

**INCO-DEV: International Cooperation with Developing
Countries (1998-2002)**

Contract number: ICA4-CT-2002-10061

6 MONTHLY ACTIVITY REPORT:

Covering period from 01/01/04 to 30/06/04

***Facilitating Negotiations Over Land and Water Conflicts
in Latin American Peri-urban upstream Catchments:
Combining Agent-Based Modelling with Role Game
Playing***



(Photo: E. Zuchiwski)

Project homepage: <http://www.negowat.org>

Integrated water management, peri-urban catchment, multi-agent simulation, role game playing, action-research

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LATIN AMERICAN PERIURBAN UPSTREAM CATCHMENTS: COMBINING AGENT-
BASED MODELLING WITH ROLE GAME PLAYING**

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Table of Contents

NEGOWAT PROJECT

Contract number : ICA4*CT 2002-10061

PROGRESS REPORT – June 2004

I. SUMMARY	5
1. REORGANIZATION OF THE TEAM AND ADAPTATION OF WORK IN BOLIVIA	5
2. CONSEQUENCES ON PROJECT DEVELOPMENT	5
II. STATE OF ADVANCEMENT OF THE DIFFERENT WORKPACKAGES.	6
1. FINALIZATION OF WP1 “PREPARE MODELING WORK”	6
1.1. Task 1.3: “Map land and water issues”	6
1.2. Task 1.4: “Develop and finalize environmental and socio-economics maps”	7
2. WP 3: “CONDUCT THEMATIC FIELD RESEARCH “	7
2.1. State of advancement in Bolivia	8
In Brazil:	8
2.2.	8
3. WP 2: “TOOLS DESIGN AND DEVELOPMENT”	9
3.1. In Brazil	9
3.2. In Bolivia	9
4. WP 4: INTERVENTION IN NEGOTIATION PROCESSES	10
4.1. In Brazil	10
4.2. In Bolivia	10
III. SCIENTIFIC COORDINATION AND ANIMATION OF THE PROJECT	11
1. TEAM MANAGEMENT	11
1.1. Team reorganization in Bolivia	11
1.2. On going reorganization for modeling in Sao Paulo	11
1.3. Exchanges and training period	11
2. OTHER POINTS	12
3. PUBLICATIONS	12
IV. ADMINISTRATIVE ASPECTS.....	13
V. PROGRAMM OF WORK FOR THE NEXT SIXTH MONTHS.....	14
1. COORDINATION	14
2. BRAZIL	14
3. BOLIVIA	14
VI. PROGRESS REPORTS OF THE DIFFERENT INSTITUTIONS.....	15
1. CIRAD – TERA	16
2. NRI	19
3. USP	21
4. APTA	23
5. UNICAMPGROUP	26
6. IIEGA	28
7. INSTITUTO POLIS	32
8. UMSS BOLIVIA	35
9. CERES	41

I. SUMMARY

1. *Reorganization of the team and adaptation of work in Bolivia*

This first semester of the second year of the Negowat project has been devoted to the following activities:

- 1) Reorganization of the local team in Bolivia (a) Dr G Vargas, who was in charge of the development of the intervention strategy with the stakeholders of Tiquipaya-Cocuapiruha (WP4), has left CERES and consequently the project. He was replaced by Dr Pablo Cuba, with a support of a junior scientist. (b) Dr Nicolas Faysse, a CIRAD-TERA pos-doc, has joined the Bolivian team in January 2004 to support the research activities in WP4.
- 2) Redefinition of the intervention mode in Bolivia. A new controversial water service project, which is to be implemented in Tiquipaya, has polarized water issues in such a way that any discussion on superficial water management is impossible. This, and the team reorganization, led to revise the intervention mode. A new strategy has been proposed that focuses on urbanization and access to urban water services.
- 3) Elaboration in both countries on the strategies of intervention and interaction with stakeholders.
- 4) Reorganization of the modeling team in Brazil in order to compensate for the difficulty to identify a pos-doc scientist to implement the work. A PhD student was recruited instead of a fully qualified researcher, but it appeared difficult to maintain the same work objectives. Dr Paz, modeler of the Bolivian team, is thus being mobilized to support the modeling work in Brazil.
- 5) Finalization of the thematic field studies both in Bolivia and Brazil, and elaboration of the first related publication.

It should be noted that some institutions faced financial difficulties as the second payment is still to be paid (because of delays in the finalization of the financial report 2003).

2. *Consequences on project development*

The difficulties met to build an integrated, multidisciplinary and multi-institutional team in Brazil and in Bolivia have led to delays in the development of field work, that were already stated in the annual report 2003.

In Brazil, it should be noted however that these initial difficulties have globally been overcome during this semester, and work is now proceeding satisfactorily. However, two thematic areas (access to water and sanitation in urban settlements and representation of water quality processes at catchment level) have started their activities only a couple of months ago. Consequently, the first results, as well as the complete conceptual framework of peri-urban catchment functioning, are not expected to be available before December 2004, instead of July 2004 for the other thematic fields.

The political situation of Bolivia in 2003, the conflictive local situation and the CERES difficulties have led to more serious delays in the implementation of the work in Bolivia.

Work planning has been reorganized, and a new intervention strategy, with a realistic planning has been elaborated.

However, these initial delays means that there will be little time to fully develop the core WP of this project (WP4), and test the simulation tools in some local negotiation processes, as well as to analyze the potentiality and limits of the methods proposed.

The steering committee has decided to request of to the European Commission **an extension of 12 months of the duration project, on the same budget basis**, to be able to fully implement WP4 and WP5 (developing the intervention strategy with stakeholders) : end of work August 2006 – final report October 2006.

Complementary funding will be locally looked for, when necessary.

II. STATE OF ADVANCEMENT OF THE DIFFERENT WORKPACKAGES.

1. Finalization of WP1 “Prepare Modeling Work”

Task 1.3 (“map land and water issues”) and task 1.4 (“Actualize land use maps”) that had not yet been completed, were finalized during this period.

1.1. Task 1.3: “Map land and water issues”

a - Brazil

The results of this task were synthesized in a draft report presented to the coordinator at the end of January 2004. Ameliorations of the document have been asked: A second draft is being finalized. An assessment of social capital within the Guarapiranga catchment committee has been finalized (Monteiro, 2004) and the same work is under progress in Cabeiceras-Tietê.

The results of the work on local communities in the Paraleilhos area (Guarapiranga catchment) have been presented the 29/05/04 to the representatives of local associations and to the municipality. This restitution was aiming to initiate the interaction process (WP4) with local actors on land/water management. It will focus on a participative development a role-game-playing to strengthen local participation in water management and interaction between local communities and the catchment Committee (WP4). In this objective, a sequence of workshops was planned with the actors to implement the work.

In Cabeiceras Tietê, restitution of the work is planned in August 2004.

b - Bolivia

The changes occurred within CERES and the situation in Tiquipaya, related to the development of a questioned water service project has led to a complete review of the strategy of intervention.

A global mapping of actors, initiated in WP1, is being finalized. It was initially developed to account for the relationships over land and water management at municipal level, with a specific interest on superficial water management. It was assumed that intervention strategy will concentrate on the concertation over the renegotiation of agricultural superficial water rights in the rapid urbanization context of Tiquipaya. However, it is now clear that irrigators are blocking any discussion related to superficial water. Moreover, a greater attention has been recently given to the issues of access to urban water services, with the development of a controversial implementation of a urban water service project¹. The work was reoriented: The different local negotiation forum or discussions related to land and/or water were reviewed. It allowed to identify a couple of situations where intervention will be implemented, basically related to the issues of access to water services in context of rapid urbanization.

1.2. Task 1.4: “Develop and finalize environmental and socio-economics maps”

In Brazil, a set of maps related to the Cabeiceras-Tietê catchment are available since April 2004. The following layers are presented at catchment scale (1900 km²) : land use, hydrological network, main water infrastructures, main geo-morphological areas, a division in micro-catchment areas and municipal territories. This maps have been integrated and used as an input in various field works. They were also transferred to the multi-agent tool to be used in the model developed at catchment scale (“*SpatMas*”). A land use map of the 80’s is being finalized in order to assess the evolution between 1980 and 2000. Mapping of social indicators, such as health indicators has still to be implemented (part of the work FSP/USP coordinated by Dr W. Gunther).

In Bolivia, the maps were already been provided last year.

2. WP 3: “Conduct Thematic field research “

In both countries, most of the thematic field studies are being completed or under finalization, with two exceptions in Brazil: (i) work on water and sanitation access and consequences for public health that has just started, due to the late arrival of Dr W Gunther in the team, in replacement of Ms R. Martins. (ii) Water quality processes at catchment scale, due to disorganization in the hydrological studies, following the partial withdrawal from Dr Kuper (Cirad) from the project since September 2003, as well as lack of data in the catchment.

Except for these two cases for which deadline has been expanded to December 2004, all draft reports (from Brazil and Bolivia) are expected by 30/09/04, according the deadlines decided during the last steering committee meeting.

¹ EPSA Macoti, developed at municipal level combining potable water and sanitation, on the basis on full cost payment by users (including investment costs). The EPSA Macoti is a test for the implementation of a new model of water service model at national level.

2.1. State of advancement in Bolivia

Multiple uses of water, irrigation (A. Duran, J Butterworth and students)	Report under finalization
Spring water management (A Duran, D Vega)	Field study being finalized
Functioning of water committee associations (R Bustamante and students)	Final report produced (Van der Meer, 2004) and restituted
Urbanization and family water demand (C. Ledo and students)	Field study completed, data under analysis
Land market dynamics (A. Lizarraga)	Field study completed, analysis phase
Reused water, environmental impact (R. Amparo)	Field study completed.
Superficial water availability (M Saenz)	Field study being finalized

2.2. In Brazil:

Hydrological studies : Water analysis (S. Sendacz and al, APTA, IP)	- Draft report elaborated (to be reviewed)
Hydrological studies : quantitative aspects (D Vanucci, IIE)	- data provided.
Hydrological studies : modeling of qualitative aspects	- work under progress
Fishing activities (P. Genova and al, IP, Apta)	- Partial report produced (to be reviewed)
Agricultural activities - urbanized area - Guarulhos (French Ministry of Foreign Affairs funding (Y. Carvalhos, APTA - IEA) - Other areas	- Draft report produced, final report expected beginning of July (Zulowski, 2004, IEA apta) - field work end in august.
Agricultural water demand (APTA IEA)	- Partial draft report elaborated
Tourism activities (T. Franca, APTA-IEA)	- End of field research end of august
Land market (B Reydon and student, UNICAMP)	- partial report under finalization (master thesis K. Bueno, 2004, Unicamp) - Complementation of field work necessary to analyze articulation of rural / urban land market
Access to potable water and sanitation and impact of public health (W Gunther, USP-FSP)	- Field studies have just started
Social capital in the water committee (characterization on the functioning in water committee) (P Jacobi and students, USP-PROCAM)	- Master thesis defended end of June (Guarapiranga) (Monteiro, 2004 Procama) - analysis is being implemented in Cabeceiras Tiete

3. WP 2: “Tools Design and Development”

3.1. In Brazil

The conceptual framework of land and water management has been complemented during the implementation of 4 local workshops.

- Two of them were more specifically dealing with the biophysical aspects (2-4 February 2004 and 26-28 April). They gathered the scientists from IIE and APTA IP, and the modelers from USP and UMSS, and allowed to propose the representation basis for the hydrological processes.
- 2 workshops were organized to facilitate integration on the socio-economical processes (29-31 March and 28-31 of June), aiming at articulating studies such as land use strategies, water infrastructure implementation strategies and land market.

These workshops were important moment to articulate the different thematic areas, as well as to mobilize and combine the first field results and expertise knowledge to represent peri-urban catchment functioning. The outcomes (synthesized in an UML representation) are being used to develop the tools (SpatMas Model and JogoMan version 2).

After discussion with the executive secretary of the water committee of Cabeiceras-Tietê, it was decided to develop a specific simulation model to deal with the question of the place of rural type of land use in the catchment, which is a controversial issue within the committee. It is expected that the related discussion will be used in the elaboration of the catchment plan, which is currently being developed. The development of “SpatMas” model is requiring the mobilization of Bernardo Paz, from the Bolivian team. The biophysical module of the model is currently being elaborated. It will include a water allocation module (in finalization), a quality module (whose conception is being under progress) and a social module (that have to be conceived).

Following the tests of last year, JogoMan, a role game playing prototype is being ameliorated with a new UML design and multi-agent implementation to allow for more flexibility and robustness of the game.

3.2. In Bolivia

There has not been real advancement on this aspect since end 2003. The reorientation of intervention methodology and strategy makes necessary to identify specific type of simulation tools, and their insertion in the global intervention methodology.

An object oriented data-base, aiming at facilitating management of information and documentation within the team have been developed and implemented on the intranet of the Bolivian team.

4. WP 4: intervention in negotiation processes

4.1. In Brazil

Various contacts were made in order to formalize partnerships with the sub catchment water committees and other institutions working on water management and environmental education in the two catchments. The discussions with the two sub-catchment committees led to the following decisions:

- *In Guarapiranga*, the work will focus on the development of simulation tools for community participation in water management. These tools will aim (i) to enhance communities' awareness and participation to the catchment management process, (ii) to diffuse, discuss and assess local appropriation of the new specific legislation and catchment plan that is being developed by the catchment committee. In this aim, role playing games will be participatively developed with communities, with one at least dealing with urban settlements and the other more related to agricultural development. The elaboration of one of these games has already been initiated (one workshop 29/05 and another 26/06)
- *In Cabeceiras-Tietê*, which is currently being elaborating its catchment plan, the project will focus its intervention on the discussion on policy options related to the management of "rural activities" in the catchment and its impact on water quality. In this aim, a MAS simulation will be developed at catchment level, and completed by other tools that still have to be discussed. The basis of the representation on the hydrological processes has already been presented and discussed with the water technical body of the catchment committee (2 meetings).

4.2. In Bolivia

The strategy has been completely redesigned with

- (1) The identification of a couple of on going negotiation platforms where work is possible. 2 main processes have been selected: (I) negotiation around potable water access ie relationships between users, potable water committees and the new water service project (ii) relationships between land use and spring management at community level.
- (2) A first draft of the intervention (including the type of simulation that will be included) is being elaborated.

III. SCIENTIFIC COORDINATION AND ANIMATION OF THE PROJECT

1. Team management

1.1. Team reorganization in Bolivia

The semester has been characterized by the reorganization of the Bolivian team, with the departure of Dr G Vargas from CERES the 15th of February. Dr Pablo Cuba will be the Negowat correspondent within CERES. Its participation will be complemented by the activities of a junior staff of CERES.

This team reorganization mobilized the local coordinating team in order to identify a viable solution, and this led to important delays in some tasks, such as finalization of conceptual framework, tools development, intervention strategies elaboration and implementation.

End of January, a CIRAD post-doc scientist was posted in Cochabamba to coordinate the activities related to project intervention in the negotiation processes (WP4)

1.2. On going reorganization for modeling in Sao Paulo

As stated in the annual report 2003, we faced difficulties to implement modeling work in Sao Paulo, as we have not been able to secure a pos-doc in simulation modeling with the available fee. A PhD student was recruited instead, but a student cannot obviously handle the same type of work. To overcome this difficulty, it has been decided to mobilize more Dr Bernardo Paz, of the Negowat Bolivian team, which is a fully trained modeler, in Brazil.

Thus, Dr Paz went twice in Sao Paulo (1) 5 days in February to participate the Brazilian internal Negowat workshop on the hydrological representation). (2) A month in April to propose a first version of the SpatMas model concentrating on the water allocation module at this step. Dr Paz will also spend a month in France in order to ameliorate this prototype (Cirad funding).

Funding of these visits that were not initially planned will be provided by the Negowat budget of CIRAD (reallocation of the Negowat funds originally aimed to finance the visits in Latin America of Dr Kuper)

1.3. Exchanges and training period

No direct exchanges between Bolivian and Brazilian (field visit) could be implemented, as initially planned because of the internal difficulties of the Bolivian team. The internal Negowat workshop (and steering committee) was also postponed to August (instead of June) in order to have more time to get results, and thus have more detailed and practical discussions.

Scientific visits and exchanges related to the Negowat project activities during the first semester 2004.

Going to From	São Paulo (Brazil)	Cochabamba (Bolivia)	Montpellier (France)
UMSS (Bolivia)	Nicolas Faysse and Bernardo Paz (1- 9 february 2004) Bernardo Paz (19 avril – 21 avril) SPATMAS development		Bernardo Paz (20 June – 20 July) SpatMas development, CIRAD funding
CERES (Bolivia)	Pablo Cuba May 2004 (4 days) (Ceres Funding)		
USP (Brazil)			
CIRAD (France)	M. Kuper : 1/6 February P Bommel : 7/14 march,	R Ducrot Cochabamba , 3 times: - 26/30 January - 15/20 march - 6 /11 June. J.C Pouget, R Calvez (IRD) Cirad (February) (Funding IRD and CIRAD)	
NRI (GB)		J. Butterworth, Cochabamba - 3 weeks February-March 2004 - 3 weeks June 2004	

2. Other points

Polis Institute has submitted to a local call (Petrobras) a project aiming at the transformation of the tools developed in the Negowat project into a training Kit for NGO called “KIT das aguas”.

3. Publications

Refereed Journal:

Tundisi, J.G.; Matsumura-Tundisi, T.; Arantes-Junior, J.D.; Tundisi, J.E.M.; Manzini, N.F; and Ducrot, R. 2004. The response of Carlos Botelho (Lobo, Broa) reservoir to the passage of cold fronts as reflected by physical, chemical and biological variables. Brazilian Journal of Biology. Vol. 64(1). 177-186 pp.

Seminar communications:

Pedro R. Jacobi, Fernando Monteiro, Ricardo Novaes, Reynaldo Romagnoli, Marina Eduarte, Maria Castellano, Fabiana 2004 (USP): Capital Social nas bacias hidrográficas- desafios metodológicos para sua mensuração. II Encontro da ANPPAS 26 a 29 de maio de 2004 Indaiatuba - São-Paulo – Brasil

Maria Castellano, Reynaldo Romagnoli 2004 (USP): Capital social e organismos gestores de recursos hídricos: o Subcomitê de Bacia Hidrográfica Alto Tietê Cabeceiras. ANPPAS. II Encontro da ANPPAS 26 a 29 de maio de 2004 Indaiatuba - São Paulo - Brasil

Ana Karina da Silva Bueno, Bastiaan Philip Reydon (UNICAMP): As áreas de proteção dos mananciais e o mercado imobiliário informal : um estudo sobre os loteamentos ilegais na Bacia do Guarapiranga. 2004 ANPPAS. II Encontro da ANPPAS 26 a 29 de maio de 2004 Indaiatuba - São-Paulo - Brasil

Yara M. C. de Carvalho; Terezinha J. F. Franca; Vilma Barban; M. Carlota M. Vicente; Vera Lúcia F.S. Francisco The São Paulo's Metropolitan rural area: environmental protection and urban expansion. Communication accepted in the XI International Rural Sociology Association: Globalization, risk and resistance. Norway, July 2004.

Students' tesis.

Van der Meer, S. "La gestion del agua potable en Tiquipaya y Colcapirhua". Centro AGUA and Wageningen University report.

Van Rooijen, D. "Waste Water Irrigation in the Peri-Urban area of Tiquipaya, Cochabamba, Bolivia. Identification and optimization of its use". MsC. Thesis Research report, Centro AGUA and Wageningen University.

Monteiro Fernando, 2004. Desempenho institucional na gestão de recursos hídricos : o caso dos subcomitês de bacia hidrográfica Cotia- Guarapiranga e Billings- Tamanduatei na Região Metropolitana de São Paulo. Tese de mestrado. PROCAM - USP.

Others (internet, on line report, etc)

Bustamante, R., Butterworth, J., del Callejo, I., Duran, A., Herbas, D., Hillion, B., Reynaga, M. and Zurita, G. 2004. *Multiple sources for multiple uses: Household case studies of water use around Cochabamba, Bolivia*. [online] Available at <http://www.irc.nl/content/view/full/8031> (accessed 22 March 2004).

Bustamante, R., Butterworth, J., Flierman, M., Herbas, D., den Hollander, M., van der Meer, S., Ravenstijn, P., Reynaga, M. and Zurita, G. 2004. *Livelihoods in conflict: disputes over water for household-level productive uses in Tarata, Bolivia*. [online] Available at <http://www.irc.nl/content/view/full/8031> (accessed 22 March 2004).

IV. ADMINISTRATIVE ASPECTS

The partners had difficulties to provide their financial report with adequate information. Thus, the last complete financial report was only presented in April 2004 (instead of mid-February as initially planned). It resulted in a long delay of payment of the second year, which is still being processed. Some institutions (UMSS, UNICAMP) have thus faced financial difficulties.

V. PROGRAMM OF WORK FOR THE NEXT SIXTH MONTHS

1. *Coordination*

The coordination will focus on the following activities

- Organization, with APTA of the third Bolivian-Brazil meeting to be held from the 16th to the 20th of August in Sao Paulo.
- Organization of a training session on role game playing
- Organization of the reporting of the field work results, including reviewing of the report, and publication.
- Elaboration of a methodology to monitor the impact of the use of the tools in the intervention processes with actors.
- Finalization of a publication to present, discuss and compare, the methodology developed in each countries, and the place of simulation tools in the intervention strategy.

2. *Brazil*

- Restitution of field work to actors, specifically on the stakeholders analysis and social capital assessment in Cabeiceras-Tietê (August), agricultural studies (July and August in both catchment), tourism and fishing activities.
- Finalization of the studies on water quality and urbanization (access to potable water and sanitation)
- WP4 development:
 - implementation of the intervention in Cabeiceras-Tietê catchment (participative development of the SpatMas Model with the catchment committee)
 - development of 2 role playing games in Guarapiranga through sequential workshops

3. *Bolivia*

- Documentation (actors, issues, process) of the processes selected
- Development of an intervention strategy for the different cases, identifying a sequence of interaction with actors, and type of tools to be mobilized and developed.
- Elaboration of a methodology to monitor the impact of the intervention process.
- Socialization of the methodology of the project at regional level. .

VI. PROGRESS REPORTS OF THE DIFFERENT INSTITUTIONS

1. CIRAD – TERA



CIRAD – TERA NEGOWAT PROJECT

PROGRESS REPORT – January – June 2004

State of advancement of the work

I. General scientific coordination and animation

1. Arrival of Dr Nicolas Faysse, a CIRAD pos-doc in Bolivia,
2. Organization and implementation of a visit of specialists of IRD (JC Pouget, R Calvez) and CIRAD (M Kuper) in water allocation modeling and water management in January 2004.
3. Organization of the visit to CIRAD of Dr Bernardo Paz to advance in the hydrological representation at catchment level (SpatMas model); Funding: CIRAD - 20th of June – 20 of July.
4. 3 coordination visits of Dr R Ducrot of one week in Bolivia (January, March and June) with focus on team reorganization and development of the intervention strategies.

Plans for the next 6 months:

- Organization of the next conceptual framework meeting (16-20 august) in Sao Paulo
- Elaboration of a conceptual paper comparing intervention strategies in Bolivia and Brazil and discussing the use of simulation in the intervention process.
- Organization and implementation of the reporting (elaboration of reports and review) of field work activities.
- Organization of a training session in Role game playing.
- Development with the Bolivian and Brazilian team of a methodology to monitor the intervention processes and use of the simulation tools in negotiation.

II. Scientific activities in Brazil

Main researcher: R Ducrot

Achievements

1. Elaboration of the conceptual framework of catchment functioning with the organization, and animation of 4 internal workshop within the Brazilian team (2 hydrological process, 2 socio-economical process) in order to build the conceptual framework of catchment functioning.
2. Organization of the visit of B Paz to support the development of the SPATMAS models.
3. Elaboration, with B Paz and the hydrological group of the Brazilian team, of the hydrological module of the SpatMas models.
4. Organization of the modeling work on water quality processes at catchment level with IIE.
5. Elaboration with D. Adamatti, J. Sichman and Pierre Bommel (visit to Brazil from 8 - 13 march) of the new version of JogoMan.
6. Organization with Polis Institute of various meeting with the catchment committees, other project and NGO involved in environmental education in the peri-urban catchment in order to structure the WP4 and the methodology of intervention.
7. Supervision of the socio-economic field work, with the participation of the coordinator to various meeting, discussing datas analysis and results.
8. Participative elaboration of the strategy of intervention with POLIS and PROCAM, with the development of a discussion on the place of simulation tools, specifically RPG, in the negotiation processes related to water management.
9. Participation to the Negowat workshops with stakeholders (29 May / 26 June) in Guarapiranga, and meetings with the Cabeiceras-Tietê committee.

Plan for the next 6 months:

- Finalization of the conceptual framework in Brazil.
- Finalization of the hydrological representation in the SpatMas model
- Organization and implementation of the test of the new version of JogoMan
- Development, with PROCAM and POLIS, and participatively with local actors, of two role game playing to discuss the specific legislation of the Guarapiranga Catchment.
- Implementation of interaction with the Cabeiceras-Tietê committee for the elaboration of the SpatMas model.
- Supervision of the implementation of the monitoring process in both cases.

III. Scientific activities in Bolivia

Main researcher: Dr Nicolas Faysse (arrival January 2004)

Work plan: Initially, the work plan was to support G. Vargas in the building of the Negowat negotiation platforms, as well as to collaborate in the study of the water resources in the basin. Two factors gave rise to a change in the work plan. First, G. Vargas left the CERES NGO. Second, it appeared that there was an emergency to focus on the set up of platforms, first in order to make sure that the information gathered would indeed be used, and second that the information needed for intervention in the platforms would be collected.

Results achieved:

1. First, during March and April 2004, a review of all existing and possible negotiation processes relating to land or water use in Tiquipaya took place. The work was done in collaboration with various colleagues in Centro AGUA and CERES. The aim was to select processes on which to intervene, with the following criteria: (a) social demand, (b) importance of the process outside the Tiquipaya area, (c) capacity of the Negowat team to improve the negotiation, (d) status of the project (either already existing or yet to be set up), (e) opportunities to achieve an agreement, (f) amount of additional information to be gathered to intervene. A prioritization of the processes was done from this exercise.
2. A draft of methodological work was written and served as a basis for discussion among the team, in terms of intervention in negotiation processes.
3. It appeared that working with Water Committees was of key importance, as an entry point for any discussion regarding drinking water use in the area. Therefore, at the end of April 2004, four workshops were organized with the water committees, in cooperation with R. Ampere from Centro AGUA. During these workshops, a previous study done by a student on a first diagnostic of the water committees was presented and proposals for continuing the work were discussed.

Problems encountered: The main difficulty met was that, due to the recent changes in the intervention strategy on the Bolivian side of the Negowat project, many aspects of the methodology were to be designed from scratch. A second problem was the instability in the side of the Ceres NGO: the junior scientist contracted after departure of G. Vargas left also in June 2004.

Future work: Basically, two main processes were selected: intervention with the water committees and discussion over spring management and urbanization in two communities of Tiquipaya. Tools of the Negowat project (Role playing games above all, maybe multi-agent systems) will be developed specifically to fit within the general intervention methodology of these processes.

Raphaële Ducrot

30th of June 2004

2. NRI

NEGOWAT – information for progress report from NRI, June 2004

Activities and progress

During the period July 2003 -June 2004 the following activities were completed:

- Participation by John Butterworth in the team workshop held in Cochabamba in November 2003.
- Visits by John Butterworth to Cochabamba, Bolivia in August 2003, November 2003, February 2004 and June 2004.
- Specific areas of work, focused on backstopping support to the team in Bolivia, included:
 - Supporting work, including development of methodologies, on Negowat engagement in negotiation processes in Tiquipaya (with Nicholas Faysee, Pablo Cuba, Rocio Bustamante, Alfredo Duran and others)
 - Supporting documentation of research on locally-managed domestic water supply systems (with Rocio Bustamante)
 - Supporting development of survey methodology and documentation of research on multiple uses of water supply systems at the household level (with Alfredo Duran, Magalay Reynaga, and Danielle Herbas)
 - Supporting other areas of research and team members as requested (on hydrological issues, linking modeling to negotiation processes, planning for project workshops, website development etc).
- Papers completed or in stage of making final revisions:

Bustamante, R., Butterworth, J., del Callejo, I., Duran, A., Herbas, D., Hillion, B., Reynaga, M. and Zurita, G. 2004. *Multiple sources for multiple uses: Household case studies of water use around Cochabamba, Bolivia*. [online] Available at <http://www.irc.nl/content/view/full/8031> (accessed 22 March 2004).

Bustamante, R., Butterworth, J., Flierman, M., Herbas, D., den Hollander, M., van der Meer, S., Ravenstijn, P., Reynaga, M. and Zurita, G. 2004. *Livelihoods in conflict: disputes over water for household-level productive uses in Tarata, Bolivia*. [online] Available at <http://www.irc.nl/content/view/full/8031> (accessed 22 March 2004).

Duran, A., Herbas, D., Reynaga, M. & Butterworth, J. *Planning for multiple uses: Household case studies of water use and livelihood activities in peri-urban Cochabamba, Bolivia*. Forthcoming.

Bustamante, R. et al. *Is there a future for locally-managed domestic water supply systems in peri-urban Cochabamba? Analysis of performance and some possible scenarios*. Forthcoming.

Planned activities for next 6 months

During the next 6 months the following activities are proposed:

- Coordinating the initial (outline) development of training outputs based upon Negowat project findings and outputs. This may include collaboration with an LA-WETNET (the Latin American partner of the CAP-NET network for capacity building in integrated water resources management) course/ workshop in conflict resolution to be held in Cochabamba in March 2005.
- Continuing to provide backstopping support to research, and documentation, on Negowat engagement in negotiation processes in Tiquipaya
- Participation in workshops and steering committee meetings.

John Butterworth

June 27, 2004

3. USP

USP - Scientific Report 2004 – Negowat Project

1. POLI group

Components: Prof. Jaime S. Sichman; Diana Francisca Adamatti (PhD student).

Since last year, we have developed a Role-Playing Game (RPG) that represents a simplification of the real phenomena of interaction between the several actors. This tool is supposed to be used as a means of domain analysis, making it possible for the project staff to learn collectively some crucial aspects of the interaction dynamics. More specifically, the model involves both land and water management problems. We have already executed two tests of this game: one with Negowat Project staff, and the other with Guarapiranga Chamber Technical members. These tests were very important, because many suggestions and modifications were proposed, with the goal to turn the game more similar to the reality. A second version of this RPG is being developed to cope with these suggestions, including a new UML model and a new Cormas implementation.

On the other hand, concerning modelling activities, some meetings with several sub-groups of the project were held, whose goal is to build a conceptual framework to one catchment area (Cabeiceiras-Tiête), using the UML model. We have also managed to integrate GIS (Geographical Information Systems) data within Cormas platform, using many layers, like cities, rivers, land use, etc.

Finally, the paper *"Using Multi-Agent Systems and Role-Playing Games to Simulate Water Management in Peri-urban Catchments"* was accepted in RC33 Sixth International Conference on Social Science Methodology 2004.

2. PROCAM group

Components: Prof. Pedro Jacobi, Maria Eugenia S. Camargo (Master student), Fernando Monteiro (Master student), Maria Castellano (PhD student).

Since last year the members of research group have been involved in two working groups under the supervision of Prof. Pedro Jacobi.

1) Development of a conceptual framework and research design on social capital. The goal is to approximate the concept of social capital to institutional performance of the five subcommittees of Alto Tiete Basin. We understand that a better institutional performance of these organisms is essential to understand the relations between state, municipalities and civil society composing as a network that allows more interaction between these segments. This networking is an instrument to generate confidence to promote consensus between the parties involved, within a framework of institutional embeddedness. The group applied

around 170 questionnaires to evaluate the existing social capital, the socio-economic characteristics of the members of the subcommittees and their perception on issues linked to water scarcity. The group produced already one collective paper presented at the meeting of the National Association of Graduate Studies and Research in Environment and Society in may 2004 and two individual papers

2) Development of role playing games tools on conflict and negotiation in watersheds. This group is more recent and is responsible for the development and analysis of strategies of role playing games that will contribute to increase the local communities participation in the discussion of the management of water resources. It also is intended to contribute so that the experiences and demands of the diverse local actors are included in the multi-agent model and finally it wants to understand how a methodology of role playing games can contribute in the development of environmental education projects. The researchers involved are actually beginning activities with the community and to obtain the first feed backs.

3. School of Public Health - group

Components: Prof. Wanda Risso Gunther and two undergraduate students and one Master student

The work of this group has been underway since the end of year 2003. It has initially developed a bibliographical research on issues linked to urban development, environmental sanitation and health, oriented towards aspects of decentralization and land occupation in peripheral areas. It has also developed a research on census data in the geographical areas under study emphasizing morbid-mortality factors and vulnerabilities related to water, divided in sickness due to hydric veiculation and sickness of hydric origin. These data will be analyzed through GIS methods.

The group has also addressed aspects linked to the basic sanitation conditions in the areas under study and has initiated the preliminary diagnosis within a framework of environmental health in the areas emphasizing the water sources, the deposit of sewage and the disposition of solid waste, and all other variables that provoke health risks to the community. It is also defining the instruments of data collection.

4. APTA

APTA'S PROGRESS REPORT: CHARACTERISING THE RURAL AREA IN ALTO TIETÊ WATERSHED

JUNE 2004

I - WORK DEVELOPMENT

Image processing, land use and soil analyses:

The work was mainly realised in Cabeceiras, integrated to the hydrology group. The Geographic Information System (GIS) has been used to integrate all collected data: protected areas and parks, roads, rivers, county boundaries, existent and projected dams, identification of all sub-catchments, water and sewage treatment units, geomorphology, fluviometric and pluviometric stations. Integrating with other researchers: farmers location, secondary homes, tourist equipment and fishponds interviewed in fieldwork besides water sample location, has been identified.

Landsat-7/ETM images from 2001/2002, aerial pictures and digital ortophotos were used for land use definition. Fieldwork with DGPS equipment was realised to obtain the true land reality, incorporated in the interpretation of land use. Soil sample has been collected. The land use and occupation in Cabeceiras and Balainho has been delayed because it is still waiting for the laboratory analyses. Soil sample collection was realised during this period due to initial delay in disbursement.

Guarapiranga's land use was updated through fieldwork.

Rural secondary data processing:

Processed agriculture information:

- Watershed: Cabeceiras and Balainho; Parelheiros and Guarapiranga from LUPA 1995/96.
- Counties: Mogi das Cruzes, Biritiba Mirim, Salesópolis and Suzano:
- Main agricultural activities from Censo Agropecuário-IBGE 1970 and 75
- Main agricultural activities from Subjective County Inventory. SAA 1985 and 1995.

It has been purchased but there is unexplained delay from IBGE. It was purchased, selected data from Censo Agropecuário, for the four mentioned counties, for the period 1975, 1985 and 1995. The last one also with the watershed boundary.

Water quality:

During the period dry-cold in august 2003, ten samples were obtained. This locations were repeated in the rain-warm season (January through March/ 2004). It was added new locations: the main tributaries of Jundiaí's and Taiacupeba's dam besides locations to evaluate different impact of land use: agriculture, urbanisation, pasture, reforestation and fishing ponds. It rose to a total of 31 samples.

Results from the water system SPAT (Cabeceiras):

It has not been observed a clear difference between the two seasons. The N concentration in the Jundiaí-Taiaçupeba' channel was two times larger than upstream the Jundiaí dam. Downstream the Taiaçupeba dam was three times greater than upstream Jundiaí. In terms of P, the concentration in both channels: Biritiba-Jundiaí and Jundiaí-Taiaçupeba, were higher than the National standard. The outflow is maintained constant through DAEE/Sabesp regulation. During the dry period, outflow are almost free, to guarantee water supply at the last dam: Taiaçupeba. In the rainy season, the outflow is regulated keeping water in the Ponte Nova dam.

Urban agriculture:

The planned field research in Balainho and Parelheiros was finished. Since the agrarian system methodology is not a subject in São Paulo's State Universities, the young researchers, contracted under this project, had to be trained through learning by doing. The analyzed urban agriculture was only the market oriented, professional activity. It was identified the areas where the complementary income urban agriculture is located, for future research. There is an increasing activity of this type of urban agriculture, mainly related to unemployment and decreasing income. It remains necessary to study the commercial structure and the possibility of crafting an environmental quality concern among farmers.

There were 29 interviews realized in Balainho and 21 in Parelheiros. This represents no less than 25% of the existing universe in 1995/96, in a situation of increasing abandonment.

In general, the main activity is horticulture developed by Japanese descendents. Some innovations were identified. It was identified the existence in Guarapiranga of a "peasant" family farmer type. They produce for family consumption, maintain a rural life style value and are the most ancient in the region (European-no Iberian, and American Indians descendents). Despite the fact that they are strongly integrated to urban life, around 50% still participate in rural community life through churches or the cultural and social Japanese organization called Bunkio. It was also identified a small number of farmers that applies environmental friendly technology. Water conflict is not open but does exist. It is mainly expressed in terms of abandoning, changing activities or digging more profound wells.

Participation in the Urban Agriculture Forum for the São Paulo region. Coordination of the methodology group concerned with exchanging experiences. Coordination, of an integrated French Government financed project in Guarulhos. Participation in Reserva da Biosfera do Cinturão Verde de São Paulo's Millenium Assessment and recently elected member of its Managing Council.

Irrigation:

It was obtained a database from 9 microcatchments spread in Cabeceiras Alto Tiete water basin. Data will be processed in terms of water quality and quantity used by agriculture.

A field research with 17 horticulture farmers was accomplished concerned with irrigation management and agriculture water demand and consumption. Orientation of a Graduate student Laura Barcelos Antuniazzi in her graduation study. Participation in the Alto Tiete Water Agency and Guarapiranga sub-committee.

Rural tourism:

Tourism was oriented to study secondary residences and tourist equipment. It was realized 13 interviews in Parelheiros and 18 in Balainho with secondary homes. It was also

interviewed owners of 15 different equipment in Parelheiros, the universe. In Balainho 18 were identified and interviewed. Data has been processed and two typologies for secondary homes evaluated: property trend and also environmental concern and impact. The tourism equipment has not yet being analysed.

It has been identified the inadequacy of the federal policy to protect native forest in metropolitan areas. Owners of secondary homes do not integrate in social rural life but their employees might. Some are leaders in their community. It seems that there is a tendency to move from isolated large property areas to housing developments of smaller size. Another trend is defining new uses for the property: first house after retirement or tourist equipment by younger generation.

The main difficulty has been associated with young researcher's detachment due to new opportunities: graduate study.

Fish ponds:

Geographic System Information (GIS) identification of 60 fishing ponds for commercial exploitation. Interview with 15 in Cabeceiras, representing 25% of the universe. Identification of sites with concentrated sportive fishing. Interview with some fishing man at the fishing ponds. Analysis and elaboration of a partial report.

II PRODUCTS:

XI International Rural Sociology Association: Globalization, risk and resistance. Norway, July 2004. The São Paulo's Metropolitan rural area: environmental protection and urban expansion, by researchers mainly from IEA/APTA: Yara M. C. de Carvalho; Terezinha J. F. Franca; Vilma Barban²; M. Carlota M.Vicente; Vera Lúcia F.S.Francisco accepted to be presented in two workshops: 1) Rural territory, environment and governance and 2) Globalization and family farm social transformations: resistance and mutations.

Planned participation:

Ana M. P.Amaral. VII Reunión Red Latinoamericana de Agricultura de Conservación - RELACO. San José, Costa Rica: November/16-19/2004. Economic viability and environmental impact of two irrigation systems in São Paulo's Metropolitan Region: a case study.

VI Brazilian Society of Production System-SBSP. Sergipe 20-22/10/2004.

II Jornadas Economía Ecológica ASAUUE Buenos Ayres November/12-13/2004

² NEGOWAT Instituto Polis.

UNICAMP - Scientific Semestral Report - 2004 – Negowat Project

5. UNICAMPgroup

Components: Prof. Dr. Bastiaan Philip Reydon, Ana Karina Silva Bueno Schlogl (Master Student).

Task 3: Urban Land markets and illegal settlements

1.Objectives and Methods:

Objectives : (i) To characterise the variability and dynamics of land rights and markets in the catchments studied taking into account : relationships with water, the urban and rural area, (ii) To identify constraints and opportunities for transformation of land market patterns related to rural, urban or environmental policies (implemented or in discussion). (iii) to identify and discuss the possible effects of regulation mechanism (taxes, municipal planning) on land markets in the catchments.

2.State of advancement

The study on the urban land markets and illegal settlements in the areas of sources has been concluded.

3. Results -Urban Land markets and illegal settlements

From the analyses of the field study on the creations settlements in the Basin of the Guarapiranga there could be seen that most of the urban occupation of the area of sources happens on illegal ways. Those are established mostly close to the regular urban areas of the district to achieve better prices. This occupation occurs through selling plots of land that are undertaken by a social organization consisting of: owner of the land, loteador, public sector, politicians and financiers.

The activity of opening a clandestine settlement involves the interactions between the aims of: loteador, the association of inhabitants, land financiers, proprietors, politicians and public sector. Depending on the interactions between these actors who form the social organization, from the implementation of the land settlement until its consolidation that this enterprise will achieve better or worse results in valuation, in obtaining infrastructure and the public equipment for one future regularization. In other words, the valuation criterion will depend on the social organization in establishing for itself the formal laws of regulation of the ground and efforts to acquire the public equipment.

The efforts of all the actors who form the social organization are a demanding fight for the infrastructure and public equipment, and mainly for the attainment of the definitive registers of its plot, the property heading. Some illegal settlements, in having a fortified social organization, obtained the basic urban equipments acquired the next services: pluvial water systems, light, water and asphalt. On the other hand, there are settlements without social organisation and lack of politic representation that are in very bad sanitation conditions.

The investments in urban land markets is highly advantageous, because it is transformation of rural land in urban plots (measured in hectares to measures in square meters). From existing data the increase in value is of about 13 times and it is exempted of any important taxes and costs of implantation of the settlements. The price of the plot is dependent on its infra-structure: size of plot, roads, and other facilities that were obtained with the public investments. After the investment is made there is also a increase in the value of the plots: many had about 400% of valuation throughout 10 years.

The agricultural property are devaluated because of decrease of the agricultural activity in the region. Many soils are idle and on sale, being an incentive for the illegal settlements. Because of that the implementation of illegal settlements, is very profitable although it is forbidden by law, but Brazilian justice is unable to hinder the settlements. The legislation of use and occupation of the ground of the areas of sources is being revised to incorporate the illegal land divisions in the official city. However these laws are still in approval phase.

4. Links with to other task and work developed by to other partners: The study of the illegal settlements is having an interface with the groups of rural development, urbanization and sanitation. A typology of the settlements was made in the modeling.

5. Detailed lists of publications related with the work developed: Publication of the Congress of the National Association of Graduation in Environment and Society heading of the work: Illegal the real estate market: a study on the illegal land divisions in sub district of Parelheiros in the city of São Paulo.

6. Outline plans will be the next semester: There will be carried out other field researches on the rural land market of the basin areas to understand better the dynamics of the interaction of both markets: rural and illegal urban.



**Instituto Internacional de Ecologia e
Gerenciamento Ambiental**

PROJECT:

**FACILITATING NEGOTIATIONS OVER LAND AND WATER
CONFLICTS IN LATIN-AMERICAN PERIURBAN UPSTREAM
CATCHMENTS: COMBINING MULTI AGENT MODELING WITH
ROLE GAME PLAYING**

6. IIEGA

PERIOD - JANUARY - JUNE - 2004

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA.

During this period effort was made to collect and organize information on the hydrological cycle in the Cabeceiras systems, and also to develop the models of water quality for Cabeceiras aquatic systems, and Guarapiranga reservoir. The following information was collected and processed:

- Data from historical series of pluviometric stations.
- Analysis, correlations and complementation of pluviometric data.
- Determination of average precipitations in the dry and wet seasons.

- Determination of the Thiessen polignos from the pluviometric stations.
- Analyses of the historical series of flushing rates.
- Determination of the Thiessen polignos for the fluximetric stations
- Determination of the relationships – Rainfall / flushing rate.
- Determination of the coefficients of surface drainage.
- Determination and delimitation of the watersheds (sub-basins) of the study area.
- Determination of the montly contribution for each sub-basin.

These results will enable the IIEGA team to analyses the climatological / hidrological relationships at the Cabeceiras sub-basin level.

The other focus of the research was to evaluate the wetlands capacity to remove nitrogen in order to provide a basis for wetland presentation as natural filters of nutrients in the Cabeceiras and Guarapiranga project. The field work was developed in the Parelheiros river floodplains.

2. EVALUATION OF THE NITROGEN REMOVAL CAPACITY IN THE PARELHEIROS RIVER FLOODPLAINS, BILLINGS/GUARAPIRANGA SYSTEM

The aim of this study was to quantify the nitrogen removal capacity along the Parelheiros River floodplain, based on nitrite, nitrate, ammonium, total dissolved nitrogen (TDN) and total nitrogen (TN) in the overlying water of the sediments.

Water and sediment samples were collected manually in 5 points in duplicate using PVC crystal-clear core liners of 60 cm length and 6 cm inner diameter.

Nitrite, nitrate and ammonium were analyzed using a Dionex ion chromatograph, model DX-80 (Dionex, USA), according to APHA (1998). TDN and TN were analyzed by spectrophotometric method after digestion with persulfate according to Valderrama (1981).

Maximum nitrate removal was observed in the central floodplain ($731.26 \mu\text{g-N m}^{-2} \text{ day}^{-1}$), while ammonium was released en all the points, which maximum releasing rate was observed in the upstream ($5647.67 \mu\text{g-N m}^{-2} \text{ day}^{-1}$), followed by the central portion of the floodplain ($3825.79 \mu\text{g-N m}^{-2} \text{ day}^{-1}$). However, considering the TDN and TN, the maximum removal rate was 12.90 and $13.43 \text{ mg-N m}^{-2} \text{ day}^{-1}$ at respectively. In the mouth of the Parelheiros River in the Guarapiranga Reservoir, the TDN and TN releasing rates were 4.50 and $4.80 \text{ mg-N m}^{-2} \text{ day}^{-1}$, respectively.

Considering that the removal rate of nitrogen is homegen along the year, the Parelheiros River floodplain in its meddle portion removes 4902 g of nitrogen per m^2

per year. Therefore, in 1 m², the floodplain in this portion removes 4902 tons of nitrogen per km² year, while in the mouth of the Parelheiros River, the floodplain removes 1752 tons of nitrogen per km² per year. In the hypolimnion of Barra Bonita Reservoir, located in the middle portion of Tietê River and considered hypereutrophic, the removal rate of nitrogen by denitrification was calculated in 1384 tons per km² per year (Abe et al. 2003). That means that the removal capacity of the Parelheiros River floodplain next to the Guarapiranga Reservoir is higher than in the Barra Bonita Reservoir.

This study demonstrate the importance of the natural floodplains in the Parelheiros River in the removal of nitrogen.

3. PUBLISHED PAPERS, PAPERS IN PREPARATION OR IN PRINTING

Tundisi, J.G.; Matsumura-Tundisi, T.; Arantes-Junior, J.D.; Tundisi, J.E.M.; Manzini, N.F; and Ducrot, R.

2004. The response of Carlos Botelho (Lobo, Broa) reservoir to the passage of cold fronts as reflected by physical, chemical and biological variables. Brazilian Journal of Biology. Vol. 64(1). 177-186 pp.

Tundisi, J.G.; Matsumura-Tundisi, T.; Arantes-Junior, J.D. and Manzini, N.F.

2004. The response of reservoirs of South East Brazil to the passage of cold fronts as reflected by physical, chemical and biological variables. Accepted in *Verhanlunder Verein Limnology* (Stuttgart, Germany).

Abe, D.S.; Tundisi, J.G.; Matsumura-Tundisi, T. and Ducrot, R.

The effect of wetlands in the denitrification processes in the Metropolitan Region of São Paulo (to be submitted to Lakes & Reservoirs Research and Management – Blackwell Scientific).

Tundisi, J.G.; Abe, D.S.; Matsumura-Tundisi, T.

The application of the Pamolare model to five reservoirs in Brazil. (to be submitted Hydrobiologia)

Tundisi, J.G.; Abe, D.S. and Ducrot, R.

Wetlands in the periurban areas of the Metropolitan region of São Paulo: their role on denitrification and nutrient cycling (to be submitted to Lakes and Reservoirs: research and management).

Tundisi, J.G. and Abe, D.S.

Eutrophication of reservoirs in urban and periurban areas of the Metropolitan region of São Paulo, Brazil. (to be submitted to Hydrobiologia).

Tundisi, J.G.

2004. Integrated management of watershed and reservoirs – case studies and perspectives (Plenary Lecture – UNESP, Botucatu (SP), July, 12, 2004). Paper will be published in the Proceedings of reservoir managements conference, 12-16 July, 2004).

Ducrot, R.; Paz, B. and Tundisi, J.G.

Facilitating concertation in the management land and water management in peri-urban catchments, example of an approach aiming to develop participatively simulations tools in the Metropolitan Region of São Paulo (Brazil).

FURTHER WORK:

a) Collection and organization of data bank for the modeling procedure of Cabeceiras and Guarapiranga reservoirs:

- 1- Nitrogen and phosphorous loads (point sources)
- 2- Nitrogen and phosphorous loads (non point sources)
- 3- River discharge
- 4- N concentration in reservoirs
- 5- P concentration in reservoir
- 6- sequence of water blooms in Cabeceiras and Guarapiranga reservoirs
- 7- Climatology / Hydrology of Cabeceiras and Guarapiranga sub-basins
- 8- Retention time of reservoirs
- 9- Dissolved oxygen in reservoirs
- 10- Total load of N, P to reservoirs
- 11- Concentration of N, P in reservoirs
- 12- Concentration of chlorophyll in reservoirs
- 13- Concentration of suspended material in reservoirs
- 14- Zooplâncton in the reservoirs

b) Modeling of water quality and eutrophication processes in the Cabeceiras and Guarapiranga reservoirs.

c) Participating in seminars, discussion groups and meetings for synthesis.

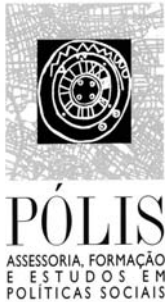
d) Further collaborating with the implementation of the “water schools” in Cabeceiras and Guarapiranga sub-basins.

José Galizia Tundisi

IIEGA

São Carlos – June, 28th, 2004.

7. Instituto Polis



Pólis – Instituto de Estudos, Assessoria e Formação em Políticas Sociais.

Activities Report from January 1st to June 30th, 2003

Coordination: PhD. Vilma Barban

PÓLIS main subjects in the NEGOWAT Project are:

- I. Social actors: Identification and analysis of the conflicts within the water and land management/use at the Guarapiranga and Tietê-Cabeceiras sub-catchments.
- II. Delivery of research, holding of focus group, preparation of workshops for the development of role-plays and debates with the local social actors of the sub-catchments in River Parelheiros, São Paulo, and River Balainho, Suzano/SP.

A- Polis Team Activities

1. Researching Activities with local social actors and development of role-play.

This semester our activities focused on complementing the field research with local Social Actors from the region of River Parelheiros in Parelheiros, city of São Paulo, part of Guarapiranga sub-catchment, as well as from the region of River Balainho, city of Suzano, connected to the Tietê-Cabeceiras sub-catchment. We reinforce that part of this research was carried out in the 2nd semester of 2003, having this semester completed the universe of existing organizations in the two sub-catchments.

Guarapiranga. In Parelheiros we have performed 31 (thirty one) interviews with local social actors – most of the times residents associations, comprehending poor neighborhoods, illegal occupations and districts of rural properties and country houses.

Once the results of the research were elaborated, a meeting with the interviewed actors was organized in order to promote the restitution and debate about those results, at a workshop held in May 2004 at the Parelheiros sub-municipality, to about 40 (forty) attended, representing 29 residents associations, Municipality and State Secretary representatives.

At this meeting we have also begun the discussions for the realization of a focus group, which will develop the role-play and the role-play game.

We are presently in the process of organizing the continuity of these workshops with these cooperators for the development of the role-play. The development of these workshops and the play is undertaken together with the coordination of Negowat Project (Raphèle Ducrot) and a PROCAM student (Marô).

Tietê-Cabeceiras: In the River Balainho area we have interviewed the local residents associations, complementing the research initiated in 2003.

According to a previous report (Dec 2003) the existing non-governmental environmental organizations in the Tietê Cabeceiras region and some local residents associations have been interviewed, as well as other social actors who are important to understand the conflicts regarding the water and soil at that sub-catchment.

In 2004 the research focused on the River Balainho region in Suzano, an area defined by Negowat Project. We interviewed 6 (six) associations and also did other interviews with residents, as well as a collection of Suzano's historical documents, with the intention of understanding the occupation process.

Still regarding this sub-catchment we will carry out a meeting - planned for the month of August 2004 - with all the interviewees in order to reconstitute the results of the research.

In this sub-catchment, according to the coordination, the project proceeds to another development logics for the MAS (Multi-agents) process in cooperation with the actors bound to the Tietê-Cabeceiras sub-committee, which we have been monitoring and trying to integrate with Polis Institute team's work.

2. Polis Institute Team Common Activities

2.1. On Negowat Project

- a) Participation in the Negowat_Brasil Team meetings
- b) Project coordination meetings
- c) Meetings with representatives of Parelheiros and Capela do Socorro sub-municipalities
- d) Presentation of the research results at the Negowat Workshop with focus on the Cabeceiras sub-catchment held between March 31st and April 2nd at CCE_POLI_USP.
- e) Participation in IEA-APTA meeting about the progress of Negowat Project researches.

2.2. Seminars and related meetings

- a) Seminar right to water, pre-paid system and the impacts on consumers - promoted by IDEC and held at Pólis Institute.
- b) South Zone Forum - organized by local organizations of Jardim Ângela
- c) Debate about the private sector on the sanitation systems around the world held at IPT-USP during the water week (20th to 26th of March)
- d) Participation in meetings at the Agência da Bacia Hidrográfica do Alto Tietê (Alto Tietê Water Basin Agency) throughout the first semester of 2004
- e) Agreement with Unisa (Universidade de Santo Amaro) to form a partnership for the development and molding of the role-play
- f) Agreement between Negowat Project and the Project of participative monitoring of the quality of the water in the Alto Tietê Basin, developed by the SOS Mata Atlântica NGO
- g) Participation in Capivari-Monos APA Council meeting
- h) Participation in the creation Bororé APA.
- i) Participation in meetings at the Urban Agriculture Forum of São Paulo city and in its executive work group

2.3. Participation in National Meeting

Participation in the Encontro Nacional de Comitês de Bacias Hidrográficas (Water Basins Committees National Meeting) held in Gramado-RS in May 2004.

3. Polis team other activities in the Project:

Development of proposal for the “Kit das Águas” (Water Kit) Project, sent to apply for a grant by the Programa Petrobrás Ambiental (Petrobrás Environmental Program), which in case is approved will become a Negowat Project partner – the beginning is planned for August 2004

4. Publications.

Development of the paper “The São Paulo’s Metropolitan area: environmental protection and poverty alleviation”, in co-authorship with Yara M. C. de Carvalho, M. Carlota M. Vicente, Terezinha J. F. Franca, from IEA/SAA and Vilma Barban, I.Polis.

B. Next tasks:

- Organization and holding of the workshops with the social actors for the formulation, testing and validation of the role-play.
- Monitoring of the process together with the social actors for the formulation of the play-man and MAS.

D. Interns academic research projects

Clarissa de Oliveira - Architecture Student at the Architecture and Urban Planning School, University Brás Cubas, in Mogi das Cruzes. Final Academic Project Subject: “Sustainable cities: how the lack of Urban Planning policies may cause social-environmental impacts: case study of Taiaçupeba Reservoir³”.

Luiz Sertório Teixeira - Geography Student at the Geography School, University of São Paulo. Advisor Professor: PhD. Odette Seabra. Final Academic Project Subject: “São Paulo’s State Law for Catchment’s Protection and the effects into the Catchment’s area”⁴.

- Pólis teamwork in the NEGOWAT Project:

Social actors: Identification and analysis of the conflicts:

- PhD. Vilma Barban,
- Clarissa de Oliveira
- Luiz Sertório Teixeira

³ “Cidades Sustentáveis: de que maneira a falta de Planejamento Urbano gera impactos sócio-ambientais: estudo de caso Represa de Taiaçupeba”.

⁴ “A Lei de Proteção dos Mananciais e os efeitos nas áreas de Bacia Hidrográfica”

8. *UMSS Bolivia*

NEGOWAT Project
Facilitating Negotiations over Land and Water Conflicts
In Latin-America Periurban Upstream Catchments:
Combining Multi-Agent Modeling with Role Game Playing

Biannual Activity Report

UMSS Partner - Bolivia

Cochabamba, June 25, 2004

Contents

1. Background
2. Study themes
3. Achievements
 - a. Scientific work
 - b. Administration
4. Problems encountered
 - a. Scientific work
 - b. Administration
5. Missions of external collaborators
6. Documents produced
7. Workshops

1. Background

According to the project programme, the following researchers have been involved in the teamwork:

Researcher	Study theme	Status
Alfredo Durán	Agriculture and irrigation	Coord. Gral Centro AGUA
Bernardo Paz B.	Modelization	Modelization, Coord. Negowat Bolivia
Nicolás Faysse	Negotiation processes	Post-Doc CIRAD, full-time in the Negowat project
Carmen Ledo	Urbanization	Director CEPLAG-UMSS
Raúl Ampuero Alcoba	Environment and negotiation processes	Temporary team member NEGOWAT
Daniel Vega	Springs	Temporary team member NEGOWAT (until July 04)
Marco Saenz	Hydrology	UMSS staff – specific support
Daniel Hebras, Magali Reinaga	Agriculture, multiple water uses	Short term contract – 4 months
Sjoerd Van der Meer (supervision: R. Bustamante)	Drinking water management	Short term contract – 5 months
Vladimir Cossio	Drinking water management	UMSS staff – specific support
Rigel Rocha	Soil use and data base	UMSS staff – specific support
Alberto Lizárraga	Land market	Temporary team member NEGOWAT (until sept. 04)

2. Temas de estudio

All the themes mentioned previously are part of the one of these following themes: a) Agriculture and water management, b) Hydrology, c) Water and land rights, d) Urbanization, e) Environment.

3. Achievements

3.1 Scientific

According to the programme, the current investigations are part of the Design and Development of the Model (WP2) and Gathering of complementary Data (WP3). In June 2004, 80 percent of the field work for the various investigation fields have been completed.

- a) Agriculture and water management. Two field work have been completed in this theme. The first one was focused on multiple water uses at family level in Tiquipaya. A general survey was done with 40 families, followed by a more specific and in-depth survey of 16 families. The second work tackled issue of spring management and analyzed the changes in their flows and the effects in terms of irrigation use. This last work is done in coordination with the hydrological study.
- b) Hydrology. There is another research project in the area, called "Water rights", undertaken by the CGIAB (General Commission for Water Management in Bolivia) and it was important to coordinate with them in terms of knowledge. This project gave the Negowat team the results of a hydrological model. Given the absence of data on climate in the K'hora Tiquipaya basin, this latter model uses available data of

the neighbouring Taquiña basin. This model proposes a reconstruction of the water available from the sources and will be used for analysis of future scenarios.

- c) Water and Land rights. With regard to water, the field work is based on study of the community-based Drinking water committees, which took responsibility of supplying water in peri-urban areas where the Municipality do not undertake the task. Twenty eight water committees were interviewed, as well as formal and informal interviews of other key stakeholders in Tiquipaya and Colcapirhua. With regard to land rights, the researcher in charge is still in a phase of collection of information, because of problems that are explained hereafter. The main source of information for his work is: the urban cadastre, the municipal decrees and formal interviews with inhabitants.
- d) Urbanization. For the analysis of this theme, it was necessary to organize a survey of the Tiquipaya inhabitants: This survey was split into two parts. A first very brief questionnaire was used on around 5,000 families. The second much more detailed questionnaire was used with 473 families. It tackles topics of availability and use of water, land market, incomes and current situation of water supply and sanitation services. These surveys are being digitalized. Since the information gathered entails various topics, it will lead to a joint analysis by the whole team.
- e) Environment. The points of source of pollution en Tiquipaya and Colcapirhua were identified, using participatory workshops. This led to analysis of water quality of samples taken in these points. Another work done by the researcher in charge of environment issues relates to trying to link pollution data and impact on health, using data on water-related diseases available in the various health centres in the study area. This researcher also supports the work on intervention in negotiation processes.

As scheduled in Work Package 4 (Development of Methodologies for Negotiation), a methodology was designed for intervention within the investigation team. This methodology involved first identifying the existing and possible negotiation processes. Second, some of the processes were selected for intervention, according to criteria such as: (a) social demand, (b) importance of the process outside the Tiquipaya area, (c) capacity of the Negowat team to improve the negotiation, (d) status of the project (either already existing or yet to be set up), (e) opportunities to achieve an agreement, (f) amount of additional information to be gathered to intervene. This intervention will use tools as planned in the Negowat Project, as MAS and role-playing games, among others. The first phase of identification was done under the coordination of the post-doctoral researcher contracted by CIRAD.

Two processes were selected. The main process will consist in working on the current drinking water supply committees in the study area, and their possible future. The work is based on a first diagnostic made previously (Van der Meer and Cossio, 2004). The second process relates to setting up discussion regarding land use and spring management at community level.

Modelling. The model and the role-playing game are already tested tools. Both tools have been developed last year and are in process of being tested and calibrated. The model and the game will be used as a pilot to develop more specific ones, suited for each negotiation processes. The researcher in charge of the modelling also supports in an intensive way the building of the Brazilian model, where there is a substantial demand. This model simulates water allocation in the Alto Tiete upper basin. This involvement of this researcher in the building of this model led him to spend a specific period in Montpellier (France).

The Internet site of the project is managed by the Bolivian team. It has been improved thanks to the support of the Information Department of CIRAD, and is continually maintained and updated. Recently, a new data base was added to this site: it will enable researchers to share information, using an easy-usable interface (www.negowat.org/sisweb/ login: khora; password: tiquipaya)

3.1 Administration

The implementation of the budget has been achieved satisfactorily. A first annual accounting report was written and improved with the support of the accounting officer in CIRAD (Mr. Gout). This enables to acquire the needed capacities and therefore, fewer corrections should be needed in the future.

The second CFM was organized in Bolivia and took place during the last week of November 2003, with the participation of the whole Bolivian team and 9 researchers from the Brazilian one. The meeting was successful; the results and reports are available on the Web site.

4. Problems encountered

4.1 Scientific work

The change of team member within our closest partner, the CERES NGO, amounted to a serious problem for the project, given that they have important responsibilities in the development of the intervention methodology.

In some cases, access to information happened to be difficult, for the following main 3 reasons: 1) Weak interest and susceptibility of the Municipal authorities, 2) Lack of willingness of some stakeholders to discuss some sensitive issues such as water rights, 3) Long-existing conflicts between the Municipal authorities and the irrigation farmer, with regard land and water management.

4.2 Administration

The problem of the exchange rate keeps on creating problems in the functioning of the project, since execution is done in dollars, while reporting must be done in euros, which keeps on increasing. This means that the commission paid to Centro Agua for administration of the budget keeps on inflating.

The status of the researcher in charge of urbanization theme changed. Currently, she is part of the direction of the CEPLAG Research Centre of the University. This promotion led to a decrease in the availability of this research, to go on working in the Negowat project. The impact was however limited, thanks to the goodwill of the CEPLAG and the participation of other students and researchers from the Centre.

The change of team member on the CERES side meant also that it took time for the new CERES person involved in to understand the project and position CERES responsibilities.

5. Missions of external collaborators

From Jan 26th to Feb. 30th, visiting period of Raphaële Ducrot, coordinator of the project.

On Jan. 26th, arrival of Nicolas Faysse, post-doctoral researcher from CIRAD.

From Jan 26th to Jan 31th, visiting period of Jean-Christophe Pouget, hydrologist from IRD.

From Jan 27th to Feb, 8th, visiting period of Rogez Calvez, hydrologist from IRD.

From March, 15 to March 20 visiting periods of Raphaële Ducrot.

From Feb, 28 to March, 10 and June, 14th to July 3rd, visiting periods of John Butterworth, researcher of the NRI.

6. Documents produced

Faysse, N. "Propuesta para la fase de intervencion en el proyecto Negowat". Unpublished document.

Paz, B. "Una experiencia de modelación y Juegos de roles en Bolivia". Second conferenc of Amazonia, from June 13 to 18, 2004, Marajo, Brazil.

Van der Meer, S. "La gestion del agua potable en Tiquipaya y Colcapirhua". Centro AGUA and Wageningen University report.

Van Rooijen, D. "Waste Water Irrigation in the Peri-Urban area of Tiquipaya, Cochabamba, Bolivia. Identification and optimization of its use". MsC. Thesis Research report, Centro AGUA and Wageningen University.

Reynaga, M., Herbas, D. and Duran, A. "Usos múltiples del agua en 4 zonas de Tiquipaya". Unpublished document.

Ampuero, R. "Sistematizacion de visitas de observaciones y sondeos en los distritos 4, 5 y 6 de Tiquipaya para el diagnostico ambiental participativo". Unpublished document.

7. Workshops organized

March, 4th: Workshop on the future sewage system in the Chilimarca area, in March 2004.

May, 22nd to 24th: Four workshops of devolution and discussion on the diagnostic of water committees, with all water committees of the study area.

June, 13th: Interinstitutional workshop of presentation of the Negowat project to the Departmental prefecture, the Municipalities and other local and regional organizations involved in water and land management.

9. Ceres

NEGOWAT PROJECT

CERES ACTIVITY REPORT (January –June 2004)

Achievements

1. The working relationship between CERES and its Bolivian partner Centro AGUA was consolidated during this period, which enabled a better coordination of the project.
2. The new CERES coordinator P. Cuba went to visit the Brazilian partners (Polis, Sao Paulo University, and the general CIRAD coordinator Dr. Ducrot) to get a better knowledge of the project methodology. A specific discussion took place with the Polis NGO, to understand their role in the project and their experience in stakeholder analysis.
3. The stakeholder analysis was achieved and the draft document is currently under revision.
4. In cooperation with Centro AGUA and Nicolas Faysse, a diagnostic of the negotiation processes was done, with subsequently a prioritization for the intervention phase.
5. A workshop was organized at regional level on June, 11th with among other institutions: the Department Prefecture, the municipalities of Cochabamba, and Colcapirhua, and representatives of the Cochabamba municipal water company SEMAPA. A presentation of the project (objectives, methodology, achievements, planned activities) took place. Afterwards, a discussion was organized on the current issues regarding land and water in peri-urban areas in the valley of Cochabamba. A draft assessment of this workshop was written by CERES and will be sent to all the participants.

6. In this same period, CERES undertook other activities that are not part of Negowat project but can have positive impacts on the future success of this project. First, a radio program was broadcasted in the valley, which tackled the issue of regional development, with specific focus on the Tiquipaya Municipality. Second, CERES manages other ongoing projects with key stakeholders such as the Tiquipaya Municipality and the Department Prefecture (for instance, Programme of Municipal Development through Citizen Participation in Tiquipaya). This enables a continuing good relationship with these stakeholders.

Problems encountered

1. The previous CERES coordinator G. Vargas left the CERES NGO and subsequently the Negowat project in January 2004. This had many negative impacts on CERES completion of its tasks, for instance the writing of the stakeholder analysis document. This led the restructuring of CERES staff participation in the Negowat project. The new coordinator is now P. Cuba, with the support of a junior researcher. A first junior researcher was employed from February to June, but left also the project and will be replaced by a junior and knowledgeable economist M. F. Quiroz from July onwards.

Programme for the next semester

1. In coordination with Centro AGUA, two processes were selected. Analysis and support of the water committees in Tiquipaya, and land use at community level. M.F. Quiroz will work specifically on the first process.
2. The June 11 workshop will be followed by others, which will aim at coordinating the groundwork achieved in Tiquipaya with the issues and stakeholders at regional level, and especially socialize the methodology used within the Negowat project.