Experiences of Inter-Institutional Collaborative Work as Forms of Multiplying the Benefits of Territorial Information

Mabel ALVAREZ de LOPEZ, Juan Carlos USANDIVARAS, Blanca AGUDIAK and Gwyn JONES, Argentina

Key words: Decentralised co-operation, territorial information, collaborative projects.

ABSTRACT

In developing countries, sources of finance for research are scarce. The habitual parameter of evaluation for researchers is publication in well-known international journals. Consequently, in the field of applied sciences, products are principally oriented towards mathematical developments or algorithmic calculation.

Public organisms such as cadastres find difficulties in simultaneously satisfying the necessities of their users, while generating new products that allow them to obtain genuine resources.

Mechanisms for co-operation among state organisms, universities and the private sector allow for the attenuation of these difficulties while concurrently generating useful applications for the community and for the development of human resources.

The Directorate of Cadastre and Land Information (DCeIT) of the Province of Chubut, Argentina has developed diverse associations in order to contribute towards the solution of concrete problems. In this paper, the co-operation and activities shared with the National University of La Plata (UNLP) are discussed:

- The administration of the permanent GPS station in Rawson, allowing the addition of a high level receiver to the services of DCeIT, offering support for the necessities of the technology, and participation in international activities of co-operation.
- An optimisation project for the use of satellite imagery in situations of risk; allowing the acquisition of the necessary knowledge in order to obtain geo-positioned images in minimum times when these can be useful in situations of risk.
- A project for the application of geo-information in order to optimise the administration of environmental health information for the Ministry of Health, Province of Chubut.
- Design monitoring networks for water quality in a project generated by the private sector, carried out by the UNLP, with finance from the deduction of taxes controlled by the State. The DCeIT contributed with its knowledge of the area and the provision of geo-spatial data.

The paper describes the experiences gained from, and the opportunities of this type of inter-institutional collaboration among different sectors.

CONTACT

Mabel Alvarez de Lopez (presenter)
Directorate of Cadastre and Land Information, DCeIT
Alejandro Maíz 169
9103 Rawson, Chubut
ARGENTINA
Tel. + 54 2965 481 141
Fax + 54 2965 481 450
E-mail: mablop@satlink.com
Web-site: http://www.catastro.com.ar

Juan Carlos Usandivaras
University of La Plata
Perón 3966, 4°E
1170 Capital Federal
ARGENTINA
Tel. + 54 11 4958 4058
Fax + 54 2965 481450
E-mail: jcu@fcaglp.unlp.edu.ar

Blanca Agudiak
Directorate of Cadastre and Land Information, DCeIT
Alejandro Maíz 169
9103 Rawson, Chubut
ARGENTINA
Tel. + 54 2965 481 141
Fax + 54 2965 481 450
E-mail: bagudiak@catastro.com.ar

Gwyn Jones
Directorate of Cadastre and Land Information, DCeIT
Alejandro Maíz 169
9103 Rawson, Chubut
ARGENTINA
Tel. + 54 2965 481 141
Fax + 54 2965 481 450
E-mail: gwestywi@infovia.com.ar

Multiplying the Benefits of Territorial Information

Mabel ALVAREZ de LOPEZ, Juan Carlos USANDIVARAS, Blanca AGUDIAK and Gwyn JONES, Argentina

1. INTRODUCTION

The Argentinean Cadastre fulfils an important role in society and has a long history of development. It has advanced significantly over the last few years due to technological advances and the possibilities of realising cadastral development projects that have been carried out in the majority of provinces with World Bank financing.

In the above context the Directorate of Cadastre and Land Information (DCeIT) of the Province of Chubut began a cadastral development project in 1992 that included 29 organisations: the DCeIT, 26 provincial municipalities, the Directorate of Forests and Parks, and the Property Register.

The implementation of the Land Information System (LIS) has increased the potential in respect of services that can be provided to society. Consequently, many opportunities and challenges are foreseen.

At the beginning of the project, the basic concepts of the LIS were established with the conviction that during its construction, room should be left for the introduction of foreseen technological and conceptual modifications in what was a period of much innovation.

The change from a traditional cadastral system to a modern one requires the development of human resources, the introduction of organisational changes, the modification of processes and the creation of new products. During these stages the combination of efforts from the public sector, the universities and the private sector permits an important added value.

2. BACKGROUND

At the beginning of the 90's when the province of Chubut began its cadastral project; the National University of La Plata (UNLP) was broadening its studies with GPS and related geodetic problems and was looking for openings with the private sector.

At this time, university relationships with the private sector did not exist. This presented problems in respect of communication, the lack of experience in the university group in carrying out solid work with real time constraints, and the absence of mechanisms for the evaluation of the reciprocal advantages of inter-institutional co-operation.

The combination of new GPS technologies and modern cadastral visions generated strong distrust among the groups of surveying professionals.

The a priori conviction that a combination of efforts from the three sectors would result in individual and group benefits lead to the establishment of certain minimum rules of behaviour which can be summarised as follows:

- The cadastre-university relationship becomes effective by means of concrete activities agreed in common. Both parties can make proposals that, in as much as possible, should include third parties.
- The university is not a contractor of cadastre and the expenses originated during activity are paid by each part in such a way that the achievement of the proposed objectives is assured.
- Both institutions and any third party participators share the results of the activity.
- The fundamental objective of common activity is on introduction to technology, rather than its creation.
- All activity should be documented.

Furthermore, it was necessary to identify actors in a human network where the same visions, objectives and deficiencies were shared, and also to share efforts that contributed to the development of human resources.

3. JOINT ACTIVITIES

3.1 Human resource development

The activities of human resource development have been realised in frequent form since 1995. At first, these activities were dedicated exclusively to the inclusion of GPS techniques. The following premises prevailed:

- That development should not only be directed towards the personnel of DCeIT, but to all other interested professionals.
- That if DCeIT wanted to incorporate GPS into its activities, the private sector should contribute in order to create, through the development of human resources, a shared vision.
- That given the dimension of the province, training should be provided for potential users in their work place.
- That insofar as possible, training should be carried out with instruments that are available in the area.
- That development should result in the constitution of a group of referent local professionals able to update their technological knowledge and allow quick local consultation.

To these ends the university adapted its academic language to meet the requirements of professionals, receiving as compensation information about the real problems of the region, in order to allow the design of valid measuring procedures in the different stages of GPS systems.

From 1995 to 2001, ten independent events were held in the cities of Rawson, Trelew, Esquel and Comodoro Rivadavia with a total attendance of 292 people. In addition to the DCeIT and the UNLP, also involved were the National University of Patagonia San Juan Bosco, professional surveying associations, the directorates of cadastre from the cities of Esquel and Comodoro Rivadavia, and the General Directorate of Forests and Parks. Independent professionals participated in individual form contributing with their support, investing their time, paying fees in some cases or contributing to the organisation of events, and in several cases contributing with their instruments and experience. In the case of the events in 1996 and 2000, collaboration from members of FIG and professionals of the DGFI was received.

Most of the events had the characteristic of courses, workshops or seminars. However, in two cases, the events allowed the validation of measurement techniques; in the first case with the prototype of a GPS differential system in real-time made by the University of New Brunswick and the UNLP; and in the second case, use was made of the permanent GPS station installed in the DCeIT.

This group of activities respond to those mentioned in (Williamson, 2001) as quoted below:

"There are two key outcomes required from building or re-engineering land administration systems; first the establishment of an appropriate land administration system and secondly ensuring that there is sustainable long term capacity of educated and trained personnel to operate the system in both the public and private sectors. All human resource development (HRD) and capacity building principles are central to these objectives. For example it is critical that capacity building is a mainstream component of a project, not an "add-on".

Also that capacity building is equally applicable to the private sector and the establishment of professions, as it is to the public sector. In this context, there are a whole range of capacity building and HRD principles and options within the land administration "tool box"".

The techniques of GPS have been incorporated, not as a tool, but as a new concept towards obtaining a land information system. This is based on the combined actions of different agents with specific problems responding to their individual necessities whose results are optimised by combined efforts. The concept of co-ordinates as support of spatial information is today a reality in the province of Chubut.

3.2 Permanent GPS station in Rawson

The principal geodetic network of the province of Chubut was established in 1994 when the transition between the concepts of traditional networks and GPS networks had not been completed. The stations were constructed in conventional form by means of concrete pillars, with the idea that these control points would be occupied by users when they needed the provided reference frame for their work. The development of instrumentation and their relative prices, and new approaches to quality and security of networks, make preferable the use of permanent observation stations, that although less dense, assure accessibility to data, provide better security in their construction, and have a permanent control of co-ordinates.

In 1998 the UNLP undertook a project to vertically monitor the tides gauges of the Argentinean Atlantic coast, in collaboration with the German Institute of Geodetic Research (DGFI). Within this context the existence of permanent stations is fundamental. The government of the Province of Chubut and the UNLP signed an agreement by which means the UNLP made available a GPS receiver. The DCeIT, as an organism of the provincial government, assumes the daily administration of the permanent station and supplies the UNLP, and also the IGS (International GPS Service), the data from the permanent station. The DCeIT also distributes data to professionals of the surveying field and to other sectors that have become habitual users, partly through the development of human resources led by Cadastre jointly with the UNLP.

The permanent station at Rawson has been in operation since 1999. The station fulfils its objective related to the measurement of the sea level and at the same time, is made available for a group of users, and to form geodetic networks in the foreseeable future. Allowing users access to the data generated by this station is necessary within the agreed policies for optimising available resources.

3.3 Optimisation project for the use of satellite imagery in situations of risk

The use of satellite images is an important component in the cadastral development of a province with a large land area (approximately 225,000 km^2). For this reason, the DCeIT has acquired a group of images covering the entire territory of the province. The knowledge about the availability of this resource within the community allowed other uses to be made of the images, in particular in situations of risk: hydraulic emergencies, heavy snowfalls etc.

The national organisation in charge of capturing and distributing satellite images (CONAE) has procedures for the immediate delivery of material during emergencies. Defining these procedures and making them available to concerned organisations has been an activity of this project.

Normally, in the case of the above-mentioned emergencies the required number of control points would not be visible in an image. Procedures were proven and the resulting precision in the positioning of images under these conditions was disseminated among concerned users.

The execution of the project confirmed the necessity to work inside verified and accepted standards if the full potential of shared land information is to be achieved.

It is emphasised that the activities of this 2 year long project, concluded in December 2001, brought the opportunity of inter-organisational and inter-disciplinary work through local and more distant activities.

3.4 Project for the application of geo-information in order to optimise the administration of environmental health information for the Ministry of Health, Province of Chubut

The importance of land information as an aid to decision making, for facilitating the administration of important volumes of land information due to geo-informational and communicational possibilities, and the need to multiply the application of land information in low use applications destined to satisfy demands and/or improve community services, motivated a project in the Province of Chubut with the participation of the following organisations:

- The DCeIT, which in an emergent multi-use role due to its possibilities for the administration of legal land objects defined either by private or public law, had the opportunity to aid other sectors which had not been habitual users of geo-spatial information.
- The Ministry of Health, a sector of the provincial government, which did not utilise geo-spatial information for the administration of its environmental health records.
- The national universities of Patagonia and La Plata, who could contribute to the solution of real problems within the community through its educational, research and training activities.

The Geospatial Data Infrastructure has an integrating role in land information due to its policies, standards, inter-institutional relationships, and collaborative forms of working, which allow for the maximisation of the benefits of land information. Within this context, a project is been realised which aims to utilise the information produced by the DCeIT from their cadastral development, in order to optimise the environmental records of the Ministry of Health, with the participation of individuals from both organisations and both universities.

The results achieved in the project during 2001, the first year of inter-institutional and interdisciplinary co-operation consist of:

- An analysis of the support of geo-information in the field of health from a geographical perspective.
- An analysis of the classical records of the Ministry of Health, applied solely to the cases of Hepatitis 'A' within a pilot area.
- A qualitative and quantitative evaluation of these records.
- The definition of processes to complete and input missing data for the pilot area.
- An analysis of the indispensable geo-information available in the DCeIT for integration with the data of the Ministry of Health.
- An evaluation of the alternatives for integrating the data of DCeIT and those of the Ministry of Health with a common identifier, and the processes necessary for its realisation.
- An analysis of the basic needs for geo-referencing and the technology available for the study involved.
- The development of human resources for defining the forms of inter-organisational and

interdisciplinary work for the actual activities of the project, and for disseminating information to the academic sector and the community.

3.5 Design monitoring networks for water quality in a project generated in the private sector

The UNLP participates in a project that strengthens the knowledge of a private company on the basis of a support system financed by means of fiscal credits for undertaken research. The objective of this project is the optimisation of the design of water quality control networks. One of the three basins adopted for the validation of the concepts of this project covers a great part of the province of Chubut.

The exchange of land information, of methodologies, and of standards between this project and the DCeIT is of mutual benefit, allowing the sharing of knowledge among members of differing disciplines.

This project is in its first year of execution and continues until the end of 2003.

3.6 Contribution of a human network and its impact on the inter-institutional collaborative work

Inter-institutional collaboration was enriched by the participation of a wide human network that in various forms contributed towards the realisation of this collaborative project. The nucleus of this human network was situated in the country but counted on international contribution.

3.6.1 International co-operation

Institution	Contribution	Impact
DGFI	Weekly computation of Rawson GPS station co-ordinates, education	Future incorporation of Rawson as an IGS station
ITC	Multiple actions in pilot projects and capacity building.	Self-confidence and the feeling of being on the right track. Increased human network.
University of New Brunswick	A real experience of participation in an international co-operation programme.	Amplified vision to engage new opportunities and accept new challenges. Increased human network.
University of Melbourne	Broad academic vision	Development of human resources. Increased human network.
University of Äalborg	Broad academic vision	Development of human resources. Increased human network.
Instituto Agustín Codazzi	Cadastre and GSDI	Future vision for the national SDI

4. LESSONS LEARNED

The experiences of inter-institutional collaborative were the result of intuition and perseverance. Now, it is felt that the rationale behind them was very clearly described in five main tenets set by Lowe (2000), written below:

1. Active involvement of all the various groups of stakeholders (transferring responsibility to them).
2. Seeking consultation and complementarity between stakeholders.
3. Decentralised management.
4. Introducing a “process” approach.
5. Giving priority to capacity building and institutional development.

1) In our experience, the first principle was translated into the conviction that each one of the principal participants should fulfil their committed activity. Work that was promised should be realised. In each one of the events that other people were involved with, especially in the those dealing with the development of human resources, diverse people from professional associations or from universities took the responsibilities of organisation, always with satisfactory results. Some of the participants of these events transformed into local references and then into multiplying agents.

2) The DCeIT and the UNLP, both state organisms, have specific primary functions: in the former case, production and services; in the later case, education and research. Each one of the different activities carried out are co-ordinated in the conviction that collaborative action has added value above that of individual efforts. Each activity allowed an improved dialogue with the associated private sector.

3) Geographical reality, with some organisms located more than 1500-km distance from each other, meant that many activities were performed by electronic communication, with the addition of sporadic meetings motivated for other ends, inside an economic context where a specific budget never existed. In this respect, international co-operation had an important impact but was not the result of agreed formal commitments, but the result of a network of people convinced of the advantages of collaboration and of co-operation as a contribution to development.

4) We find ourselves facing two important changes, the DCeIT is evolving from a tax centred focus to a source and agent for land information, and the UNLP from an "Ivory Tower" to an university integrated with the problems of society. In this process the interaction between both organisations is of mutual benefit. But, this interaction can only be interpreted as an informal agreement, which is realised by punctual activity carried out within very defined time periods that can be individually evaluated. In the activities of human resources development, an indicator of success has been the superior number of participants than foreseen.

5) Training realised in the use of geodetic reference frames, GPS and the new uses of co-

ordinates has allowed a better understanding of the use of GIS techniques by DCeIT personnel, and has positively modified the attitude of private professionals in order to change their traditional techniques of measurement and to digitally present their work. To achieve this, the professionals have co-operated among themselves and have begun an increased exchange of experiences and knowledge with agents of the public sector. Diverse organisations of the public sector resort to the DCeIT as an authority in the problems of handling land information, generating co-operative projects among these organisations. This tends to improve the quality and quantity of spatial information contributing to the best understanding of the problems and decision making. Different forms of inter-institutional collaborative work between organisations in developing countries is possible that not only results in mutual benefit but can change the cultural aspects of both government and private sector.

5. CONCLUSIONS AND RECOMMENDATIONS

In developing countries, many wide-ranging opportunities are presented for the development of shared land information through collaborative works. This is because of:

- The increased capabilities of the organisations and their human resources through inter-disciplinary and inter-organisational interaction.
- The increased possibilities of assisting social, economic and environmental demands that none of the organisations in isolated form could satisfy in a context of strong economic limitation.
- The strengthened capabilities while assuming responsibilities based on common visions and objectives.
- The increased self-confidence among persons and organisations which becomes apparent, is maximised in countries where long term forecasts are always affected by considerable economical, political and institutional barriers.

Based on the experience and lessons learned during several years, it is strongly recommended that human networks be strengthened in order to achieve inter-institutional collaborative work as forms of multiplying the benefits of territorial information.

REFERENCES

Alvarez de López M., (1997) *Perspective Land Records State and National*, Proceedings Global Spatial Data Infrastructure Conference, Chapel Hill, North Carolina, USA, October 1997.

Alvarez M, Agudiak B, Mascheroni Torrilla E, (1994*) The Trend of Argentine Cadastre Towards Land Information Systems*, Commission 7, XX international Congress, SGS 761 1994.

Alvarez M, de Meijere J, Paresi C, (1996*) Structured Development of Territorial Information System in the Province of Chubut, Argentine*, Proc. FIG 63 PC Meeting and International Symposium, Buenos Aires, Argentina.

Claverie H.H.; Alvarez de López M (1998*) Integration of Forest and Cadastral Projects in*

the Province of Chubut, Argentina, in Cadastre and Land Management, Commission 7, XXI International Congress, Developing the Profession in a Developing World, pp. 541 – 549.

De Meijere J., Alvarez de López M, Georgiadou Y (1998*) Maintenance of Cadastral Information Systems: A Case Study from the Province of Chubut, Argentina*, in Cadastre and Land Management, Commission 7, XXI International Congress, Developing the Profession in a Developing World, pp. 212 – 219.

Georgiadou Y, Kleusberg A.; de Meijere J., Alvarez M.; Usandivaras J C., (1997*) The Argentine Cadastre in Transition*, Geomatica, Vol.51, Nr. 2.

Lorente H, Esteban D, Usandivaras JC, Brizzi J, Brunini C, Canosa D, Georgiadou Y, Kleusberg A, Langley RB, (1996*) A Contribution to the Development of Mapping Infrastructure in Argentina*, Symposia papers of the FIG 63rd. PC Meeting and International Symposium, pp. 108-118, Buenos Aires.

Lowe P. (2000) *Support for decentralised cooperation - Operational Guide to decentralised cooperation*, European Commission, DG Development A4 (00) D/1424, Brussels. http://europa.eu.int/comm/development/sector/ngo/files/keydoc6_en.pdf, accessed 10 January,2002.

Williamson I.P. (2001*), Land Administration "Best Practice" providing the infrastructure for land policy implementation*, Department of Geomatics, The University of Melbourne, Victoria, Australia. http://www.sli.unimelb.edu.au/research/publications/IPW/2_01Williamson_LUP.pdf, accessed 10 January, 2002.

BIOGRAPHICAL NOTES

M. Alvarez de López is the Director of the Directorate of Cadastre and Land Information in the Province of Chubut, Argentina, Professor of Land Information Systems at the National University of Patagonia, and Director of Chubut's Cadastral Development Project. She is also acting General Secretary of the Federal Council of Cadastre in Argentina, and the Cadastral Group Co-ordinator of the Permanent Committee for Spatial Data Infrastructure in the Americas. In FIG congresses, papers have been presented at Spain 92, at the XX Congress in Australia 94, at Argentina 96, and at the XXI Congress in England 98.

J. C. Usandivaras is Professor in Geodesy at the Faculty of Astronomical and Geophysical Sciences at the National University of La Plata.

B. Agudiak is Departmental Manager of Cartography and Georeferencing at the Directorate of Cadastre and Land Information in the Province of Chubut, Argentina, and has been linked to Chubut's Cadastral Development Project since 1992. In FIG congresses, papers have been presented at Spain 92, at the XX Congress in Australia 94, and Argentina 96.

G. Jones (MSc Rural Resource Management, BSc(Hons) Surveying & Mapping Sciences) is a Geotechnical Advisor for Chubut's Cadastral Development Project and has been linked with this project since 1995.