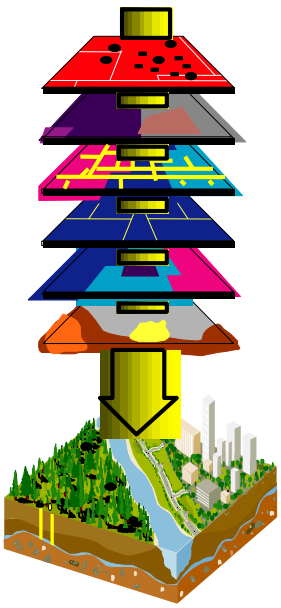
NATIONAL LAND MANAGEMENT AUTHORITY

LAO LAND TITLING PROJECT II

LAND INFORMATION COORDINATION STRATEGY



Vientiane, Lao PDR, 22 December 2006

Professor Don Grant AM

STRATEGIC STATEMENT

To establish a Lao National Spatial Data Infrastructure (LSDI) by December 2008 with the following four corner stones:

- **Institutional Framework.**
  Inter-institutional agreements, Data sharing policies, data pricing policies, institutional responsibilities, legislation, private integrity policies and operational modalities.
- **Technical Standards**
  Establishment of standards concerning data format, data exchange, software, metadata, coding, buying-ordering and maintenance.
- **Fundamental Datasets**
  Spatial datasets that are needed by a number of institutions in the SDI. Basic map features upon which most attribute data in different institutions is linked.
- **Technical Framework**
  The actual hardware, communication facilities and other technical solutions needed.

To these generally adopted corner stones must be added a **Communications Network** to ensure that all Stakeholders and the community at large are aware of the existence and far reaching implications of such a national infrastructure.

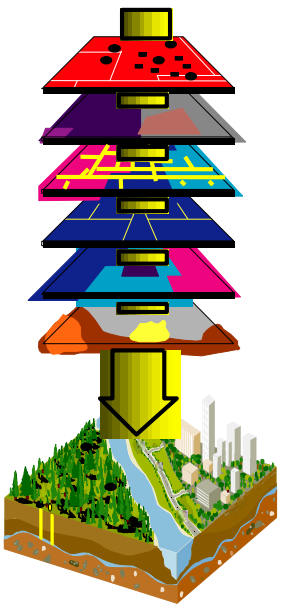
The LSDI will be built adopting the following guidelines:

- The strategy will be user focused and outcome driven,
- Management and sharing of spatial information will be based on a cooperative approach across Government, the private sector, and academia,
- Custodianship of data and information products should be the cornerstone of recognizing rights and responsibilities within a broader framework of access and use. The datasets will represent the single authoritative source of the data,
- Framework information will be the authoritative base datasets of the Spatial Data Infrastructure and will underpin the use of all business information,
- Data custodians will determine data quality standards in consultation with users to ensure that the data is “fit for purpose”,
- Meeting spatial information education and training needs to provide sufficient capacity is a whole of State responsibility and will be coordinated across all sectors and levels of the spatial information industry,
- Custodians of spatial datasets will make them available in accordance with agreed access guidelines and where possible a common access mechanism to facilitate ease of access and use,

- Custodians will have pricing and licensing arrangements that are as simple and clear as possible to encourage the use of spatial information, while ensuring sufficient income to support maintenance of the data and to protect intellectual property,
- Development of technology and applications will be based on the principle of interoperability, thereby facilitating sharing and exchange of data, and
- Users can be provided with pathways that fully exploit the framework and use the infrastructure to deliver real outcomes.

NATIONAL LAND MANAGEMENT AUTHORITY

LAND INFORMATION COORDINATION STRATEGY



Volume 1

Executive Summary

Vientiane, Lao PDR, 22 December 2006

LAO PDR
LAND INFORMATION COORDINATION STRATEGY
EXECUTIVE SUMMARY

1. Purpose of this Executive Summary.

The purpose of this Executive Summary is, like the Framework Report, to be ***brief*** in order to encourage a wide audience to read the document and ***comprehensive*** enough to act as a window to the Attachments which deal in varying detail with the Terms of Reference attached as Appendix A. This Executive Summary will deal with the Objectives and Scope of Work, and the Outputs and Deliverables as set out in the Terms of Reference (TOR). The TORs have been generally based on the Project Appraisal Document of the Second Land Titling Project which describes, under Component 1, the Development of Land Policy and Regulatory Framework, the Sub-Component which is Coordination of Land Information. It is appreciated that this may be the only document to which many readers have access and accordingly covers the breadth of the Assignment but with little depth. The Attachments provide the depth.

2. Assignment Design.

The assignment commenced on October 16, 2006 and was completed on the 22 December, 2006. There was a gap of two weeks between November 20 and December 1 when the Draft Report (a condition of the TOR) was considered in the absence of the author. The assignment included field visits to Bolikhamsay, Oudamxay and Luang Namtha, interviews with members of the government, the public sector, the international donor community and the private sector. But the emphasis of the work was directed at the preparation and conduct of a series of Workshops and Seminars outside of the TORs at which close to one hundred people participated. Following these Workshops and meetings with the Project Director and his Team the approach to the total report was varied and it was agreed to limit the Framework Report to less than 30 pages supported by the Attachments. Both the Executive Summary and the Framework Reports were to be a standalone documents leaving readers seeking further information to access the Attachments. The Executive Summary was to deal with the requirements as set out in the TOR and to be less than 20 pages.

3. Terms of Reference

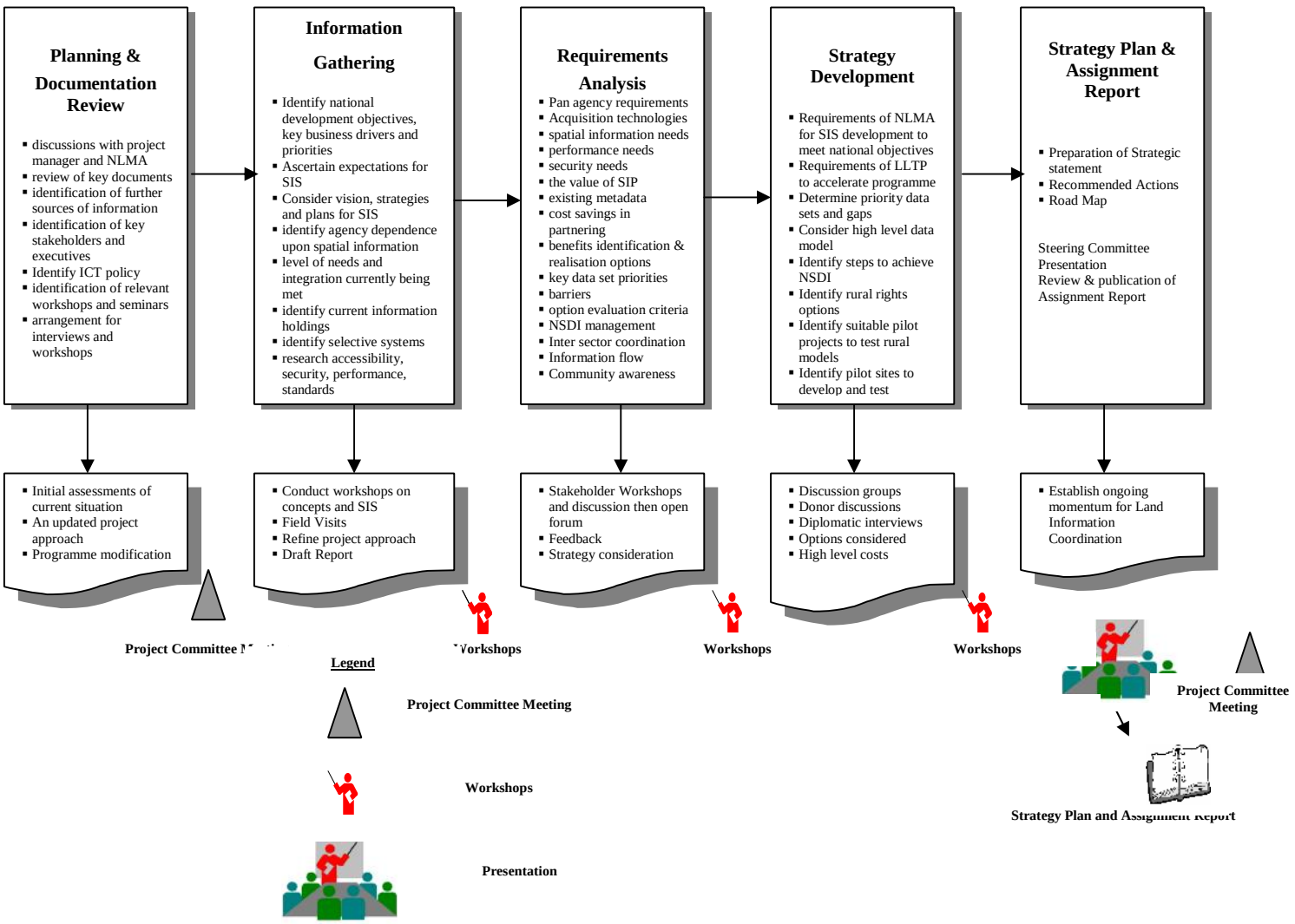
The TORs were discussed prior to the commencement of the assignment. The Consultant indicated that some of the TORs were premature, unrealistic or that inadequate information was available. He made a number of comments for modification of the TOR in his financial proposal. Indeed the suggestion that a Draft Report would be ready after five weeks into the assignment demonstrated a lack of understanding of the Laos environment for the information gathering phase and the inevitable changes to the requirements of the assignment. Indeed, at that mid point when a Draft Report was

required with completed style and format, the Consultant was attempting to make headway with two counterparts who had divergent priorities with a different focus and expectations of the outcome of the Strategy. TORs are attached as Appendix A.

4. Attachments

The Attachments deal with each of the Tasks and Objectives described on page 2 in the TOR and any other subjects that were considered relevant for future reference in working towards and implementing a Land Information Coordination Strategy. They are extensive and will require study by those to whom the future of the NSDI is entrusted. The term Attachment is used to accommodate Appendices and Annexures when included.

Laos Land Information Coordination Strategy Methodology



5. Methodology

The Methodology included a:

- Planning and Documentation Review,
- Information Gathering,
- Requirements Analysis,
- Strategy Development, and
- Strategy Plan and Assignment Report.

The Schema for the detailed contents of this approach is described above.

6. Problem

The lack of accessible, integrated spatial information in relation to land and the natural resources of Lao PDR is resulting in:

- **Rapid deterioration of the physical resources of the country,**
- **Growing social disruption due to the inappropriate use and occupation of land.**

7. Key Issues

The key issues when considering the development of the coordination issues are:

- SDI governance
- Access to data
- Data quality
- Interoperability
- Integratability

These are discussed at length in Attachment 11 where the Vision and Objectives are developed.

8. Major Findings

The Findings are described at length in Attachment 10. They were covered under a number of headings which included:

- Land and Natural Resources Sector Policy,
- Spatial Planning,
- Co-ordination,
- Organisation,

- Management, and
- Staffing.

Although difficult to summarise due to their extent, the following brief statement is an indication of the current situation:

- Immature institutional arrangements and user/ provider relationships,
- Project and donor focused land information acquisition,
- Inconsistencies in the availability and quality of spatially referenced data,
- Inconsistent policies concerning access to and use of spatially referenced data,
- Incomplete knowledge about the availability and quality of existing spatially referenced data, and
- Lack of relevant practice in the utilisation of enabling technologies.

9. Priorities

Other jurisdictions have had similar experience to that of Laos when embarking on the building of a National Spatial Data Infrastructure to achieve coordination of land information.

A number of priorities are usually identified and include:

- Improve institutional arrangements.
- Develop policies and guidelines to remove barriers to information flows.
- Facilitate all jurisdictions moving in the same direction on policy issues such as access, copyright and privacy.
- Coordinate development and adoption of a minimum set of standards focused on data quality.
- Facilitate useful and well documented statements of data quality.
- Update directories of available information.
- Facilitate interoperability where needed to support flows of information.
- Promote the integratability of data where needed (what needs to fit together should fit together).
- Investigate defining and refining priorities for national datasets.
- Develop the people and capacity to build the infrastructure including education, skills formation, research and development initiatives.

10. Major Recommendations.

The recommendations are drawn from the Framework Report and deal with a wide range of issues. Many of them overlap due to the pan agency nature of spatial information and have impacts on many stakeholders. However, for ease of consideration they have been put into a number of categories. This section has been reduced for brevity to describe the major recommendations. The entire list of recommendations can be found in Appendix H.

National Level Policy

- Government to recognise that spatial information, similar to physical infrastructure like transportation and utilities, is treated as an infrastructural asset,
- Describe national development objectives,
- Appoint a leading organisation to coordinate the building of spatial datasets and manage the NSDI,

NLMA Minister

- Appoint a Strategy Steering Consultant (SSC) to manage the Road Map,
- Initiate design of National Spatial Data Infrastructure with NGD by October 2007 with initial creation by December 2007,
- Identify two or three Pilot Projects, at least one being in Vientiane, to demonstrate the capability and relevance of the use of spatial data to assist in the growth of good governance. These projects should be high profile with political and community implications ensuring wide publicity,
- Establish effective organisational and institutional arrangements,

National Spatial Data Committee

- Identify and adopt an appropriate metadata system,
- Nominate custodians for each data set,
- Establish NSDI and locate to relevant agency,
- Adopt the Lao National Datum 1997 which has its origin at the Astro Pillar in Nongteng Village, Vientiane,
- Carry out an inventory of all spatial data sets, national, provincial, regional and project that exist and are needed,
- Identify and arrange the conversion or construction of all essential data sets,
- Promote the use of geographical information, its methods and tools through a Land Information Strategy Communication Plan.

NLMA Policy Level

- Agree on a common strategy for spatial information and GIT,

- Consider a means whereby the GOL gains access to or ownership of all digital spatial data pertaining to Laos,
- Identify appropriate outsourcing mechanisms of data acquisition, maintenance and management,
- Commission a Business Case to assess the feasibility of investment in the development of a National Land Information Framework,

NLMA Operational Level

- Determine spatial data needs to meet national objectives,
- Conduct an Institutional Arrangements Study in the changed circumstances due to the location of conservation, planning and management functions within the NLMA,
- Conduct an Organisation, Management and Operations Review (OMO) of the NLMA,
- Conduct a desk study for appropriate technologies to service rural titling needs,
- Conduct a feasibility study on a new digital map with the accuracy of 1:50 000 to cope with use of natural recourses and investments in infrastructure,
- Consider options for rural land titling,
- Investigate technologies for urban titling.

LLTPII

- Continue with the LTP II in the 9 Provincial Capitals for urban and peri-urban lands between Dec. and June 2007,
- Design modifications adopted for LTP II approach by June 2007,
- Phased introduction of modified approach for all urban and peri-urban lands during 2007-2008,
- Titling expanded to all urban areas from 2008,
- National Urban Land Titling completed by 2012.

National Geographic Department

- Conduct phased National Aerial Imagery between 2007 and 2010,
- Orthophotography mapping completed by 2012,
- Acquire national data coverage of priority data sets,
- Construct a new digital map with an accuracy of 1: 50 000 to be able to cope with the development and investment needs of the country.

Donor Level

- Develop a coordination and alignment approach for donors currently supporting overlapping and redundant GIT interventions,
- Encourage donors to realise that GI is part of a national infrastructure across all levels of public authority and across all different sectors,

- Encourage donors to initiate an institution building programme on Spatial Data Infrastructure, focusing on human resources and organisation development and fostering a transparent and efficient use of Geographical Information,
- Realign existing donor funding to build the data sets necessary for effective planning and the good management of land and natural resources.

11. Objectives and Scope of Work.

To the minimum requirements of the Strategy as set out in the TORs under the section referring to Objectives and Scope of the Work have been added the Expected Outputs and Deliverables as set out in the TOR on page 3. These rely for completeness on the material in the Attachments but for convenience are summarized briefly below:

11.1. A National Land Information Coordination Vision Statement to guide implementation, and a statement on the National land information coordination goals.

The Vision and Objectives are dealt with in detail in Attachment 11. In summary the Laos Spatial Data Infrastructure (LSDI) vision will ensure that Laos' economic growth, and social and environmental interests are underpinned by quality spatially referenced information. This spatially referenced information must be current, complete, accurate, affordable, accessible and integratable.

Many countries around the world are developing national spatial data infrastructures and it should be acknowledged that an LSDI is a key element in delivering benefits from collection, management and use of spatially referenced information.

Therefore the LSDI vision is that:

Laos' spatially referenced data, products and services are current, available and accessible to all users in the public, private and academic sectors and the international/donor community.

Generally international and regional experiences have identified the following priority areas for early implementation of a NSDI and the Goals and Objectives are described in the relevant Attachment. They include:

- SDI governance
- Access to data
- Data quality
- Interoperability
- Integratability

11.2. A Statement on the Governance and Coordination of National Land Information development.

Over the past few decades, map based information has been transformed from what was the paper location of objects to the digital discovery of computer or electronic enabled information. This information is referred to as spatial information and is considered to be the fuel for spatial data infrastructures and comes from a variety of sources.

A spatial data infrastructure is a concept for dealing with the environment in which spatial information is present. Spatial data infrastructures are comprised of the framework data bases, the institutional structure, the standards for operation, the expertise of staff and the financial resources necessary to create, to drive and to maintain these infrastructures. The characteristics for successful exploitation of this land related information, in order to assist responsible and timely whole-of-government decision making, include the:

- recognition by Government that spatial information, similar to physical infrastructure like transportation and utilities, is treated as an infrastructural asset;
- effective establishment of organisational and institutional arrangements;
- comprehensive directory of information and information sources;
- effective establishment of partnerships between agencies and organisations at all levels of government, the private sector and academia; and
- provision of appropriate access to and delivery of the diverse land related information sets in order to support the growth of a spatially enabled information community.

The development of a National Spatial Data Infrastructure should be designed and receive policy direction through a National Spatial Information Committee of the Land Policy Council. A National Spatial Data Centre will be created with the operational aspects being located at the National Geographic Department and the Committee Structure being serviced by the Centre for Research and Information for Land and Natural Resources (CRILNR) in the NLMA. It will be responsible for the creation of metadata and the development of standards and training for Laos PDR as to spatial information. It could be staffed by suitable staff from other land related information agencies. It would be beneficial for pan agency understanding if staff from Line Ministries are seconded from time to time to the Centre. The organisation and details of the Centre will be identified as a future task in the Road Map. The Concept of multi sector Land Information Sharing is depicted in Attachment 12.

The Diagram in Attachment 12 shows the many sectors, that use and currently create spatial information for the national good. In the absence of a metadata system very little is known about the existence and the content of these varied geographic or spatial data sets. They have been developed for specific agency purposes from specific agency budgets and are usually jealously guarded from other agencies for a variety of reasons. Often they are not shared because the data are not current or they are incomplete and the responsible agency could be embarrassed by the state/condition of the data sets. The

National Spatial Data Centre can become the hub where information about this national spatial information can be found. The NSDC is not necessarily[1] the repository of the data but the source of knowledge as to the location of the data set and the information or metadata about that data.

The characteristics of the Laos PDR NSD Committee should ensure that it has wide representation and is responsible for, among other things, policy, management, standards, infrastructure and training within the realm of national spatial information needs. It has a Steering Committee and is linked to all other sectors through a Communication Network. The Laos PDR Information Sharing Concept is a means of ensuring that:

- public funds for the acquisition of land related information is appropriately managed,
- an inventory of relevant data sets is publicly known,
- the information is accessible,
- the conditions for use of that information is public,
- duplication is minimized,
- better allocation for the maintenance of information is done, and
- standards are developed to provide data integration potential.

An appropriate communications network must be introduced to ensure adequate understanding of the power of the NSDI and the role of the CRILNR. This should be directed to the Line Ministries and the public at large to ensure there is effective use of the data and the systems which flow from the data.

The national information-sharing concept is an approach which should be kept in mind as each agency acquires equipment, identifies data needs, captures information and develops its maintenance programme. It is an evolutionary process and initially should concentrate on the development of standards, metadata, policy and funding issues. However, it is also essential that at the earliest possible stage, some integration of fundamental data sets is done to demonstrate the capacity and relevance of land related information for rational national decision-making. This integration with the addition of some thematic data sets for topical use and economic planning should be made public to ensure that political and community support is encouraged and maintained.

For the moment, suffice to say that, the Centre must ensure:

- Movement towards the better promotion of geographical information, its methods and tools;
- Agreement on a common strategy for geographical information and GIS;
- Coordination of acquisition, diffusion and access policies related to geographical data;

[1] It may be appropriate for the District NLMA Office to be the repository for multi agency District spatial data when other agency facilities are not adequate.

- The encouragement of cooperation between GIS projects by offering a platform for exchanges and discussion in order to facilitate the sharing of knowledge, experiments and resources;
- The promotion in the use of tools and standards for modeling and geographical data exchange.

In addition to answering questions of an economic, environmental and social nature related to development projects, the Centre must establish a base, which will support the emergence of a real national infrastructure for geographical information. The central idea of "high quality information through dedicated personnel" is certainly one of the principal keys to achieve these ambitious goals.

As a preliminary to the formal establishment of a NSDI, cautious steps should be taken as previous attempts to coordinate land information have failed or stalled[2]. Accordingly, as set out in the Road Map it is recommended that initially a SIS Users Network be created by the bringing together of like minds from the government, private sector and the donor community. From this grouping, ideas could be formulated to identify suitable projects which could be built to demonstrate the effectiveness and relevance of SIS to the country and the community. One such project could be a Flood Model for Vientiane and another in the rural area could be a complete coverage of existing Concessions showing the terrestrial and socio-economic influences. A suggested Composition of the Users Group is shown in the Attachment 12.

11.3. Guidelines for the use, provision, acquisition, security and management of land information.

Considerable detail is explained in Attachment 11 when describing the Vision and Objectives. A number of priorities for further action are usually identified and include:

- Improve institutional arrangements.
- Develop policies and guidelines to remove barriers to information flows.
- Facilitate all jurisdiction levels to move in the same direction on policy issues such as access, copyright and privacy.
- Coordinate development and adoption of a minimum set of standards focused on data quality.

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[2] On 30 and 31 May 2002, a GTZ project, SMRP, supported the first "Workshop on Management and Exchange of Geographic Information / Data Standards / Metadata base Development" in Lao PDR, held at NAFRI. The workshop recommended to follow up by holding regular coordination meetings. It was followed by a meeting of the then newly founded "Working Group on Data Standards / Metadata base Development at NAFRI" on 08 November 2002. From this meeting emerged a decision to establish an "inter-ministerial working group on GIS + Information Systems". SMRP ended around the same time and with it the immediate German support to this activity. The working group was founded and met, and it is believed that by about April 2004 Mr. Khamsone of MAF-IC was its vice chairman. JICA is currently supporting an IKM working group mainly within MAF, which may well be a successor of these earlier working group meetings. Personal Communication from Christoph Feldkoetter on 17 December 2006.

- Facilitate useful and well documented statements of data quality.
- Update directories of available information.
- Facilitate interoperability where needed to support flows of information.
- Promote the integratability of data where needed (what needs to fit together should fit together).
- Investigate defining and refining priorities for national datasets.
- Develop the people and capacity to build the infrastructure including education, skills formation, research and development initiatives.
- The coordination strategy will be user focused and outcome driven,
- Management and sharing of spatial information will be based on a cooperative approach across Government, the private sector, and academia,
- Custodianship of data and information products should be the cornerstone of recognizing rights and responsibilities within a broader framework of access and use. The datasets will represent the single authoritative source of the data,
- Framework information will be the authoritative base datasets of the Spatial Data Infrastructure and will underpin the use of all business information,
- Data custodians will determine data quality standards in consultation with users to ensure that the data is “fit for purpose”,
- Meeting spatial information education and training needs to provide sufficient capacity is a whole of State responsibility and will be coordinated across all sectors and levels of the spatial information industry,
- Custodians of spatial datasets will make them available in accordance with agreed access guidelines and where possible a common access mechanism to facilitate ease of access and use,
- Custodians will have pricing and licensing arrangements that are as simple and clear as possible to encourage the use of spatial information, while ensuring sufficient income to support maintenance of the data and to protect intellectual property,
- Development of technology and applications will be based on the principle of interoperability, thereby facilitating sharing and exchange of data, and
- Users can be provided with pathways that fully exploit the framework and use the infrastructure to deliver real outcomes.

There is also a need to communicate with and obtain feedback from all stakeholders. For this purpose, the LSDI Committee needs a Communication Plan. The areas of activity contained in the plan should include online resources, publications, projects and presentations. In some cases, communication could be generic to a wide audience, in other cases it would need to be tailored to the needs of particular data provider or user groups.

A key activity for the LSDI implementation in 2007-8 is to conduct an LSDI workshop series around Laos. An aim is to solicit feedback and to get ownership of LSDI implementation actions from stakeholders in government agencies, academic institutions, professional associations and business enterprises.

11.4. Minimum standards for public access to land information and service delivery by local land offices.

To discuss minimum standards for public access to land information and service delivery by local land offices in Laos PDR is a little like asking someone what flavour ice cream he would like when he has never seen an ice cream. Service delivery is not an issue in Laos except in certain limited areas like the telecommunications industry and in some parts of the banking industry where some recent changes have occurred in relation to customer awareness. In the majority of areas, and the further one travels from Vientiane, time is not a major deterrent to transacting business and the very act of having the opportunity to relate to someone, for whatever reason, is used as a communication event to learn more about another human being and share some news.

Laos is a relatively small place and the atmosphere is neighbourly. The people are averse to the orderly queue concept of the British and European societies and favour the Chinese approach of having a single focus on the counter or public servant providing one with a commodity, a pass or ticket. But the Lao people bring a courtesy to these negotiations which is often absent in other Asian societies.

Further, the communications between national, province and local levels is poor to non existent. The facilities at the local level are limited and the information flow between all levels is hampered by many restraints; not the least of which, at the moment, is the dynamic institutional arrangements which are taking place as a result of the recent creation of the NLMA. It will be some time before a stable environment is achieved and only after an Institutional Arrangements Study is done and the results implemented.

Nevertheless there is a growing awareness of customer rights and the expectations of service delivery through, perhaps, the interface with an increasing European influence. Accordingly it is worthwhile taking the opportunity to consider the principles and experiences of other land related agencies to learn from them. Such information will assist the slow adoption of such behaviour in Laos. Principles, such as those adopted under the Blair government in Britain, are worthy of consideration when the time is appropriate to seriously address the issues of service delivery. These were referred to as the nine ‘Principles of Public Service Delivery’ and were as follows:

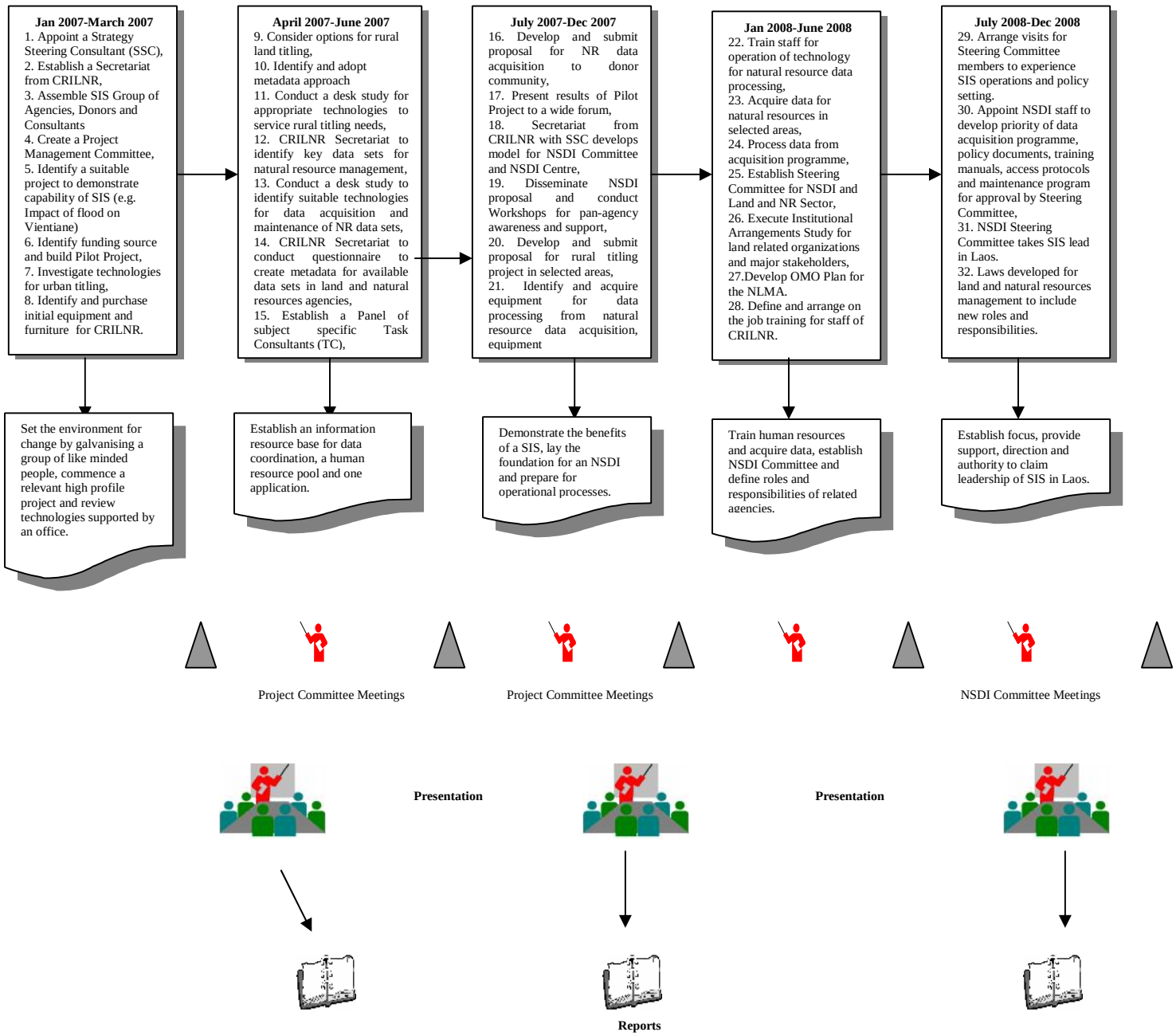
- Set Standards of Service
- Be Open and Provide Full information
- Consult and Involve
- Encourage Access and Promotion of Choice
- Treat All Fairly

- Put Things Right When They Go Wrong
- Use Resources Effectively
- Innovate and Improve
- Work with Other Providers

These are the principles on which public service delivery standards can be based and against which performance is measured.

11.5. The National Land Information Coordination Strategy provides the framework upon which to guide land information development in Lao PDR.

Laos SIS Project Road Map



11.6. Establish the National Objectives for ICT, e-governance, and spatial information;

Under the umbrella of the Prime Ministers' Office, the (UNDP) together with (STEA) developed a project entitled "ICT for Development in Lao PDR" which started in September 2004. The project consists of two main objectives:

- developing a policy framework,
- enabling digital standardisation for Lao information exchange to implement this government strategy in terms of ICT.

The Objectives are to Strengthen the capacity of the Lao Government to address issues relating to the standardisation of Lao digital information exchange, build consensus through the LaDIEN and create suitable ICT standardization for the Lao PDR.

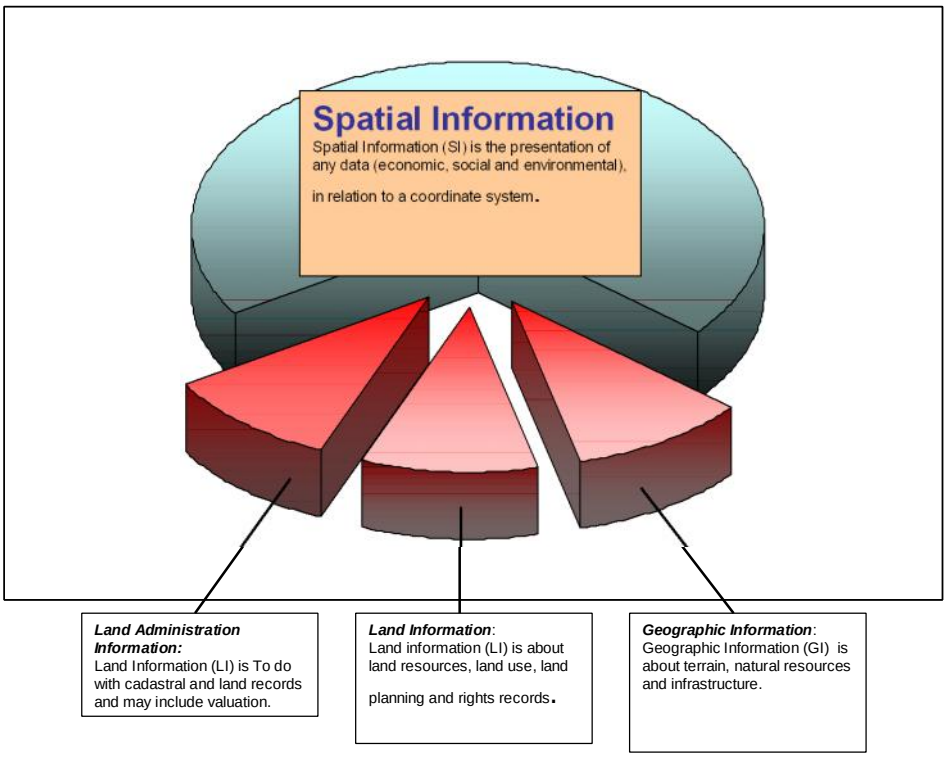
The e-policy was drafted in March 2004 by the STEA and various stakeholders from both government and private sectors such as STEA, Ministry of Communication Transportation Post and Construction, Ministry of Education, Ministry of Justice, and National University of Laos. The policy consists of nine priority areas. E-policy has been revised according to the needs of Lao PDR and it is now complete and awaits government approval

Internet access is available only in those cities with telecommunications infrastructure. The Internet is used mainly for email and browsing. Only government ministries maintain their own websites, providing basic information on their respective roles and structures. E-government of the extent seen in developed countries is a distant concept for Laos. In fact, the government has not provided any online services.

The difficulties of introducing ICT into Lao PDR and the desired successes are considerable. Nevertheless, the recent and ongoing introduction of improved telecommunications facilities will assist greatly in the information flow from and to all levels of government and the community. STEA is the policy making body but it would not be appropriate for STEA to store and manage the burgeoning spatial data for Laos. STEA is already providing a whole-of-government (WOG) warehouse capability for e-governance and general administrative information. It has also provided training in GIS. But at this stage it would seem appropriate to focus on the CRILNR as the facility for supporting an NSDI and the National Committee to ensure clear responsibility for the sharing of spatial information. The National Geographic Department should continue to perform or manage the major role of spatial data acquisition and maintenance and expand its role into the natural resources area. In turn the line agencies should rely on the NGD for the bulk of data acquisition and major projects whilst performing the necessary analytical tasks in keeping with their mandates.

11.7. Reach consensus on the LTP II objectives for land information coordination,

The coordination of land information goes well beyond the LTPII objectives. However, there seems to be general consensus as to the need for a coordinating mechanism and discussions at the Workshops would indicate that the NLMA was the preferred agency to fulfill this role. The LTPII objectives could be considered as focused on land administration information which is a part of the land information set. This in turn sits as part of the spatial information envelope which includes the land administration information, land information and geographic information as follows:



It is essential that the LTPII Project continues to work closely with the NGD as it has done in the past and follows the development of an integrated and coordinated land information arrangement in Lao PDR. This should be easier now that the DOL is incorporated within the NLMA.

11.8. Outline the roles of all stakeholders in the coordination of land information,

Stakeholders can be divided generally into producers, users, value added resellers, suppliers and academia. They all have a role which is often overlapping or twofold in that the same agency or private firm could be a producer and a user or value-adder. At this stage and, accepting that there will be the adoption of an NSDI concept, the situation could be as follows:

- The CRILNR could provide the Secretariat for the National Spatial Committee which would be a Committee of the Land Policy Council. The Centre would maintain the metadata system and be the knowledge source as to the location for all spatial data,
- The NGD would continue to be the major spatial data acquisition and management agency. It would, however, increase its role to manage natural resource data. This, and any other functions, may be done through outsourcing to the private sector,
- Land related agencies like Agriculture, NAFRI and MCTPC would continue to add attribute data to the foundation data sets supplied by the NGD for analytical purposes in the main stream of their respective roles,
- Academic institutions would continue to monitor the educational needs and be advised by the NSC,

11.9. Define the scope and responsibilities of the National Land Information Centre.

The detailed mandates, responsibilities rights and duties of the National Land Information Center, now called the Centre for Research and Information of Land and Natural Resources, are set out in Attachment 5. The CRILNR in brief, and among other things, will:

- conduct data collection and scientific, methodological, policy and legal studies related to land and all its related natural resources,
- establish and manage land and natural resource information system,
- disseminate and distribute information related to land and natural resource,
- supply needed data and information to line agencies, parties and local authorities,
- undertake study, data collection, evaluate and assess the capacity and suitability of every (plain, plateau and mountain) type of land,
- supply needed information and in cooperation with concerned institution and localities, undertake land valuation for each every land type and location,
- cooperate with foreign countries and organizations in the field of research and information of land and related natural resource,
- take the lead in the elaboration of national policies and strategies related to land and natural resource research and information activities,
- cooperate with concerned line agencies in the research of scientific and methodological, policy and legal information,

- assemble and compile all information related to land and natural resource available in the country,

11.10. Recommend policies and protocols for the sharing of data by government agencies.

The sharing of data starts with the concept of spatial data and its management and further details are provided in Attachment 7.

By adopting a whole of government approach it can be decided:

- what data sets are essential for good governance,
- the appropriate technologies for acquisition,
- the most suitable method for acquisition,
- which agency is the appropriate custodian to hold/store the data set.
- what metadata approach will be adopted.

In the case of Lao PDR there are some opportunities to consider new approaches to the "ownership" of digital data. It seems reasonable to claim that all data captured for projects, international, national, local or specific should be the property of the state. There would, of course be exceptions to certain types and extent. Exceptions could include the result of mineral exploration studies which are commercially valuable. But even these could be archived under certain conditions by the State. As a minimum, all data sets should be recorded from a metadata perspective. At the strategic level the sharing of information is a precursor to the Vision described in Attachment 11. Currently the use of existing information is inhibited mainly by the:

- Lack of knowledge as to what exists,
- The uncertain content of the existing data sets,
- Confusion as to the role of data custodians,
- The absence of consistent, or the non-existence of, standards, and
- The access protocols which usually revolve around informal networks or artificial pricing mechanisms.

The present system for pricing GI is hampering the use of GIS and support for decision making in Laos. During the development phase of information technologies, users in the government sector should pay, as a maximum, only the transaction cost. Printed map sheets are on sale at reasonable prices but many users are scanning the old maps instead of using the GIS Base Map due to the comparatively high price for the digital map. A pricing system that restrains the use of public infrastructural investment is a waste of resources. Some of the agencies visited are sharing data with other state organizations, charging only for the transfer of data. If a foreign aid project requires datasets, then usually a fee is charged. A new pricing policy is required to encourage the use of geographical data.

As discussed earlier there are various opinions and reasons for adopting certain access approaches. The weight of opinion in the international community favours access at a cost which will not deny widespread use of the data. The French example given in Attachment 7 is some justification for this approach but also is the claim that taxpayers' money has already been used for the acquisition of such data and should therefore be "free". A balanced view is that within government the data should be transferred free of charge when in a raw condition. When costs are incurred by way of enhancement, preparation of data, assembling or extraction costs, copying or transmission costs these could be taken into account.

11.11. Recommend policies and protocols for making the information available to the public.

In making information available to the public, charges should, as with the access by government agencies, be at a rate to not inhibit the use of data. Where transaction or preparation costs are incurred, the consumer should be required to pay a minimum fee. The fee, like in initial registration of land titles, should be so devised as to encourage general participation and the increased the use of spatial data.

11.12. Specify national data standards.

The widespread use of geographic information is creating a need for standards. Consistent and accessible information, and associated systems and services contribute to making life simpler and increase the reliability and effectiveness of the goods and services we use.

There are three types of geospatial-related standards:

- **Content standards**—including land use codes, surveyor codes, data dictionaries for cadastre, geographical place names, bathymetry;
- **Access standards**—including GDA94, ISO 19100 series (*Geographic information*), ISO 23950 (*Information Retrieval*—Z39.50), most OpenGIS standards; and
- **Exchange standards**—including Geography Markup Language (GML), Scalable Vector Graphics (SVG), Uniform Resource Identifiers (URIs *aka* URLs).

The International Organization for Standardization (ISO) is a world-wide federation of national standards bodies. It is responsible for promoting the development of standards to facilitate the international exchange of goods and services. Within ISO, Technical Committee 211 (ISO/TC 211) is dedicated to developing and deploying standards relating to Geographic information/ Geomatics, also known as the ISO 19100 series. Whilst the core standards are conceptual, they provide a solid foundation for the development of technological implementations.

The OpenGIS Consortium (OGC) works closely with ISO/TC 211. OGC is an international consortium of businesses, governments and universities that develops publicly available geoprocessing specifications, or OpenGIS® Specifications. These support interoperable solutions that "geo-enable" the internet, wireless and location-based

services, and mainstream IT. They also empower technology developers to make spatial information and services more accessible to users. OpenGIS® Specifications often relate to technology implementations, including definition of interfaces; with some being formalised as ISO 19100 standards.

Standards[3] can be at the strategic level as with the INSPIRE guidelines for data acquisition:

- that spatial data should be collected once and should be included at the level where this can be done most effectively;
- that it must be possible to combine seamlessly spatial data from different sources across the nation, and preferably the region, and share it between many users and applications;
- that it must be possible for spatial data collected at one level of government to be shared between all levels of government;
- that spatial data needed for good governance should be available on conditions that are not restricting its extensive use; and
- that it should be easy to discover which spatial data is available, to evaluate its fitness for purpose and to know which conditions apply to its use.

They may deal with GIS characteristics or data exchange needs and treat with such matters as symbology and coordinate systems. They may be subject or theme specific like a Geodetic Control Database Standard where the standard will provide guidance to those establishing databases and will facilitate the exchange of information between databases.

Accordingly standards can be simple or complex, management or subject specific, strategic or tactical. In order to provide some clarity of the term for this Consultant Task 6, reference for regional purposes was firstly made to the document "Mekong River Commission, Procedures for Data and Information Exchange" adopted by the MRC Council at its Eighth Meeting in Bangkok. The Definition of Terms in that document includes:

Standards: *Guidelines for data handling that are recognized as best practice in their relevant scientific or technical disciplines, with the objective to minimize the transaction costs of using data.*

However, Standards are not static. They are part of a process which includes the creation, review, adoption and implementation process. The intent of standards is to provide continued growth and succession so the benefits of transition from newly emerging to fully mature information systems can be reached. The implementation stage does not see the end of the standard development. The process is arduous and it is essential to maintain comprehensive record systems of the approach and decision making in relation to the adoption of standards.

[3] Standards are dealt with in more detail in Attachment 6

Probably the most important standard for Laos at the moment is the Metadata Standard: Simply defined[4], metadata is 'data about data.' Used in the context of digital spatial data, metadata is the background information, which describes the content, quality, condition, and other appropriate characteristics of the data. Paper maps contain metadata, primarily as part of the map legend. In this form, metadata is readily apparent and easily transferred between map producers and map users. When map data are in a digital form, metadata is equally as important, but its development and maintenance often require a more conscious effort on the part of data producers and the chain of subsequent users who may modify the data to suit their particular needs.

For the purposes of cataloging and documenting an agency's geospatial data, metadata should be maintained. Metadata is useful for managing libraries of data for internal use as well as for sharing with a community of users, through a clearinghouse, or other catalog. Metadata is also useful for understanding issues associated with the transfer or translation of geospatial data between agencies, data models, or software platforms. Developing and maintaining metadata protects an organization's internal investment in geospatial data. There are four roles that metadata can play:

- **Availability**
  - Metadata are used to determine what data exist for a particular geographic location.
- **Fitness for use**
  - Metadata are used to evaluate whether a particular set of geospatial data meets an identified need.
- **Access**
  - Metadata are used to facilitate the acquisition of an identified set of geospatial data.
- **Transfer**
  - Metadata are used to help process and use a set of geospatial data.

Perhaps the most important operational standard is the adoption of the Lao National Datum 1997 which has its origin at the Astro Pillar in Nongteng Village, Vientiane. Adoption of other geodetic datums like the Indian 1954, Indian 1960, Vientiane 1982, Lao Datum 1993 and WGS84 will only prolong confusion and the difficulty of integration. Further, the Lao National Datum 1997 is the best approximation to the sea-level surface in the region of Lao PDR and is favoured by the NGD.

To conform with the TOR and attempt to specify national data standards, at this stage of spatial information development in Laos, would be less than productive. From the outline given above it is clear that the development of standards is a process and must be relevant to the spatial environment current in Laos. STEA should provide the IT envelope, as part of its ICT Policy role, into which all information is to be acquired and managed. Then it should be the responsibility of the CRILNR to manage the development of standards

[4] "How To Guide on Metadata Implementation", section 1.1. Authors: David Hart & Hugh Phillips. Version: June 10, 1998.

while acting as the Secretariat for the NCDI Committee. These standards must then be promulgated to the data acquisition agencies, donors and contractors for adoption.

11.13. Recommend National Framework datasets and outline the agencies to be responsible for maintaining these datasets.

There is no updated documentation on available geographical datasets because similar or identical data is stored at several agencies. One of the first things to do in order to identify and share databases is to make an inventory of all available GI datasets in Laos. This is in line with the proposal on implementing a Metadata system as the key to GI datasets leading towards a NSDI.

There are at least four datasets with relatively good accuracy, compared with alternative datasets, covering the whole of Laos:

1. One is the dataset on locations of villages and their names and codes surveyed with GPS during the national census, 2005.
2. The highest accuracy dataset on national and provincial roads was the survey made by Lao Consulting Group, commissioned by MCTPC, 2001-2002.
3. Spot imageries from 2002 covering the whole of Laos is available at FIPD at the scale of 1:50 000 for the northern parts and 1:100 000 for the southern parts of Laos.
4. The contour lines scanned by MRC from the1:50 000 maps made by the US Army Map Service 1963-1967.

NAFRI has had long experience in using GIS and has elaborated an "Information Service Strategy" 2003. Their soil dataset is of common interest covering the whole country. NAFRI is the only institution encountered using the GBM. Data is shared with FIPD, STEA, MRC and NGD. As part of the Lao –Swedish Upland Agriculture and Forestry Program there is an institutional cooperation and GIS capacity strengthening from the Lund University GIS Centre. The project is working on transforming different datasets to one geodetic datum to be interoperable.

Based on experience in other, and even more advanced countries, Laos does not have the time to create the traditional institutional arrangements, invest in the equipment and train the people to acquire, analyse, monitor and distribute the spatial information to safeguard the natural resources and improve the livelihood of the people. It would seem that the only way that the situation can be addressed is by a national urgent and rapid acquisition of land related information[5] by the use of the private sector. Whilst this should be done on a national basis there may well be priority areas due to specific activities which would dictate the sequence of events. There are, as already claimed, a number of national data sets like the Census of 2005 and others which provide an excellent start to integrate information for decision making.

[5] This information can then be used to effectively plan and visualise the influence of decision making at all levels and relate spatial information to national objectives.

Bearing in mind the type of development which is likely to take place in keeping with the national development objectives and the prevailing pattern it should be possible to identify the characteristics which run with such development. This would then indicate the sort of spatial information needed for planning purposes. These data sets may be the topography, the population distribution, the extent of forest cover, the soil type, administrative boundaries and the transportation corridors. Having identified the types of data needed it is then necessary to do an inventory of the data available and the extent or coverage of this data. Appropriate repositories should be assessed like the Ministries, donors, MRC, private contractors and international providers[6]. As mentioned earlier it is not possible to acquire and assemble this data bank in a suitable and integratable format within the existing resources of the Laos Government sector.

Accordingly, an initial approach would be to realign the existing donor funding to call for appropriate international organisations to build the data sets necessary for effective planning and the good management of land and natural resources. The GOL would be required to institute a system of re-supply and refreshed data from the village, district and provincial levels to ensure the quality, coverage and currency of the data sets. This data flow would require a reliable system of maintenance of which the CRILNR is well aware. The information sets would be the property of the GOL and the contractor would act as the outsourcing agent.

Whilst the spatial information would be the property of the State and managed by the contractor, the operational line Ministries would develop the capacity to use the data for project purposes and to analyse the data for integrated decision making within their agencies. This is in line with the approach taken by STEA where it provides the repository or server for other departments to access their data so saving the line agency the cost of computer investment and other associated costs. In the case of spatial information the National Geographic Department would work closely with the contractor and hold an updated set of all land, property and natural resource data sets. The NGD would also be required to provide Project Mapping and data integration for the GOL. The CRILNR would act on behalf of the NLMA as the National Spatial Data Secretariat.

In concert with such a major national undertaking it would be appropriate to:

- Carry out an inventory of all spatial data sets, national, provincial, regional and project that exist,
- Build an Inventory of State Lands,
- Build an Inventory of Concessions and Leases,
- Build an Inventory of Protected Areas,
- Build an Inventory of Conservation Areas,
- Build an Inventory of Production Areas,
- Build an Inventory of Land Use Planned Areas,

[6] On the Nam Ngum Watershed Management project alone there were more than twenty international and national organizations involved, with the majority creating spatial data.

- Develop a Land Capability Map,
- Locate population locations and spatial extent down to village level,
- Define the location of all issued Land Titles and planned programmes,
- Define the location of all allocated rights to land including TLUCs,
- Describe the transportation Network,
- Record and classify the Transportation Network,
- Identify appropriate outsourcing mechanisms of data acquisition, maintenance and management.
- Develop a metadata system to record the existence and the details of all spatial data,
- Identify the type of development expected to be carried out in Laos,
- Determine the characteristics of these developments,
- List the information sets required to service the next five to ten years of national development initiatives,
- Identify the conservation areas of the country,
- Develop specifications for the acquisition and maintenance of these data sets,
- Design and implement a training programme to use these data sets,
- Develop an equipment need for the relevant Laos agencies for acquisition, analysis, integration and distribution of information sets,
- Identify access and sharing policies, and
- Consider a means whereby the GOL gains access to or ownership of all digital spatial data pertaining to Laos.

To maintain the momentum of such a national project it could be augmented by a regional initiative and/or pilot projects to trial some of the ideas and develop appropriate systems whilst the national information sets are identified and compiled and the institutional arrangements are put in place. Such an approach is outlined in the Road Map.

11.14. Outline a course of action to progressively improve the capacity of all agencies involved in land administration and land titling to participate in the management and coordination of digital land information. This will include recommendations for the progressive computerization and improvement of capacity to manage digital spatial data.

To attempt a serious and comprehensive analysis and design leading to an action plan for the progressive computerisation of all relevant national agencies and to identify the staff development needs of the country with respect to computerisation, including training and education is a formidable task[7]. It is also one that requires considerable preparatory work.

[7] The extent of this task was raised when I initially considered the TOR. My comments then in relation to each of 8 and 9 were:

Such work would include initially an Institutional Arrangements Study which would, inter alia, consider:

- Government policy,
- Relevant institutional assessment and constraints,
- Future government policy,
- Economic reform,
- International practice,
- Information technologies,
- Privatisation, and
- Technology transfer

and a wide ranging Organisation, Management and Operations Review (OMO) which would, inter alia, include:

- Assessment, realignment and strengthening of the NLMA,
- Strengthening staff training,
- Recruitment of staff,
- Retaining trained staff,
- Ensuring the sustainability of the NLMA by making provision for the education of future managers and technical specialists.

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The current institutional situation in Lao PDR is one in which the land related organisational structure is in a state of turbulence with the Department of Lands, only becoming a part of the NLMA on the 27 November 2006, and significant down stream implications currently being resolved. As the designer of the current DOL organisation for the LLTPII World Bank PAD, the Lead Consultant for both the Ghana Land Related Institutional Arrangements Study and the EU funded Polish Integrated Cadastral System, the Consultant for the Sri Lanka Institutional Arrangements Study and inaugural Chairman of the PSMA Australia the author is justified in making these and other claims which follow. The state of training and relevant level of computerisation in Lao PDR varies considerably. Existing mapping suffers from a range of datums; involves the use of considerable "cartographic licence" when assembling maps; there is little digitisation of spatial data and what has been done is generally not readily integrated; there is no whole of government metadata system; there is little spatial information or mapping available in the rural areas; a general ignorance within government of the availability and the sources of information; frequently poor telecommunications; inadequate office facilities and few trained staff. The level of competence varies greatly from agencies like the MCTPC which have considerable data and expertise, the NGD which provides a service to government and has worked well with the LLTPII down to the local level where the

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- This also will be limited to a generic view since to do this effectively would necessitate a comprehensive assessment of the existing capacity of human and facility resources in all sections-central, provincial and local levels.

- An indication of data set acquisition and movement, analysis and storage will be necessary to complete such a staff development programme.

situation can range from fair to bad. At the regional level the MRC provides a different and professional level of skills and data holdings.

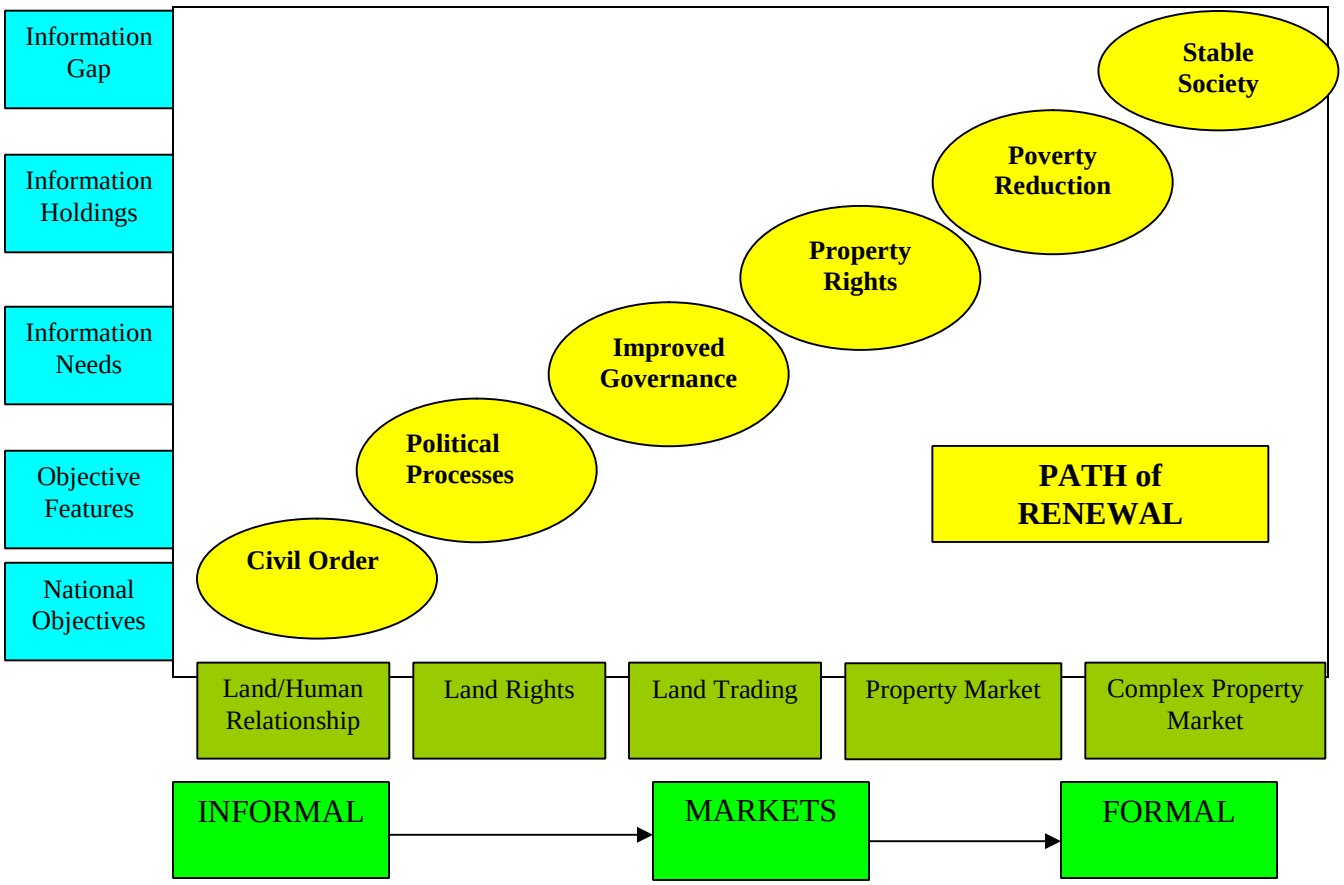
The recent creation of the NLMA and its organic CRILNR has set the scene for a potential change but emphasis on computerisation in the absence of effective institutional arrangements will simply tinker at the edges of the problem and do little but satisfy the whims of technologists. Indeed it may have a negative effect. There should of course be considerable energy directed at the improvement of the technical situation in land related agencies in Laos and this should focus on the creation of a Centre of Excellence within which staff will wish to remain employed and an effective transmission of data from and to all levels. To spread resources too thinly among all agencies with limited resources will achieve little. Priority should be given to the establishment of the CRILNR with appropriate equipment, logistics and training and the setting up of offices at the Provincial and District levels to ensure effective maintenance, two way data flow and dissemination of data both vertically and horizontally. A strong public awareness programme should be devised and launched when the system has stabilised (to avoid unreasonable expectations) and to build confidence in the community. To concentrate on the CRILNR and the hierarchy of data flow will encourage the understanding of the use of data and stimulate the local level of involvement. This emphasis should be accompanied by the identification of two or three Pilot Projects, at least one being in Vientiane, to demonstrate the capability and relevance of the use of spatial data to assist in the growth of good governance. These projects should be high profile with political and community implications ensuring wide publicity.

The training needs are a different matter. There are some major decisions which have to be made to set the platform for an identification of these needs. Initially the decision has to be taken as to whether the government is the appropriate place to acquire and manage spatial data. As claimed elsewhere in this report, Laos does not have the time to establish the structure and go through the traditional processes of acquiring data within government. Accordingly serious consideration should be given to the outsourcing and management of key data sets. However, whatever the decision there will be the need for significant training within government at all levels. This will take the form of data acquisition and maintenance practices where the key data sets are to be augmented. But an emphasis should be placed on the analytical training whereby the implementing agencies will be able to enhance the key datasets with relevant attributes to perform their agency roles.

In an attempt to satisfy, to some degree, the TOR and in the absence of the necessary government policy as to the approach to data acquisition and management, consultation has been had with a number of agencies and coarse estimates made as to the raw equipment needs and the type of training-limited to acquisition, analytical and users-which could be considered in any national planning attempts. The figures for computing and training needs as shown in Appendices A and B are total needs and no recognition or investigation of existing holdings has been attempted.

12. Conclusion

The approach adopted for the development of a strategy for the coordination of land information is to link the information with market development and adopt a "step by step" approach as indicated in the following Diagram:



The strategy for the coordination of land information should commence with the determination of national objectives which will vary from country to country. In the case of Lao PDR a relevant set would be:

- Poverty Alleviation,
- Social Equity,
- Strong and Good Governance,
- Sound Natural Resource Management,
- Sustained Economic Growth through:
    - Hydropower Generation,
    - Sustainable Forestry,
    - Development of Agro-forestry,
    - Mining,
    - Tree Plantation, and

- Ecotourism.

At this point the characteristics or features of each of these objectives can be determined and the spatial information necessary to underpin these objectives can be defined. Existing holdings can then be identified which in the case of Lao PDR would, say, include:

- GIS Base MAP from NGD,
- NBS Census data 2005 – x & y coordinates for all villages in LAO PDR,
- Contour lines digitized by MRC from the US Army Map Service,
- Soil data from NAFRI,
- NBS made a census for 2005,
- MCTPC has an accurate data set on the National and Provincial road network

The institutional arrangements should be considered early in the process and could be as follows:

- Identify a Users Group and several Pilot Projects of national and political significance,
- Seek funding for the building of the data sets to serve these projects,
- Build the pilot projects and disseminate the results widely,
- Design the needs of an NSDI,
- Develop policies and staff needs for the NSDI,
- Create the NSDI Committee and data sharing arrangements,
- Establish the NSDI.

Finally, the information gap is defined by the shortfall between what is needed and the existing holdings. Whilst a logical and simple approach, it is complex in the implementation since it involves the people and organisations that make up society at all levels and from most sectors. Experience indicates that members of the bureaucracy are not enthusiastic about change and when dealing with methodical and systematic processes like the accumulation and maintenance of spatial data there is a tendency to lose political support due to the size of the task and the consumption of resources in the building phase. Accordingly, energy and commitment is needed to ensure that the momentum of such a powerful initiative is maintained.

Appendix A

Revised Terms of Reference for the Development of a Land Information Coordination Strategy for Lao PDR

A. Background

The Government of Laos has commenced a long-term land titling project aimed at the development of the land administration's capacity to support the country's economic development and poverty reduction goals. The Ministry of Finance (MOF), through the Department of Lands (DOL), implements the project. Funding for the project is provided by the World Bank through the Credit financing for operations, the Australian Government (AusAID) and the German Government (GTZ) through grant financing for Technical Assistance (TA). The first phase of the Land Titling Project (LTP) commenced in July 1997, and ran to the end of September 2003. A second phase (LTP II), began on October 2003 and will run until December 2008. LTP II will provide secure land titles in urban and peri-urban areas. IN addition several rural development projects financed by donors (such as irrigation projects) request for land titles to be provided to beneficiaries before the start of these projects.

The economic, social and environmental development goals of a nation are underpinned by vast amounts of land related information. Land information is related to the position of land titles or properties, and may also be related to a position on the earth's surface (e.g. through coordinates). This information may be in paper form, or be contained in digital files. Land information may also be stored in textual files such as title registers or databases, or be represented in graphical form on maps or plans. All these types of land information are important resources for the government of Laos, industry and individuals.

Land resource assessment and steps towards poverty alleviation in rural and urban environments are improved by the use of up-to-date and comprehensive land information. Cadastral maps, aerial photography and land use maps of State, private and common lands are used daily in land administration and management activities conducted by the Ministry of Forestry and Agriculture, the Ministry of Finance, and the Ministry of the Office of the Prime Minister. Many other forms of land information are used and maintained by other government departments and agencies.

At present, many of the activities related to the management and use of land data in Laos are uncoordinated and ad-hoc. This consultancy aims to provide an over-arching National framework for the collection, management and distribution of land information, within which the government agencies involved in the Land Titling Project (Phase II) can operate. There is a need for the development of a comprehensive national framework of institutional arrangements, land information policy, data and standards to guide the development of Laos land information resources and activities. This overarching framework should be considered to have the same importance as public infrastructure such as road networks. Successful development of such a framework leads to the

reduction of duplication of effort, the establishment of standards for recording information, and investment in land information and activities. As Lao does not have such a framework in place, the strategy developed in this consultancy will identify common land information themes for the efficient investment in land information activities and resources, and help define the components of the framework for land information coordination.

This assignment will explore land information policy development for the government of Laos, define the various components of a national framework for the coordination of land information, outline the stages of development of the strategy, and provide recommendations for implementing the recommendations. The strategy should be consistent with the national information (land and other information) goals of the Lao Government, but be presented in form that allows the land information needs of the Land Titling project to be addressed. For this purpose, the LTP II will recruit a qualified consultant to assist in preparing a land information coordination strategy.

B. Objectives and scope of work

The National Land Information Coordination Strategy should comprise (as a minimum):

- A National land information coordination vision statement to guide implementation, and a statement on the National land information coordination goals; and
- A statement on the governance and coordination of National land information development; and
- Guidelines for the use, provision, acquisition, security and management of land information, and
- Minimum standards for public access to land information and service delivery by local land offices.
- The National Land Information Coordination Strategy provides the framework upon which to guide land information development in Lao PDR.

Working under the supervision and guidance of the Project Director of LTP II, the consultant will pursue the following tasks:

1. Determine the role and responsibilities of all agencies involved in the collection of land information. Identify all relevant agencies the Land Titling Project that should be involved in land information coordination.
2. Identify which government and private organisations are collecting land information, the format in which it is collected, and how it is used. This review should involve an assessment of who the users of this land information are.
3. Review the current national policies and strategies for Information and Communication Technology (ICT) and e-governance and how these relate to the sharing of land information.
4. Review the key data-sets that are relevant and available for the assignment and make recommendations on the establishment of framework datasets.
5. Identify the role and scope of the National Land Information Center.
6. Make recommendations for the establishment of national data standards.

7. Make recommendations on protocols for data sharing and the pricing of data within the government sector as well as making that information available to the public.
8. Prepare an action plan for the computerisation of all relevant national agencies. This should include a plan for the progressive computerisation of agencies down to the Province and Local level.
9. Review and map out the staff development needs of the country with respect to computerisation, including training and education.
10. Any other task reasonably related to the above.

At the end of the assignment, the consultant will present the findings and recommendations at a stakeholders' workshop, organised by the Project Director, and based on the feed back and suggestions received, the assignment-completion report would be finalised and submitted.

C. Expected Outputs and Deliverables

1. A draft strategy should be prepared, distributed to all stakeholders, and discussed in a workshop. The strategy should:
    a. Establish the national objectives for ICT, e-governance, and spatial information;
    b. Reach consensus on the LTP II objectives for land information coordination,
    c. Outline the roles of all stakeholders in the coordination of land information,
    d. Define the scope and responsibilities of the National Land Information Center.
    e. Recommend policies and protocols for the sharing of data by government agencies.
    f. Recommend policies and protocols for making the information available to the public.
    g. Specify national data standards.
    h. Recommend National framework datasets and outline the agencies to be responsible for maintaining these datasets.
    i. Outline a course of action to progressively improve the capacity of all agencies involved in land administration and land titling to participate in the management and coordination of digital land information. This will include recommendations for the progressive computerization and improvement of capacity to manage digital spatial data.

2. Upon receipt of comments/advice from the stakeholders on the draft strategy, a final version of the strategy will be prepared and submitted to the Government of Laos, the World Bank, and TA (AusAID and GTZ).

Consultative meetings will be organized twice during the course of this assignment. The first meeting will be organized by week-six of the assignment and the second meeting after the finalization of the draft report by the end of week-eight (toward completion of the assignment).

D. Minimum Qualifications of Consultant

The consultant should have a Degree in surveying, geomatics, or an area relevant to the consultancy, and a favourable higher degree.

The successful candidate will be fluent in the English language.

The consultant should have a good knowledge in Land Titling Projects or Land Management Projects and extensive experience in developing countries or countries in transition, preferably in Southeast Asia. In particular, the consultant should have at least 10 years experience in the development of land information systems, particularly with government.

E. Funding, Coordination and reporting

Subcomponent 1(c) of the Land Titling Project (Phase II) supports the development of a policy for collection and sharing of land information by land-related agencies. The component will finance the engagement of a consultant to develop the land information coordination strategy. The consultancy will be funded from IDA loan.

Technical assistance for Component 1 is provided by GTZ, and an international land policy adviser has been engaged to support the implementation of Component 1.

The consultant will work closely with the LTP II Project Director and Director-General of Department of Land Use Planning and Development (DONLUPAD) and will periodically update the Project Director on the progress made. All reports (including draft and final) will be submitted to the Project Director for reproduction and dissemination to all relevant agencies.

During the mission in Lao PDR, the consultant will be accompanied by an official representative of DONLUPAD.

F. Proposed Timetable and Contract

The consultancy should commence as soon as possible and be for a duration of 8 weeks in one mission. The following is an indicative timetable.

First Part: Investigation of the national objectives, policy and standards for ICT, e-government and e-information; exploratory investigations of existing land information activities in Lao PDR. Identify the existing users of land information (2-3 weeks).

Second Part: Undertake interviews to determine the land information users and needs of relevant Lao Government agencies, and key supporting partners, including the use of and need for spatial information and activities. This should include government agencies both directly involved in the Land Titling project and those not involved in the LTP but with an involvement in the use spatial information (2 weeks). During this part, the Consultant will visit one Province (Vientiane Province or Bolikhamxay) and one district in this Province.

Third Part: Preparation of draft report and initial recommendations. Presentation and discussion of the results at a workshop to LTP stakeholders and representatives of the major users of land information (2 weeks).

Fourth Part: Second Meeting - presentation of findings (draft strategy) to all relevant agencies for feedback and review. Incorporate feedback from the meetings and completion of final report (1-2 weeks).

The consultant shall submit his financial proposal that will include all costs to complete the assignment. The financial proposal will be negotiated with the consultant. Following the signing of the contract, the consultant will be requested to submit his work plan indicating the time schedule to complete the assignment. The work plan shall be presented and discussed with the client in a meeting by week 1. After the meeting the consultant shall finalize the work plan and proceed to completing the assignment.

The contract will be a lump-sum contract of which payments are tied to the Consultants' outputs and deliverables, as follows:

Outputs or Deliverable	Percentage of Payment	Expected Date of completion and/or submission	Number of Copies
1. Conformed copy of contract and submission of work plan	Twenty (20)	Within week 1 following commencement	Five
2. Draft Strategy (report and recommendations)	Fifty (50)	Within 6 weeks following commencement	Five
3. Final Version of the Strategy	Thirty (30)	Five (5) days after the completion of the assignment	Five

All reports shall be in English.

During the mission, the Consultant may use office facilities at DONLUPAD and DOL and shall be provided transport with driver. The costs for the two consultative meetings and/or workshops for the presentation of initial findings and recommendations and the draft report shall be provided by DOL.

Appendix B

Abbreviations

ADB	Asian Development Bank
ANZLIC	Australian and New Zealand Land Information Council
ASEAN	Association of South-East Asian Nations
AusAID	Australian Agency for International Development
CISP	The Community Initiatives Support Project
CRILNR	Centre of Research and Information for Land and Natural resources
DLO	District Land Office
DOL	Department of Lands
DONLUPAD	Department of National Land Use Planning and Development
DoR	Department of Roads
DSS	Decision Support Systems
ESRI	Environmental Systems Research Institute
FAO	Food and Agriculture Organisation
FINNIDA	Department for International Development Cooperation, Finnish Ministry of Foreign Affairs
FIPD	Forestry Inventory and Planning Division
GBM	GIS Base Map
GBM	GIS Base Map
GI	Geographic Information
GIS	Geographical Information System
GIT	Geographical Information Technologies
GMS	Greater Mekong Subregion
GOL	Government of Laos PDR
GPS	Global Positioning System
GPS	Global Positioning System
GTZ	German Agency for Technical Cooperation
HMLR	Her Majesty's Land Registry
IAR	Institutional Arrangements Review
ICT	Information Communication Technologies
ICT	Information Communications Technology
IDA	International Development Association
IGN	Institut Géographique National
INSPIRE	Infrastructure for Spatial Information in Europe
IRAP	Integrated Rural Accessibility Planning
ISO	International Standards Organsation
IT	Information Technology
JICA	Japanese International Cooperation Agency
LaDIEN	Lao Digital Information Exchange Network
LDC	Less Developed Country
LRD	Local Roads Division
LSDI	Laos Spatial Information Infrastructure
LTP	Land Titling Project

LUPLA	Land Use Planning and Land Allocation
Lux-Development	Agence Luxembourgeoise pour la Cooperation au Developpement
MAF	Ministry of Agriculture and Forestry
MCTPC	Ministry of Transport, Communication, Post, and Construction
MOF	Ministry of Finance
MoU	Memorandum of Understanding
MRC	Mekong River Commission
NAFRI	National Agriculture and Forestry Research Institute
NBCAs	National Biodiversity Conservation Areas
NGD	Prime Ministers Office, National Geographic Department
NLMA	National Land Management Authority
NLPC	National Land Policy Committee
NPEP	National Poverty Eradication Programme
NR	Natural Resources
NSDC	National Spatial Data Centre
NSDI	National Spatial Data Infrastructure
OGC	OpenGIS Consortium
PAD	Project Appraisal Document
PLO	Provincial Land Office
PMO	Prime Ministers Office
PRoMMS	Provincial Road Maintenance System
PSMA Australia	Public Sector Mapping Agencies Australia
PTD	Planning and Technical Division
RMS	Road Management System
SDI	Spatial Data Infrastructure
SDI	Spatial Data Infrastructure
Sida	Swedish International Development Authority
SIS	Spatial Information Systems
SOE	State Owned Enterprise
SSLCC	Soil Survey and Land Classification Centre
STEA	Science, Technology, Environmental Agency
TLUC	Temporary Land Use Certificate
TOR	Terms of Reference
UNDP	United Nations Development Programme
UXO	Unexploded Objects
WCS	Wildlife Conservation Society
WFS	Web Feature Server
WLIA	Wisconsin Land Information Association
WOG	Whole of Government
WWWC	World Wide Web Consortium

Appendix C

People Met

Name	Title/Profession	Organisation
Kham Ouane Boupha	Minister	NLMA
Alistair Maclean	Ambassador	Australian Embassy, Vientiane
Annlis Aberg	Swedish Embassy Charge d' Affaires,	Swedish Embassy
?? Bouakam	Secretary and Division Manager	NLMA
Anders Aberg	Consultant, Swedesurvey	Vientiane
Anongsone Phommachan	Head of Procurement	DOL
Bouavanh Phutthavong	Director of Photogrammetry Division	Prime Ministers Office, The National Geographic Department
Bounhom Heuangsavath	Director, Science and Technology Division	Prime Ministers Office, The National Geographic Department
Bounta Phetdara	Deputy Provincial Project Director	CISP, Oudomxay
Bountieng Sanaxonh	Team Member	CRILNR
Carl Mossberg,	Director	Ramboll Natura, Vientiane Office
Chanseng Phongpachit	Deputy Director of PD	Lao National Mekong
Chanthaviphone Inthavong	Director	CRILNR
Chris Flint	Resettlement Specialist	SWECO International
Christoph Feldkötter	Technical Adviser	GTZ, Mekong River Secretariat
Daniel Carter	Technical Advisor	LLTPII
David Barber	Consultant	AusAID
David McDowell	Land Registration Advisor, LLTPII	DOL, MOF
Florian Rock	German Team Leader, Land Policy Advisor	GTZ
Frank Lieber	Software Architect	Bangkok, Thailand
Garry Oughton	Founder and Chairman	*Ecolao*, Vientiane
Geert De Bruycker	Regional Office Manager	Lux-Development S.A., Vientiane
Grant Young	Logistics Manager, Phu Bia Mining Ltd	Vientiane
Head of PAFCO	Land Committee and ten other people from related activities.	Luang Namtha Land Office
Howard Fielding	Managing Director, Aquaculture	Quy Nhon, Vietnam.
Huon Rath	GIS Specialist	Mekong River Commission
Ithiphone Chanthamaline	Team Member	CRILNR
Jane Davies	Senior Program Manager	AusAID
Jeremy Ferrand	GIS Consultant	Terran GIS
Jorn Mirete	GIS Consultant, Lao-German Program Rural Development in Mountainous Areas of Northern Lao PDR	GTZ

Kankeo??	Head of Land Office and 10 others	Bolikhamsay Province
Keith Bell	Task Manager	The World Bank
Khame Phalakhone	Deputy Director General	MAF, Department of Planning
Khampane Sopha.	Village Committee Member and Nai Baan	Ban Sisaat, Paksan District
Khamsouk Vannabouathong	Administrator, Lux-Development S.A.	Vientiane Office
Kongkham Sourigna	Deputy Director General	National Geographic Department Prime Minister's Office
La Thongkham	National Project Manager	Nam Ngum River Basin Development Sector Project
Le Van Diem	Programme Coordinator, Information and Knowledge Management Programme	Mekong River Commission
Lindsay Owler	Managing Director	Argonaut Resources (Laos) Co.Ltd.
Marcel Brigger	Director, Universal Tire Recycling	St. Laurent, Quebec, Canada
Marit Aakerholt	System Consultant	Prime Ministers Office, The National Geographic Department, GIS-Centre
Mark Marquardt,	Consultant	The World Bank
Michael Dwyer	PhD Student, University of California	Oudomxay NLMA Office
Michael Hassett	First Secretary	AusAID
Michael Hedemark	Program Co-Director	Wildlife Conservation Society
Mike Callaghan	GIS Specialist	*Ecolao*, Vientiane
Oudonisack Philavong,	Deputy Chief, Secretarial Office,	Lao National Mekong
Oulaphone Onokeo	GIS Specialist	Lao National Mekong
Peter Fogde	Forest Engineer	Burapha Group
Phaiboun Budsaba	Head of Administration Division	DOL
Phonpasit Phissamay	Director	STEA, Vientiane
Phouangphanh Sayasane	Chief of Cartographic Division	Prime Ministers Office, The National Geographic Department
Phoukhong Phongsa	Country Liaison Officer	GT
Phouvieng Sythalavong	General Manager	Finnmap-International, Vientiane
Pinphakore Xayavong	Project Management Assistant/Translator.	LLTPII, DOL
Robert Tizard	International Training Adviser	UNESCO, Luang Namtha
S. Thatheva	Deputy Director of the Information Centre	MAF
Sean Foley	Consultant	*EcoLao*, Vientiane
Siphandone Sihavong.	Project Director	LLTPII, DOL
Somphet Khammany	District Governor	Paksan
Sountone Saulisack	Deputy Head of Planning and Finance Division	DOL
Steve McFadzean	Team Leader Technical Assistance	LLTPII, DOL
Ten Farmers/Villagers and Field Officers	Group Meeting	Namsing Village Project Office
Vankham Keophandy	Director General	DOL

Veikko Jantunen	Marketing Manager	Finnmap-International, Helsinki Finland
Viengkeo Phetnavongxay	Operation Officer, Rural Development	The World Bank, Vientiane
Virana Sonnasinh	Technical Officer	Lao National Mekong Committee, Secretariat Office
Virana Sonnasinh,	Program Officer,	Lao National Mekong
William Tuffin	Advisor	Green Discovery, Luang Namtha
Yiannis Varelidis	Project Management Adviser, Lux-Development S.A.	CISP, Oudomxay

Appendix D

List of Documents

Type	Name of Report	Prepared by
Atlas	National Atlas of Lao PDR, CD	GTZ
Book	Atlas of Laos, The Spatial Structures of Economic and Social Development of the Laos PDR,	Bounthavy Sisouphanthong and Christian Taillard, NIAS; Silkworm Books
Book	Geospatial Data Infrastructure Concepts Cases and Good Practice	Richard Groot and John McLaughlin
Book	The Peasant Betrayed	John P. Powelson and Richard Stock
Brochure	Brochure of Geodetic, Photogrammetric and Cartographic Work Carried out I LAO PDR	PMO, NGD, 2005
Brochure	Geodetic, Photogrammetric and Cartographic Works carried out in Lao PDR 2005	NGD
Brochure	Integrated Rural Development Programme Luang Namtha	GTZ
Census 2005	Population and Housing Census, 2005, Result on the Province and District level	Preliminary Report, September 2005, NSC
Conference Preparation	Second International Conference on Sustainable Sloping Lands and Watershed Management: Linking research to strengthen upland policies and practices programme 12-15 December 2006	NAFRI
Correspondence	Second LLTPII Supervision Mission	World Bank
Discussion Paper	Development of Land Policy in Lao PDR	LLTP, Gosta Palmkvist
Discussion Paper	Biodiversity Conservation, Protected Areas and the Development Imperative in Lao PDR: Forging the Links,	IUCN Lao PDR
Draft	A Five Year Strategic Framework for IUCN's Programme in Lao PDR, 2007-2011	IUCN
Draft	Master Plan on National Land Use, Lao PDR	Central Committee on Land Management and Land forestry Allocation
GEO-3	State of Environment, LAO PDR, 2001	UNEP, RRC.AP, STEA, August 2001
Guidelines	WLIA Standards	WLIA
Information	Summary Record of the Lao-German Government Negotiations on Development Cooperation Bonn, 5-6 September 2006	
Information	Concept note for Medium Sized Project in GEF Biodiversity for Lao PDR	NAFRI

Information	Lao Land Titling Project Overview	DOL
Inventory	Bolikhamxay Province, Environmental Inventory,	IUCN and Swedish International Development Cooperation Agency, March 2000,
Law	Decree on Surveying, Aerial Photography and Mapping Activities in the Territory of LAO PDR	No. 255/PM, August 2005, PMO
Law	Decree of the National Land Management Authority, May 2004	PMO
Law	Decree for Forestry Strategy to the Year 2020 of the Lao PDR, 2005	PMO
Manual	Secure Land Tenure: "New Legal frameworks and Tools in Asia and the Pacific"	FIG Commission 7
Minutes	Minutes of the 3rd Partnership Commission between the Lao People's Democratic Republic and the Grand Duchy of Luxembourg (Vientiane, 18 September 2006)	
Minutes	Minutes of Agreement between the GOL and the ADB Mission for the Proposed Grant Assistance from the Japan Fund for Poverty Reduction to the Lao PDR September 2002	ADB
NAFRI	Information Service Strategy, 2003-2010	Information Management Division, April 2003
Policy	Study on Land Tax and Land Fees Policy in Lao PDR	GTZ
Policy	Lao PDR Production Forestry Policy, Status and Issues for Dialogue, Volume 1 Main Report, October 27, 2000,	World Bank/SIDA/Ministry of Foreign Affairs, Government of Finland.
Questionnaire	ELIS Survey	SEMLA
Reference Manual	Local Referencing and Road Condition Survey, Data Handover, Final Report, July 2001, Third Highway Improvement Project,	Lao Consulting Group Montgomery Watson Harza No. 2934_LA
Reference Manual	The Lao National Datum 1997	NGD, October 1997
Reference Manual	Lao Road Maintenance Program (RMP), User Manual – Application Guide, 2003	Ramboll Denmark Cr. 3481-LA; NDF No. 352-LA
Reference Manual	The Lao National Datum, 1997	LLTP

Report	Access to Basic Needs and Services in Savannakhet Provnice, Provincial Summary	IRAP Savannakhet MCTPC/UNDP/ILO project Lao/95/001, January 2000
Report	Accessibility Data Base, Muang Viengkham	IRAP Luangprabang, Project Lao/95/001
Report	Biodiversity Profile for Luang Namtha Province	MAF/STEA with Danida and UNDP
Report	Building Statistics and information Basis for Agricultural Sector in 21st Century March 2003	JICA
Report	Environmental Action Plan November 1993	Organisation for Science, Technology and Environment
Report	Existing Land Tenure and Forest Lands Study, May 2002.	Lao Consulting Group, for DOL re LTP,
Report	Final Report, Covering the period 1995 - 2001	MCTPC, LRD, April 2001
Report	Geographic Information in Use in Lao PDR	Anders Aberg, Swedesurvey
Report	LTP 1 Implementation Completion Report.	LLTPII, DOL
Report	PAD LLTPII	World Bank
Report	PAD LLTPII	World Bank
Report	Report on Geographic Information Systems, GIS, / Remote Sensing, RS, Consultancy, February 2003	Christoph Feldkötter, GIS Consultant
Report	Report on The Assessment of Forest Cover and Land Use During 1992-2002, July 2005	MAF
Report	Road Network Analysis, Xiengkhouang Province, October 1999	Dep. of Planning and Co-operation
Report	Rural Development Committee, T2 Training Modules 1-4 on Data Analysis	MCTPC
Report	Rural Development Committee, T3 Training Modules 1-4 on Project Development	MCTPC
Report	Science, Technology and Environment Agency, Ministry of Agriculture and Forestry, National Capacity Building Project. Overview of Databases and GIS Resources within the Natural Resources and Environment Sector in Lao PDR.	STEA
Report	Second Six Monthly Report, October 2006	LLTPII
Report	Shifting Cultivation Stabilization Project 1998	FAO
Report	Study on State Land Leases and Concessions in Lao PDR	GTZ
Research	Lao Environmental, Institutional and	EcoLao for Stockholm

Report	background Research Project ADB: Strategic Environmental framework for the Greater Mekong Sub-region September 2000.	Environment Institute,
Review	A Review of Conservation Management in Lao PDR, Lao Swedish Forestry Programme, Vientiane, November 1998,	Lao-Swedish Forestry Programme
Review	Review of Protected Areas and Development, Lessons Learned in Cambodia, Lao PDR, Thailand and Vietnam.	PAD Partnership
Strategy	Biodiversity Country Report 2004	MAF/STEA with Danida and UNDP
Strategy	National Strategy on Environment to the Years 2020 and Action Plan for the Years 2006-2010	PMO
Strategy	Strategic Framework in Support of the National Priorities in Environment, Science and technology and Intellectual property, Standardization and Metrology 2006-2010	STEA
Study	Concept Paper – Pilot Land Titling Activities in Rural Areas	
TA Report	Spatial Data Management-LTP II	AusAID
TA Report	GIS projects in Vientiane: A Comparison of Users	AusAID
TA Report	Developments in Cadastral Survey PPP	
TA Report	Study on Land Allocation to Individual Households in rural Areas of Lao PDR	GTZ
Technical Framework	Land Records Management System in India-Technical Framework	Map Asia Conference
Technical Framework	Design of LRS in Context of Indian Environment	Map Asia Conference
Technical Framework	Land Information service for Use in Agriculture and Rural Development	Map Asia Conference
Technical Report	STEA's role in ICT Development of Lao PDR.	PMO
Watershed Classification	The WSC Data Users Guide, GIS-Applications for Watershed Classification,	Centre for Development and Environment, University of Berne July 1997 and MRC

LAO SIS ROAD MAP	
January 2007-March 2007	
1	Appoint a Strategy Steering Consultant (SSC),
2	Establish a Secretariat from CRILNR,
3	Assemble SIS Group of Agencies, Donors and Consultants
4	Create a Project Management Committee,
5	Identify a suitable project to demonstrate capability of SIS (e.g. Impact of flood on Vientiane or Land Zonation on the Vientiane Plains and a Rural Pilot Project in Oudamxay)
6	Identify funding source and build Pilot Project,
7	Investigate technologies for urban titling,
8	Identify and purchase initial equipment and furniture for CRILNR.
Outcome	
Set the environment for change by galvanising a group of like minded people, commence one or more relevant high profile projects and review technologies supported by an operational office.	
April 2007-June 2007	
9	Consider options for rural land titling,
10	Identify and adopt metadata approach
11	Conduct a desk study for appropriate technologies to service rural titling needs,
12	CRILNR Secretariat to identify key data sets for natural resource management,
13	Conduct a desk study to identify suitable technologies for data acquisition and maintenance of NR data sets,
14	CRILNR Secretariat to conduct questionnaire to create metadata for available data sets in land and natural resources agencies,
15	Establish a Panel of subject specific Task Consultants (TC),
Outcome	
Establish an information resource base for data coordination, a human resource pool and one or more applications.	
July 2007-December 2007	
16	Develop and submit proposal for NR data acquisition to donor community,
17	Present results of Pilot Project/s to a wide forum,
18	Secretariat from CRILNR with SSC develops model for NSDI Committee and NSDI Centre,
19	Disseminate NSDI proposal and conduct Workshops for pan-agency awareness and support,
20	Develop and submit proposal for rural titling project in selected areas,
21	Identify and acquire equipment for data processing from natural resource data acquisition, equipment and technologies,
Outcome	
Demonstrate the benefits of a SIS, lay the foundation for an NSDI and prepare for operational processes.	

January 2008-June 2008	
22	Train staff for operation of technology for natural resource data processing,
23	Acquire data for natural resources in selected areas,
24	Process data from acquisition programme,
25	Establish Steering Committee for NSDI and Land and NR Sector,
26	Execute Institutional Arrangements Study for land related organizations and major stakeholders,
27	Develop OMO Plan for the NLMA.
28	Define and arrange on the job training for staff of CRILNR.
Outcome	
Train human resources and acquire data, establish NSDI Committee and define roles and responsibilities of related agencies.	
July 2008-December 2008	
29	Arrange visits for Steering Committee members to experience SIS operations and policy setting.
30	Appoint NSDI staff to develop priority of data acquisition programme, policy documents, training manuals, access protocols and maintenance program for approval by Steering Committee,
31	NSDI Steering Committee takes SIS lead in Laos.
32	Laws developed for land and natural resources management to include new roles and responsibilities.
Outcome	
Establish focus, provide support, direction and authority to claim leadership of SIS in Laos.	

Appendix F

STRATEGY STEERING CONSULTANT
DRAFT
TERMS OF REFERENCE

VACANCY ANNOUNCEMENT

INTERNATIONAL CONSULTANT
Institutional Arrangements in the National Land Management Authority of Lao PDR

The newly created National Land Information Authority (NLMA) is currently building its resource base. The grouping of the relevant agencies is now taking place. This will require the development of institutional arrangements between all stakeholders and all levels of management throughout the country. The World Bank is looking for a competent and qualified consultant to support the Authority in this work.

The consultant will be responsible for helping the Secretariat of the Minister's Office and staff of the Centre of Research and Information for Land and Natural Resources to reengineer the NLMA as follows:

- To define and manage a Road Map for future operations and the maturing role of the NLMA;
- To build a shared understanding across Ministries and within the NLMA of the objectives and modus operandi of the NLMA;
- To develop a suitable coordination forum for all land related donor and national projects;
- To develop and monitor an appropriate organizational structure for the NLMA;
- To define, arrange and manage appropriate economic, social, and environmental studies to clarify the relationship between national land objectives and the community;
- To pursue and develop relationships between international land and natural resources agencies;
- To develop networking arrangements to enhance the opportunities for the citizens of Lao PDR in the fields of land and natural resources and spatial information;
- To identify appropriate educational opportunities for professional, technical and public awareness programmes;
- To identify and negotiate economic opportunities for international ethical investors to join with the State and citizens of Lao PDR to protect the environment and enhance the livelihood of the rural population;
- To identify and recommend general management improvements within the NLMA.

A Detailed Terms of Reference is available on request.

Qualifications.

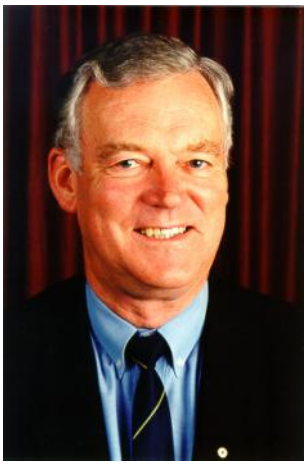
- A Masters degree in a relevant discipline;
- Work experience within relevant government agencies over a period of not less than fifteen years;
- Held a senior position within a land management/land administration agency for at least ten years;
- A firm understanding of the direction and international trends in land administration;
- An ability to work in a consultative and inclusive manner including experience in building consensus with diverse groups people;
- Work experience in South East Asia and especially in Lao PDR.

Duration and Location

The contract will run for two years from the second quarter of 2007, including approximately 150 days of work each year. The role will require a full time effort for an initial several months, and will then be part time after that period. The majority of the time will be spent in Vientiane but occasional travel to the Provinces will be required. There is the possibility of a one year extension subject to demand and performance.

Appendix G

Curriculum Vitae



Professor Don Grant

AM, RFD, MEnvSt *Adel*, HonDSurv(Melb), HonDAppSc *CSturt*, HonDSc *UNSW*, FISAust, FIEAust, CPEng, FRICS, Chartered Surveyor (UK), FAICD Dip.

Don Grant graduated from the Officer Cadet School Portsea in June 1954. He resigned from the Australian Regular Army in 1962 after a number of postings in Australia, New Guinea and Japan. He continued to serve in the Army Reserve until 1984. In civilian life he worked in private practice in two states, local and state government. He was the Surveyor-General of New South Wales, Chief Executive Officer of the Surveyor General's Department, President of the Board of Surveyors and Chairman of the Geographical Names Board for fourteen years until he resigned in 2000. During that latter period he was involved in considerable overseas involvement on behalf of New South Wales. In his capacity as Surveyor General he was the architect of considerable change in New South Wales, Australia and internationally. Professor John McLaughlin, President, University of New Brunswick, says of Don Grant, "Professor Grant is internationally recognised as a senior administrator and scholar in the mapping sciences. He has a strong academic background in both surveying and administration, coupled with a wealth of professional and management experience. His efforts to develop an integrated approach to land information management, and his concepts related to land administration, are widely known and cited within both the academic and professional communities. Don Grant is one of perhaps no more than half a dozen individuals in the English-speaking world who have both the depth of understanding and the breadth of experience needed to examine the potential role of government surveying and mapping organisations in the next decade."

Don is a Registered Surveyor and holds a Masters of Environmental Studies from the Adelaide University. In 1993 he was made a Professorial Associate in the Faculty of Science and Agriculture at Charles Sturt University and in May 1997 was made a Doctor of Applied Science, *honoris causa* at Charles Sturt University and a Doctor of Science, *honoris causa* at the University of New South Wales. In 1997, he was also made a Professorial Fellow of the Department of Geomatics at Melbourne University and an Adjunct Professor of the Department of Linguistics at Macquarie University. In 2004 he was made a Doctor of Surveying, *honoris causa* at the Melbourne University. Between 2000 and 2002 he was the Chief Advisor to the National Hellenic Cadastre in Greece and has provided assistance to a number of other European countries in the field of land administration at the strategic level. From late 2004 to August 2005 he was the Chief Technical Adviser for a major Swedish funded programme in Vietnam.

Don was appointed as a Member of the Order of Australia in the 1994 Queen's Honours List. In 1998 Don was awarded the Mapping Sciences Institute, Australia, Gold Medal and the AURISA Eminent Individual Award. Don was a Fellow of the Institution of Surveyors, Australia; a Fellow of the Royal Institution of Chartered Surveyors, United Kingdom; a Fellow of the Institution of Engineers, Australia; and a Fellow of the Australian Institute of Company Directors. He was also the Australian representative of Commission VII of the International Federation of Surveyors (FIG).

Don has worked in most States of Australia, in the public and private sectors and the defence forces, serving in Australia and abroad. He has consulted or advised in Afghanistan, the Sultanate of Brunei, the Maritime Provinces of Canada, Greece, the Bahamas, Sri Lanka, Ghana, Hong Kong, Indonesia, Thailand, Malaysia, the Philippines, Lao PDR, Vietnam, Zimbabwe, Pakistan and the Peoples Republic of China. He has augmented his practical experience by publishing widely and, through this, has influenced much of the contemporary thinking in his field. In this regard, Professor Peter Dale, former President of the Royal Institution of Chartered Surveyors and the Federation Internationale des Geometres considers Professor Grant to be “a man who combines academic insight with pragmatism. His published works show an originality of thought and a breadth of understanding that is, sadly all too uncommon in land surveying”.

As an Electoral Boundaries Commissioner he was involved in both State and Federal Electoral Boundaries Redistributions. Through his role as the inaugural Chairman of the Public Sector Mapping Agencies (PSMA), he united all jurisdictions in Australia to meet the national census mapping needs of the Australian Bureau of Statistics - a precursor to the creation of a National Spatial Data Infrastructure. He is currently engaged in Lao PDR, the Philippines and Vietnam advising on matters relating to land administration and the coordination of land information.

As the designer of the Department of Lands organisation for the Lao Land Titling Project II as described in the World Bank PAD, Lead Consultant for the Ghana land related Institutional Arrangements Study and the EU funded Polish Integrated Cadastral System, the Consultant for the Sri Lanka Institutional Arrangements Study and inaugural

Chairman of the PSMA in Australia, Don Grant is uniquely qualified to analyse, reengineer and realign organizations that are undergoing significant structural change.

Appendix H

Recommendations

The recommendations are drawn from the Framework Report and deal with a wide range of issues. Many of them overlap due to the range of interests and have impacts on many stakeholders. However, for ease of consideration they have been put into a number of categories.

National Level Policy

- Government to recognise that spatial information, similar to physical infrastructure like transportation and utilities, is treated as an infrastructural asset,
- Describe national development objectives,
- Appoint a leading organisation to coordinate the building of spatial datasets and manage the NSDI,
- Ensure that all jurisdictions are moving in the same direction on policy issues such as access, copyright and privacy,
- Determine the location and extent, assess the benefits, impact and mitigation measures of the existing and planned allocation of all Concessions,
- Assess the external costs to the State of the hydro power projects in terms of maintaining watershed health for a sustained supply of suitable raw material. This could include the loss of productive land, conservation of forest cover, the denial of traditional agricultural practices like shifting cultivation, the stabilization of sloping land and the surveillance of the forests. These costs should be offset as any government contribution to donor projects,
- Assess the external costs to the State of major works like mining, the East West and North South road corridors and the proposed railway link from Kunming-Vientiane-Pakse-Thakek-Vietnam and Cambodia for appropriate consideration of the contribution made by Lao PDR to the region,
- Identify, through appropriate Cost Benefit studies, the social, economic and environmental benefits to downstream countries from the conservation initiatives and costs of Lao PDR.

NLMA Minister

- Appoint a Strategy Steering Consultant (SSC) to manage the Road Map,
- Establish a Panel of subject specific Task Consultants (TC) to support the Road Map,
- Initiate design of National Spatial Data Infrastructure with NGD by October 2007 with initial creation by December 2007,
- Identify two or three Pilot Projects, at least one being in Vientiane, to demonstrate the capability and relevance of the use of spatial data to assist in the growth of good governance. These projects should be high profile with political and community implications ensuring wide publicity,
- Establish effective organisational and institutional arrangements,

- Decide on the Ministry responsible for each data set to avoid redundancies and improve efficiency,
- Consider partnerships between the State, the rural community and international ethical investors to maintain the natural resources and improve the livelihood of the farmers through profit sharing in the long term exploitation of forest products.

National Spatial Data Committee

- Nominate custodians for each data set,
- Investigate, define and determine priorities for national datasets,
- Establish NSDI and locate to relevant agency,
- Establish an appropriate maintenance regime for key data sets,
- Introduce pricing and licensing arrangements that are as simple and clear as possible while ensuring sufficient income to support maintenance of the data, to protect intellectual property and not deny or inhibit widespread use of the data,
- Develop policies and guidelines to remove barriers to information flows,
- Facilitate all jurisdiction levels to move in the same direction on policy issues such as access, copyright and privacy,
- Identify and adopt an appropriate metadata system,
- Coordinate, through well documented statements, the development and adoption of a minimum set of standards focused on data quality,
- Facilitate interoperability to support the the flow of information hierarchy and promote the use of tools and standards for modeling and geographical data exchange,
- Encourage cooperation between GIS projects by offering a platform for exchanges and discussion in order to facilitate the sharing of knowledge, experiments and resources,
- Coordinate spatial information research, education and training needs across all sectors and levels of the spatial information industry,
- Adopt the Lao National Datum 1997 which has its origin at the Astro Pillar in Nongteng Village, Vientiane,
- Develop specifications for the acquisition and maintenance of key and thematic data sets,
- Develop an equipment need for the relevant Laos agencies for acquisition, analysis, integration and distribution of information sets,
- Identify access and sharing policies,
- Carry out an inventory of all spatial data sets, national, provincial, regional and project that exist,
- Identify the conservation areas of the country,
- Build[8] an inventory of State Lands,
- Build an inventory of Concessions and Leases,
- Build an inventory of Protected Areas,
- Build an inventory of Conservation Areas,
- Build an inventory of Production Areas,

[8] Commission or arrange the building through appropriate organizations.

- Build an inventory of Land Use Planned Areas,
- Build an inventory of all population locations and spatial extent down to village level,
- Build an inventory of all allocated rights to land including TLUCs,
- Build a digital data base of the Transportation Network,
- Develop a Land Capability Map.

NLMA Policy Level

- Agree on a common strategy for spatial information and GIT,
- Consider a means whereby the GOL gains access to or ownership of all digital spatial data pertaining to Laos,
- Identify appropriate outsourcing mechanisms of data acquisition, maintenance and management,
- Determine the interaction between maintenance and management of the conservation forests and any appropriate financial assistance from the Conservation Fund,
- Identify carbon credit opportunities with a view to directing revenue to the salaries of the conservation staff to ensure responsible management and monitoring takes place to maintain and enhance the health of the environment,
- Ensure land tax and property rates are relevant, work for the approved and sustainable land use, generate revenue and avoid informal dealings and revenue leakage,
- Identify mechanisms for land owner participation by contributions of land, money or labour when and where the local amenity is improved through the allocation or construction of public facilities, infrastructure development and local rehabilitation as a result of town planning initiatives,
- Consider a means whereby the GOL gains access to or ownership of all digital spatial data pertaining to Laos,
- Identify appropriate outsourcing mechanisms of data acquisition, maintenance and management.
- Commission a Business Case to assess the feasibility of investment in the development of a National Land Information Framework,
- Eliminate institutional and data policy barriers from the use of geographical information,
- Proposal for National Town Planning initiatives prepared by January 2007,
- Phased introduction of Town Planning Training, Schemes and Guidelines commenced in 2008 and completed by 2015.

NLMA Operational Level

- Determine spatial data needs to meet national objectives,
- Determine the feasibility of the existing National Land Use Plan (8 million for agriculture and forestry production, 2 million for built up area including infrastructure, mining and hydro electric and 14 million for Conservation,

- Identify appropriate technologies for nation wide data acquisition,
- Conduct an Institutional Arrangements Study in the changed circumstances due to the location of conservation, planning and management functions within the NLMA,
- Conduct an Organisation, Management and Operations Review (OMO) of the NLMA,
- Conduct a desk study for appropriate technologies to service rural titling needs,
- Conduct a feasibility study on a new digital map with the accuracy of 1:50 000 to cope with use of natural recourses and investments in infrastructure,
- Assemble spatial data sets in order to conduct simulation studies for land valuation, revenue generation and land/people relationship,
- Encourage cooperation between GIS projects by offering a platform for exchanges and discussion in order to facilitate the sharing of knowledge, experiments and resources,
- Consider options for rural land titling,
- Conduct a desk study to identify suitable technologies for data acquisition and maintenance of NR data sets,
- Develop approach for the acquisition, diffusion and access policies related to geographical data,
- Investigate technologies for urban titling,
- Determine the relevance of the National Land Use Plan for each Province, the benefits and disadvantages to that Province and the priority of appropriate development and support.
- Assess the capability of Production Forests by region to maintain the forest industry output and the conservation of the natural resources.
- Assess and monitor the health conditions of the Key Watersheds.
- Identify lands under the eight Land Use types and allocate for management purposes to the appropriate Line Ministry.
- To assess the appropriate locations for specific agro-forestry like palm oil, rubber, eucalyptus or bio-energy products for contract farming or concessions to optimize the production and development of value added industries,
- Identify existing practices and additional appropriate opportunities to maintain and enhance the sustainable livelihood of the rural population by the development of a range of new skills e.g. terracing, timber and non-timber production, agro-forestry and monitoring of any intervention in conservation forests,
- Support the proposed Socio-Economic Atlas by the Swiss National Centre of Competence in Research North South as it will make a major contribution to the macro information base.

LLTPII

- Continue with the LTP II in the 9 Provincial Capitals for urban and peri-urban lands between Dec. and June 2007,
- Transition Period for consideration of Realignment Design of LTP II in urban and peri-urban areas between December 2006 and June 2007 to achieve acceleration of Project,

- Design modifications adopted for LTP II approach by June 2007,
- Phased introduction of modified approach for all urban and peri-urban lands during 2007-2008,
- Titling expanded to all urban areas from 2008,
- National Urban Land Titling completed by 2012,

National Geographic Department

- Conduct phased National Aerial Imagery between 2007 and 2010,
- Orthophotography mapping completed by 2012,
- Acquire national data coverage of priority data sets,
- Construct a new digital map with an accuracy of 1: 50 000 to be able to cope with the development and investment needs of the country.

Donor Level

- Develop a coordination and alignment approach for donors currently supporting overlapping and redundant GIT interventions,
- Encourage donors to realise that GI is part of a national infrastructure across all levels of public authority and across all different sectors,
- Encourage donors to initiate an institution building programme on Spatial Data Infrastructure, focusing on human resources and organisation development and fostering a transparent and efficient use of Geographical Information,
- Realign existing donor funding to build the data sets necessary for effective planning and the good management of land and natural resources.

Communications Level

- Promote the use of geographical information, its methods and tools through a Land Information Strategy Communication Plan,
- Start a GIS users network connecting like minds from the government, private sector, the donor community, and producers of GI, meeting regularly, to create contacts and foster the use of metadata, national standards, new applications for GI technologies through workshops and conference,
- Ensure appropriate access to and delivery of the diverse land related information sets in order to support the growth of a spatially enabled information community,
- Establish partnerships between agencies and organisations at all levels of government, the private sector and academia for the sharing of spatial information,
- Conduct an LSDI workshop series around Laos during 2007-8.

Appendix I

NLMA Urban Pilot Research Project

1. Project Title: Digital Land Management and Administration Research Project.

2. Project Background: Based on the recent need[9] to enhance land use planning, demarcation of administrative, state land, natural reserve, forest land and concession boundaries and to speed up the process of land titling as a tool for obtaining collateral this research intends to study the possibilities to provide technology through integrated datasets using the available information or information that can be easily obtained. It is our belief that easy, responsible access to collateral and loans from the bank could mean a boost to the economy through improved agriculture (and forestry) management.

3. Project Objective: Increase the *usability* of existing geographical data or data that can be easily modified in order to support good governance by:

- the improvement of land use planning and land use zoning;
- bring the society closer to a better living environment;
- enable the demarcation of administrative boundaries that are a key element in zoning and land use planning;
- provide access to the demarcation of state lands, natural reserves, forestland and concessions.

The existing data will also provide technology to study faster the adjudication processes in land titling and ways to speed up cadastral surveys, as the cadastral boundaries are an essential part of land use planning. It should be noted that short cuts related to land registration are few, but the research will study such solutions keeping in mind the collaterals.

4. Project Approach: The Research will be located in Vientiane Province and based on data that already exists:

- Vientiane Plane digital topographical map on 1:5000 scale (equivalent;)
- Colour aerial photo of Vientiane Plain on 1:15000;
- Ortho photo produced for cadastral mapping;
- Existing ground control with coordinates; and
- Existing cadastral boundaries

The Research will be located in the Districts of Xaisettha and Xaitani where the above data is mainly available. Concrete targets for the research will be areas with dense settlements, agricultural paddy areas and state land /state land / natural reserve / forest land /concession an their boundaries.

[9] Workshop on Land Use Planning –Land Forest Allocation 18/19 December 2006.

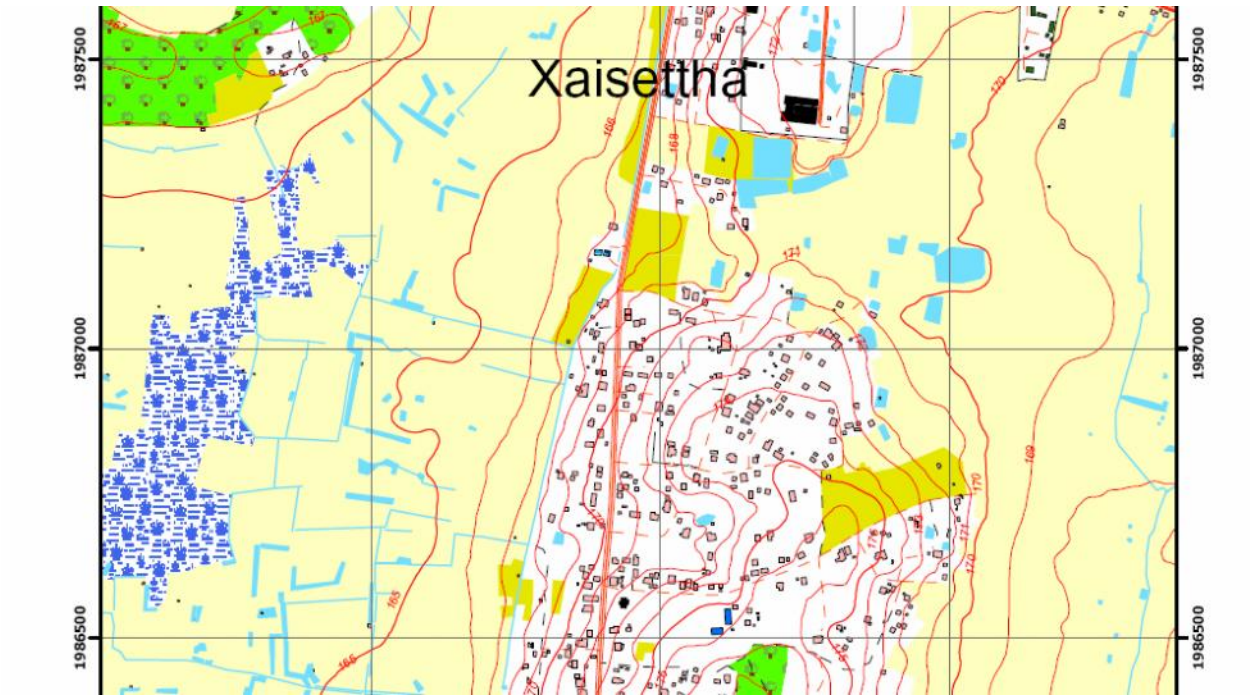
The administrative boundaries have been drafted on 1:100,000 topographical maps and clearly need adjustment with the right media and recorded onto the national coordinate system.
Overall coordinating - establishing the data in national coordinate system will be one of the corner stones of the research. Coordination will be the common denominator for the integrated datasets with location and attribute datasets.

5. Project Budget: It is estimated that with the man months, improving the existing data and facilities with limited equipment to study different aspects the research will need a budget of about 100,000 €.

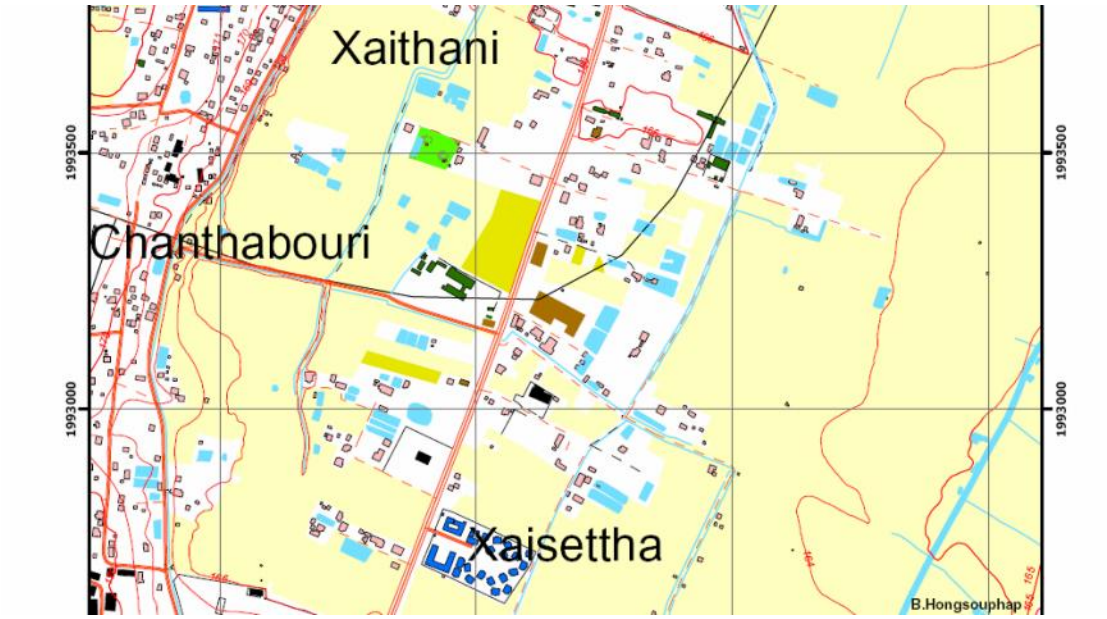
Duration will be 4-6 months.

6. Executive and Implementing Agencies: National Land Management Authority (NLMA) of the Office of the Prime Minister, in cooperation with the National Geographic Department, the National Statistics Centre, the Ministry of Agriculture and Forestry, the Ministry of Finance and the Vientiane Prefecture.

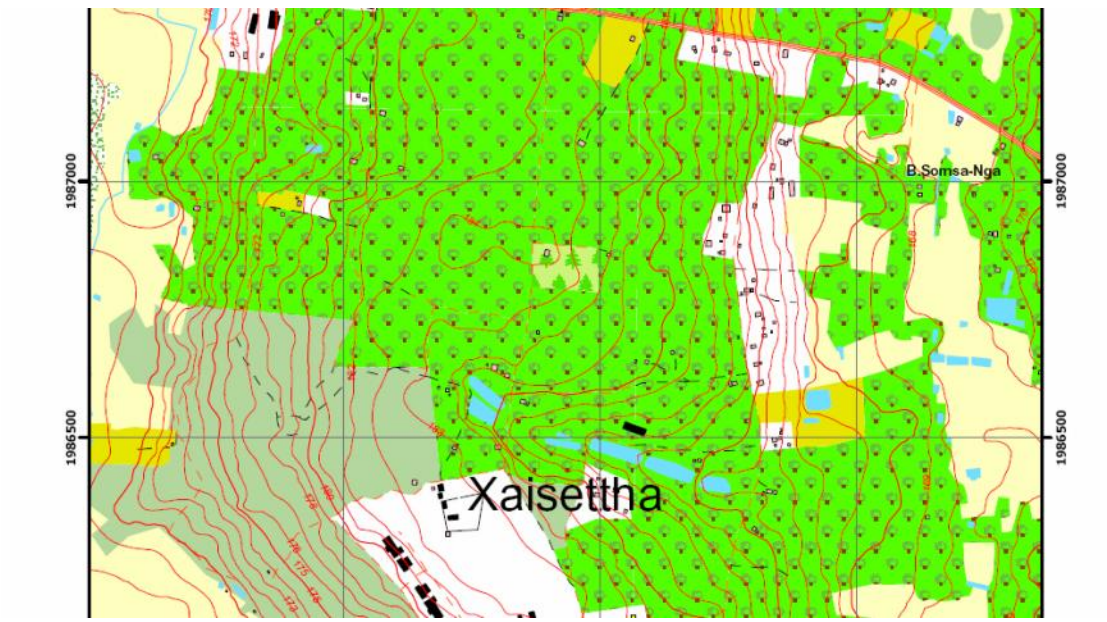
7. Maps of the Area:



Residential Settlement



District Boundary Area



Rural Forest Area

Scale: 1:20000

In addition to the usual legend of detail, the line map, among other things, includes the following digital information (Vientiane Plane):

Map scale 1:5000 based on colour aerial photography having the following digital data ”layers” (for example):

- contours of elevation with 1 m contour interval;
- road network with road classification of width and paving situation and accessibility;
- administrative boundaries, province / district boundaries;
- cadastral parcels;
- buildings classified by use, private / public / commercial / industrial buildings, schools, monasteries, water towers, power lines / gasoline stations, hospitals;
- vegetation / land use information, such as rice field, rocky / sand areas, swamps, sparse / dense forest, bush / bamboo / grass land, plantations, orchard with growth like teak, eucalyptus, banana, coffee, kapok, sugar, pineapple, papaya; and
- Each such planimetric map feature can also have attached additional attribute information like cadastral land parcels which can have information of the size, ownership, address etc.

Appendix J

NLMA Rural ResearchPilot Project

1. **Project Title:** National Land and Spatial Digital Information System for Sustainable Development in Rural Lao P.D.R (abbreviated below as NLSDIS)

2. **Project Objective:** Increase the *usability* of geographical information in order to support good governance by:
   - increasing the *quality* (both appropriateness and spatio-temporal accuracy) of available geographical information;
   - improving *procedures* for commissioning, collecting, handling, storing and distributing geographical information; and
   - increasing *accessibility* of geographic data by eliminating institutional barriers to data access.

3. **Project Approach:** Work backwards from *governance objectives* to *practical spatial data needs* by (i) surveying current policy research and government declarations about governance goals; then (ii) conducting case-based research on spatial data use in relevant contemporary development projects; then (iii) creating a national resource governance data set that balances spatio-temporal accuracy, analytic compatibility and ease of use, and expenditure of personnel and financial resources.

4. **Executive and Implementing Agencies:** National Land Management Authority (NLMA) of the Office of the Prime Minister, in cooperation with the National Geographic Department, the National Statistics Center, and the Ministry of Agriculture and Forestry.

5. **Proposed Project Duration:** about four years (beginning Feb. 2007).

6. **Proposed Budget:** USD 10,200,000 ($20,000 for stage 1; $180,000 for stage 2; $10,000,000 for stage 3).

7. **Project Rationale**: The National Land Management Authority was established as part of the government of Lao PDR's 'growth with equity' development strategy. The NLMA's focus is the promotion of good governance vis-à-vis natural resources, which sit at a strategic intersection of comparative economic advantage (rich natural resources, low population density, geographic location) and ongoing efforts to integrate remote areas into regional markets via the construction of transport, electricity and communications infrastructure. Continuing in the path of using markets, legal reforms, and rights clarification begun in the 1980s and 90s with the New Economic Mechanism, the Constitution, the LUPLA (Land Use Planning and Land Allocation) programme, and the national Forest and Land Laws, the NLMA is currently in the process of establishing a National Land Information Coordination System (NLICS) in order to:

- help create land use zones based on a combination of scientifically-and socially-derived needs and limits;
- measure a given piece of land's compliance with agreed-upon land use zonation and assess unambiguously who is responsible for managing it;
- evaluate the risks and merits of land concession proposals vis-à-vis the resource entitlements and land rights of local communities;
- assess the validity of requests for changes in land use zonation;
- estimate various 'carrying capacities' of a given land use regime in a given area over a given span of time;
- help design policies to economically stimulate or limit particular types of land use;
- provide information needed to do cooperative 'town hall' planning processes in order to take advantage of the *village* as a communal decision-making institutions; and
- increase upward flow of information (indicators) from villages to regulatory bodies.

From an information perspective, this means getting the *right spatial information* to the *right user*, in the *right place*, at the *right time*. This, in turn, requires both improved information *coverage* and improved information *flow* between government offices, development projects, villages and points in between.

Much of the spatial data created to date has focused on specialized–and localized–resource inventories (e.g., hydropower potential). In many cases, development projects have chosen to create their own data because of the lack of, or ambiguities with, existing data. Difficulties with this largely *ad hoc* approach to spatial data creation include incomplete coverage of usable data sets (due to their project-specific, often private-sector, origins); inadequate data format;[i] out-of-date data (e.g., provincial boundaries and village names and locations on the commonly-used 1:100,000 topo series); difficulties with data aggregation (e.g., boundary disagreements when LUPLA maps or urban parcel maps are lined up next to one another); inadequate spatial resolution;[ii] missing spatial data;[iii] missing meta-data;[iv] lack of meta-data standards; inability to purchase maps and data outside Vientiane; and absence of formalized 'upward' channels from the field to Vientiane for data updates (e.g., village locations and territory boundaries). The National Geographic Department's new 1:100,000 intended scale national GIS data set is attempting to remedy some of these problems, and represents an important step toward national-level data synthesis. Yet much remains to be done, and getting *practical adequate* data on topography, land use, and land cover (vegetation) remains one of the most pressing problems for governmental attempts to regulate natural resource use. This proposal focuses on those three data sets (topography, land use and land cover) because *these data sets are the key remotely observable components* of the more detailed, and more field-based spatial information needed for the range of activities that the NLMA seeks to oversee.

While the identification of information needs is where the rationale for many data production projects ends, we take it as only the beginning. A number of current

governance problems arise, perhaps paradoxically, around topics that have already been the subject of extensive data collection efforts (forest inventory, for example). The key question to be addressed in this project is *the practical relationship between resource governance efforts and the use of geographic information*. Such a perspective, rather than focusing on purely 'technical' issues, focuses on applied questions like the following:

- What kind of land cover map is most useful in regulating the allocation of land concessions to a rubber company? What should such a map show?
- How detailed, and how accurate, should a topographic map be in order to prioritize and plan development interventions aimed at stabilisinging swidden agriculture via land development (e.g., terrace-building)?
- In order to effectively use land use planning as a tool for governance and development in rural areas, how should land use be categorized in different areas? Should categorization systems change according to scale?
- How recent does such a map have to be in order to facilitate, rather than confuse, a discussion with villagers about their rights and responsibilities to their village territories?
- What attributes about remote transportation networks are needed in order to assess the potential for economic integration of the areas they access?
- Should village name and location information be updated yearly? More often? Less often?
- How should updated spatial information be distributed from the central government to district and provincial officials and to development project staff working in the field, and vice versa?
- Given the economic imperatives for production and plantation forestry, what criteria should be used to differentiate lands suitable for each, and to distinguish them from candidates for conservation?

8. **Project Description**: The NLSDIS project will happen in three stages. During the first stage, we will use our access to policy-makers and their advisors to ascertain key commitments to rural resource governance reform, and to identify questions about geographic information needs that arise from them. We anticipate a few months duration for stage one.

In stage two we will conduct case study research on three to six development projects that have made use of different spatial data acquisition strategies, ranging from 'high-end' (expensive and detailed) approaches (e.g., high-definition satellite imaging, new aerial photo surveys), through 'mid-range' approaches (e.g., medium-definition satellite imaging, existing aerial photography), to 'low-tech' approaches (e.g., village participatory mapping). This research will identify the advantages and disadvantages of using different types of spatial data collection strategies and technologies, and will attempt to link these advantages and disadvantages to the information needs identified in stage one. We expect to focus on the mid-to high-range approaches (aerial photography and middle-resolution satellite imagery, e.g. Spot 4), which generate sufficient geographic detail for ascertaining *land capability for different production regimes* in addition to present land use. Nonetheless, we also believe that studying the range of

methods will contribute to stage three, in which we attempt to operationalize the lessons learned about the relationship between data creation and information use. We anticipate stage two lasting about six months.

The third stage will be the most involved part of the project. It will begin by (i) selecting a combination of technologies and field methods that best meet the needs of rural resource governance reform. It will then (ii) assemble them into three national data sets showing *topography*, *present land use*, and *vegetation* by acquiring the required remote data and conducting the associated interpretation work (to be specified during stage 3.i). Finally, it will (iii) coordinate with other parts of the NLICS to implement a national data flow system capable of keeping topography, land use and land cover data updated and distributed (i.e., getting the right data to the right people, in the right place, at the right time). As with 3.ii, operational details for stage 3.iii will be worked out during stage 3.i on the basis of information gathered during stages 1 and 2). We anticipate stage three lasting about three years.

The three data sets created during stage three will play a central role in the regulatory activities of the NLMA because they will be designed as *living data sets* the updating process of which is integrated into the tasks of using them. This is intended to combat the endemic problem of having spatial data that takes so long to be produced that it is out of date by the time it is widely available. The technical features of the NLICS will allow data integration and querying via Geographic Information System (GIS) technology. Our focus in *this* proposal on *practical usability at the data creation stage* is intended to preclude the 'garbage-in-garbage-out' syndrome which can result from an approach that focuses on technical issues (e.g., high-resolution accuracy) at the expense of practical information needs of policy, planning and regulation (e.g., temporal accuracy).

In sum, this project seeks to harness the extensive, if sometimes frustrating, experience of contemporary development projects in order to produce topographic, land use and land cover data that meet the practical needs of the NLMA's office-and field-based resource governance reform efforts.

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[i] Paper format often makes overlay analysis and linking of attribute data prohibitively difficult, and altogether precludes re-projection – a problem especially for detailed topographic data because the most detailed national topographic data set is the (now out-of-print) 1:50,000 topo series, which is in a projection different from the 1997 Lao National Datum.

[ii] Identifying polygons of uniform slope class (e.g., targeting land between 5% and 25% slope for agricultural terracing) is an important village-scale application of topographic data. Most current digital and paper topographic data sets provide inadequate spatial resolution for doing this. Substantial confusion is caused by the relatively fine spatial resolution of some existing Digital Terrain Models, which have 30 by 30 meter or 50 by 50 meter cells. But much of the data on which this digital data is based has horizontal uncertainty greater than 100 meters, and has been exacerbated by the 'generalizing' of contour lines during the digitization process.

[iii] In some cases, information about agricultural and forest land allocation exists only in tabular (non-spatial) format, creating difficulties identifying its relationship to other land use zones or, in some cases, even finding it. In other cases, confusion about spatial data has masked confusion about on-the-ground governance issues (for example, about criteria for the designation of production forest, or the precise location of administrative boundaries – of protected area, of districts, of village territories).

[iv] Inadequate meta-data precludes using much existing data because the user has an inadequate basis for knowing how the data was created, and thus what its strengths and weaknesses are. (*Intended scale* and *keyword definition* are two critical pieces of information that are often missing.)