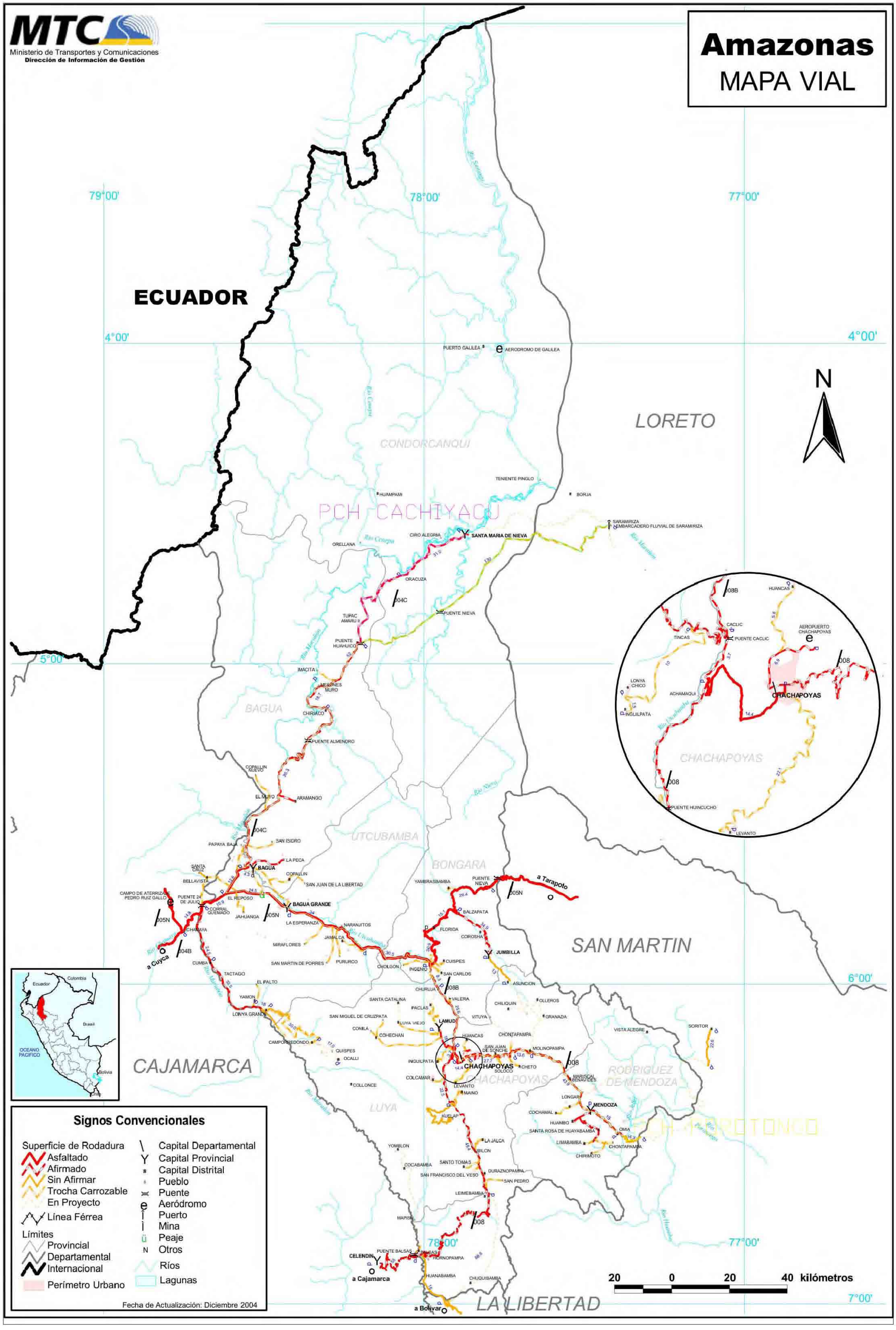
Appendix II Access Route for Project Sites

MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Amazonas
MAPA VIAL



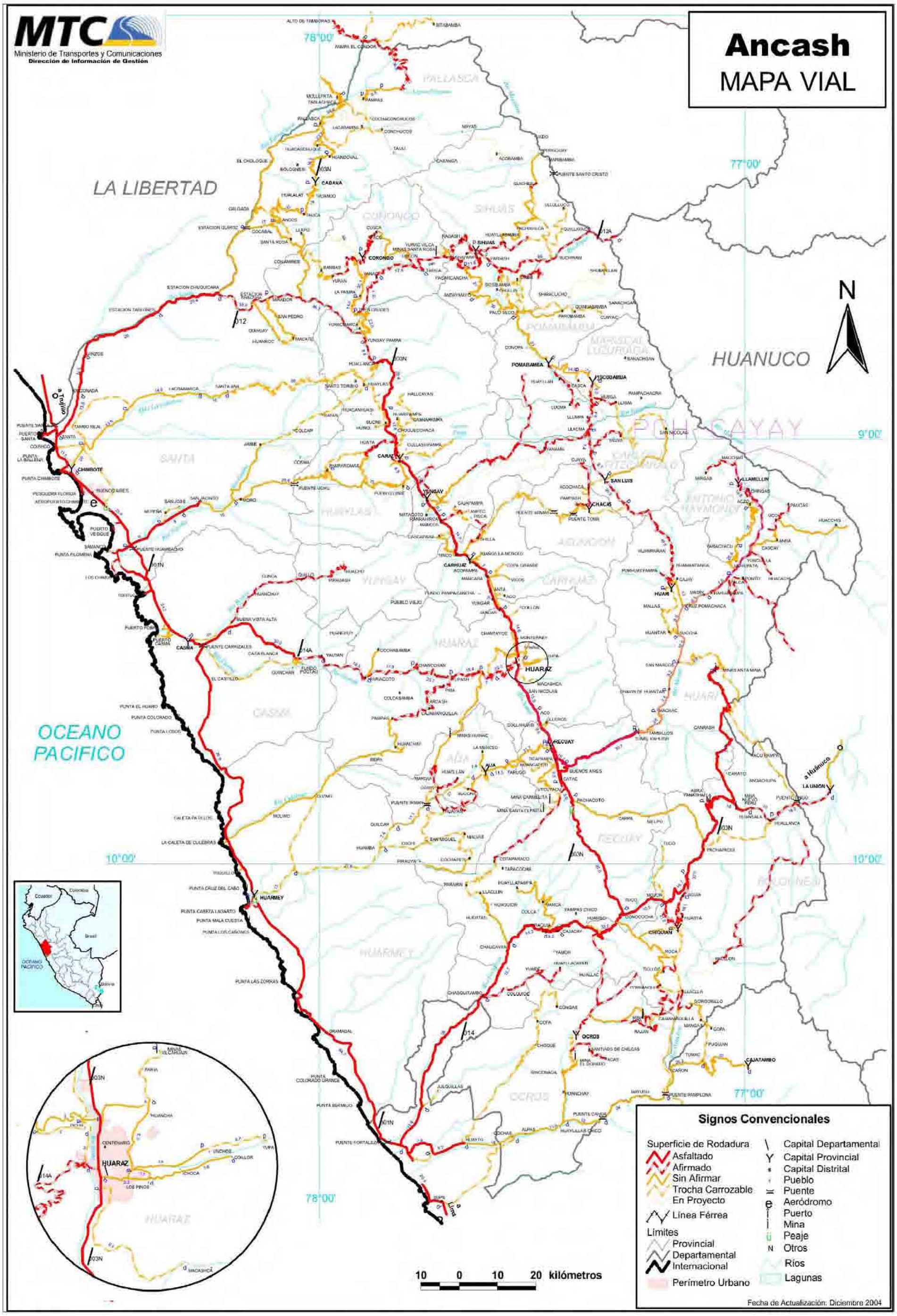
Signos Convencionales

Superficie de Rodadura	Capital Departamental
Asfaltado	Capital Provincial
Afirmado	Capital Distrital
Sin Afirmar	Pueblo
Trocha Carrozable	Puente
En Proyecto	Aeródromo
Línea Férrea	Puerto
Límites	Mina
Provincial	Peaje
Departamental	Otros
Internacional	Ríos
Perímetro Urbano	Lagunas

Fecha de Actualización: Diciembre 2004

MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Ancash
MAPA VIAL



MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Arequipa
MAPA VIAL

MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Cajamarca
MAPA VIAL

Signos Convencionales

Superficie de Rodadura
- Asfaltado
- Afirmado
- Sin Afirmar
- Trocha Carrozable
- En Proyecto
- Línea Férrea

Límites
- Provincial
- Departamental
- Internacional
- Perímetro Urbano

- Capital Departamental
- Capital Provincial
- Capital Distrital
- Pueblo
- Puente
- Aeródromo
- Puerto
- Mina
- Peaje
- Otros
- Ríos
- Lagunas

Fecha de Actualización: Diciembre 2004

ECUADOR
PIURA
AMAZONAS
LAMBAYEQUE
LA LIBERTAD
SAN IGNACIO
JAEN
CUTERVO
CHOTA
SANTA CRUZ
HUALGAYOC
CELENDIN
CONTUMAZA
CAJAMARCA
SAN MARCOS
CHACHAPOYAS
CAJABAMBA

79°00' 78°00' 7°00' 6°00' 5°00'

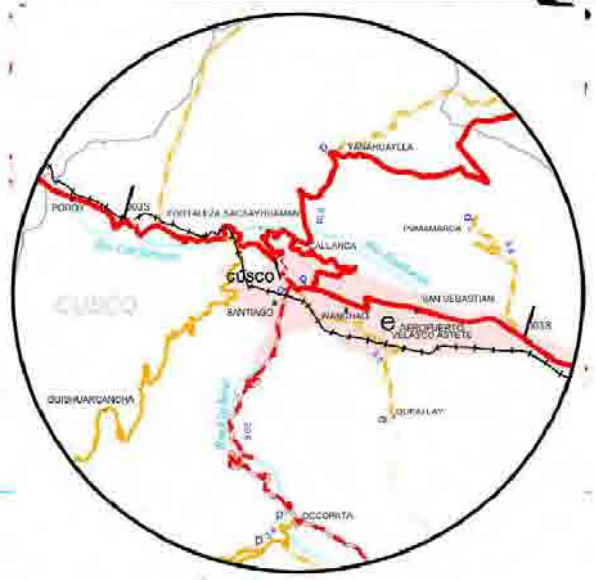
N

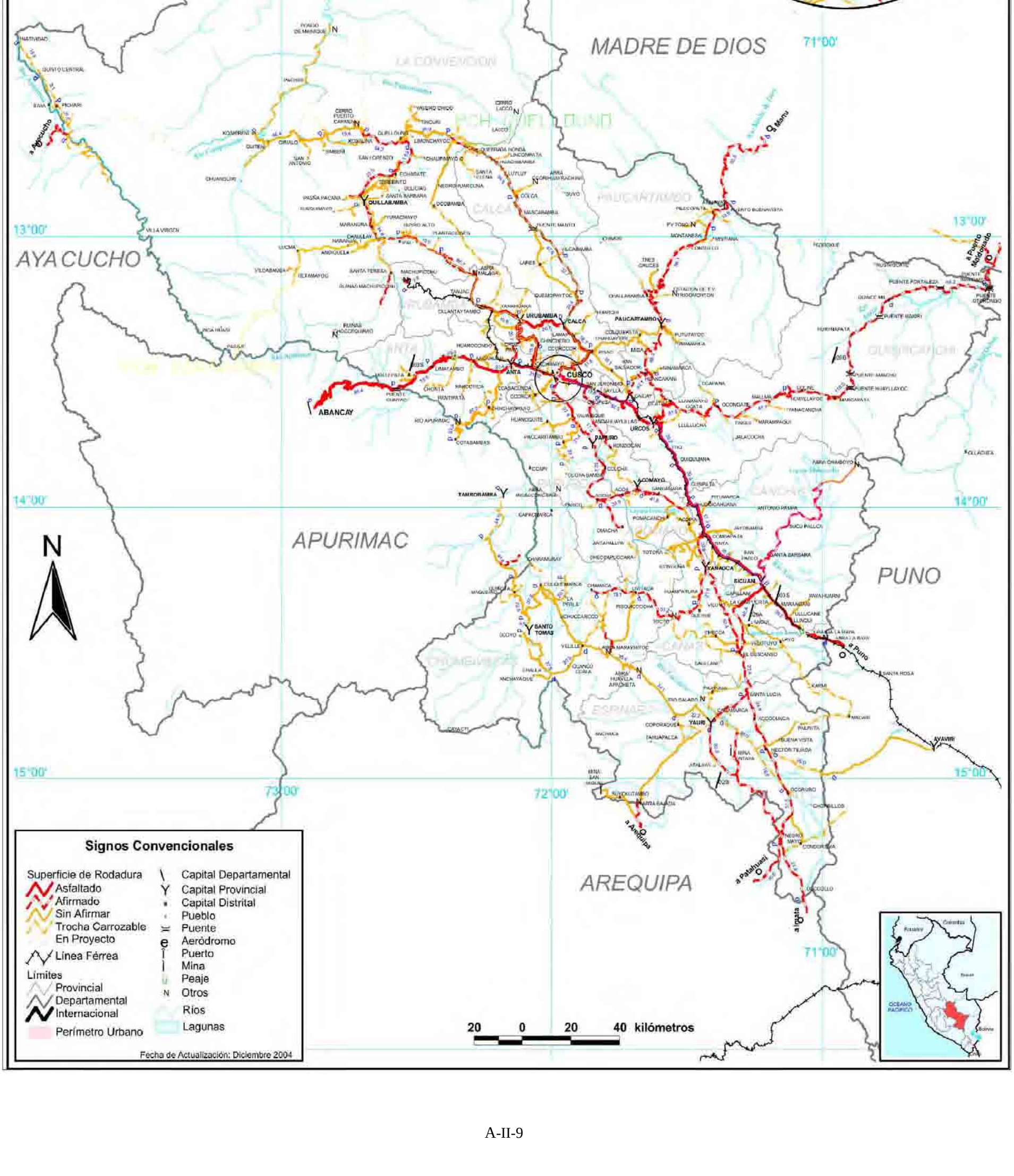
10 0 10 20 kilómetros

Ecuador Colombia Brasil Bolivia Chile OCEANO PACIFICO

MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Cusco
MAPA VIAL





MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Huánuco
MAPA VIAL

Signos Convencionales

Superficie de Rodadura
- Asfaltado
- Afirmado
- Sin Afirmar
- Trocha Carrozable
- En Proyecto

Línea Férrea

Límites
- Provincial
- Departamental
- Internacional

Perímetro Urbano

- Capital Departamental
- Capital Provincial
- Capital Distrital
- Pueblo
- Puente
- Aeródromo
- Puerto
- Mina
- Peaje
- Otros
- Rios
- Lagunas

Fecha de Actualización: Diciembre 2004

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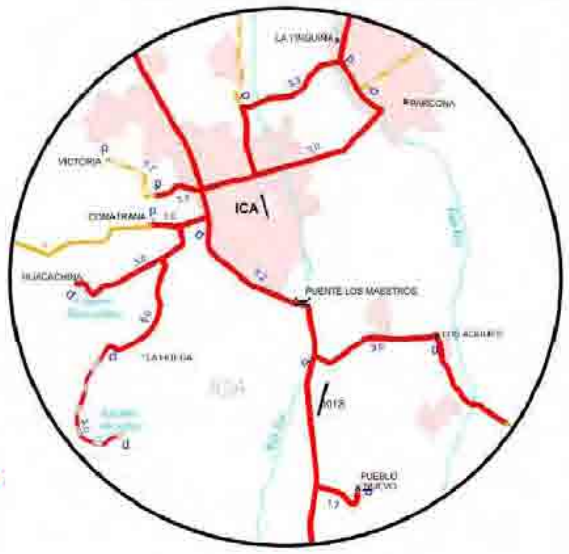
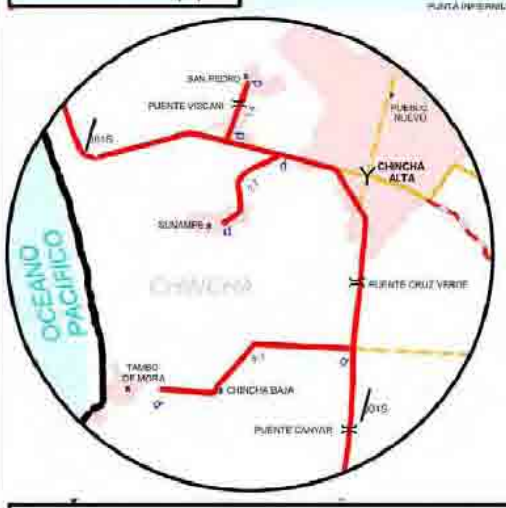
MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Ica
MAPA VIAL





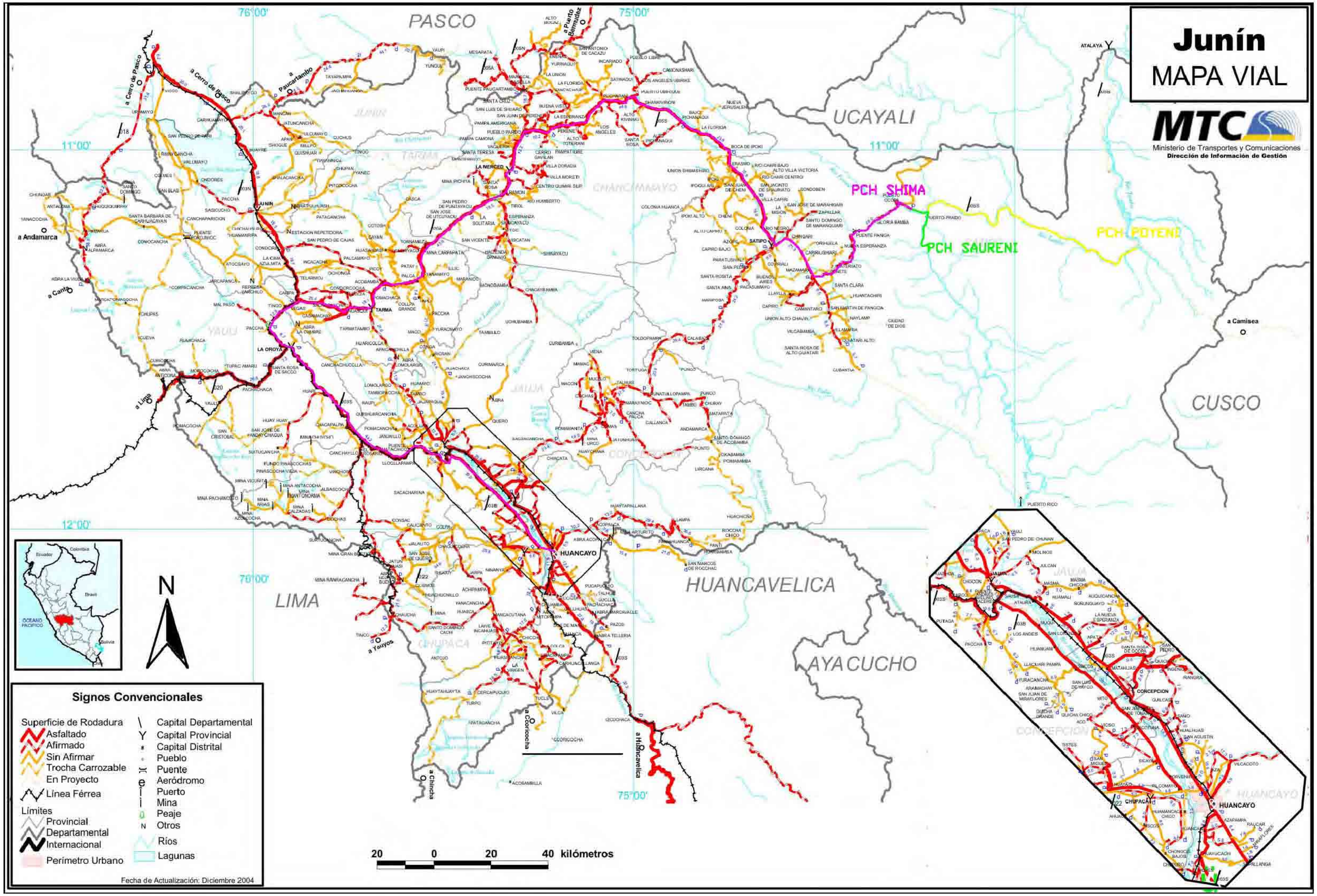
Signos Convencionales

Superficie de Rodadura	Capital Departamental
Asfaltado	Capital Provincial
Afirmado	Capital Distrital
Sin Afirmar	Pueblo
Trocha Carrozable	Puente
En Proyecto	Aeródromo
Línea Férrea	Puerto
Límites	Mina
Provincial	Peaje
Departamental	Otros
Internacional	Ríos
Perímetro Urbano	Lagunas

Fecha de Actualización: Diciembre 2004

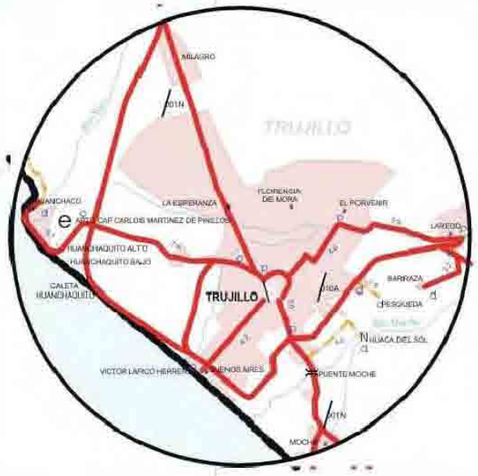
N

10 0 10 20 kilómetros


Junín
MAPA VIAL
MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión
PASCO
UCAYALI
CUSCO
LIMA
HUANCAVELICA
AYACUCHO
PCH SHIMA
PCH SAURENI
PCH POTENI
HUANCAYO
JAUJA
CONCEPCION
CHUPACA
TARMA
LA OROYA
SATIPO
LA MERCED
N
Signos Convencionales
Superficie de Rodadura
Asfaltado
Afirmado
Sin Afirmar
Trocha Carrozable
En Proyecto
Línea Férrea
Límites
Provincial
Departamental
Internacional
Perímetro Urbano
Capital Departamental
Capital Provincial
Capital Distrital
Pueblo
Puente
Aeródromo
Puerto
Mina
Peaje
Otros
Ríos
Lagunas
20 0 20 40 kilómetros
Fecha de Actualización: Diciembre 2004

MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

La Libertad
MAPA VIAL



N

Signos Convencionales

Superficie de Rodadura
- Asfaltado
- Afirmado
- Sin Afirmar
- Trocha Carrozable
- En Proyecto
- Línea Férrea

Límites
- Provincial
- Departamental
- Internacional
- Perímetro Urbano

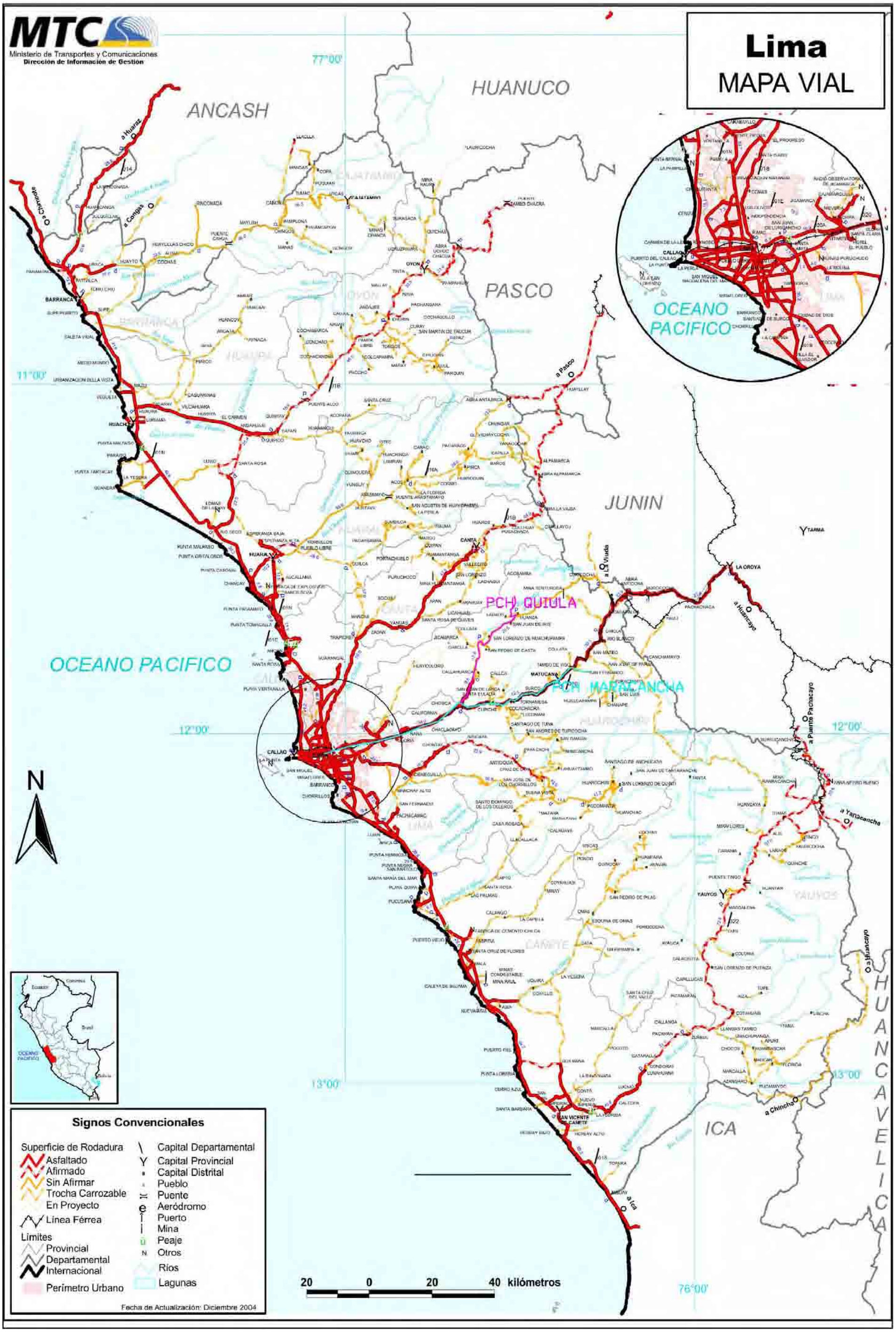
- Capital Departamental
- Capital Provincial
- Capital Distrital
- Pueblo
- Puente
- Aeródromo
- Puerto
- Mina
- Peaje
- Otros
- Ríos
- Lagunas

Fecha de Actualización: Diciembre 2004

20 0 20 40 kilómetros

MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Lima
MAPA VIAL



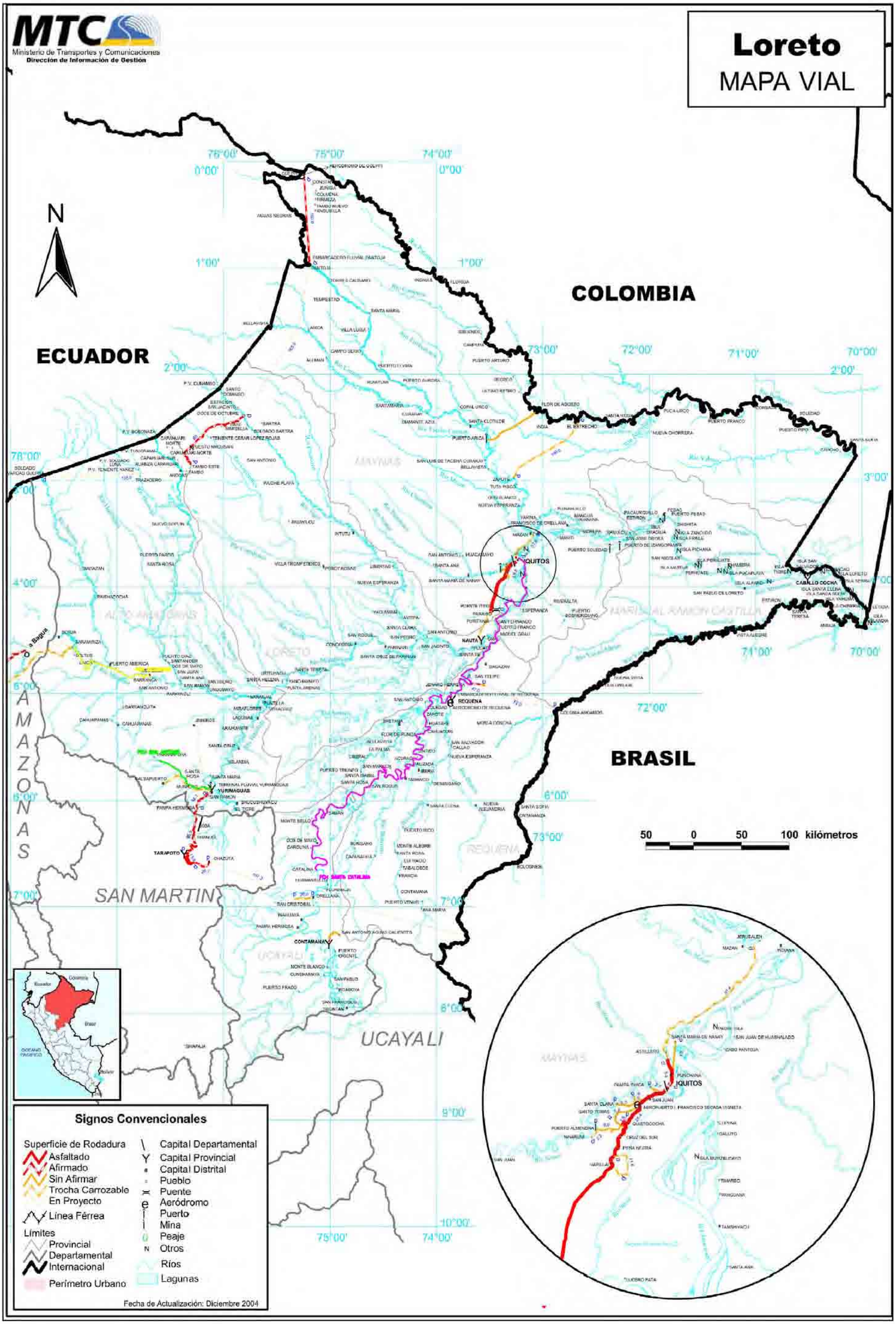
Signos Convencionales

Superficie de Rodadura	Capital Departamental
Asfaltado	Capital Provincial
Afirmado	Capital Distrital
Sin Afirmar	Pueblo
Trocha Carrozable	Puente
En Proyecto	Aeródromo
Línea Férrea	Puerto
Límites	Mina
Provincial	Peaje
Departamental	Otros
Internacional	Ríos
Perímetro Urbano	Lagunas

Fecha de Actualización: Diciembre 2004

MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Loreto
MAPA VIAL



Puno
MAPA VIAL

MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Signos Convencionales

Superficie de Rodadura
- Asfaltado
- Afirmado
- Sin Afirmar
- Trocha Carrozable
- En Proyecto
- Línea Férrea

Límites
- Provincial
- Departamental
- Internacional
- Perímetro Urbano

- Capital Departamental
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- Capital Distrital
- Pueblo
- Puente
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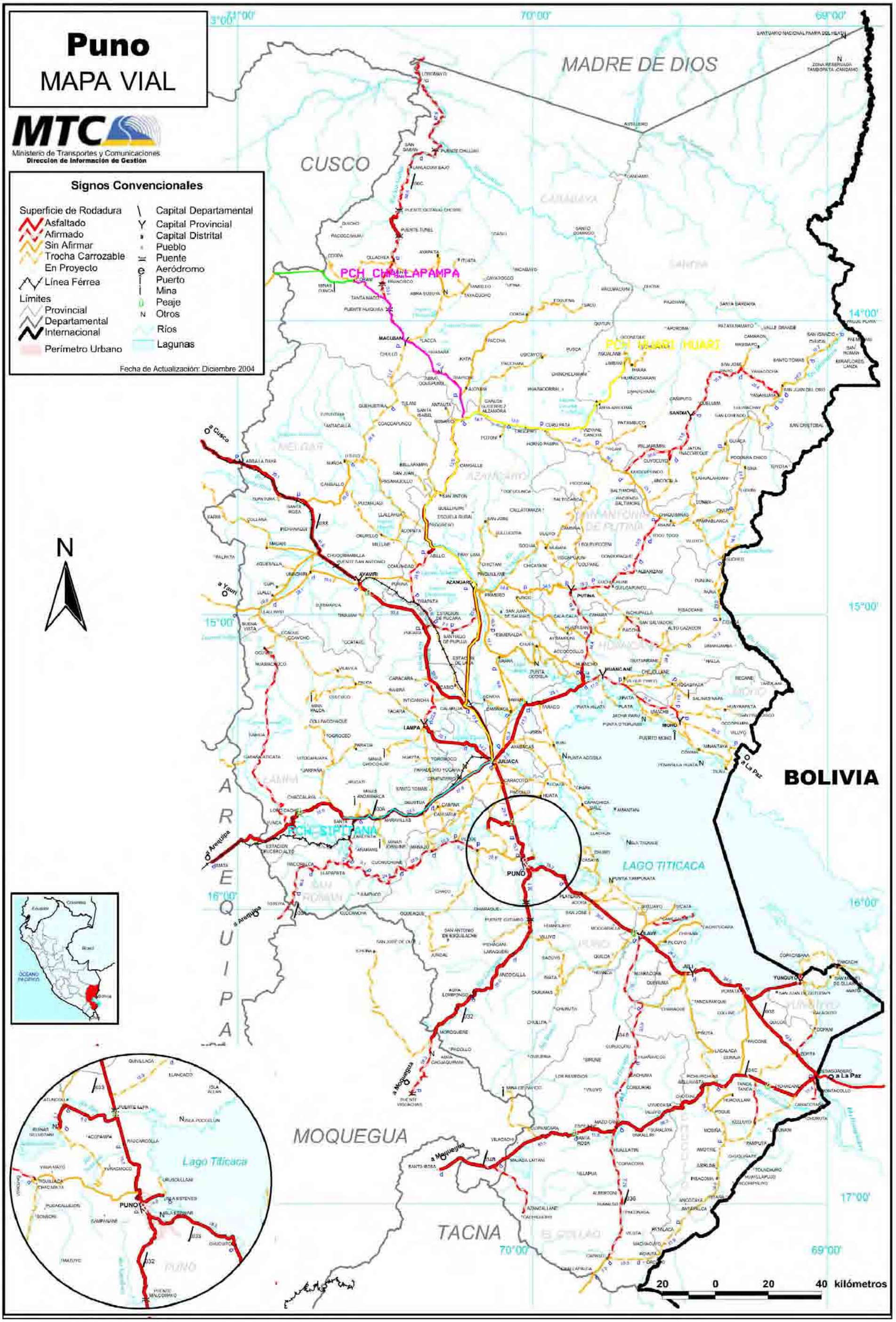
- Otros
- Ríos
- Lagunas

Fecha de Actualización: Diciembre 2004



Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

San Martín
MAPA VIAL

Signos Convencionales

Superficie de Rodadura
- Asfaltado
- Afirmado
- Sin Afirmar
- Trocha Carrozable
- En Proyecto
- Linea Férrea

Limites
- Provincial
- Departamental
- Internacional
- Perimetro Urbano

- Capital Departamental
- Capital Provincial
- Capital Distrital
- Pueblo
- Puente
- Aeródromo
- Puerto
- Mina
- Peaje
- Otros
- Rios
- Lagunas

Fecha de Actualización: Diciembre 2004

PCH SELECACHI

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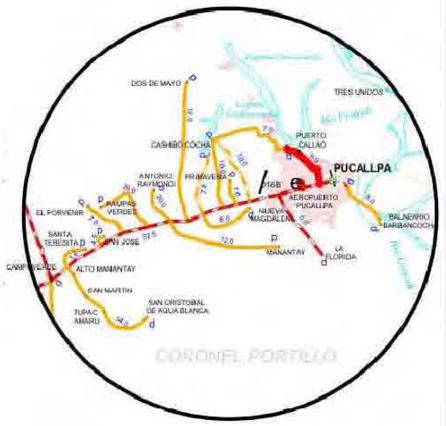
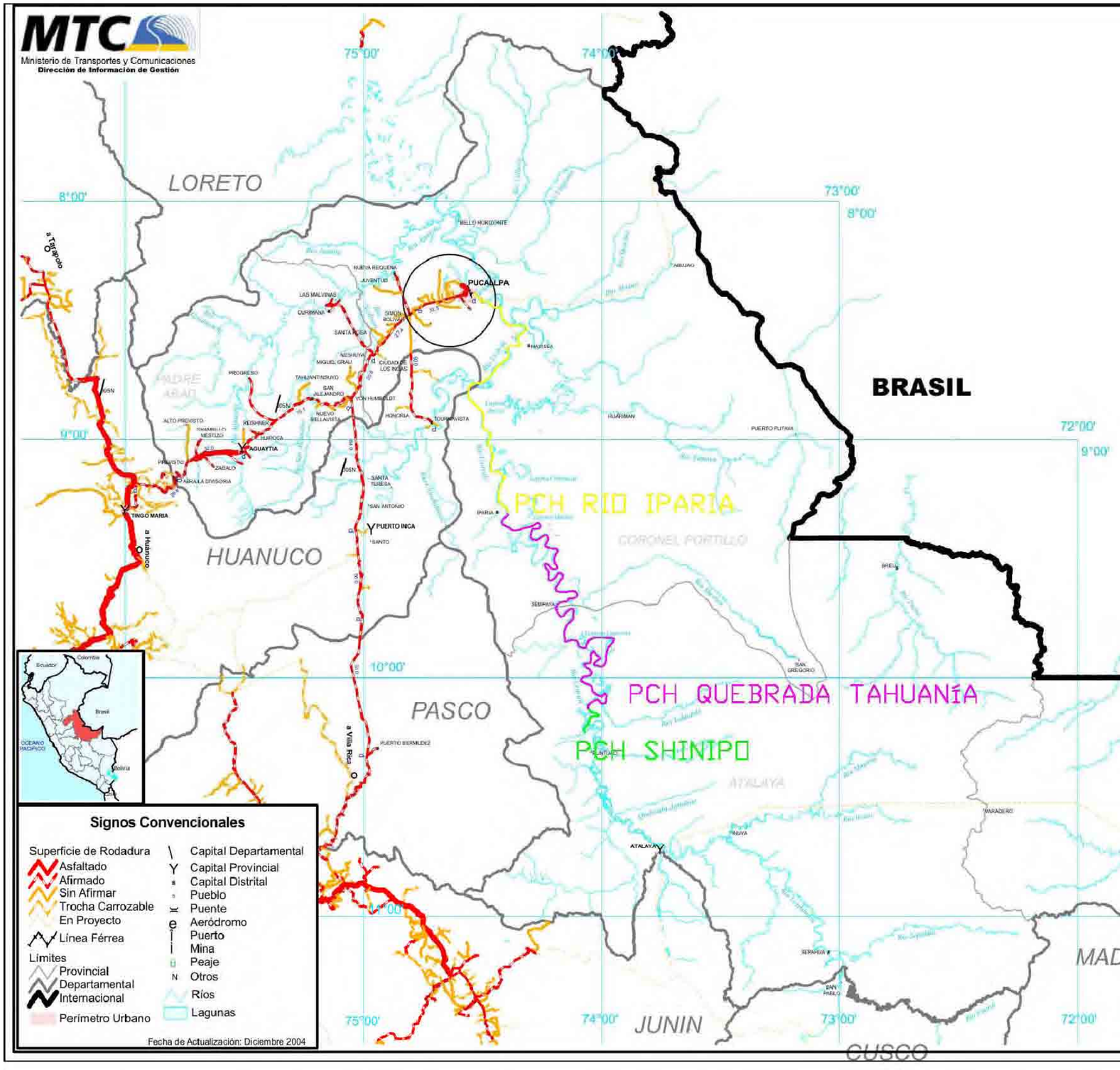
MTC
Ministerio de Transportes y Comunicaciones
Dirección de Información de Gestión

Ucayali
MAPA VIAL





Signos Convencionales

Superficie de Rodadura
- Asfaltado
- Afirmado
- Sin Afirmar
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- En Proyecto
- Línea Férrea

Límites
- Provincial
- Departamental
- Internacional
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- Capital Departamental
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- Puerto
- Mina
- Peaje
- Otros
- Ríos
- Lagunas

Fecha de Actualización: Diciembre 2004

Appendix III Changes after Electrification in Four Surveyed Electrified Communities

Appendix III Changes After Electrification in Four Surveyed Electrified Communities

Appendix III-1 Table 1: Principal changes relating to improvement of income and production

Localidad/ community	Cambio	change	number	Activity
Balsapuerto	PUEDE HACER SUS ARTESANIAS	Can do handicrafts.	6	handicrafts
	PUEDE COSER HASTA TARDE	Can sew till night.	4	Sewing
	VENDEN HASTA MAS TARDE (NOCHE)	Sell more trade (night).	3	running shop
	PUEDO CONGELAR LOS PRODUCTOS QUE VENDE	Can freeze products for sale.	2	
Catilluc	SE HA INSTALADO UN CENTRO ACOPIO DE LECHE	Milk collection centre was installed.	8	milk production
	HAY MAYOR PRODUCTIVIDAD DE LECHE	More milk production.	5	milk production
	HAY MAYOR USO DE ASERRADEROS	More use of sawmills.	5	lumbering
	LE DEDICA MAS TIEMPO AL TRABAJO	Dedicate more time for working.	4	
	VENDEN HASTA MAS TARDE (NOCHE)	Sell more trade (night).	2	running shop
	AVANZAN CON SUS TEJIDOS POR LAS NOCHES SIN PROBLEMAS	Advance weaving at night without problem.	1	weaving
	LE DEDICAN MAS TIEMPO AL TRABAJO	Dedicate more time for working.	1	
	OBTIENEN MAS GANANCIA	Obtain more gain.	1	
	PUEDE COSER HASTA TARDE	Can sew till night.	1	sewing
	TEJEN MAS CANTIDAD	Weave more quantity/ more production.	1	weaving
Comunidades en Isla de Taquile	AVANZAN CON SUS TEJIDOS POR LAS NOCHES SIN PROBLEMAS	Advance weaving at night without problem.	40	weaving
	TEJEN EN MAYOR CANTIDAD / MAS PRODUCCION	Weave more quantity/ more production.	23	weaving
	OBTIENEN MAS GANANCIA	Obtain more gain.	13	
	DEMORAN MENOS TIEMPO EN TEMINAR SUS PRODUCTOS	Less delay of terminating production.	12	
	AHORA TERMINAN SUS TRABAJOS MAS RAPIDO	Finish work more quickly.	10	
	TEJEN MAS CANTIDAD	Weave more quantity/ more production.	8	weaving
	LE DEDICA MAS TIEMPO AL TRABAJO	Dedicate more time for working.	6	
Gran Perú	VENDEN HASTA MAS TARDE (NOCHE)	Sell more trade (night).	2	running shop
	VENDEN HASTA MAS TARDE (NOCHE)	Sell more trade (night).	3	running sshop

Note: Changes that more than five respondents of all four communities are listed.
Source: JICA Study Team 2008

Appendix III-2 Table 2: Principal changes relating improvement of improvement of quality of life

Localidad	cambio	change	num
Balsapuerto	PUEDEN VER TELEVISION	Can watch television.	10
	LOS NINOS PUEDEN ESTUDIAR DE NOCHE	Children can study at night.	7
	HAY MAS COMODIDAD DE HACER LAS COSAS CON LUZ	More convenient to do matters with light.	6
	COCINAN LA CENA MAS TARDE	Prepare supper later (after dark).	2
	LA CALIDAD DE VIDA ES MEJOR CON LA LUZ ELECTRICA	Quality of living is better because of electric light.	2
	AHORA SE ALUMBRAN CON LUZ ELECTRICA	Now have electric light.	1
	HAY MAYOR USO DE ELECTRODOMESTICOS	Better usage of domestic electricity.	1
Catilluc	AHORA SE ALUMBRAN CON LUZ ELECTRICA	Now have electric light.	16
	AHORA SOLO ENCIENDEN FOCOS PARA ALUMBRARSE	Only put on the bulb for light.	12
	HAY MAYOR USO DE ELECTRODOMESTICOS	Better usage of domestic electricity.	12
	LOS NINOS PUEDEN ESTUDIAR DE NOCHE	Children can study at night.	6
	LA CALIDAD DE VIDA ES MEJOR CON LA LUZ ELECTRICA	Quality of living is better because of electric light.	5
	PUEDEN VER TELEVISION	Can watch television.	3
	YA NO GASTAN MUCHO EN VELAS / KEROSENE / PILAS	Need not pay too much for candle/kerosene/dry batteries.	2
	HAY MAS COMODIDAD DE HACER LAS COSAS CON LUZ	More convenient to do matters with light.	1
	YA NO SE DANA LA VISTA CON EL HUMO DE KEROSENE / VELA / LAMPARAS	Not ruin their sight by smoke of kerosene/candle/lamp.	1
Comunidades en Isla de Taquile	DUERMEN MAS TARDE	Go to bed later.	29
	LOS NINOS PUEDEN ESTUDIAR DE NOCHE	Children can study at night.	8
	NO GASTAN MUCHO POR MANTENIMIENTO DE PANEL	No need to pay too much for maintenance of panel.	8
	CENAN MAS TARDE	Eat supper later.	5
	COCINAN LA CENA MAS TARDE	Prepare supper later (after dark).	5
	HAY MAS COMODIDAD DE HACER LAS COSAS CON LUZ	More convenient to do matters with light.	4
	YA NO GASTAN MUCHO EN VELAS / KEROSENE / PILAS	Need not pay too much for candle/kerosene/dry batteries.	4
	YA NO SE DANA LA VISTA CON EL HUMO DE KEROSENE / VELA / LAMPARAS	Not ruin their sight by smoke of kerosene/candle/lamp.	4
	PUEDEN VER TELEVISION	Can watch television.	1
Gran Perú	YA NO COMPRAN KEROSENE / PILAS	No need to buy kerosene/dry batteries.	8
	YA SE PUEDE ESCUCHAR LA RADIO A CUALQUIER HORA	Can listen to the radio whenever they want.	7
	HAY MAS COMODIDAD DE HACER LAS COSAS CON LUZ	More convenient to do matters with light.	4
	PUEDEN VER TELEVISION	Can watch television.	4
	DUERMEN MAS TARDE	Go to bed later.	3

Localidad	cambio	change	num
	LOS NINOS PUEDEN ESTUDIAR DE NOCHE	Children can study at night.	3
	YA NO GASTAN MUCHO EN VELAS / KEROSENE / PILAS	Need not pay too much for candle/kerosene/dry batteries.	3
	COCINAN LA CENA MAS TARDE	Prepare supper later (after dark).	1
	NO GASTAN MUCHO POR MANTENIMIENTO DE PANEL	No need to pay too much for maintenance of panel.	1

Note: Changes that more than five respondents of all four communities are listed.
Source: JICA Study Team 2008

Appendix III-3 Table 3: Principal changes relating to social issues

Localidad	Cambio	changes	Num
Balsapuerto	SE PUEDE PASEAR FACILMENTE POR EL PUEBLO POR LAS NOCHES	Can walk easily in the village at night.	14
	LA LUZ FACILITA LA SEGURIDAD	Light increased security.	12
	SALE A PASEAR CON SUS AMIGOS / FAMILIA	Take a walk with friends/ family.	9
	PUEDE VISITAR A SUS FAMILIARES / AMIGOS	Can visit families/ friends.	8
	PUEDE QUEDARSE MAS TIEMPO EN LA NOCHE CON SUS AMIGAS / OS	Can remain more time at nights with girl/boy friends.	6
	LOS ROBOS SON MENOS FRECUENTES	Thefts are less frequent.	5
	LA VIDA SOCIAL HA AUMENTADO	Social life has been increased.	4
	LA SEGURIDAD HA AUMENTADO	Security has been increased.	1
	SE CUIDAN SOLOS CON EL ALUMBRADO PUBLICO	The public lighting protect us from things that can danger us (thieves, accidents)	1
Catilluc	LA SEGURIDAD HA AUMENTADO	Security has been increased.	14
	HACER FIESTAS DURAN HASTA LA NOCHE	Execute festivals continuing till night.	13
	SE CUIDAN SOLOS CON EL ALUMBRADO PUBLICO	The public lighting protect us from things that can danger us (thieves, accidents)	9
	LA VIDA SOCIAL HA AUMENTADO	Social life has been increased.	7
	LAS REUNIONES SOCIALES DURAN MAS	Social meetings continue more time.	7
	LA LUZ FACILITA LA SEGURIDAD	Light increased security.	3
Comunidades en Isla de Taquile	HACER FIESTAS DURAN HASTA LA NOCHE	Execute festivals continuing till night.	12
Gran Perú	LA SEGURIDAD HA AUMENTADO	Security has been increased.	6
	HACER FIESTAS DURAN HASTA LA NOCHE	Execute festivals continuing till night.	2
	LA VIDA SOCIAL HA AUMENTADO	Social life has been increased.	2
	LA LUZ FACILITA LA SEGURIDAD	Light increased security.	1
	SE CUIDAN SOLOS CON EL ALUMBRADO PUBLICO	The public lighting protect us from things that can danger us (thieves, accidents)	1

Note: Changes that more than five respondents of all four communities are listed.
Source: JICA Study Team 2008

Appendix III-4 Table 4: Principal changes relating to information reception

Localidad	cambio	change	num
Balsapuerto	PUEDEN ESCUCHAR MAS TIEMPO LAS NOTICIAS POR LA RADIO	Can listen to the news by radio longer time than before.	13
	ESTAN MEJOR INFORMADOS	Being more informed than before.	10
	HAY MAYOR INFORMACION POR TELEVISION	Have more information through television.	10
	AHORA PUEDO MIRAR POR TELEVISION LAS NOTICIAS	Can watch news by television.	9
	VEN LAS NOTICIAS POR TELEVISION A NIVEL NACIONAL	Watch news of national level by television.	2
Catilluc	AHORA PUEDO MIRAR POR TELEVISION LAS NOTICIAS	Can watch news by television.	18
	HAY MAYOR INFORMACION POR TELEVISION	Have more information through television.	15
	HAY MAYOR INFORMACION POR TELEFONO	Have more information through telephone.	13
	HAY MAYOR INFORMACION POR INTERNET	Have more information through internet.	11
	COMPRENDEN MEJOR LAS NOTICIAS VIENDOLAS POR TELEVISION	Understand more news coming by watching television.	9
	ESCUCHAN LAS NOTICIAS A NIVEL NACIONAL	Listen to the news of national level.	4
	ESTAN MEJOR INFORMADOS	Being more informed than before.	2
	PUEDEN ESCUCHAR MAS TIEMPO LAS NOTICIAS POR LA RADIO	Can listen to the news by radio longer time than before.	2
	VEN LAS NOTICIAS POR TELEVISION A NIVEL NACIONAL	Watch news of national level by television.	2
Comunidades en Isla de Taquile	VEN LAS NOTICIAS POR TELEVISION A NIVEL NACIONAL	Watch news of national level by television.	21
	ESTAN MEJOR INFORMADOS	Being more informed than before.	8
	ESCUCHAN LAS NOTICIAS A NIVEL NACIONAL	Listen to the news of national level.	7
	COMPRENDEN MEJOR LAS NOTICIAS VIENDOLAS POR TELEVISION	Understand more news coming by watching television.	6
	PUEDEN ESCUCHAR MAS TIEMPO LAS NOTICIAS POR LA RADIO	Can listen to the news by radio longer time than before.	3
	AHORA PUEDO MIRAR POR TELEVISION LAS NOTICIAS	Can watch news by television.	1
Gran Perú	PUEDEN ESCUCHAR MAS TIEMPO LAS NOTICIAS POR LA RADIO	Can listen to the news by radio longer time than before.	12
	SE ENTERAN DE LAS NOTICIAS DEL MOMENTO	Know the latest news.	5
	ESTAN MEJOR INFORMADOS	Being more informed than before.	4
	VEN LAS NOTICIAS POR TELEVISION A NIVEL NACIONAL	Watch news of national level by television.	3
	ESCUCHAN LAS NOTICIAS A NIVEL NACIONAL	Listen to the news of national level.	2
	AHORA PUEDO MIRAR POR TELEVISION LAS NOTICIAS	Can watch news by television.	1
	HAY MAYOR INFORMACION POR TELEVISION	Have more information through television.	1

Note: Changes that more than five respondents of all four communities are listed.
Source: JICA Study Team 2008

Appendix IV Report on the Field Survey on the Pilot Project of MEM for the Productive use of PV System in Puno Region, 17-21 February, 2008

Appendix IV Report on the Field Survey on the Pilot Project of MEM for the Productive use of PV System in Puno Region, 17-21 February, 2008

1. General matters

(1) Place

This is the pilot project site of MEM for the productive use of solar panel system and its administration model.

The project site is localidad of Vilcallamas Arriva in Pisacoma District, Chucuito Province, Puno Region. This community lies on the high plateau with the altitude 4,350m above sea level and near the border line between Peru and Bolivia.

The number of households is approximately 60 according to the report of Centro de energía renovable of National University of Engineering (CER-UNI.)

(2) Site survey

The site survey was done on 18th February 2008 by the members of the JICA study team accompanied by Ing. Alwin Iapana. As there is almost no person living in or near the community at the time of the site survey, the JICA study team interviewed few people who remained in their winter houses located in the surrounding area. Also, the team interviewed to Ing. Rafael Espinoza Paredes, leader of the Pilot Project and director of CER-UNI.

Figure IV-1 Centro poblado of Vilcallamas (left) and solar panel (right)

2. Background of the pilot project

This project is under implementation by CER-UNI in the framework of the pilot project of productive use of solar system of MEM with financial support of UNDP.

UNI chose this community among the communities on the list prepared by MEM according to such criteria as (i) intention of productive use of energy, (ii) no plan of electrification, (iii) far from the existing electricity line, and (iv) number of households is between 50 and 100.

UNI started talking with inhabitants of Vilcallamas about the project and finally achieved their agreement. They started the project in October 2007 by installing solar panel system and production machines.

3. Project contents

(1) Machines

The plan of this project principally consists of generator, battery, machines and earths (source: Report 3 of UNI).

Table IV-1 Principal components of the project

No.	Unit	Components
1	Generation unit	Photovoltaic generator of 2040 Wp, 48 VDC
2	Control unit	Controller of 55A X 110A, 48 VDC
		Inverter 3500 W, 48 VDC/ 220 VAC, 60 Hz
		Data registration machine and sensor
3	Unit of electricity storage	Twenty four (24) batteries of 2 V, 720 Ah C100
4	Consumption unit	Two (2) stitching machines (remalladoras) of 600 W
		Two (2) sewing machines of 600 W
		Two (2) shearing machines of 320 W
		Four (4) lamps of 32 W
		Twelve (12) lamps of 12 W
		Eight (8) spinning machines of 50 W
		Two (2) computers of 200 W for primary school
5	Unit of earth	Two (2) units of earth (tube type), one is AC and the other is DC

Source: 3rd report on the project (CER UNI)

(2) Capacity building - organization establishment and training

The UNI team plans that a user's organization like a small enterprise shall manage the productive use of solar energy. For achieving this purpose, they established an association consisting of seven inhabitants who intended to participate in productive use of solar energy. It is composed of one president and three section, namely administration, technique and commercialization. Also, UNI team thinks it better to organize a network of producer to enjoy the scale merit and to get more profit from market.

As the team deeply understands the lack of experience and knowledge of the association, they give training on the subjects required in each section. The training started in November 2007 and will be given in every month till October 2008 (12 months project). The team also understands that marketing is most difficult subject, so they contacts with Ministry of Production, Ministry of Industry and some NGOs to request technical support about marketing.

The CER-UNI team plan to give same training to women (who are not members of the producer's association).

(3) User's fee

Installation fee for these structures was set at 500 soles and monthly fee is set at 300 soles; the payment unit is not a person but the producer's association. UNI team expects that the users can repay if they sell three sweaters at 100 soles each. However, the monitoring report says that no products have been born due to lack of expertise and marketing of users. Therefore, initial payment has not been completely paid yet and no monthly fee was paid till now.

4. Finding at the site survey

(1) Income generation activity of Vilcallamas

- Main production activity of this community is transhumance and main income source is fiber sale and, though it is not clearly mentioned by the inhabitants, informal trade with Bolivia. Knitting and textile are mainly for domestic use so far, but some inhabitants go to towns to sell these products when they need additional income.
- An interviewed person said he uses hand-made knitting products (scarf) at home and sells them to tourists at Puno or Juliaca when he needs money. As transportation cost from Pisacoma to Juliaca is 13.5 soles (one way), this work is not often profitable.

(2) Activity using solar energy

- First of all, no person, not only adult person but also aged persons, babies and animals, were found in Vilcallamas at the survey time. People of this area, in general, are in charge of transhumance and stay in the summer village, hours from Vilcallamas on foot, from January to March. This means that the PV system and production machines are not used during summer season. Also, almost all young persons have gone out of the community to towns to find job.
- PV system, controlling system and batteries were installed in October 2007. Four spinning machines were brought and set at the meeting hall of the community.
- Members of the producer' s association are mainly men and elder persons. Traditionally, men work at weaving and women work at spinning; however, male (household heads) participate in spinning work in the project.
- A trainer periodically comes from UNI to give training to users on the usage of the spinning machine and color design of yarns. Also, he gives training in administration and marketing.
- The users have little experience in selling handicraft till now. They know Puno and Juliaca are big market places; some inhabitants of this area sporadically go there to sell handicrafts. However, they get little profit from this activity because they hardly understand the price and quality necessary for them if they want to get profit. Also, the transportation cost is rather high.

- According to an inhabitant (old male user), who once got training of spinning machine, seldom works in the workshop because it is cold and he prefers working at home. Though his main job is animal husbandry and main income source is sale of alpaca fiber, he does not know the shearing machine. Also, he personally has not received any benefit from the solar system so far.

Figure IV-2 Inside the workshop (left) and weaving machine (right)

(3) Commerce

(a) No person sold the products made by the machines till the time of interview (more exactly till the end of December 2007 as they stopped working at that time). During November and December, users tried to understand the usage of the spinning machine. Director of CER-UNI said that they start the research, and training of marketing when inhabitants come back to Vilcallamas and also that they will contact with ministries to request support of commercialization.

(b) Generally commercial activity needs to prepare a business plan composed of cost and quantity of necessary material, quantity of each type of production, expected quantity of product, gross and net profit estimate. The association has not made any (monthly or annual) business plan yet.

(c) For example, a scarf made of alpaca yarn is generally sold at 25 soles at Puno (market price), but it takes four to five days to make one by hand; it means that the gross profit is five soles per day, which is less than standard labour fee of constructing work. Also, it is not sold every time because the quality is not excellent comparing with other scarves sold in the market of Puno.

(d) According to the members of the producer’s association, the president of the group said that they need to find the marketing after users come back to the main village.

(e) Judging from interview result, they hardly know about the market price, competition and quality required for successful commerce of handicraft. This is why CER-UNI team

continues to give training to them for increasing quality of products and competitiveness. As the training was given only for two month, the result was not so clear on February 2008.

(4) Repayment

Users understand that they have to repay for the cost of installation of the PV system, but they think it impossible at present because they get any profit from the machines so far. The JICA study team recommends that users should think of the above mentioned business plan.

5. Examination of the productive use of electricity in Vilcallamas

(1) Analytical consideration

A set of conditions is considered to be indispensable for successful business in rural area. They are: experience of the production in concern, knowledge/skill of the production, experience of sales of the products, marketing (existence of markets and transportation), material availability, and existence of intention and future plan of sale expansion.

(a) Experience of production: Inhabitants of Vilcallamas (or in this area) have long time worked at weaving and knitting; however, they have no experience of spinning with electric machine. Training scheme in this project is reasonable and the method will be applied in other similar projects when the user's skill shows progress. On the other hand, they have no knowledge and skill about solar system, according to the users.

(b) As for the experience of sale of textile, they have little experience. They used to sell products only when they need income. They have no close relation with markets and have no idea about the sustainable sales. As weaving and knitting are common products sold in the touristy market in Puno, they need to get strong competitiveness for getting income from commerce of these products in the markets of Puno and Juliaca.

(c) According to the users, marketing research is not implemented. They have no knowledge about business plan, either. Because rural people are not accustomed to commercial competitiveness in general, quality control, market standard and marketing, this is the most important field to be strengthened in any production project.

(2) Consideration of project scheme

To deal with lower capacity and understanding of inhabitants, the project should follow the comprehensive steps consisting of information sharing, agreement, training and finding other support of rural development. The scheme of this project was formulated based on the understanding of abovementioned situation. One and the most important problem that was shared by the CER-UNI team and JICA study team at their meeting was that the capacity building of rural people takes time and that 12 months of capacity building planned and budgeted in this pilot project is too short to fully increase user's capacity, to monitor their activity and to feedback. Time for trial and error is also needed for inhabitants to obtain a good experience.

6. Recommendation

(1) Importance of monitoring and feedback

As the project has just started and the users are still receiving training, it is too early to learn any experience from this project though the basic design can be understood clearly. However, CER-UNI team tries to enhance the inhabitant's capacity to get profit from production. Though they have no time for monitoring, it shall be recommended that MEM continue monitoring and, based on the monitoring result, to feedback the result to their activity.

(2) Necessity of business plan

If they want to be successful in commercialization, then they need to prepare a business plan. Following is an example of business plan.

Necessary points for the business plan

(i) To set the target amount of sale and number of products. Also, users need to estimate the sales rate. If a group gets 200 soles as monthly gross profit that is equivalent to the fixed monthly repayment amount and if the members sell a sweater at 100 soles, they need to sell two sweaters every month. Not all the sweaters they make are sold at the market.

(ii) To set the target number of daily production. If they want to produce three sweaters in a month, they need to make one in every ten days and to prepare necessary amount of yarn before production using the spinning machine. Arrangement of man power is also necessary.

(iii) Also, to keep the necessary amount of fiber before production.

(iv) It must be considered that the PV users of Vilcallamas leave the main village where the workshop is located to go to the summer village for three month. Though users do not produce anything in this period, they have to repay. Thus, necessary number of production is four instead of three (to cover the repayment of twelve months by the production of nine months).

(v) This calculation is for the necessary income only for repayment. If they want to get more profit from commerce, it is obvious to produce more sweaters.

(vi) It is also considered that the number of sweaters that are left unsold.

(vii) Finally but most important is that they need to make a business plan by comparing and examining necessary amount of sweater, necessary production time, available man power and available machines.

Appendix V Summary for environmental and social consideration

Appendix V Summary for environmental and social consideration

1. Full title of the Project and relevant report

Master Plan Study for Rural Electrification by Renewable Energy in the Republic of Peru (Estudio del Plan Maestro de Electrificación Rural con Energía Renovable del Perú)

2. Type of the study

Master plan study

3. Environmental category and reason for categorization

Category B

Reason: The purpose of this master plan study is to formulate a master plan for rural electrification using PV system and mini/micro hydropower. The study itself does not directly affect surrounding environment because neither facility construction nor implementation of pilot projects are not included in the scope of the master plan study.

This summary focuses on the rural electrification projects that the master plan proposes to be implemented and are formulated based on the result of the Pre-Fs, a part of the master plan study. Environmental and social impact on surrounding natural environment and social condition are considered in the master plan and project formulation.

4. Agency or institution responsible for the implementation of the project

Directorate of projects (hereinafter called as 'DPR'), Ministry of Energy and Mines (hereinafter called as 'MEM'), Republic of Peru *Dirección de proyectos, Ministerio de Energía y Minas, República del Perú*

5. Outline of the study (objectives, justification, location, proposed activities, and scope of the study)

(1) Objectives

The objective of this study is to establish the master plan consisting of strategy, approaches and model plans of sustainable rural electrification by renewable energy for the areas where, like Andean and Amazon areas, electrification by grid extension has difficulty. Another objective is to enhance the capability of Peruvian human resources, by transferring techniques from the study team, to promote rural electrification based on the master plan as well as to renew the master plan.

(2) Justification of the study

The national electrification rate in Peru was estimated at 78.7% in 2005, but discrepancy between urban and rural areas remains one of the important development issues. For example, FONCODES's 'Poverty Map' using the data of 1993 National Census indicates that the percentage of people living without electricity is 68.2% in Cajamarca (highest region) and 3.8% in Callao (lowest region). Recently, electrification projects by grid extension are in progress by regional and local governments who have fund in the current trend of decentralization in Peru and application of the CANON system to regional and rural development. However, technical quality and management system hardly assure the sustainable electricity service. Also, in poorer regions without these funds, electrification projects are not implemented.

Peruvian Government intends to achieve economic growth, alleviate poverty as well as increase of living standard in rural area by promoting electrification plans. In the jungle (selva) and mountainous (sierra) areas where grid extension projects require huge amount of budget and time for construction, small scale electrification by locally available renewable energy, such as PV system and mini/micro hydropower, is expected to increase electrification rate effectively. Actually, MEM/DPR has not accumulated experiences in implementation of renewable energy. Especially, policy and know-how are not established in such fields as organization for operation, maintenance and management, environmental, gender and social consideration including gender, billing system.

Formulation of the master plan is indispensably needed in Peru in this context.

(3) Contents of the master plan

The master plan for rural electrification by renewable energy principally contains the following plans and propositions.

(a) Selection of target communities to be covered by renewable energy

(b) Proposition of the mechanism for sustainability (containing technical and financial support, supply chain, capacity building and training, etc.)

(c) Proposition of sources and procedure of funding

(d) Proposition of establishment of micro enterprise for self-reliant and sustainable electricity management

(e) Standard design including cost estimate and model plan both of PV system and mini/micro hydropower

(f) Basic design and cost estimate of electrification project of each of the four Pre-FS sites

(g) Proposition of social and environmental consideration required for sustainable use and management of electricity including gender-related issues

(4) Realization of the master plan

MEM executive staff says that the Peruvian government will be able to electrify rural areas by renewable energy with the funds on hand to increase the electrification rate. In this case, it is not assured that MEM will sufficiently apply the bottom-up approach and self-reliant management system as well environmental and gender consideration that the master plan proposes.

6. Description of the project site

(1) Natural environment

The Republic of Peru composes of three geographical regions: an arid coastal region (costa, 12% of the country), the inland Andes mountainous region (sierra, 28%) and tropical plain of the Amazon River bordering Colombian and Brazil (selva, 60%). Peru's economy and culture reflect this varied geography. The object of this master plan study is mainly sierra and selva regions.

Peruvian geographer Javier Pulgar Vidal proposed to divide Peru into eight environmental divisions.

Chara or Chala (coast): coastal area up to about 500 meters above sea level, characterized by very low precipitation and desertification. Rather high humidity and low temperature. Quechuan term 'chara' means the condition that cloud hangs low over mountains.

Yunga (hot valley): western slope of the Andes from 300 meters to 500 meters above sea level, characterized by high sunshine volume, dry climate and high daily temperature difference. This area is also found at eastern slope of the Andes from 1,000 meters to 2,300 meters above sea level where precipitation is much higher than the western slope.

Quichua (warm valley): valleys and basins situated from 2,300 meters to 3,500 meters above sea level characterized by warm climate and moderate inclination, which is the most populated area in Peru and many cities, such as Cusco and Cajamarca, were constructed.

Suni (chilly upland): from the upper limit of Quichua up to about 4000 meters above sea level, characterized by cold temperature and limit of cultivation in Andean mountainous area. Suni means high altitude in Quechua.

Puna (cold highland): area above 4,000 meter above sea level, characterized by cold temperature (annual average temperature is 0 – 7 C.) and by grass land vegetation where animal husbandry is main subsistence activity.

Janka (snowy mountain): 4,800 meters and over above sea level that is the lower limit of snow and glacier, characterized by very poor vegetation and high mountains covered by snow and glacier. It has been the object of belief of Andean people.

Rupa rupa or lupa lupa (hot): hilly area on the eastern slope of the Andes from 400 meters to 1,000 meters above sea level characterized by tropical rain forest and high precipitation.

Omgua: riverine plain of the upper Amazon below 400 meters above sea level, characterized by tropical rain forest and high precipitation.

(2) Social and economic indicators

Basic social and economic indicators of Peru are summarized in the box below and the map is on the next page.

Area[*1]:	total:	1,285,220 km^2	GNI in Atlas method (2006)[*3]	
	land:	1.28 million km^2	GNI:	US$82.7 billion
	water:	5,220 km^2	GNI capita:	US$2,929.0
Population[*1] (21 Oct. 2007):		28,220,764	GDP (2006) [*3]:	US$93.3 billion
Annual population growth rate			GDP annual growth rate (2006) [*3]:	8.0%
(average 1993-2007) [*1]:		1.6%	GDP composition by industry (2006) [*3]	
Life expectancy at birth[*2] (2007 est.)			primary:	6.6%
	total:	70.14 years	secondary:	33.8%
	male:	68.33 years	tertiary:	59.6%
	female:	72.04 years	Population below national poverty line[*4](2004)	
Literacy rate[*2] (2004 est.)			national:	51.6%
	total:	87.7%	urban:	40.3%
	male:	93.5%	rural:	72.5%
	female:	82.1%	Human development (2005)[*5]	
			HDI:	0.773
			rank:	87th (medium human development country)

Source: *1=The first report of the 2007 National Census (INEI)
*2 = The World Fact Book (CIA)
*3 = Peru Data Profile (The World Bank)
*4 = Peru at a glance (The World Bank)
*5 = Human Development Report 2007/2008 (UNDP)

The country is, according to the Regionalization Law (2002), divided into 24 regions. Regions are sub-divided into 194 provinces that consist of 1831 districts.

(3) Current economic condition

Abundant mineral resources are found in the mountainous areas, and Peru's coastal waters provide excellent fishing grounds. However, overdependence on minerals and metals subjects the economy to fluctuations in world prices, and a lack of infrastructure deters trade and investment. After several years of inconsistent economic performance, the Peruvian economy grew by more than 4% per year during the period 2002-06, with a stable exchange rate and low inflation. Growth jumped to 7.5% in 2007, driven by higher world prices for minerals and metals. Peru is ranked among medium-income fast developing countries by the World Bank.

Despite the recent strong macroeconomic performance, underemployment and poverty have stayed persistently high. The poverty level measured by the calorie-base criterion and the percent of

population below the poverty line shows that there is a remarkable difference between urban and rural zones.

Map of Peru

7. Legal Framework of environmental and social considerations

(1) Laws, regulations and standards related to environmental and social issues

The environment law has not been enacted in Peru at the time of master plan study. Each ministry takes measure against environmental issues occurred in the fields in charge and there is no nation wide examination and a standard has not been established yet. It is DGAAE (Dirección general de asuntos ambientales energéticos) and DGE (Dirección general de electricidad) who work for the tasks relating to environmental impact assessment in Ministry of Energy and Mining (MEM).

Volume of power generation determines if a project is obligated to develop EIA studies or not.

(a) When the study involves hydropower plant with capacity less than 20 MW, it is not required to prepare an EIA study. DGE gives authorization of the project of hydropower plant with capacity between 10 MW and 20 MW, while regional government gives authorization of the project of hydropower plants with capacity between 500 kW and 10 MW. However, DGAAE can require to the implementer the presentation of a mean of environmental management if necessary and the implementer must study EIA even if the capacity is less than 20 MW when environmental impact may be supposed to occur.

(b) When the study involves hydropower plants with capacity lower than 500 kW, which will be the target of this master plan, DGE only requests a summary about the project, but it does not give any authorization.

(c) There are no regulations in Perú concerning solar panel systems for electrification.

Relation between capacity of power generation and EIA

<table>
<tr><td rowspan="2">Generation type</td><td colspan="4">Capacity of output</td></tr>
<tr><td><= 500 kW</td><td>500 kW< < =10 MW</td><td>10 MW< < =20 MW</td><td>20 MW<</td></tr>
<tr><td rowspan="2">Hydro power</td><td>Sending letter to DGE –MEM</td><td>Authorization by regional government</td><td>Authorization by DGE-MEM</td><td rowspan="2">EIA</td></tr>
<tr><td colspan="3">DGAAE can require IEA and EIA if necessity is found.</td></tr>
<tr><td>PV system</td><td colspan="4">No regulation</td></tr>
</table>

Source: JICA Study Team 2007 based on the information from DGAAE-MEM.
* DGAAE may request EIA regardless of the scale of power generation if judged necessary.

(d) Apart from these regulations of MEM, SNIP (Sistema Nacional de Inversión Pública, National System of Public Investment) regulates that implementer compulsorily prepare EIA (both identifying impacts and making mitigation plans) from profile level for all development projects, regardless of the scale.

(2) Relative agencies and institutions

DGAAE is in charge of EIA. But DGE is also in charge of authorization of the project covering all project components including environmental issues.

8. Evaluation and mitigation plan

The object of the master plan is the dispersed type power generation by renewable energy. The scale of power generation is fixed by the power demand, but generally the demand volume in remote rural community is small and so is the scale of power generation. This fact may generate less impact on environment in almost all cases. Also, PV system is well known as appropriate to environmentally fragile areas.

The environmental elements that are supposed to relate to the rural electrification by renewable energy (extracting from the JICA guideline), rating and major adverse impacts understood in the Pre-FS and the master plan study, countermeasures described in the master plan are summarized in the following Table 1.

Table V-1 Evaluation of environmental elements

(Environmental elements in the list of the guideline that relate to the master plan)

No.	Environmental Elements	Rating	Justification of the rating
Social aspects			
1	Resettlement	D	The scope of this master plan does not propose large-scale hydropower plants that may entail resettlement
2	Land use and regional resources use	D	Mini/micro hydropower plant needs certain area of land for facility installation even though the necessary area is not large. It is proposed in the master plan that the implementer must consider the inhabitants who live in the concerned area, especially land owner, so that they consent to the project implementation at the initial stage. (Possible measure is to use public land or non occupied land.) In case of project implementation in privately owned land, MEM generally compensate (money) for the land use.
3	Social capital and local decision-making institutions	D	Electrification by renewable energy is generally a small scale project and needs management of facilities by user community by itself. The master plan mentions that project implementation shall be informed and discussed with inhabitants from the first stage, public awareness should be raised about renewable energy and facilities, and training should be given to them. Generally, there are traditional community rule or by-law, and groups and/or social system to deal with community development and social issues. Thus, these communities are supposed to be able to manage power facilities when appropriate organization is established among them and when support in techniques and management is given to them.
4	The poor, indigenous and the ethnic minorities	C	1. The master plan covers all inhabitants living the target areas (sites) listed by MEM, though electricity service may be supplied to some selected groups with omitting vulnerable people in a few cases. Remaining problem is that remote areas where ethnic minorities live may be excluded due to lack of convenient transportation system. 2. If amount of electricity bill is beyond the limit of user's affordability, electricity cannot be used. Theoretically and ideally all cost should be covered by users, but realistically it is difficult and the implementer is required to take measure, i.e. subsidy, to reduce the user's charge. The master plan proposes possible measure against high cost. 3. As the amount of willingness-to-pay and social/cultural condition differs site by site, the implementer needs to confirm the area-specific conditions by social survey and meeting to reach agreement with users about project implementation. The master plan includes proposition of this procedure.
5	Inequitable distribution of both adverse impacts and benefits	C	1. The master plan proposes to establish community-based organization for management of facility and finance. This self reliant management system is supposed to minimize inequitable distribution of both adverse and preferable impacts. Also, it proposes establishment of micro enterprise for management

No.	Environmental Elements	Rating	Justification of the rating
			of electricity supply service. 2. In case of mini/micro hydropower, as mentioned in Environmental Element 2 of this table, adverse impact may occur to land owners or land users by land use for facility construction. The implementer should find public land or non-occupied land to prevent this problem.
6	Conflict of interest among the stakeholders		
7	Gender	C	Women's participation in social activities is lower than that of men in rural communities in Peru and it is apprehensive that women are excluded from any stage of electrification process (decision, management of organization, facility management) and get less benefit. To avoid social exclusion, the master plan proposes that implementer must: i) interview not to only men but women in the social survey at the beginning of the project to understand actual social, economic and gender condition of the community in concern; ii) invite not only male but also female household members to the public hearing so that both men and women can understand renewable energy and the project and can offer own opinions; iii) train both male and female users in facility operation and maintenance, iv) facilitate users to select women members for the management organization and micro enterprise to be established; v) monitor if both men and women participate in management and receive benefit of electricity equally after commencement of the electricity service Though culture and tradition are too strong to be changed quickly, electrification itself is expected to improve the inequitable gender condition by applying these steps.
8	Historical and Cultural Monuments	D	It is possible to install PV system projects in any type of the protected area in Peru. IEE and EIA are required for mini/micro hydropower projects in both protected area and buffer zone to avoid giving damages to natural, historical and cultural monuments. There are no candidate sites on the list of MEM for mini-micro hydropower in the historical heritage areas.
Technical and physical aspects			
9	Water Pollution	D	Materials like concrete used for construction of hydropower plants contain chemical ingredients. If they are disposed in the river water, it may cause water pollution. The maser plan proposes that the implementer is obligated to supervise contractor's engineering work from environmental point of view at construction stage. Also, the scale of construction is very small for the project that the master plan proposes and the possibility of water pollution is supposed low.
10	Solid Wastes	C	1. Actually authorized companies (registered to the Ministry of Health) treat and recycle used batteries. The master plan and the manual prepared by the JICA study team for local governments propose the battery recycling system. It includes: collection of used batteries, storing, selling to companies, treatment and recycling, selling recycled batteries to PV users. The master plan also recommends to MEM to control and monitor battery recycling. 2. As there is no institutional framework for control of water pollution and dust pollution that might occur during the battery treatment, MEM/DPR is recommended to give administrative directives to the factories that discharge pollution in collaboration with ministries in charge of environment and battery (Ministry of Health, Ministry of Production). 3. The master plan proposes that the implementer shall manage the appropriate treatment of solid waste of construction works.

No.	Environmental Elements	Rating	Justification of the rating
11	Noise and Vibration	D	At the construction stage of mini/micro hydropower plants, construction machines make a noise. The master plan describes that the implementer must inform neighbouring people about construction schedule in advance. At the machine operation stage, level of noise and vibration by power generation of mini/micro hydropower plants is to be controlled to keep low by planning design, construction supervision and on-site management of facilities operation. However, as the capacity of generation is mini/micro level, considerable noise and vibration are not anticipated.
12	Landform and geology	D	It may occur that landform is changed by construction of mini/micro hydropower plant (for example, installation of PVC penstock under the ground) and that construction machines damage landform when it moves or works. However, the scale of construction is rather small. Master plan describes that the implementer must predict possibility of such problem, make detail plan to avoid it, and supervise careful construction at each project site.
13	Water Use	C	In case of mini/micro hydropower, river water level may decline between intake and power station. If the water source is used by irrigation or other social uses, it may cause conflict between electricity users and owner of water source (especially when water level is low). To avoid this conflict, the master plan proposes that the implementer is required to understand water usage and its beneficiaries in each project site at the site survey. If he/she finds water right problem, he/she needs to discuss with water users and to make a plan to keep water level constant. If irrigation system exists in the project site, the implementer has to apply permission of water use right for electrification to Ministry of Agriculture. Also, at the public hearing, the implementer must explain the issues relating to water use to all inhabitants.

Reference: "Environmental Guidelines for Infrastructure Projects", JICA, 2004 (some modifications)

Note: Evaluation classification

A: Serious impact is expected.

B: Impact is expected to a certain extent

C: Not strong impact is expected but impact sometimes occurs.

D: Impact may occur at low level or it may not occur.

Source: JICA study team, 2008

9. Analysis of alternatives including 'without project' option

(1) Rationale of the rural electrification by renewable energy

Two power generation types, PV system and mini/micro hydropower, are examined and proposed in the master plan according to the scope of work (signed 14th September 2006) and the minutes of meetings (signed 8th September 2006). This master plan study was developed based on them. MEM/DPR aims to raise the coefficient of national electrification to 93.1% by 2015. To that effect, the following policies have been taken:

(a) Power supply by National Interconnected System

- It plays a central role in power supply, promoting foreign investment and private sector participation, which adopts concession system in the sectors of hydropower generation and transmission/distribution.

- In order to improve the coefficient of electrification, cross subsidy regime called “FOSE” is introduced for the whole power industry operating under the National Interconnected System to subsidize power tariff for consumers with small demand.
- The main strategy is liberalization and privatization.

(b) Grid extension by FONER fund to the outside of the concession areas allocated to concessionaire distribution companies

- In order to promote electrification in the areas difficult to develop grid extension in terms of business management, initial costs are subsidized by means of FONER established with the financial assistance of the World Bank/GEF. The amount of the subsidy is capped at US$800/connection.
- The minimum number of connections is 1,000 and financial/economic efficiency is given with great importance, which can be led to suppose that remote areas with small dispersed localidades with small demand, distant from existing grid lines, are left out of the target of electrification.

(c) Grid extension by MEM/DPR according to PNER (Plan Nacional de Electrificación Rural)

- The government bears initial investments, transferring electrification systems and entrusting administration to concessionaire distribution companies or ADINELSA in order to electrify those areas who do not allow for electrification even with subsidy such as FONER in terms of business management.
- One of the criteria of implementation is the cost of grid extension, that is, US$1,000/connection; those areas that require over that amount of investment are left out of the target of electrification.

(d) Electrification by renewable energy or SPERAR (Soluciones peruanas a electrificación rural en las areas aisladas y de frontera con energías renovables)

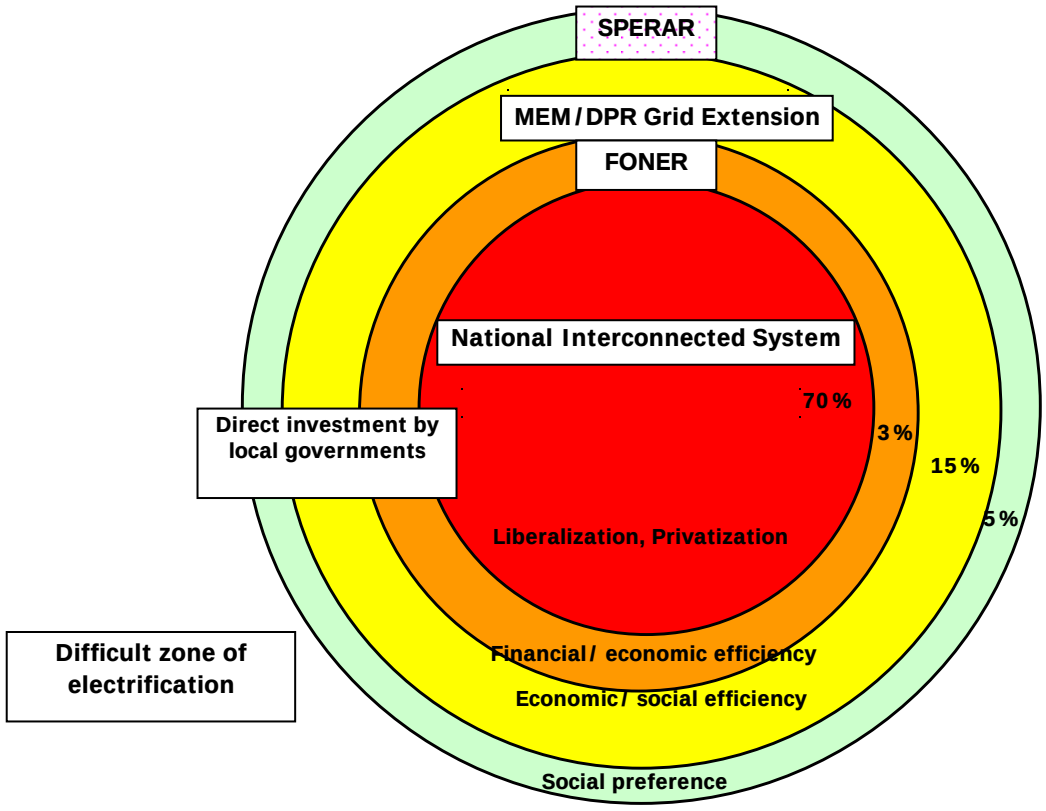
- Electrification in such areas as are difficult to be covered by the above three electrification strategies is one of the issues to be dealt with in this master plan (SPERAR).
- SPERAR will cover those remote areas impossible to be covered by the above three electrification strategies, because they have small power demand due to poverty and scattered houses.
- Electrification cannot be justified for these areas in terms of financial/economic/social efficiencies, it is necessary to apply social preference and political priority.

(e) Direct investment by local governments

Some regions and districts who have ample funds from CANON invest to electrification by extension of the existing grid. As the technical level is not sufficient and economic efficiency is

ignored, sustainability seems low. Also, these governments do not inform these projects to MEM because of the decentralization system.

The policy and main features of each strategy for electrification are summarized in the diagram below.



This figure means that, if electrification by renewable energy is not judged feasible, no electrification means will be applied to these areas, which means the option of "without project".

From a technical point of view, mini/micro hydropower generation is feasible only where hydropower of proper potential is available. If hydropower plant is not feasible due to shortage of water resource, water right or other reasons, PV system will be applied for generation. PV system is exclusively introduced in the natural protected area even where water resource exists. If hydropower plant or PV system are not feasible, there is no other option of electrification (= option of "without project").

(2) Alternatives to the project activities

If the rural electrification project that the master plan proposes is not implemented, the situation of each environmental impact will not possibly be as shown in the Table 2.

Table V-2 Environmental impact under the condition 'without project'

No.	Environmental Elements	Impact of 'without project'
1	Resettlement	Nothing will occur.
2	Land use and regional resources use	Nothing will occur.
3	Social capital and local decision-making institutions	No change
4	The poor, indigenous and the ethnic minorities	No change
5	Inequitable distribution of both adverse impacts and benefits	No change
6	Conflict of interest among the stakeholders	
7	Gender	No change. Women living in the weak gender equality condition may lose chance to participate in the social activity that the master plan proposes.
8	Historical and Cultural Monuments	Nothing will occur.
9	Water Pollution	Nothing will occur.
10	Solid Wastes	No strict regulation will be established on used batteries.
11	Noise and Vibration	Nothing will occur.
12	Landform and geology	Nothing will occur.
13	Water Use	Nothing will occur.

(3) Remaining problem

It must be noted that MEM or regional/local governments intend to implement rural electrification by their own budget according to the method they used to follow. Without consideration of social, environmental and gender issues that the master plan proposes, the situation of each environmental impact may occur.

10. Mitigation measures for major environmental /social impacts

See the Table 1 in the section 8.

11. Result of the stakeholder meetings (objective of the meeting, participants, and agenda)

During the period of the master plan study, specific stakeholder meetings were not held for the purpose of environmental issues. Instead, the JICA study team held seminars to explain the result of plan, progress and result of the study, where the JICA study team explained the important issues relating to the environmental consideration. There was no question and comments on the spot.

12. Monitoring plan for environmental and social impacts, including organizational structure and schedule of implementation

The master plan proposes that the implementer obligatorily examines and surveys the environmental elements that may cause adverse impacts on community and nature at Pre-FS and FS stages; then he/she submits the letter that attests the planned project in concern will not give damages to environment. After commencement electricity service, a micro enterprise established by users will be responsible for monitoring of environmental and social impacts. MEM, as the comprehensive competent authority of electrification, will control the quality of the project implementation and service based on the report of the users through DREM (Dirección regional de energía y minas) and give administrative direction if it is needed.

13. Result of the discussion with recipient government

(a) According to the understanding of MEM/DPR and MEM/DGAAE, IEA and EIA are not required for mini/micro hydropower plants equivalent to and less than 500 kW (28 of 29 candidate sites mentioned in the master plan are less than 300 kW) and PV system, even though they can requires presentation of environmental management plan they decide it necessary.

(b) Comment of DGAAE on the environmental section of the draft final report is only correction of the facts. They do not mention their opinion and attitude about the environmental evaluation and mitigation plan. One of the possible reasons of this is that DGAAE is in charge of IEA and EIA and does not concern the other environmental issues (social conflict, used batteries…).

(c) Legally, it is OSINERGMIN who is in charge of protection and conservation of environment. OSINERGMIN works for tariff setting and supervises the generation, transmission and distribution, but their main task is investment and very few staff work for supervision of environment.

(d) Ministry of Environment was established in May 2008 and will start their business in January 2009. New decrees and regulations are under preparation at the time of the preparation of the draft final report. It was impossible to contact with this new ministry at that moment.

(e) As conclusion, there is no specific governmental institution responsible working for all environmental issues relating to rural electrification. This fact causes the dispersion of responsibility and experiences among institutions.

14. Other relevant information

(1) Procedure of environmental impact appraisal

The procedure to be taken for EIA of electrification projects is different by the capacity of power generation. Figure 1 shows the required activities of each type of project according to the Law 25844 "Executive order in Electrical Concession Law".

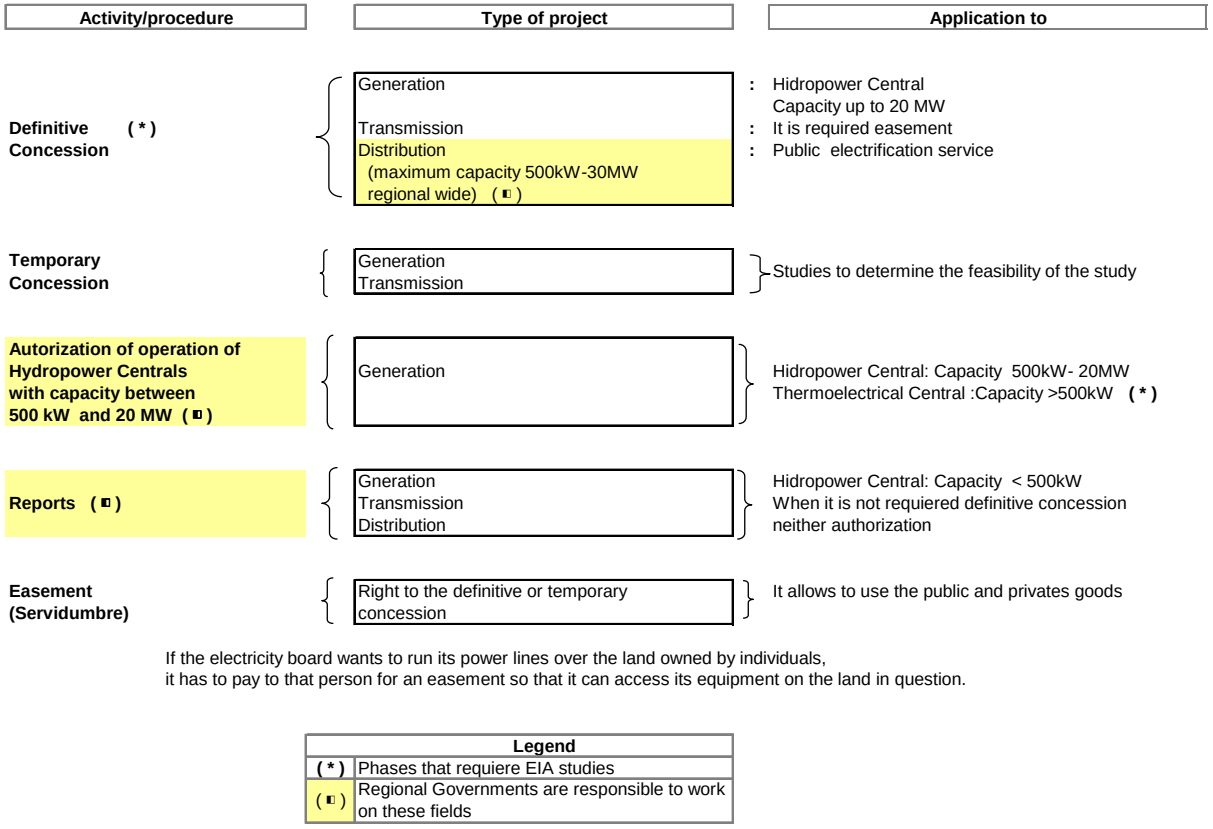


Figure V-1Figure V-2 Procedure of environmental impact assessment for electrification projects

(2) Nature protected area

The following box shows the categories of Nature Protected Area in Peru.

Explanation and regulation of use of protected area

1. National Park *Parques Nacionales*

A national park refers to a plot of land set aside by the central government and usually designated as the area free of development. National parks include pristine wilderness areas or other pieces of environmental heritage which the nation has deemed worthy of preservation.
These areas protect ecological integrity of one or more ecosystems, vegetal or animal species, for current and future generations.

2. National Sanctuary *Santuarios Nacionales*

A National Sanctuary is a place designated by INRENA where the habitat of a particular species as well as the landscape and natural formations is protected. This area is available primarily for scientific research and/or environmental monitoring.

3. Historical Heritage *Santuarios Históricos*

Historical Heritage is the area that implies nationally important stories about the Peruvian nation and is representative of the national experience through both the physical features that remain and the traditions that have evolved within them.

4. Protected Landscape *Reservas Paisajísticas*

Protected Landscape is the area where INRENA protects the harmonious relationship between nature and human beings. In this area, the interaction of men and nature over time has produced a distinct character with significant aesthetic, cultural and/or ecological value, and often with high biological diversity.

5. Wildlife Refuge *Refugios de vida silvestre*

It is areas whose management needs an active intervention to guarantee the maintenance of the habitats, as well as to satisfy the particular necessities of certain species, as reproduction places and difficult places to recover or to maintain the populations of such species.

6. National Reserves *Reservas Nacionales*

Natural Reserves are areas dedicated to the conservation of biological diversity and constant and sustainable use of vegetal species as well as aquatic or wild animals.
In these areas commercial use of the natural resources is allowed according to the approved management plan. The commercial activity is supervised and controlled by the competent national authority. The person who intends to start commercial use must prepare the management plan and receive the permission of INRENA.

7. Communal Reserves *Reseervas comunales*

Communal reserves are areas dedicated to the conservation of vegetal species and wild animals for the benefit of rural communities located in the neighbourhood zone. Use and commercialization of these resources will be made according to the approved management plans, supervised by the authority and leading by the same beneficiaries.
Communal reserves can be established over arable lands, cattle, forest purposes or wetlands: natural or artificial, permanent or temporary, abandoned or used actually, including the surface of sea whose depth doesn't exceed 6 meters.

8. Protection Forest *Bosques de Protección*

Protection Forest is established in order to guarantee the protection of erosion process of fragile lands. In this area it is allowed to develop activities that will not put the land and vegetation at risk.

9. Hunting Areas *Las Cotos de Caza*

Hunting areas are areas where specific type of hunting is allowed according to the sport regulations.

10. Reserve Zone *Las zona reservada*

Reserve Zones are the areas that gather some conditions to be considered as Natural Protected Areas but need complementary studies to determine among other things, their extension and category. These areas are also protected by the Peruvian State.

11. Reduction or transitional Zone (buffer zone) *Las zonas de amortiguamiento*

The areas of transition are those neighboring or adjacent to the nature protected areas of the System due to their nature and location, which require a special treatment to guarantee the conservation of the protected area. The master plan of each area will define the extension. The activities in these areas should not put in risk the ends of the nature protected area.