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## **ANNUAL REPORT 2005**

**Covering period from 01/01/05 to 31/12/05**

***Facilitating Negotiations Over Land And Water  
Conflicts In Latin American Peri-urban Upstream  
Catchment: Combining Agent-Based Modelling With  
Role Playing Game***

### **NEGOWAT project**



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**FACILITATING NEGOCIATIONS OVER LAND AND WATER CONFLICTS IN  
LATIN AMERICAN PERIURBAN UPSTREAM CATCHMENTS : COMBINING  
AGENT-BASED MODELLING WITH ROLE GAME PLAYING**

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## **1 EXECUTIVE SUMMARY**

In our rapidly urbanising world, population densities no longer allow for unlimited access to safe water. Competition for water, often associated with a struggle for land, tends to be exacerbated in peri-urban areas, because of the wide range of users, the dynamic land use pattern as well as the specific hydrological functions provided to the city. This competition is associated with the growth of shantytowns with inadequate sanitation arrangements and increased pollution runoff. To face the challenge of sustainable land and water management at the urban fringe, new regulations are being experimented based on better integration of civil society in decision-making processes, at municipal level for land issues and at watershed level for water issues.

The NEGOWAT project aims to elaborate structure and test a methodology combining an agent-based modelling approach and role game playing as a discussion and mediating tool for facilitating negotiations/discussion over land and water management issues, in the specific context of the urban fringe of metropolitan upstream catchments in Latin America. The research aims thus to provide (i) a conceptual tool that will allow to analyse land and water management in this context (ii) a methodology (including computing tools) and its guidelines for its implementation to explore, test and discuss scenarios while reinforcing the participation of marginalised stakeholders of the city fringe in all stages of the processes.

The research is implemented simultaneously in two countries: In Bolivia, in the municipality of Tiquipaya, part of the metropolitan region of Cochabamba (1 million of inhabitants); In Brazil, the work is carried out in the spring areas of the Metropolitan Region of São Paulo (18 millions inhabitants), more specifically in the Guarapiranga catchment and the Cabeceiras-Tietê catchment. The activities are implemented by two multidisciplinary teams that gather specialists in different thematic field areas (urbanisation, farming system research, hydrology, sociology, institutional economy, law), specialists in modelling, in action-research and intervention with stakeholders.

The first part of the project (2003 – 2004) was devoted to the implementation of field studies in various thematic areas and aimed to synthesize existing information and provide complementary data to back intervention. The second part starting in 2005 focused on the development and implementation of intervention processes based on the use of simulation tools, more specifically role playing games.

In Bolivia, the Negowat teams had tested in 2004 an approach to facilitate negotiations to settle a site/time specific conflict with an adhoc multistakeholder platform: a methodology was developed to ease the tensions related to the implementation of the municipal potable water project (Macoti project). The outcomes and results as well as the potentialities and gaps of the methodology have been analyzed. In 2005 the work was devoted to two intervention processes at local level: (i) support of community drinking water committees (ii) support to dialogues on the impact of urbanization on irrigation canals.

The first process aimed to develop and test of a methodology to support community-based drinking water committee, with an effort on the internal management issues: definition of by-laws, tariffs, management of users debts, and dialogues with external institutions. The methodology designed was implemented in 4 drinking water committees. A generic role playing game platform was designed which allows to adapt a game to the specificities of each drinking water committee. 7 sessions of the game were played and analyzed. The method was validated by test in the southern part of Cochabamba and was presented in other places of Bolivia.

The second process aims to support negotiation on how to manage locally land and water to minimize the impact of urbanization on irrigation canals whose maintenance and drainage function are being jeopardized by uncontrolled urbanization. The approach was aiming to lead to local agreement between irrigations farmers and urban dwellers in order



to ensure protection of the canals. The role playing game developed which is closely adapted to the situation studied was played in 10 sessions in 2 communities.

In these processes, role playing games that were implemented at an early stage of the process proved to be interesting to mobilize stakeholders, to introduce the issues and different point of views, to initiate a discussion on the principles of solutions and enable a better dialogue between local stakeholders. They did not allow technical discussions of solutions. Their implementation also proved costly in term of preparation of game session (convocation).

In Brazil, the project is testing an approach to facilitate discussions and negotiations between an institutionalized multi-stakeholder platform (the catchment committees) and atomized local actors, in order to strengthen catchment committees and its role in integrated water management. It aims to build capacity of local stakeholders and small scale land and water users aims to facilitate and strengthen their participation in these participative bodies in order to discuss regulatory issues.

In Guarapiranga, the main objective is to facilitate the dialogue on the issue of management of land use (land use choice, control of urbanization, infrastructure development) and its impact on water quality in the context of the implementation of the specific law of Guarapiranga. The methodology proposed combines (i) specific working sessions with local leaders of the communities or urban and periurban farmers to capacitate them on related issues (ii) discussion sessions using simulation tools representing local land use planning, the dynamic of land market and its consequences on the water resources. In The Alto-Tietê Cabeiceras, the work is being developed with the catchment committee in order to develop an internal dialogue on the management of water in a quantity and quality perspective, and the consequences for the evolution of agriculture in the area. The work is being developed on the basis of discussion sessions using a computerized a specific role playing game (AguAloca). Difficulties in getting validated information about water quality at catchment level led to delay in the development of the tools.

2005 was devoted to the development of the simulation tools following a method proposed by the French companion modeling group and using the generic conceptual framework developed during 2003 and 2004. Collective working sessions gathering experts of the projects permitted the characterization of (i) the dynamic of resource(s) (ii) the actors (iii) the interaction between actors and resources or between actors (iv) the spatial and time scale of each elements. A modeller helps to integrate the discussion in a common base that was then developed into the game. Tests combine validation of the principles of the game (framework and rules) by experts and actors and feasibility test by students.

First results on the development of the tools indicated that game and game session development is time consuming, whether to develop the agreed underlying framework, to develop the game supports and materials, to balance simplification and complexity of the representation, or to develop the computerized base when necessary. Computerized simulation is interesting to represent complex resource dynamic that may requires a lot of time to be represented differently but may be perceive as a black box.

Various Brazilian experiences of use of role playing game for capacity building and training have also been identified and are being compared with the Negowat games and interventions.

The experience gathered in periurban context, tools development and methodological aspect of intervention approach is being synthesized and organized in training material in the form of PowerPoint presentations and related texts, that will be tested in training course modules under preparation.

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## **2. ANNUAL SCIENTIFIC REPORT 2005**

**Covering period from 1<sup>st</sup> January 2005  
to 31<sup>st</sup> of December 2005**

### **Project NEGOWAT**

***Facilitating Negotiations Over Land And Water  
Conflicts In Latin American Peri-urban Upstream  
Catchment : Combining Agent-Based Modelling  
With Role Playing Game***



## **2 ANNUAL SCIENTIFIC REPORT 2005**

### **2.1 INTRODUCTION**

In developing countries, cities development puts an increasing pressure on water resources in their peri-urban areas. While peri-urban catchments often offer important services to their related city, their functioning are durably affected by urbanisation. In this interface, domestic water uses compete with various other water needs such as irrigation, recreational uses, flood control, etc. It results in increased competitions over water availability and quality degradation. These competitions are all the more exacerbated, that it is often combined with a competition for access to land as cities fringe supports the urban expansion processes and presents very diversified modes of land occupation. In South America, these tensions are accentuated by the expulsion to the periphery of economically, politically or sociologically marginalized communities. In a context of implementation of new institutional arrangements for more participative and integrated land and water management, can we contribute to improve the negotiation processes in the periurban interface?

The specific objectives of the Negowat research project are to : (1) Design and test a methodology to facilitate negotiation and the avoidance of conflicts by using tools permitting to integrate various types of knowledge and explore the functioning of periurban catchment through scenarios simulation; (2) To increase the capacity of Latin American partners to undertake participatory and multidisciplinary research; and (3) To increase the negotiation capacity and participation of marginalized communities, positioned at the periphery of the discussion processes.

In Brazil, the work is being developed in two sub catchment of the Metropolitan Region of São Paulo, the Guarapiranga catchment and the Cabeceiras-Tietê catchment. In Bolivia, the work is developed in the valley area of the municipality Tiquipaya, in the metropolitan region of Cochabamba.

This report presents the state of advancement and results in 2005 of the project that was initiated in 2003. In 2004, some adaptation was made in the initial workplan in order to take into account the evolution in the local context and work evolution. Activities related to the elaboration of role playing game were integrated in Working Plan 2 (WP2) as a central part of the work-package. The Working Plan 4 (WP4) structure was also reorganized and encompasses all activities and tasks related to intervention processes. The adaptations were presented in detail in the 2004 report. As it was impossible to intervene in ongoing negotiation concerning natural resource management the Bolivian team has focused its intervention on 3 processes at local level. Multi-agent modelling was not used as no complex resource dynamics was involved. In Brazil, the global objective remains to contribute to strengthen the catchment committee through adapted intervention based on computerized role playing games.

Delay in the first phase of the project and difficulty to organize the team have led to important delay that resulted in a 12 month extension of the project duration. Work has been implemented differently in both country and the results presented in this report vary from one team to another. In Brazil, year 2005 has been mostly devoted to the development of simulation tools, mobilizing the different partners of the project while in Bolivia the intervention processes were entirely finalized in the same period.

This report presents the state of advancement of the work. The results for the Negowat Brazilian mostly deals with methodological aspects of tool development and intervention process, while we present the first results of the intervention process as a whole and RPG implementation in Bolivia.



## 2.2 COLLECT COMPLEMENTARY DATA – CONDUCT COMPLEMENTARY FIELD STUDIES” WP 3 –BRAZIL AND BOLIVIA:.

### a.1 Objectives and methods

The field studies aimed to synthesize existing information and provide complementary data to back intervention.

### a.2 State of advancement

The WP3 report have been elaborated and diffused, in paper and CD format :

*R Ducrot. 2005 ed. WP3 report. Brazil 242 pages ; Bolivia. 142 pages + CD.*

**In Brazil**, 3 contributions that were missing are being finalized.

- Apta team is currently finalizing the report of the different field studies it carried out. Their elaboration has been stopped in January 2005 because of Apta administrative and financial problems. The work was only re-initialized in October 2005. The final detailed reports will be provided at the end of February 2006.

The work includes a report on the production system of Alto-Tietê Cabeceiras and Guarapiranga (statistic and qualitative analysis), a discussion about water demand for agriculture the watershed, a discussion about rural tourism policy in the municipality of Alto Tietê. These studies were completed by two specific works: a characterization of the economic aspects of the agricultural production in Alto Tietê Cabeceiras and a characterization of the social organization in the rural areas studied.

- AIIEGA (São Carlos) has provided its final report with detailed results concerning the water quality dynamic in the catchment studied.
- Unicamp has also provided the final version of the Master's Thesis of Karina Bueno "*A lei de proteção aos mananciais e mercados de terras: um estudo sobre loteamentos clandestinos*", Máster thesis, Universidade de Campinas, 152 p. + annexes.

In 2005, Apta and CIRAD have carried out a specific study: characterization of agricultural practices about agro-toxics and first assessment of risks in the water resources. This work was not originally included in the project workplan but the issue is important in the discussions within the Cabeceiras-Tietê catchment committee. Complementary funding from Cirad permitted to implement this preliminary study. The main results of this study are presented in the Cirad specific report.

**In Bolivia**, a French student has undertaken a review of the institutional models for water supply and sanitation in Latin and Central America periurban areas where water is supplied by community-based drinking water committees. The preparation of WP4 underlined that there were many practical experiences in supporting community-based drinking water committee management in South America, but few of them have been documented. It was thus decided to support the elaboration of a book on "experiences in supporting water committee" to be published in 2006.

### a.3 Difficulties and problems

The main difficulties are related to the different timing for the various teams to carry out and finalize the field research.

*a.4 Plan for next year*

**In Brazil :**

- 1- Diffusion of the last contributions and reports (Apta, FSP-USP)
- 2- A common publication that will summarize the main results of field research and its consequences for catchment management and tools development have been initialised, under Dr Ducrot coordination. The objective is to publish this paper in a Brazilian Journal.
- 3- Elaboration of a new research project (to be coordinated by Apta) to elaborate a methodology for monitoring the impacts of agricultural practices on water quality.

**In Bolivia**

- 4- A book on “experiences in supporting water committee” with contribution of several institutions of Latin America on the topic published.

## **2.3 “TOOLS AND MODELS DESIGN AND DEVELOPMENT” WP2**

### **2.3.1 Task 2.2: Develop simulation tools : introduction**

This part aims to present the different simulation tools, their specificities, their methodology of development as well as the lessons learned from their development and use. As they are still being developed in Brazil, a specific attention is given to the presentation of their methodology of development. In Bolivia, the report will focus on the lessons learnt from the use and implementation of the tools and consequences for the development of new tools.

### **2.3.2 Task 2.2 Develop simulation tools in Brazil**

*a.1 Objectives and methods*

The work-plan initially included the development of one model by catchment and one related role-playing game. The work-plan was adapted to the situations chosen and 5 tools are currently being developed:

- 1) A role playing game JOGOMAN, that is a prototype to capacitate the team on the development, building and implementation of a simulated role playing game and related session (especially animation and debriefing aspects). This prototype evolved in an academic training tool that aims at introducing discussions about objectives, potentialities and functioning difficulties of an urban catchment committee.
- 2) A multi-agent model is being developed in order to represent the land and water management at catchment level (1.500 km<sup>2</sup>) and introduce discussion on the evolution of agricultural activities in the Cabeceiras-Tietê (SPATMAS).
- 3) AGUALOCA is a computerized game that aims at discussing multi-uses of water at catchment level from the double perspective of water allocation and pollution management.
- 4) A computerized game named TER'AGUAS, that aims at discussing the impact of land use changes, land speculation and urban planning (including urban infrastructure development) on water quality at local level (a territory of 10km<sup>2</sup>). Polis Institute has also initiated some work to adapt this game for environmental educational purpose (game JogAtor).

- 5) This game is completed by a non-computerized tool (JOGOPOL) focusing on water pollution dynamic. This game is more oriented toward environmental education of local communities than collective discussion involving different types of actors. .

The structure and basis of the different tools are presented in table 1 and 1b.

These different models are based on the same global conceptual framework that was presented in the 2004 report. The structure and detailed model of each game was refined during workshops that gathered the different specialists of the project. The method to refine the models followed a specific discussion pattern elaborated by the Companion Modelling group (<http://cormas.cirad.fr/fr/reseaux/ComMod/index.htm>). This pattern relies on the identification and specification of (i) the resource(s) dealt with, their own dynamics and interaction (ii) the actors involved in the management of these resources (iii) the interaction between actors and resources (actions of actors on the resources), (iv) the interaction between actors, (v) the spatial and time scale of each elements of this representation. Computerized elements are then developed in the multi-agent Cormas platform (<http://cormas.cirad.fr/>) when necessary.

The global methodology of development and test of the tools is part of the methodological results of the project and is presented and discussed in part a.3.

#### *a.2 State of advancement and main achievement for 2005*

### **JOGOMAN**

The game is fully developed and tested. It has been played 5 times until now with graduation and pos-graduation students:

Local	date	Student type	Nb of students	Nb of rounds
Unisa Universidade Santo Amaro	22 /10/2004	Graduation	19	1
FIG (Faculdade Integradas de Gurulhos)	12/11/2004	Graduation	13	1
Procam - USP	29/10/2004	Pos graduation	09	2
FSP : Faculty of Health Science USP	25/02/2005	Pos graduation	16	2
UMC Universidade de Mogi das Cruzes	02/04/2005	posgraduation	20	3

In 2005, two new functions were introduced that enables logging (store previous actions and organize the memory of a session) and replaying rounds of the game. These functions are important to (i) correct on the spot any mistakes made in introducing decisions in the computer (ii) to allow to replay the game during the debriefing phase, (iii) to stop a game at any moment and start it again later on. These functions will be used in all computerized tools developed by the project.

A master thesis analyzing the potentials and limits of this type of games for academic training, testing an adapted monitoring methodology, and comparing various local experiences of role playing games is currently being finalized. (M.E Camargo, Procam-USP)

### **SPATMAS**

In 2005, the work focused on the representation of water allocation and integration of quality functions in the model. It uses historical data from rain regimes of the catchment analysed by IIE. An appropriate algorithm from Graph Theory was implemented in the platform language (Smalltalk) in order to represent the network of rivers, canals, dams etc. The model development has been stopped in order to first finalize the AguAloca model.

TOOL	TYPE	STRUCTURE	COMMENTS
JOGOMAN	Computerized Role Playing Game representing a virtual periurban catchment on a very abstract basis, including various municipalities	<ul style="list-style-type: none"> <li>a) <b>7 to 15 players</b> representing 4 types of roles : mayor of a municipality, private landowners including irrigators, representative(s) of an association for housing rights, state body for water management, one water and sanitation firm. Each player has decisions to make regarding land uses and occupation and/or infrastructure development</li> <li>b) The computer assesses the impact of their actions on the pollution of a reservoir and the player's economical consequences using simplified non calibrated mathematical model.</li> <li>c) Each turn a catchment committee meeting is organized to discuss the results and attempt to provide a catchment plan in order to mitigate the impact of urbanization on the reservoir</li> </ul>	A prototype tool, <u>not to be used with stakeholders</u> . It can be used for academic training in catchment management issues. Flexibility in the number of players is allowed by development of 7 different versions of the games
SPATMAS	Multi-agent simulation model representing the Spat area of the Alto-Tiête sub-catchment/	It combines (i) a representation of land use at catchment level at a basic spatial scale of 25 ha, (ii) the representation of the hydrological systems with a arc-node representation (3 reservoirs in activities, 2 to be developed), (iii) a simplified representation of the evolution of quality in the reservoirs (VollenWeider equation) (iv) and social actors limited to the water firms, municipalities, and reservoir managers.	The development of the model is currently stopped as the modelling efforts were concentrated on the development of the AguAbca game
AGUALOCA	Computerized game representing a virtual catchment inspired from the Cabeiceras Tietê situation	<ul style="list-style-type: none"> <li>a) The virtual catchment gathers 2 municipalities, 3 reservoirs (and possibilities to build 3 others), with 7 players (2 mayors, 1 manager of a water firm, 1 industrial representative, 1 representative of farmers, 1 manager of reservoirs, 1 monitoring agent)</li> <li>b) Water resource dynamics includes water allocation between the 3 mains uses (industrial, irrigation, domestic water) and pollution of water (simplified representation of the dynamic of P -the limiting factor of eutrofication in reservoir). The quality functions used are taken from the Mqual model of Guarapiranga, and analysis of the reservoir dynamics made by AIIGEA. Forced calibration is used and adapted to the virtual catchment designed</li> <li>c) Actions of players deal with water demand, water licence demand, effluent management, management of quality discharge licences following the legislation of water management at catchment level</li> </ul>	<p>Land use management aspects are very simplified and the main focus is water allocation and effluent management, through management of water and pollution discharge licences.</p> <p>A specific effort was made to use indicators that are effectively used by the managers of the resource: these indicators have still to be validated by the actors.</p> <p>Some aspects of management (for example the use of wetlands as a reservoir); an important aspect has not been yet implemented.</p> <p>No flexibility in the number of players possible.</p>

Table 1 : Presentation of the different simulation tools being developed in Brazil.



TOOLS	TYPE	STRUCTURE	COMMENTS
JOGOPOL	A non computerized game representing water quality processes	<ul style="list-style-type: none"> <li>a) Up to 16 players, representing landowners, or district representatives and a water firm. The spatial support holds 16 plots, a river and a reservoir</li> <li>b) Pollution processes are explicitly represented by using balls of various colours. The games details the various types of pollution (local and diffuse pollution, domestic pollution, etc.)</li> <li>c) Collective discussion can be oriented toward various issues: water access, land use control and development of sanitation infrastructures.</li> </ul>	The game is more oriented toward environmental education on pollution processes for local communities than discussion between different types of actors with decision responsibilities (district representatives, water firm etc). Though a very simplified representation, the game might still be too complicated to provide good discussion support and might need further simplification
TERAGUAS	A computerized role playing game representing a 15 km <sup>2</sup> catchment with a large wetlands area	<ul style="list-style-type: none"> <li>a) 4 to 15 players representing a mayor, a water management firm, representatives of landowners of different types (farmers, secondary housing owner, big land owner, business man) and district representatives. The basic spatial scale is 1 ha allows realistic decisions concerning local land uses.</li> <li>b) Proportional calibration is used for land use and pollution functions. There are 150 landowners represented. Thus the model proposed do not oversimplify the pollution aspects (mostly linked to the number of people in the area) neither the land market dynamic. Water pollution representation is based on the functions developed by AguAloca using coefficient of pollution developed in the MQUAL model but water allocation is not represented.</li> <li>c) Some agents in the model have automatized actions and activities as it is impossible to have 150 players.</li> <li>d) Land use changes are represented in detail with a complete set of options. The game is organized to allow explicit representation of land speculation dynamics</li> <li>e) Players activities focuses on land market process, changes of land use and urban infrastructure development.</li> <li>f) Collective discussion can be oriented on local land use planning and infrastructure development planning</li> </ul>	<p>The game have not yet been fully validated and tested.</p> <p>It integrates the complexity of land-use planning in periurban municipality (urban infrastructure, road, water access, land speculation, variability of land uses) but the related material and support are complex.</p> <p>Tests have to be implemented to assess its accessibility especially for district and community representatives. A specific support for these players might be necessary, for example to fill the decision sheet which requires reading and writing abilities.</p>

**Table 1 bis : Presentation of the different simulation tools being developed in Brazil.**

*The MQUAL model is a correlation model linking land use and water quality to be implemented by law in each sub-catchment (for the moment, only the Guarapiranga MQual model is available to define the N and P pollution charge allowed at municipality level. Municipality then has to develop an adapted land use plan in order to keep to the density objective defined with the help of this model.) (CD MQUAL versão 1.3, Modelo de correlação uso do solo-Qualidade da Água, Bacia do Guarapiranga, 2003. Prime Engenharia, Secretaria de estado do Meio Ambiente, São Paulo. CD)*

TOOL	DESCRIPTION	USE OBJECTIVE	STATE OF ADVANCEMENT	2006
JOGOMAN	A computerized role playing game, on a virtual and abstract catchment	Training tool for academic purpose (1) on the role of catchment committee (2) on negotiation elements to achieve catchment planning	5 tests done. The outcomes will be analysed in a M. Camargo master's thesis under finalization (Procam/USP)	Possible integration in the training course to be developed in USP and possible game sessions in other pos-graduation training course (Unicamp)
SPATMAS	Multi-agent simulation model representing the Spat area of the Alto-Tietê sub-catchment/	To contribute to the discussion on the role, place and evolution of agriculture with the Cabeiceras-Tietê sub catchment committee To be combined with the game AguAloca. Possibility to articulate its use with other tools developed by the committee such as Mqual model for Cabeiceras-Tietê.	It was planned to finalize the representation of hydrological functions and integrate quality process, land use change dynamic and population dynamics. This has not been done as the team focused on the development of the related role playing game AguAloca.	Integration in the model of the quality processes in relation with allocation processes. The functions developed for AguAloca will be used. A major difficulty is the calibration of the model given the difficulties to get access to data. games sessions will be used to model actors actions and interactions. Land use change dynamic will have to be developed.
AGUALOCA	Computerized game representing a virtual catchment inspired from the Cabeiceras-Tietê situation	To be use with the committee to initiate a discussion about management of multi water uses taking into account jointly quantity and quality objectives.	A first version of the game is being finalized (delivered by end of January 2006) and is planned to be tested with actors A modified completed version planned by end of march 2006	Implementation and monitoring game session with the catchment committee
JOGOPOLO	A non computerized game representing water quality processes	Environmental education of local community: transferring knowledge on pollutions and responsibilities of different actors	First test developed with district representatives. Various suggestions of simplification to be implemented	Implementation and monitoring game session with a selected public (local communities)
TER'AGUAS	A computerized role playing game representing a 15 km <sup>2</sup> catchment with a large wetlands area	To contribute to gather local actors with catchment representatives to enhance dialogue and collectively build stakes	A first prototype of the game has been elaborated.	Implementation of the test Organization of a session of workshops with stakeholders to discuss land and water issue and discuss appropriation of the specific law of São Paulo- monitoring of its impact

Table 2 : State of advancement of the tools

## AGUALOCA

4 meetings were held between May and July/2005 to define the game detailed structure: the meeting gathered specialists in hydrology and water quality (Suzana Sendacz, Wanda Gunther, Lucie Clavel), in agriculture (Yara Carvalho, Terezinha Franca) and sociology (Vilma Barban). The game was then developed by Lucie Clavel (CIRAD-Procarn) with support of Poli-USP (Cesar Rabak and Danilo Figueredo) for the computing aspects, using part of the simulation engine developed in the SpatMas model. An important effort was made to integrated water allocation with water quality processes, in relation with actors' activities.

The game is currently being finalized. A first test of the material and game support (15<sup>th</sup> December 2005) have led to simplifications in the data sheets and data interfaces. A first version is to be provided at the end of January and the final version, integrating actors' comments is expected at the end of March/2006.

## JOGOPOL

A first version of the game has been tested with some actors by the Polis Institute (17<sup>th</sup> December 2005). Results of the test are presented in part 4.3. The final version must be finalized by end of February 2006.

## TERAGUAS

Various meetings were held between February and June 2005 in order to elaborate the game basis. These meetings gathered various researchers of the project (Maria Eugenia Camargo, Pedro Jacobi; Wanda Gunther, Terezinha Franca, Vilma Barban). The computer basis was implemented by Raphaële Ducrot (Cirad) using some functions developed in others tools by POLI-USP (Quality function basis of AguaAloca, function log and replay developed for JogoMan)

A first version has been elaborated. The game is being calibrated. A first session of test (November 2005) (with students of the project) have led to the amelioration of some functions.

Polis Institute has initiated some work to adapt this tool for an environmental educational purpose at community level. A first version of the adapted game (JogAto) has been produced but further work is necessary to finalize the game.

### *a.3 Results and outcomes*

#### *Method to develop the simulation tools*

The methodology is presented in graph 1.

A first literature survey (by one scientist: the coordinator of the project) led to the elaboration of a first representation of the functioning of land and water management in the area studied. This conceptual framework was used to develop a first game prototype – JogoMan -. This game was in a second phase adapted to be used as an academic training tool. The development of the prototype was used to train some of the partners on various technical aspects concerning the development of computerized role playing games: More specifically, game structure, game session organization and development, organization and contents of debriefing, basis for monitoring and analysis of game session, game material development and support.

In a second phase, discussion with experts and a better knowledge area permitted to modify the first basis of the representation. In parallel, in each sub catchment and in concertation with some actors, the specific issues to be dealt with were selected and the main orientations for the work proposed.

The conceptual framework was refined through specific workshops, gathering the team specialists and following a discussion pattern proposed by the Companion Modelling Group resources a specific discussion pattern elaborated by the Companion Modelling group (<http://cormas.cirad.fr/fr/reseaux/ComMod/index.htm> Inra, Cirad, Cemagref, ). This pattern relies on the identification and specification of (i) the resource(s) dealt with, their own dynamics and interaction (ii) the actors involved in the management of these resources (iii) the interaction between actors and resources (actions of actors on the resources), (iv) the interaction between actors, (v) the spatial and

time scale of each elements of this representation. A modeler helps to organize, integrate and synthesize the discussion in a common framework.

A specific attention was given to the hydrological dynamic given the complexity of the processes in the catchment studied. Details of the hydrological processes were modeled by a small group of specialists (hydrologist specialist and modelers) while the integration of the other processes gathered a more diversified team (sociologist, agronomist, economist, urbanist etc).

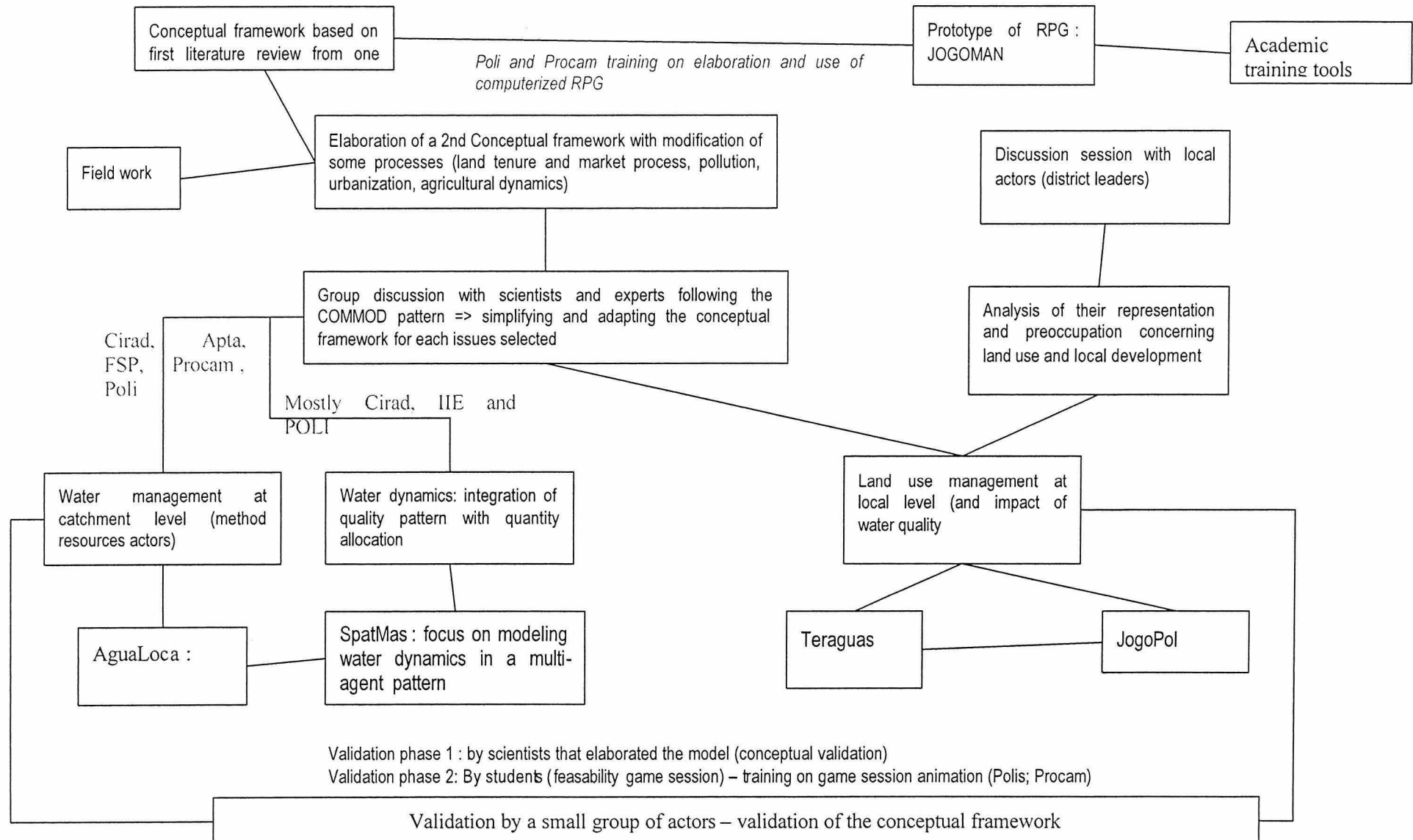
The framework was then transformed in a computerized model by a small group of computer specialists. There could have been a closer interaction between the scientists that contributed to the elaboration of the framework and the modeling team. But, lack of time and availability of senior scientists and computing difficulty made this interaction difficult.

The next step is the validation of the game by the same scientists that have been involved in its design by participating to a game session. Their participation at this stage is important to verify and validate that the final representation proposed by the game integrates well their own representation. In a second step, a test is implemented with students, in order to validate not the conceptual basis of the game (as with scientists) but its material feasibility and ability to be played. Both tests lead to modification and simplification of the game (rules, roles, etc) and supports.

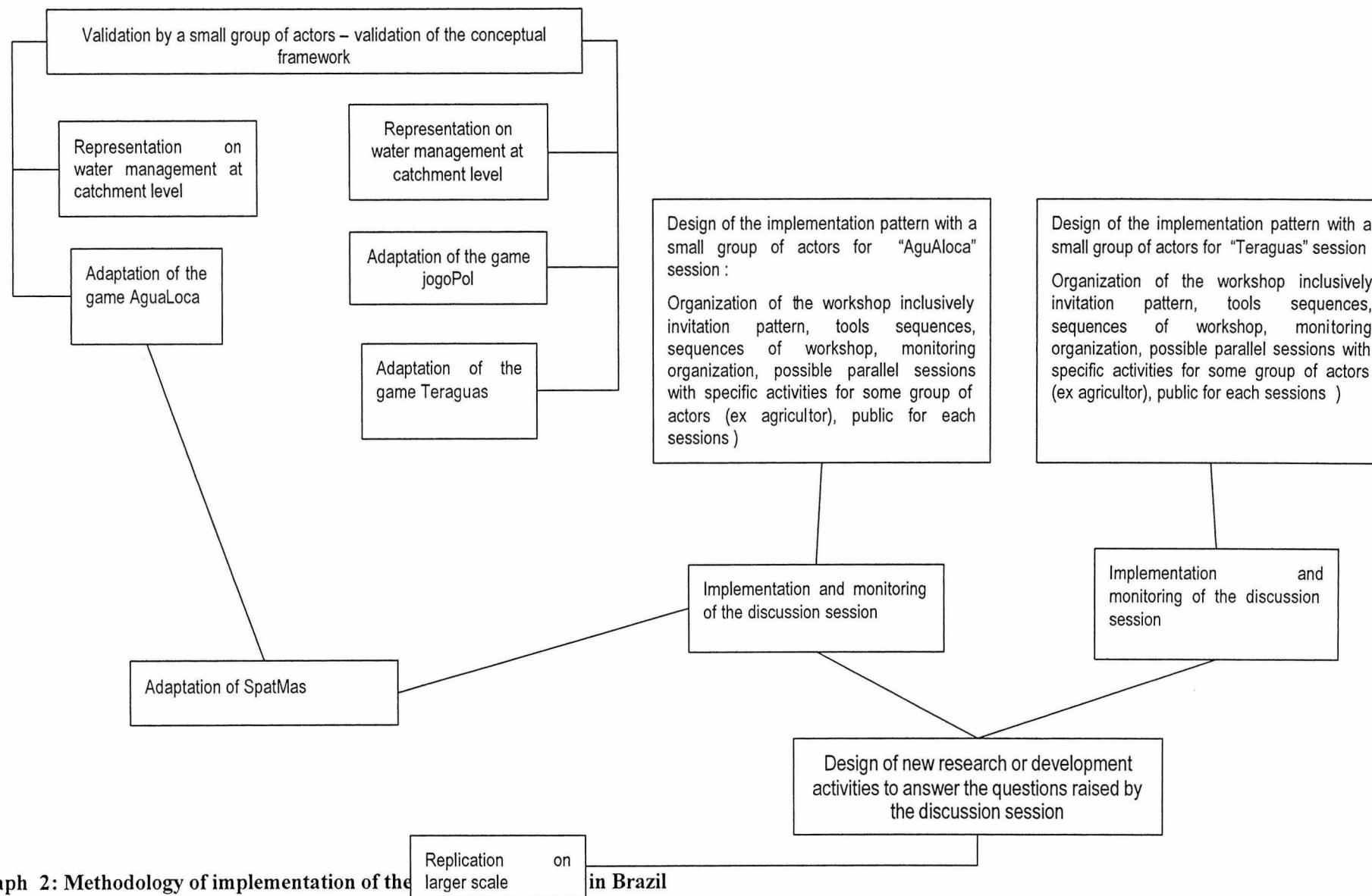
The third step of the test is the validation of the game (model) by a small group of actors that is already well known by the project team. This test is not a discussion session. It aims to validate two aspects (i) to what extend are the representations of actors well taken into account by the model proposed ? (ii) to what extend is the game proposed a good support to discussion on the issue that was selected ? This test led normally to an adaptation of the game, in order to integrate the point of view of actors in the conceptual framework and game.

The implementation methodology is being elaborated. The specific implementation methodology is to be designed jointly with a small group of actors. This "organizing committee" will have to define the sequences of activities, the invitation pattern and mode, the public invited, the location of the workshop, the monitoring. Each discussion session are going to be monitored. A specific effort has to be made to assess how the outcomes of the discussion are (or not) integrated in "real" negotiation processes





**Graph 1: Methodology of development of the simulation tools in Brazil :**



Graph 2: Methodology of implementation of the game in Brazil

### ***Various games related to water and land governance and management in Brazil***

In Brazil, various experiences of development and uses of role playing game in the context of natural resources management were identified and compared (Camargo et al., in press). RPG has thus been used as environmental education tools in formalized courses for technicians and local communities. These experiences aimed to capacitate local stakeholders on specificities of the resource(s) to be managed and often focused on new legislation aspects or on the complexity of the institutional background of resources management (and the variability of actors and interests). Another type of experience focused are the governance games to train technicians and decision makers of traditional sectorial agencies in negotiation techniques and skills. These games aim at facilitating the integration of interests and points of view of others stakeholders by trainees that were used to unilateral decision making. The players are oriented to look for the “best decision making processes for the situation proposed” with the help of an external facilitator. Playing governance games suppose a good preparation of players that have to incorporate different information and necessitates extended sessions (more than a day, sometimes 5 days). Any of these experiences included simulation of resources dynamics: their focus were on the decision making processes, and did not consider the implementation phase, possible impact on the resource, and possible later adaptation.

### ***The specificities of the Brazilian Negowat games***

The tools developed by the Brazilian Negowat teams aimed to facilitate the discussion between the different types of actors (local communities and decision makers / representative of sectorial agencies) as well as to help them integrate institutional background with the dynamic of resources management. They all relies on the same basis and include:

- A spatial support, which is more than a support to help the players to project themselves in their role (as in many environmental educational games). The spatial support is the basis for players' activities and decision making, and may evolve in time. It also supports the evolution of the resources either under natural dynamics, or actions of the players.
- Each round of the game includes a decision making process phase (individual and collective) and a phase of decision implementation (on an individual basis) in order to help the players to make the links between collective /individual decision making and interest, and the sequence decision / implementation/ monitoring/ new adapted decision.
- Each round includes an obligatory collective discussion phase, when all players are supposed to gather, analyze the situation and reach if possible a negotiated decision that they are latter free to implement on an individual basis or not.
- Each player deals with specific information. There is no psychological information as each players is supposed to project its own representation in the game. The information provided is thus only related to the decision making processes, and provided at the beginning of the game. After each round, he receives updated indicators that help him to assess the results of his decisions. A player may have to look for further data with other players as the game evolves. It is not necessary to provide all necessary information to the players some of them can be stored and be released on demand but this information have to be available.
- Calibration is an important step of the game and various options are possible: forced calibration aims to rapidly create tensions between players (option chosen in JogoMan, AguAloca and JogoPol); real calibration or proportional calibration (same calibration as normal but proportional ) help players to relate to real life situation and project themselves in the game (option chosen for Teraguas).

One specificity of our games is the attention given to the interaction and decision making pattern between actors and resources to prepare the game. On the contrary, development of the governance games focuses on the interaction modes between actors (in the design of the “conflict matrix”). Designers try to pre-identify as exhaustively as possible the detailed interaction processes between actors, which supposes a good previous knowledge of the social aspects. This analysis aims to

anticipate as far as possible the interaction between players in order to organize the facilitation of the game toward a win-win negotiation. CoMmod games, on which the Negowat games are based, do not necessarily aim to develop a “satisfying” negotiation processes as (i) errors and mistakes can be interesting to analyze to understand the different aspects of interaction between actors and resources (ii) games are on purpose not too close to reality in order to avoid to reproduce real conflict, thus game solution are not expected to be transferred in real life decision making.

### ***JogoMan: main outcomes from game development and first use***

- When the players have little knowledge of the situation, they may have difficulties to project themselves in their roles. In this case, it might be necessary to provide precise and detailed information on the role. On the contrary, when the players are well aware of the situation (case when each player assumes his/her own role as in real life), detailed role definition makes it difficult for the players to refer to its own experiences, limiting the dialogue of the game with reality, which is the objective of the game. Detailed information on the role has to be avoided. Thus, the information given to define the role has to be carefully chosen depending on the players.
- The more disconnected the players are from the situation, the more basic are the lessons learnt from the game. For example, an undergraduate student that had no previous knowledge on water management focused on the existence and role of catchment committee, and the variability of interests between actors, or difference between collective and individual interest. On the contrary, graduate student in environmental sciences focused on more complex aspects of the game (such as complexity of information management and decision making process and implementation).
- The development of a round is time consuming and computerized simulation may contribute to accelerate the process. The first round is always difficult to play. It is important not to devote too much time to this round as people will learn by doing, not by reading instructions, even well adapted.
- Not all games can be played by every person. In some games, it is necessary for the players to have a previous knowledge of the underlying elements and framework to have a good game dynamic.
- Games are powerful mobilizing tools, creating links between players and the Brazilian public answer well to this type of tool. It was difficult to end the game session to start the debriefing phase.

#### *a.4 Links with other tasks and work developed by other partners*

Tools have been developed with inputs from WP3. Having functioning tools is a condition to implement WP4. The delay in the development of the tools directly translated in delay in the implementation of WP4

#### *a.5 Difficulties and problems*

Game development requires specific techniques and is time consuming. It is estimated that the development of the games proposed requires 1 to 4 months of full time (the longer for computerized game).

The game development method chosen tried to integrate the different partners in the elaboration of the game. But the method requires a lot of participation and some partners could not attend all sessions and some fail to see the links or their added value to the process. As no senior scientist could participate to the whole development of a game from its beginning to the definition of the session, this task was carried out by a student under the orientation of the coordination of R Ducrot. Consequently, there is little institutional appropriation of the method.

Lack of human resources in hydrology and modeling led to delay in the development of the computerized game.

*a.6 Plan for next year*

- Finalization of the different games and implementation of the test with actors.

### **2.3.3 Task 2.2 Develop simulation tools in Bolivia**

*a.1 Objectives and methods*

Two games have been developed and used in Bolivia.

- The RPG Larq'asninchej ("our water" in quechua) was developed to support a process of discussion between urban dwellers and irrigators on the impact of urbanization on irrigation canals.
- The game SosteniCAP aims to support a process on the functioning on community-based drinking water committees. The game is a very generic representation of this drinking water committee which can be adapted to the context of each committee.

No previous organized stakeholder platform in each case existed: The discussion platform was thus entirely designed by the Negowat Bolivian team. The RPGs were designed to be used with grassroots' stakeholders, which entailed specific attention to make sure that persons with little formal education could participate in the game. Both games are to be used at the first steps of the processes as a capacity building tool and mobilizing tool.

*a.2 State of advancement and main achievement for 2005*

Both games was designed, tested and played various times (cf WP4).

*a.3 Results and outcomes*

Each game was developed by a very small group (1 or 2 of scientists of the Bolivian team) then tested with students, before being validated by a small group of actors (generally leaders of the communities). The Bolivian team underlined that students tend to focus on the quantitative aspect of the game when actors pay more attention on the qualitative aspects (underlying framework).

The test of Larq'asninchej led to various simplifications and evolutions of the game, to provide a game with rules fully adapted to the local communities where it was used. Much attention was devoted to the game support, in particular its graphic interface. On the contrary SosteniCAP remains very generic and have to be readapted to the specific context of each committee where it is used.

Both game use a specific tool to initiate the debriefing ("the ladder of satisfaction") designed by the Bolivian team. This tool allow player to express their level of satisfaction about their achievement in the game independently of their effective results. This process proved to be a good starting point for the debriefing.

The design of SosteniCAP led to an interesting choice in terms of calibration. The first calibration (proportional calibration with a reduced number of families) was criticized as non realistic by the players. They asked to adapt the number to more realistic figures. The calibration was then adapted in order to get the figure managed by the virtual drinking water committee close to real ones. It appeared that the benefits of capacitating the players about the accounts of the real committee outweighed the difficulty of increasing per 10 the results of any action of a player.

The two games were designed so as being at a medium distance with reality. The game needed to be close enough from reality to enable players to use elements of the reality in the game (for instance, rules to take decisions or elements to justify his actions). In the same time, the game needed to be far enough from reality in order to prevent a situation where real local conflicts between players would destroy the game dynamics.



a.4 *Links with other tasks and work developed by other partners*

The games were used in various discussion sessions and processes, whose results are presented in part 2.4.

### **2.3.4 Lessons learnt from the development of the tools in Brazil and Bolivia: first elements**

Game development is time consuming, even for a non computerized game, even if practical experiences in game development and use facilitate the development process. The first phase is to elaborate the game basis (underlying conceptual framework). Game development is easier and quicker to be developed by a very small group of designers. This main drawback of this method is the risk that the game will only reflect a specific and partial point of view about the situation (the point of view of the designer(s)). Building a more collective representation requires a couple of discussion sessions (2 to 4 meetings) in function of the number of experts or "actors" mobilized and complexity of the issues. The time might be reduced when a first conceptual framework is available (about resources, main actors, main interactions), (for example the generic SosteniCAP game developed in Bolivia provides such a framework). The discussion may then focus on detailing some specific aspects of the framework or practical aspects of the game (support etc).

The elaboration of the game is also a simplification process. But it is important to reach a balance between simplification and the objective of the game. A too simple game may not reach its objective of involving all actors as some actors or processes may not have been well represented. A too complex game may exclude some important actors. In Bolivia, the actors involved in each process, even with different interests were socially close: they were grassroots stakeholders. In Brazil, the challenge is to allow grassroots stakeholders and community leaders to discuss with representatives of sectorial agencies and municipalities. A too simple game is not challenging enough to maintain attention and real participation of the latter actors when a too complex game can exclude local actors. Games also need to be close enough from reality to enable players to use elements of the reality in the game (for instance, rules to take decisions, or elements to justify his actions). In the same time, the game needed to be far enough from reality in order to prevent a situation where real local conflicts between players would destroy the game dynamics. The balance between these different aspects is not easy to strike and it may require various tests and adaptation to obtain a satisfying tool.

Computerized simulation is interesting to represent complex resource dynamics (such as hydrological dynamics) that may requires a lot of time to be represented in another way (this is the case of the JogoPol game). But computerized simulation may be perceived as a black box by actors. In this case, a previous working phase detailing the modeled functions can help them to understand role of computer. But it requires another working time with actors which is not always possible. It is may also require writing and reading abilities to fill data sheet. Previous experiences have shown that it is possible to use computer with grass root stakeholders if previous attention is given to explaining its functioning, if the decisions required are familiar to the players (relates closely to their daily life) and if the provided indicators are exactly the same as those used in daily life. The acceptance of computer by local actor will be tested in 2006 in Brazil with the AguaLoca and Teraguas games. Specific attention will be given to facilitate the filling of data sheet (for example by direct assistance to player with no reading/writing abilities).

Organization and animation of the game is an important part of the session: This includes presentation of the situation and objectives of the game, the presentation of the roles and time sequence of the different operation. A specific attention has to be devoted to this aspect.

Another important part is the debriefing phase as it allows the players to make sense of what happened during the game and help them to link the development of the session with real life situation as well as broaden the game discussion by introducing other kind of possible development that where not taken into account during the game. The "satisfaction ladder" developed by the Bolivian team appears to be a good way to start the debriefing allowing each player to present how he perceived its achievement in the game (independently of the actual results).

Even non computerized games require a significant time to be developed and tested, as any other simulation tools. The investment is such that it might be difficult to accept that the game has only a

local and brief usefulness at a specific step of an intervention process. A game answers to a specific question which can be to transfer knowledge (about resources dynamics, social dynamics, institutional background, economic or management), to build capacities (for example for joint stake analysis, in collective choice of rules, to dialogue with partners, on decision making etc), to mobilize actors and create a group dynamics. This depends on the public, the situation and the objective of the intervention and it is unlikely that the same simulation tool can be used with same result in another process even if it is very similar. In other words, these simulation tools are, as many others, disposables, even if the development work in itself is an important step for scientists and experts to synthesize information and data and promote an in-depth interdisciplinary dialogue. The challenge for scientists is to provide a generic methodology and knowledge that will indicate when the investment effort is worthwhile and interesting and how to reduce the development time by a proper and validated methodology. This will be part of the work developed in 2006.

## **2.4 “DEVELOP AND TEST AN APPROACH TO FACILITATE NEGOTIATION COMBINING VARIOUS TOOLS” - WP 4-**

### **2.4.1 INTRODUCTION**

In Brazil, water management at catchment level relies on a complex and well defined institutional background that includes legislation for water management and its articulation with land management at municipality level. Catchment committees are the consultative/legislative body in charge of proposing management tools, as defined in the legislation. In the Guarapiranga sub-catchment, a previous project funded by the World Bank during the 90's had contributed to the implementation of the committee in this catchment. Consequently, in this area various tools have already been discussed such as the Guarapiranga specific law that has been voted final December 2005. The Cabeceiras Tietê catchment committee is more recent and is less organized. The Negowat intervention takes place in this context, with a global objective to contribute to strengthen the work of the catchment committees.

In Bolivia, there are very few formal multi-stakeholder processes: Negotiations are taking place always in an informal way, with references to traditional uses. It is important to point out for example that there is still no legislation governing water management in Bolivia. This entails that it may be difficult for an external institution to enter as facilitator of the process. This is especially valid for the Tiquipaya Municipality which has been the centre of many conflicts involving water management during the last 4 years. Thus the process selected for intervention dealt marginally with water flow / water quality and where more related to investment and infrastructure management.

### **2.4.2 COMMON ACTIVITIES**

#### **a) Task 4.1.1 Training course on the “Use of role playing game for companion modelling”.**

##### *a.1 Objectives and methods*

The objective of this task was to organize a training course to capacitate scientists of the project in the elaboration of role playing game for research-intervention related to natural resources management.

The original plan of the project planned that four scientists were to be trained in an ongoing course in France organized by Cirad. It has been decided to implement a specific course in Latin America in order to allow more partners of the project to participate to the course. Thus, a specialist from INRA who is closely working with CIRAD on this aspects and that animates the training course in France accepted to coordinate the Negowat training course. The organization cost was included in UMSS budget.

##### *a.2 State of advancement and main achievement for 2005*

As scheduled in the technical annex and according to the adaptation of the program proposed by the steering committee, the course “Role Playing Game for Natural Resources Management” was organized for the Negowat team in Bolivia from the 23 to the 28 of May 2005.



The session was coordinated by Dr Michel Etienne from INRA-CIRAD (France). The trainers were Dr Pierre Bommel, Dr R Ducrot, Dr N Faysse from CIRAD and Dr B Paz from UMSS-Centro Agua.

Six persons of the Brazilian team (4 senior scientists, 2 students), 5 person of the Bolivian team and 6 persons of UMSS and Ceres participated to this training course.

*a.3 Main results and outcomes:*

The course was an important step to help the partners to conceptualize various aspects on the use and development of RPG. It was also an important moment to help to formalize a methodology of monitoring and evaluation of the interventions.

The analysis of the training session is provided in Annex (in French). It points out the following results: The objectives to develop awareness and to provide the methodological basis for game elaboration were fully reached, but the participants would have liked to have more information on the way games can be used. The participants fully appreciated to be capacitated in the development of such tools, the extension of their technical knowledge on games and interest of debriefing, and how to better valorize the moment of the game. Being able to identify the weak points of the game was also an important result of the training, more specifically on the session discussing the game elaborated by the trainees. Globally, the course has improved their capacity to develop games.

The most positive assessment came from trainees that had accompanied the project since its beginning. They felt that the training was an important moment to synthesis information, to discuss some of the work done, to clarify the long term objectives of some of the tasks in which they have been involved since the beginning of the project. Exterior participants (trainees send by their institutions) had more difficulty to make sense of the course and their assessment was more reserved.

*a.4 Links with other tasks*

The training was a fundamental task for the participant to participate to WP4.

*a.5 Difficulties and problems*

In order to avoid partial participation to the course, we had chosen to locate the course in a remote area. It resulted in logistical difficulties (such as delay to reach the place) as well as the non participation of Bolivian senior scientists. Thus, participation in Bolivia was limited to Negowat personnel under short term contract which can limit the institutional appropriation of the method.

Overall the course was mentioned as very intensive, and people would have liked to have more spare time. It should be mentioned however that some trainees would have like to deepen some aspects of the course (which would have necessitate a longer training course) while it has been difficult to mobilize senior scientist for more than a week. Moreover, it has been very difficult for the group to respect the proposed timing which also contributed to the intensive session to compensate delays.

*a.6 Plan for next year*

The short course developed by Centro Agua in 2006 will include some aspects of this course: a couple of hours will be devoted to role playing games.

**b) Task 4.2 Development of a monitoring method for RPG and agreement building**

*b.1 Objectives and methods*

The objective of this task is to design a method to monitor and assess discussion during the simulation – role game playing session.

Literature review indicates that few interventions using simulation tools were accompanied by a systematic monitoring and impact assessment. Thus, the various experiments of companion modelling intervention developed by the COMMOD group have never been properly monitored and assessed, apart from the work developed by W. Dare experiment in Senegal (Dare, 2005)

Given this lack of references, each team has elaborated its own proposal. The proposals take into account the main focus of the tools (game or other) used, their integration in the global intervention process and the different referential framework basis.

#### *b.2 State of advancement and main achievement for 2005*

In Bolivia, an ex-post evaluation was undertaken in the different process sessions. The partial outcomes are documented in two document proposed in annex of this report (Penarrieta, R, 2005 ; Quiroz F., 2005).

In Brazil, the method elaborated under the coordination of USP-Procarn is still being discussed. A first draft has been tested to monitor the academic session of JogoMan. The results of this training session are currently being analysed in a master thesis. .

#### *b.3 Main results and outcomes:*

**In Bolivia,** the evaluation was based on 1) the written notes, audio records and video records from the RPG sessions; 2) ex post interviews with people that came to play as well as people who decided not to participate in the RPG. The last evaluation of SosteniCAP, in one district, was complemented by an ex ante analysis of the knowledge and opinion water users had of their water committee.

In order to evaluate the RPG tool, several hypothesis and objectives were defined and tested: (i) Hypothesis 1: The stakeholders invited to play do accept to take time to play and enter in the game dynamics. (ii) Hypothesis 2: The players understand the game and can participate actively (iii) Hypothesis 3: The players accept the game as a representation of the reality.

The detailed evaluation of the completion of these hypotheses can be found in Peñarietta (2005) and Quiroz (2005)

**In Brazil :** The PROCAM group have proposed to base the evaluation and monitoring method on the theoretical framework on social learning developed by the INCO project HarmoniCop.

The first draft of the method proposes (i) a rapid assessment of 5 simple questions answered by all players at the beginning of the game (reason of participation, main representation on the problem) (ii) 5 questions answered by the players at the end of the question (what did they learn about the issue studied, about negotiation) (iii) a monitoring guidelines with a synthesis guidelines to be provided at the end of the game (iv) a more detailed interview to analysis game impact a couple of weeks after the session (this part has not been tested yet).

The PROCAM team have been completed in order to organize the monitoring activities, and analysis of the sessions in 2006.

#### *b.4 Links with other tasks*

The implementation of this monitoring and assessment method is an important step of the WP4. It is a necessary step to assess the interests and limits of the tools proposed given the objective of the intervention.

#### *b.5 Difficulties and problems*

The different approaches chosen, state of advancement and theoretical background between both teams made difficult the elaboration of common method and framework analysis. The coordination between both teams (Bolivia, Brazil) is mainly done through discussion between the CIRAD scientists. The discussion beneficiates from the support of an internal research activity within the Companion Modeling Group (CIRAD – CEMAGREF – INRA) about this question. It is expected that the development of a common powerpoint presentation about “monitoring and assessment” for the training materials will allow to compare and discuss the different approaches.

End of 2006, beginning of 2007, CIRAD will fund specific investigation to monitor the impact of the method for local stakeholders a-posteriori (after a couple of months).

*b.6 Plan for next year*

Implementation of the monitoring and assessment method in Brazil and analysis of the results.  
Finalization of the analysis in Bolivia.

Common discussion on the method in the final report of the project.

### **2.4.3 INTERVENTION AND DISCUSSION SESSIONS IN BRAZIL**

**a) Task 4.1 : Design method for discussion session implementation in Brazil**

*a.1 Objectives and methods*

The objective of this task is to design a method for intervention process with stakeholders, relying on the simulation tools designed by the project. This task includes the identification of the issue to be dealt with and the definition of the intervention strategies (the different steps of the intervention)

In Brazil, 2 intervention processes have been selected:

1. **“Teraguas process”**: Facilitation of the dialogue between the catchment committee and local stakeholders on the issue of land and water planning at catchment level. This intervention will be principally implemented in the Guarapiranga sub-catchment. The simulation tools to be used in this intervention are the JogoPol and Teraguas games, but it is possible depending on the evolution of the discussion to develop other activities (for example discussion using the MQual simulation model). The tool will be used more specifically to discuss appropriation mode of the specific law of Guarapiranga as well as impact of the new road infrastructure in the area (Rodoanel).

This intervention includes capacity building of local stakeholders and small scale land and water user on water pollution, institutional aspects of land and water management as well as 2 sub-activities to be carried out by Apta specifically oriented toward agricultural and rural stakeholders. It is expected that these specific activities will help to mobilize stakeholders which are traditionally little active in participative processes relative to land and water management. The specific planned activities are:

- Workshops with farmers, aiming at participatively assessing the possibility of crafting a set of “good agricultural practices and rules” associated with “friendly water use label”, based on the discussion on actual and potential water demand and economic elements (cost and revenue) of farmers activities (leader APTA);
  - The development of a local multistakeholder platform to elaborate a local proposal for multiple use of water and alternative land uses in a micro-catchment (a couple of 10 ha). (leader APTA);
  - Capacity building sessions on pollution and consequences at households levels for a public of local urban dwellers (leader POLIS) , using and developing the JogoPol game (leader Instituto Polis)
2. **“Process AguAloca”**: Facilitation of a discussion within the catchment committee of Cabeceiras-Tietê about the implementation of water quantity and quality licences at catchment level and introduction of a discussion on the place and role of agriculture.

This includes specific activities with farmers’ water management and uses (Leader APTA) and the development of a global vision of quantity and quality management at catchment level (game AguAloca). The game sessions can be followed by uses of other simulation tools such as Mqual or Spatmas model if the team manages to calibrate and validate it in time, given the set of available data.

### *a.2 State of advancement and main achievement for 2005*

There have been little advances in Brazil in this task in 2005, most of the work being devoted to the elaboration of the tools.

However, an organizing committee has been created joining representative of the project and of the Cabeceiras Tiete subs catchment to elaborate a complete strategy. The committee has asked for a rapid test of the game in order to elaborate the planning of activity for 2006. They also wish to test the tools in training session in which they are involved.

### *a.3 Problems and difficulties*

Lack of human resource at coordination level (the coordinator is also involved in modeling and development of the tools) make difficult the articulation between partners and activities. The coordinator faces difficulty to maintain an integrated work between the different partners as each partner tends to favour activities with their "traditional clients" or actors with whom they are used to work (for example: the catchment committee for PROCAM, the water agencies and municipalities health service for FSP, the rural and agricultural actors for APTA, and the local district leaders for POLIS). This results in the feeling that that each other interests and "actors" are not properly taken into consideration by other partners. A lot of work has thus to be devoted by the coordinator to make the bridges between partners and processes, underlying the similarities of conceptual framework supporting analysis and tools, articulating specific activities independently developed with the central activities of the project.

Another difficulty lies in the limited availability of senior scientists to fully accompany the different steps of the process from the detailed definition strategies and field implementation. As a consequence some fail to see the articulation between the different activities and the added value of their contribution during the different step of the process.

Lack of human resources in modeling and game development also resulted to slower advances in the elaboration and finalization of the tools with consequent delay in the implementation phase. The team is unable to respond rapidly to demand of adaptation or rapid test (case for the Cabeceiras Tietê committee that asked for a rapid test of the game in 2006, that we will be unable to implement because of delay in the game finalization).

### *a.4 Plan for next year*

Implementation of the different processes.

## **b) Task 4.3 Organize validation workshop in Brazil**

### *b.1 Objectives and methods*

The objective of this task is (i) to organise one workshop with stakeholders to validate the model proposed through role game playing (ii) to analyse the discussion process during the meeting (iii) to validate the representation proposed through the models.

### *b.2 State of advancement and main achievement for 2005*

Only one workshop was implemented in 2005 to validate the JogoPol game, a game for environmental education on water pollution dynamics for local actors (part of the Teraguas process). The test was implemented the 17<sup>th</sup> of December 2005.

### *b.3 Main results and outcomes:*

The game could have been more playful and appears a bit too much didactic. The discussions were somewhat limited and mostly focussed on water access at district level. The game session could be reorganized to correct this problem;

The public of the test were local district leaders. The game did not appear to be well adapted to their preoccupation and interest. They would be probably more interested in a Teraguas game which is more adapted to discuss local land planning, and infrastructure development including land

regularization issues, with representative of Sabesp and of the municipality. They underlined that the game seems more interesting at communities level (with grassroots stakeholders) to introduce some issue about water and sanitation access. They suggested accompanying the game with specific booklets explaining the different legal aspects. It will be difficult to develop a complete environmental education kit before the end of the project given the little time and financial resources left, but a guideline for the elaboration of this kind of kit can be elaborated.

Previous discussion have underlined that there is little knowledge and information on pollution. Pollution is associated with health problems but the connection is loose. Water access had household level is not perceived as a difficulty and household can manage different sources of water for domestic use, associated with different quality (in relation to potential health problem mainly).

Various adaptations were proposed in order to better adequate the game to the representation of the actors. The most important was that subterranean water was missing and has to be represented in the game.

#### *b.4 Plan for next year*

Validation workshop for AguaLoca and Teraguas.

### **2.4.4 INTERVENTION AND DISCUSSION SESSION IN BOLIVIA**

#### *a) Task 4.1: Design method for discussion session implementation in Bolivia*

In Tiquipaya, three intervention processes were scheduled, in order to develop and test methodologies for negotiation: 1) the Technical Roundtable on the MACOTI water and sanitation project; 2) impacts of urbanization on irrigation canals in the Linde and Kanarancho local communities; and 3) support in the functioning of community-managed drinking water committees.

The focus on 2005 was on the design and test of the intervention session for the impact of urbanization on irrigation canals and support in the functioning of community based drinking organization. . .

As they were no pre-existing negotiation platform concerning this two processes, it was possible to design simultaneously the whole process and the RPG, i.e., it was possible to decide where to position the RPG within the whole process, how linkages could be thought from the outset between both, etc.

The methodology designed for each processes is presented in graph 3 and 4.

#### Impacts of urbanization on irrigation canals

As analyzed in 2004 (see previous report), in two communities of Tiquipaya, Linde and Kanarancho, the chaotic urbanization process jeopardizes the maintenance of local irrigation canals. These two communities are also located in a wet area, with many local springs, and the canals have also a function of drainage, which is of importance for both irrigation farmer and new urban dwellers. Against this background, intervention was organised in 2005 to lead to local agreements between irrigation farmers and urban dwellers in order to ensure a protection of the canals (figure 1).

#### Support in the functioning of community-based drinking water committees

The second process revolved around the development and test of a methodology to support management of community-based drinking water committees. This methodology (figure 2) aims at improving the management of these water committees. In Tiquipaya, efforts were put on the internal management issues: definition of by-laws, tariffs, management of user debts. In the South Zone of Cochabamba, work was also done in supporting the committees' dialogue with external institutions.



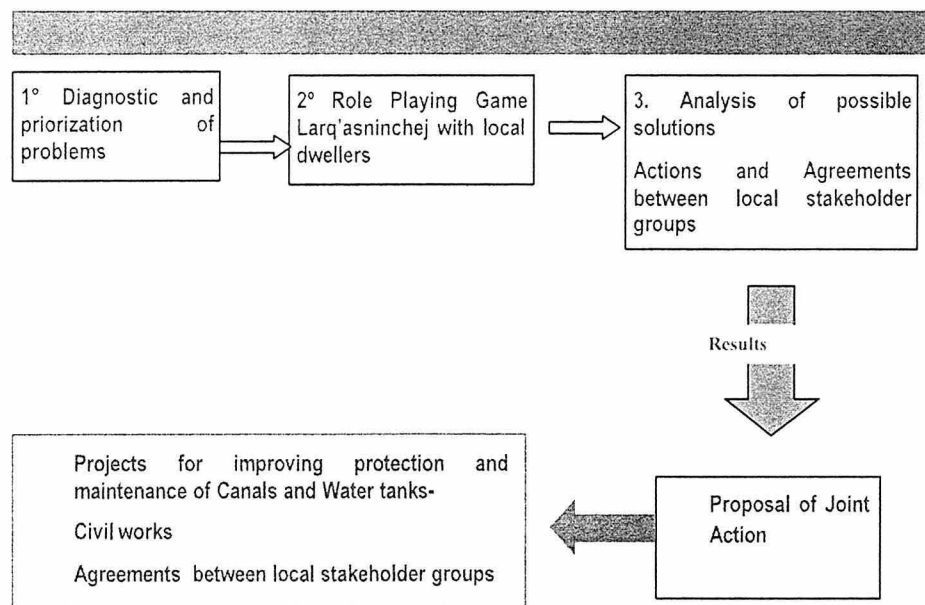


Figure 1: Intervention process methodology to deal with the impact of urbanization on irrigation canals

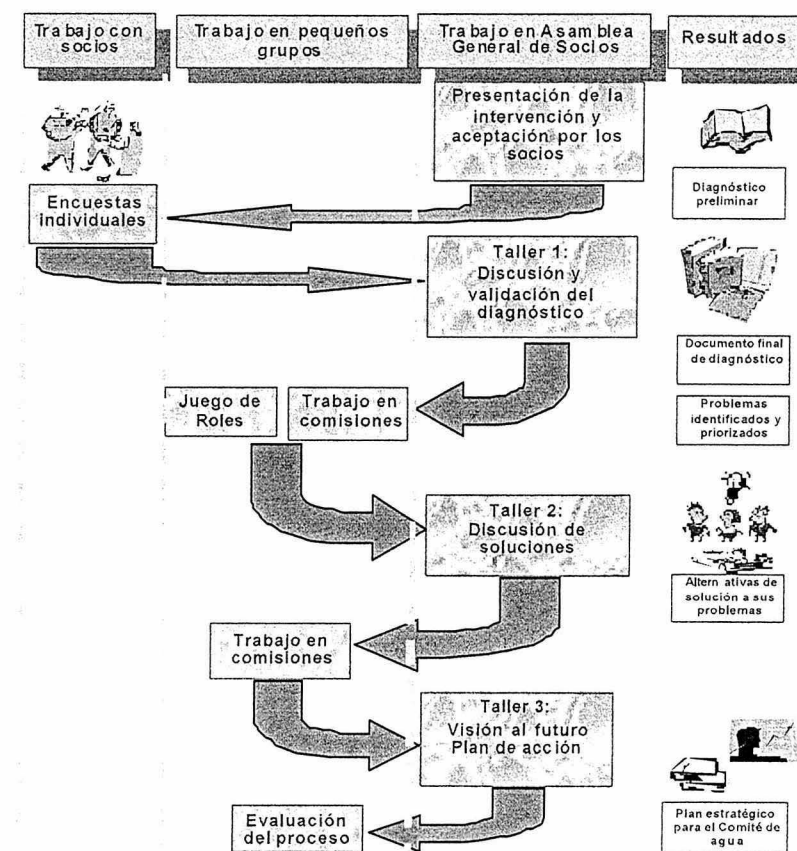


Figure 2: Intervention process with drinking water committees and use of the sosteniCAP RPG.

Each methodology are presented in details in Quiroz and al, 2005, and Penarietta, R 2005, available in annex.

#### State of advancement of the different processes

The two processes have been fully implemented in at least 2 different situations. The team is currently finalizing a synthesis summarizing the main results and outcomes, lessons, and difficulties of the methodology and process. This synthesis will be available in April 2006.

#### Outcomes and results.

An important result of the process is the importance of the convocation for the RPG to ensure the success of the RPG session in the intervention process as a whole. ..

### **b) Task 4.4: implementation of intervention process to support negotiation Bolivia.**

#### Technical Roundtable

The Technical Roundtable process was completed at the end of 2004. At the end of 2004, the newly elected municipality won the elections by a large margin. This new municipality initiated a Committee for the Social Control of the MACOTI project, elected by the OTBs. The Negowat team was officially recognized as the facilitator of this social Control Committee. However, the Committee found itself with no support from the municipality (which was ultimately uninterested in social control), nor from the OTBs, and finally waned. Anyway, the Negowat team did not invest many efforts in this follow-up, the core of the work being the second and third processes presented hereafter.

#### Impacts of urbanization on irrigation canals

The process went well in the two local communities (Linde and Kanarancho) , and led to a proposal of investment to protect canals and to local agreements between irrigation farmers, the local community organization and the Tiquipaya Municipality. For the first time in Kanarancho, the urban dwellers participated in the maintenance of the canals.

The RPG Larq'asninchej game was used in 10 sessions overall with local actors. Each of the 2 communities of Linde and Kanarancho was divided into 4 zones. When Larq'asninchej was played with irrigation farmers and urban dwellers, all participants had to swap their role in the game, i.e., an urban dweller played an irrigation farmer in the game.

An ex-post evaluation of the use of the RPG was undertaken, based on the analysis of the sessions and ex post interviews with community members who participated in the game or who decided not to participate (cf. the evaluation document, Peñarrietta, 2005).

#### Support in the functioning of community-based drinking water committees

The methodology was implemented in 4 drinking water committees: in Tiquipaya, the Villa Oruro and COMAPHA committees; and in the South zone of Cochabamba, the Alto Pagador and Barrios Unidos water committees.

In the 3 cases where the whole methodology was used (Villa Oruro, COMAPHA, Barrios Unidos), the SosteniCAP RPG was used and tackled most of all the issue of user debt in paying the water tariff. It was played in 7 sessions.

An ex-post evaluation of the use of the RPG was conducted in Villa Oruro, based on the analysis of the sessions and ex post interviews with community members who participated in the game or who decided not to participate (cf. the evaluation document, Quiroz, 2005). The evaluation of the RPG sessions played in Barrios Unidos will be completed in January 2005. In Barrios Unidos in December 2005, an ex ante evaluation of the knowledge community members had of their water committee was undertaken to permit comparison with the ex post evaluation.

In both cases of SosteniCAP and Larq'asninchej, the RPG was evaluated as a powerful tool to do capacity-building and enable better dialogue between local stakeholders. Larq'asninchej proved also useful to motivate local community-members in entering the intervention process. The discussion of possible solutions to the problems addressed in the game were mainly on the principles themselves,



and not on technical details, since the games did not enabled detailed technical discussions of solutions. It was nevertheless evaluated that playing RPGs sessions with all grassroots stakeholders is costly in terms of time spent in inviting community members.

## **2.5 SCALING UP” - WP 5-**

Because of the discrepancy of advancement of the work between Brazil and Bolivia, the development of the activities of this work package is very unequal. The work in WP5 is far more advanced in Bolivia than in Brazil.

### **2.5.1 Task 5.1 Validate method**

It was proposed to validate the method to replicate the process in different situations. This has only been initiated in Bolivia. The method proposed for this replication as originally planned in the technical annex had to be reviewed given the adaptation of the intervention method made during the project.

In Bolivia, the method for replication includes:

- (i) Implementation of diffusion workshops : one workshop on the impact of urbanization in the valley of Cochabamba was organized by Ceres and CentroAgua with an attendance of 80 members from irrigation associations and municipalities.
- (ii) Test of replication of the methodology to support water drinking committee in other context as the Southern area of Cochabamba or in the area of Sucre (cf report of CentroAgua)

New project proposal was elaborated in order to diffuse the method proposed to support water drinking committees and was submitted to different funding agencies.

### **2.5.2 Task 5.2 diffuse results**

#### **a) Task 4.1 Short courses and workshop**

##### **Bolivia.**

A specific training course is planned in UMSS in March and April 2006. Three 3-days modules will be organized on: 1) methods for diagnostic of land and water uses in peri-urban areas; 2) tools to support multi stakeholder platforms; 3) use of RPGs to support negotiation processes. This training course is already fully recognized by the University, and in 2006 will evolve into a future permanent graduation course.

The Negowat training materials will also be used during the Centro AGUA Master Course on Integrated Water Resource Management from January 23<sup>rd</sup> to 28<sup>th</sup>.

Three final workshops are also scheduled: 1) with local stakeholders in Tiquipaya; 2) with academics and professional in Cochabamba; and 3) a presentation of the whole project in La Paz for national organizations and international cooperation, which will be organized hopefully in coordination with the local office of the European Union.

##### **Brazil**

Procam is initiating the preparation of a short course on “Negotiation and mediation on conflict, stakeholder analysis and water management in River basin” that will integrate results and materials developed by the Negowat project

**b) Other diffusion materials**

**Bolivia**

- A book will be written on the experience of the Negowat project in Bolivia. It will contain the most salient articles, as well as an assessment of the way the project was designed and modified during its period of existence.
- A CD will also be designed and distributed to Bolivian Institutions involved into water management and local government. This CD will contain all the published documents of interest for these institutions.
- Other material includes the book on capitalizing experiences of organizations in terms of supporting community-based drinking water committees should be edited and published by May, 2006. (Product of WP3).
- Two other short documents to capacitate the management of drinking water committees will be published: one on tariffs, and another one on methods for the financial management.

The Bolivian team has also designed and published

- 3 capacity building booklets, for a public on local leader on the following theme : urbanization issue in Tiquipaya, water resources and water use in Tiquipaya, water and sanitation Macoti project and the conflict it led to.
- 4 CERES methodological short-texts summarizing for a broad public 4 researches undertaken by Negowat: Stakeholder analysis - Dynamics of land and water in Tiquipaya - The experience of the Technical Roundtable in Tiquipaya, on the MACOTI water and sanitation project - Methodology to support the management of community-based drinking water committees

**Brazil**

There will be no time during the project to propose a full range of diffusion activities, but it will be possible to find funding for a final workshop to present the result to a public of professional of catchment managers in 2007 (after the project official ending).

**Common publication: Brazil / Bolivia/India**

A final book will be elaborated gathering contribution relating the experiences of the project in Brazil, Bolivia and India (funding DFID), presenting and discussing the development and implementation of the discussion tools.

**c) Task 5.2 end user training material**

**c.1 Objective and methodology**

The agreed detailed plan for the training materials is to produce, test, finalise and disseminate training materials that can be used by the research partners and other organisations to strengthen capacities in the main focus of the project: methodologies for negotiating peri-urban land and water conflicts. These training materials are targeted at middle-level professionals and students (e.g. NGOs, regional and local government staff, University staff and researchers) involved in the management of land and water resources. Training is focused on transferring and developing knowledge in appropriate methodologies for use in different situations on potential and actual conflict

A detailed plan for completion of the training materials was developed during and following visits by John Butterworth to Bolivia and Brasil in April including workshops with the team focused on training materials on 11 April (Cochabamba, Bolivia) and 15 April (Brasil).

### c.2 *Results and deliverables*

The training materials are made up of a series of modules (see list below for proposed list of modules). Each module includes a powerpoint presentation, and one or more supporting documents/ papers providing further information. All these materials will be made available on a CD and the project website. The modules are:

#### *Contexts: an introduction to peri-urban land and water conflicts*

- A global overview
- Cochabamba, Bolivia
- Sao Paulo, Brasil
- Chennai, India
- Governance and negotiation processes: characteristics and frameworks

#### *Methodologies and tools for negotiations*

- Overview framework for using tools and methodologies (e.g. companion modelling approach) within negotiation processes
- (Short-term) multi-stakeholder platforms
- Role playing games: an introduction
- Role playing games: use and assessment within intervention processes in Bolivia
- Role playing games: use and assessment within intervention processes in Brasil
- Multi-agent systems
- Bayesian networks
- Scenario-based planning
- Monitoring and evaluation of interventions/tools in negotiation processes
- Facilitation and mediation skills
- Negotiation strategies and techniques

#### *Other methodologies to support negotiation processes in peri-urban zones*

- Stakeholder analysis
- Drinking Water Committees: How to analyse and build capacity in community-managed peri-urban systems
- River Basin Committees: building on social capital and networks
- Statistics and surveys: How to analyse and use statistics on urbanisation and to undertake household surveys in peri-urban zones
- Land use: How to analyse land use in peri-urban zones
- Land Markets: How to investigate land markets in peri-urban zones
- Water Rights: How to investigate water rights in peri-urban zones
- Multiple Water Use: How to understand multiple uses of water in peri-urban zones
- Hydrology of peri-urban catchments (quantity and quality)
- Agricultural change in peri-urban catchments
- Mitigating impacts of urbanisation on irrigation systems
- Analysing health impacts of water and sanitation access in peri-urban areas
- Development processes to build upon recreation and environmental value of mixed land use in peri-urban areas

Initial training modules were tested as part of the LA-WETNET (the Latin American partner of the CAP-NET network for capacity building in integrated water resources management) training course/ workshop in conflict resolution held in Cochabamba in May 2005.

19 draft training modules out of (now) 29 have been completed. These are in various stages of testing, approval, editing and translation (into English, Spanish and Portuguese).

The module will be completed and finalized in 2006.

### c.3 *Difficulties and problems*

It has been difficult to mobilise the inputs of all the partners in a timely fashion and some modules are still only partially completed and need some improvement. Other researchers have been reluctant to rapidly develop 'draft' training modules based on our existing knowledge (for subsequent later improvement) preferring to wait until other research activities have been completed.

## 2.6 Product and outcomes

### 2.6.1 Publications

#### a) *Published in 2005*

##### a.1 *Refereed Journal:*

1. M. BOUZID, R. DUCROT, Y. M. CHAGAS DE CARVALHO, R. A. L. IMBERNON. 2005. Dynamiques agricoles périurbaines et gestion intégrée de l'eau, Cas d'un bassin-versant producteur d'eau dans la région métropolitaine de São Paulo (Brésil). Cahiers agricultures, Cahiers Agricultures vol. 14, n° 1, janvier-fevrier 2005, 131-137.
2. R DUCROT, A. K. S. BUENO, B. P. REYDON, 2005. Institutional arrangements for articulating land and water management in peri-urban catchment: example of the metropolitan region of São Paulo, Brazil. International Journal of Water, Vol. 3, No. 2, 2005, 186-203

##### a.2 *Book and book contribution*

3. Barban V. Between the legal and the real – the necessity of information to the citizen participation. In, Dowbor, L. e Tagnin, R. A. (org) Managing water as if it was important: environmental management and sustainability. São Paulo: Ed. Senac São Paulo, 2005
4. Jacobi P. Comitê de Bacias hidrograficas. O que esta em jogo na gestão compartilhada e participativa. In, Dowbor, L. e Tagnin, R. A. (org) Managing water as if it was important: environmental management and sustainability. São Paulo: Ed. Senac São Paulo, 2005. pp81-88
5. SENDACZ, S.; MONTEIRO, A.J.; MERCANTE, C.T.J.; MONTEIRO, A.J.; MENEZES, L.C.B.; MORAES, J.F. 2005 Sistemas em cascata: concentrações e cargas de nutrientes no Sistema Produtor Alto Tietê, São Paulo. in Nogueira, M.G.; Henry, R. & Jorcin, A..(eds) Ecologia de Reservatórios: Impactos Potenciais, Ações de Manejo e Sistemas em Cascata. p.417-434
6. TUNDISI, J.G. 2005 – Gerenciamento integrado de bacias hidrográficas e reservatórios – Estudos de caso e perspectivas. In: Ecologia de Reservatórios – Impactos Potenciais, ações de manejo e sistemas em cascata. Organizadores – Marcos Gomes Nogueira, Raoul Henry e Adriana Jorcin.UNESP/ Rima Editora. pp 1 – 21

##### a.3 *Conference proceedings (complete text and summary) :*

7. AMPUERO, R. FAYSE, N., Quiroz, F. *Metodologia de apoyo a Comités de Agua Potable*. Paper presented at the seminar Agua 2005, CINARA, Cali, November 2nd – 4th, 2005.
8. COSSIO, V. *Use of a methodology to support the design of a short-term multi-stakeholder platform in a water and sanitation project in Tiquipaya (Bolivia)*. Paper presented at the Stockholm World Water week, Sweden, 21-27 August 2005.
9. BARBAN V.. *Spring Areas in the Metropolis of São Paulo/Brazil: the Residents, their Organizations and Social Participation*. EFFICIENT 2005 - 3rd Conference on Efficient Use and Manangement of Water, Chile, 14 a 19/03/2005
10. BARBAN V. , ROJOT, C. E MORAIS, C.K. 'Shared Management: information and formation for the citizen participation'. "Encuentro por una Nueva Cultura del Agua en América Latina", Fortaleza, Ceara, Brazil 05 a 09/12/2005. Cd (available: <http://www.unizar.es/fnca/america/index2.php?idioma=pt&x=0512>, capture 20/01/2006)



11. CARVALHO, Y. M. C.; ZUCHIWSCHI, E.; FERREIRA, S. E.; FRABETTI, G. L. 2005. Perspectivas para a Agricultura da Bacia do Alto Tietê. IN: VI Simposio Latino Americano sobre investigación Y Extensión en Sistemas Agropecuarios (IESA-AL-VI). Colombia, 20-22 /07/2005. Summary Proceeds.... (and CD-ROM).
12. CARVALHO, Y. M.C.; FRANCA, T. J. F.; BARBAN, V.; VICENTI, M. C.; FRANCISCO, V. L.a F.S. 2005. The São Paulo's Metropolitan area: environmental protection and poverty alleviation. XI World congress of Rural Sociology. Trondheim, Norway. July, 25-30, 2004. (available <http://www.irsaworld.org/XI/papers/groups.html> group 18; captured 31/12/2005)
13. CARVALHO, Y.M.C ;FRANCA, T.J.F. 2005. A preservação dos mananciais da região metropolitana de São Paulo e a multifuncionalidade. IN: VI Simposio Latino Americano sobre investigación Y Extensión en Sistemas Agropecuarios (IESA-AL-VI). Colombia, 20-22 /07/2005. summary - Proceeds.... (and CD-ROM).(Summary)
14. CARVALHO, Y.M.C ;FRANCA, T.J.F. 2005. A preservação dos mananciais da região metropolitana de São Paulo e a multifuncionalidade. IN: XLIII Congresso da Sociedade Brasileira de Economia e Sociologia Rural – SOBER / 2005 FEA Ribeirão Preto-USP. Ribeirão Preto, 24 a 27/07/2005. Proceeds.... (and CD-ROM)
15. CASTRO, P. M. G.; MARUYAMA, L. S.; MERCANTE, C. T. J.; BEZERRA DE MENEZES, L. 2005. Diagnóstico da atividade pesqueira no Alto Tietê (São Paulo, Brasil): contribuição à gestão de usos múltiplos da água. IN: XVI Encontro Brasileiro de Ictiologia . João Pessoa, Jan. 2005. (summary) Proceeds....
16. CASTRO, P. M. G.; MARUYAMA, L. S.; MERCANTE, C. T. J.; BEZERRA DE MENEZES, L. C. 2005. Perspectivas da atividade pesqueira no Alto Tietê, São Paulo: contribuição à gestão de usos múltiplos da água. IN: XIV Congresso Brasileiro de Engenharia de Pesca. Fortaleza, 18-22/10/2005. Proceeds....
17. DUCROT R., PAZ B., POUGET J.C, TUNDISI J.G.. Le développement d'outils de simulation pour faciliter les consultations concertations dans pour la gestion de bassins versants peri-urbains: exemple de São Paulo, Brésil. Eds. D.V Savic, M.A Marino, H H. G. Savenije, J.C Bertoni. Sustainable Water Management Solutions for Large Cities. Proceedings of symposium S2 held during the Seventh IAHS Scientific Assembly at Foz do Iguaçu, Brazil, 3-9 April 2005. IAHS Publ. 293, 2005. 132-140
18. DURÁN, A. *Lineamentos de una politica de concertación para la gestión multisectorial del agua en los Andes*. Paper presented at the conference "encuentro por una nueva cultura del agua en América Latina", Fortaleza, Ceara, Brasil, 5-9 December, 2005. available : <http://www.unizar.es/fnca/america/index2.php?idioma=pt&x=0512> (captured 20/01/2006) and CD
19. FRANCA. T.J.F. ; CARVALHO, Y.M.C. ; ANDRADE, J.P.; VIÉGAS, J. . 2005. Turismo e lazer em áreas periurbanas de proteção de mananciais: território, paisagem e multifuncionalidade. IN: XLIII Congresso da Sociedade Brasileira de Economia e Sociologia Rural – SOBER. Universidade de São Paulo-USP-Ribeirão Preto–SP, 24-27/07/2005. Proceeds....(CD-ROM)
20. FRANCA. T.J.F. ; CARVALHO, Y.M.C. ; ANDRADE, J.P.; VIÉGAS, J. . 2005. Turismo e lazer em áreas periurbanas de proteção de mananciais: território, paisagem e multifuncionalidade. IN: VI Simposio Latino Americano sobre Investigación y Extensión en Sistemas Agropecuarios (IESA-AL-VI). Colombia, 20-22 /07/2005. (summary) Proceeds (and CD-ROM)
21. GÜNTHER, W. M. R., ARTEIRO, M. G., FREITAS, S. M. Acesso à água e afastamento de esgotos na sub-bacia Tietê Cabeceiras: Condições e Implicações Sanitárias e Ambientais. In: 23o Congresso Brasileiro de Engenharia Sanitária e Ambiental, September, 2005, Campo Grande, MS, Brasil.
22. JACOBI P, GRANJA S.I - "aprendizagem social na gestão compartilhada de bacias hidrográficas em áreas periurbanas na américa latina". "Encuentro por una Nueva Cultura del Agua en América Latina", Fortaleza, Ceara, Brazil 05 a 09/12/2005. Cd (available: <http://www.unizar.es/fnca/america/index2.php?idioma=pt&x=0512>, capture 20/01/2006)

23. MORAES, J.F.L.; CARVALHO, J.P.; VALERIANO, M.M.; CARLSTROM FILHO, A.A. 2005. Evolução do uso das terras na sub-bacia hidrográfica Tietê-Cabeceiras entre 1977-2001. In. Anais do Simpósio Brasileiro e Recursos Hídricos, XVI, João Pessoa, PB. (CD-ROM).
24. PEÑARIETTA, R. *Facilitando procesos de dialogo sobre el problema de la invasión urbana en zonas agrícolas bajo riego*. Paper presented at the conference “encuentro por una nueva cultura del agua en América Latina”, Fortaleza, Ceara, Brasil, 5-9 December, 2005.
25. QUIROZ, F., Ampuero, R., Faysse, N. *Metodología de fortalecimiento a comités de agua potable en zonas peri urbanas. Desarrollo y validación en base a experiencias de Cochabamba, Bolivia*. Paper presented at the conference “encuentro por una nueva cultura del agua en América Latina”, Fortaleza, Ceara, Brasil, 5-9 December, 2005. available : <http://www.unizar.es/fnca/america/index2.php?idioma=pt&x=0512> (captured 20/01/2006)
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a.4 *Participation to Conference without available proceedings:*

27. ADAMATTI, D.F.; SICHMAN, J.S.; BOMMEL, P.; DUCROT, R.; RABAK, C.; CAMARGO, M.E.S.A\*. JogoMan: A Prototype Using Multi-Agent-Based Simulation and Role-Playing Games in Water Management. \*CABM-HEMA-SMAGET, Bourg-Saint-Maurice, Les Arcs, France, 2005.
28. ARTEIRO, MG Günther, WMR Expansão urbana, acesso aos serviços de saneamento e impactos à saúde na sub-bacia Tietê Cabeceiras. In: Conferência Regional sobre Mudanças Globais: América do Sul, II. São Paulo: IEA/USP. 2005.
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30. SENDACZ, S.; MERCANTE, C.T.J.; MONTEIRO, A.J.; MENEZES, L.C.B. 2005. Cargas de Nitrogênio e Fósforo relacionadas a impactos antropogênicos na bacia hidrográfica do Alto rio Tietê (Cabeceiras), São Paulo. IX Congresso Brasileiro de Limnologia. Ilhéus, BA, 24- 29/07/ 2005.

a.5 *Others (internet, on line report, etc)*

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32. CD : Material do Curso “enfoque de juego de roles en la modelacion de acompanamiento. 23-27 de mayo 2005, Cochabamba Bolivia. Proyecto Negowat. CIRAD, INRA, Centro Agua-UMSS,
33. Faysse N., Courivaud A. 2005. Organisations communautaires et entreprises de distribution d’eau en Amérique Latine. Typologie d’une coexistence aux modalités varies. Letter no. 49, December 2005. Newsletter on water and sanitation issues, edited in French by the PsEau NGO.
34. A video on water use and water access problems in the South Zone of Cochabamba, realized by two French students: Julien Cognac et Federico Zammito, from November 2004 to August 2005.

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36. Vicente, M.C.M.; Kulaif, J.T.; Francisco, V.L.F.S. Uso do solo rural e indicadores sócio-econômicos nas sub-bacias de Tietê Cabeceiras e Guarapiranga. Bem preservado, Cinturão controla até enchentes. Estado de São Paulo- Suplemento Agrícola 6/07/ 2005. p g
37. TUNDISI, J.G. – Nature Makes a Difference in the City – SCIENCE – Letter to the Editor. September – 2005. Vol. 309. No. 5740. 1489 – 1490 pp.

a.6 *Project reports*

38. DUCROT R ed. 2005. Second Annual Report covering period 01/01/04 to 31/12/04. Project Negowat. Report CIRAD n° 62/04. 120 p. + annexes. CD
39. R DUCROT. 2005 ed. WP3 report. Brazil 242 pages ; Bolivia. 142 pages. CD
40. N. FAYSSE, V. COSSÍO, B. PAZ, F. QUIROZ, R. AMPUERO. 2005. Use of a methodology to support the design of a short-term Multi-Stakeholder platform: the case of a water and sanitation project in Tiquipaya (Bolivia). NEGOWAT, Cochabamba - Bolivia ([pdf file](#) 207 Kb). Spanish version ([pdf file](#) 144 Kb). Accessible in the website :
41. N. FAYSSE, V. COSSÍO, B. PAZ, F. QUIROZ, R. AMPUERO. 2005. A Methodology for intervention in the design and evaluation of a short-term Multi-Stakeholder Platform. NEGOWAT, Cochabamba - Bolivia ([pdf file](#) 112 Kb). Spanish version ([pdf file](#) 144 Kb). Accessible in the website.
42. COSSIO, V. Booklet on the legal issues for community-based drinking water committees with drawings, to be used by drinking water committees' management committees.
43. PEÑARRIETTA, R. *Evaluation of the use of an RPG in Linde and Kanarancho*. Internal Negowat Report.
44. QUIROZ, F. *Evaluation of the use of an RPG in the Villa Oruro drinking water committee*. Internal Negowat Report.
45. QUIROZ, F. *Revista de literatura sobre metodologias de apoio a Comitês de Água Potable*. Internal Negowat Report.
46. VEGA, D. Summary of the workshop of impacts of urbanization on irrigation schemes in Cochabamba valley
47. Breves del Ceres, n°10 Outubro 2005 : Identificación y análisis de grupos de intereses en Tiquipaya en función a un espacio de negociación sobre el proyecto Macoti. 8 p.
48. Breves del Ceres, n°9 septiembre 2005 Desarrollo de recursos hídricos y disponibilidad de agua. 8 p.
49. Breves del Ceres, n°11 Noviembre 2005 Metodología de apoyo a comités de agua potable (CAP) em zonas periurbanas. 8 p.
50. Breves del Ceres, n°12 Diciembre 2005 La mesa técnica: aplicación de una metodología para diseñar una plataforma temporal de múltiples grupos de interés. 8 p.
51. Parlakupaj, Boletim Mural de Ceres con la Buena noticia de los valles. Año 10, Enero febrero 2005, n°45. Tema : La experiencia de negociación Del proyecto Negowat. 4p.
52. Parlakupaj, Boletim Mural de Ceres con la Buena noticia de los valles. S.d.. Tema : La mesa técnica sobre el proyecto alcantarillado y agua potable mancomunado Colcapiruha Tiquipaya



**b - Publication in preparation**

**b.1 Refereed journal**

1. M. BOUZID, R. DUCROT, Y. M. CHAGAS DE CARVALHO, R. A. L. IMBERNON. Dinâmicas agrícolas peri-urbanas e gestão integrada da água : Caso de uma bacia produtora de água na Região Metropolitana de São Paulo. CADERNOS DE CIÊNCIA & TECNOLOGIA, v.22, n.2, mai./ago. 2005, In press.
2. CASTRO, P. M. G. DE; MARUYAMA, L. S. ; MERCANTE, C. T. J. & BEZERRA DE MENEZES, L. CPerspectiva da Atividade pesqueira no Alto Tietê: contribuição à gestão usos múltiplos da água. Bol. Inst. Pesca. (In press)
3. M.E CAMARGO, R DUCROT, P JACOBI. Using role-playing game for capacity building on water and land management: comparing some Brazilian experiences Simulation and Gaming, special issue of role playing game for natural resources management, in press.

**b.2 Book and Book contribution**

4. ANNE CHOHIN-KUPER, RAPHAËLE DUCROT, JEAN-PHILIPPE TONNEAU AND EDOLNICE DA ROCHA BARROS. Role-playing game development in irrigation management: a social learning approach. Chapitre d'ouvrage, Ed. S. Perret, In press
5. ABE, D.S.; TUNDISI, J.G.; VANNUCCI, D. & SIDAGIS-GALLI, C. Avaliação da capacidade de remoção de nitrogênio em uma várzea da Cabeceira do reservatório de Guarapiranga, Região Metropolitana de São Paulo. In: Tundisi, J.G. et al (Editores). Eutrofização na América do Sul: causas, consequências e tecnologias para o gerenciamento e controle. IIE/CNPq/PROSUL (in press).
6. TUNDISI, J.G.; ABE, D.S.; MATSUMURA-TUNDISI, T.; TUNDISI, J.E.M & VANNUCCI, D. reservatórios da Região Metropolitana de São Paulo: consequências e impactos da eutrofização e perspectivas para o gerenciamento e recuperação. In: Tundisi, J.G. et al (Editores). Eutrofização na América do Sul: causas, consequências e tecnologias para o gerenciamento e controle. IIE/CNPq/PROSUL (no prelo).
7. TUNDISI, J. G.; MATSUMURA-TUNDISI, T.; SIDAGIS, C. – Eutrophication in South America: causes, consequences and technologies for control and management. IIE / IIEGA, CNPq / PROSUL / Brazilian Academy of Sciences, 590 pp. (in Portuguese Spanish and English).

**2.6.2 Other outcomes**

**a) Training**

**a.1 Concluded Msc (in 2005)**

Brignol V. 2005 : Pollutions des eaux d'origine agricole dans le bassin versant de Cabeceiras-Tietê, Région Métropolitaine de São Paulo, Brésil : état des lieux. Stage de Fin d'étude. DAA d'agronomie. Département Sciences et Genie de l'Environnement. ENSAIA, INPL, CIRAD, APTA, 37 p + annexes

Alix Courivaud. 2005. Relaciones entre las organizaciones comintarias de agua potable, empresas municipales y el estado en zonas periurbanas de America Latina. Aplicacion al xaso de Cochabamba. ENGREF.

VIÉGAS, J. F.. Turismo em áreas de Manancial: Uma Análise da Vocação Turística na Região de Parelheiros, RMSP, 2005. São Paulo, Universidade São Marcos–USM, 159p.(dissertação)

*a.2 Organization of training course module (in 2005)*

Training course on Use of Role Playing games for companion modelling, organized by Centro-Agua and CIRAD, Vila Tunari, May, 23<sup>rd</sup>-27<sup>th</sup>. Attendance 20 persons.

Training Course : Methodologies for negotiations on water management. Organized by LA Wet-NET, Negowat (Centro-Agua) and PROMIC. Cochabamba, April, 25-29. 10 hours of presentation given by the Negowat team. Attendance : 30 academics, NGO, Professional from Latin American countries

Seminar of presentation of methodologies and result of the Negowat project in Sucre, December 6h organized by Chuquisaca prefecture and SNV. 8 hours training course, 25 participants.

*a.3 Intervention in existing training course (in 2005)*

Seminar of presentation of methodologies and result of the Negowat project in Cochabamba, September 29<sup>th</sup>-30<sup>th</sup>: 14 hours of presentation, attendance : 15 people mainly from UMSS and NGO CERES.

Instituto de Pesca' Graduate School. Course: Fishing, Sustentability and Scientific Research. CARVALHO, Y.M.C. Aspectos da sócio economia pesqueira: o caso do Alto Tietê. 03/05/2005.

CASTRO, P.M.G.. Perspectivas da atividade pesqueira no Alto Tietê: contribuição à gestão de usos múltiplos da água. August/2005.

Intervention of M.E CAMARGO in activities linked to the Agenda 21 program, in collaboration with an NGO and school of 1st grade in the municipality of Embu and Tabão da Serra na RMSP, and based on her work on role playing games.

*a.4 New project (contract signed in 2005)*

The ALFA project GovAgua contract ("Environmental Governance in Peri-urban Water Basin Management in Metropolitan Areas – social, environmental, territorial and institutional dynamics" of a duration of 36 months between USP and The European Commission have been signed. It gathers 1 academic institutions among which 5 are participating in the Negowat project. It is coordinated by Procam-USP (Dr Jacobi) and will beneficiates directly from Negowat outcomes.

Financial support from French Ministry of Foreign Affairs (MAE) for collaborative activities between APTA-IEA and CIRAD to develop analysis on quality and marketing strategies in horticultural production of the RMSP.

In 2005, Cirad has been initiating a project (GRENAT) about the pollution impact of agricultural practices in 3 sub regions of Brazil (Mato Grosso, Nordeste, and Metropolitan Region of Sao Paulo). The activities of the Grenat project in Sao Paulo are being developed in collaboration with APTA and in strong interrelation with the Negowat activities. This initiative contributed to stimulate a new research group on the issue of agricultural pollution in water which is to be strengthened in 2006. The objective is to elaborate a joint project proposal in 2006.

A French research project (« la modélisation d'accompagnement : une pratique de recherché en appui au developpement durable comMod ») have been approved in 2005 funded by ANR (Agence National de la Recherche). This project proposes to assess the comMod approach as a whole, by comparing various experiences developed over the world by the comMod group (Cirad, Inra, Cemagref). The Negowat activities are part of the interventions that will be monitored and compared in 2006 and 2007.

a.5 *Expertise and technical support to decision makers*

- Increased relation of APTA- IEA with municipal governments of Suzano and Guarulhos, as well as with the São Paulo's Urban Agriculture Forum to develop an urban agriculture project. During 2005 there was continuous demand for consultancy in different issues.
- P Jacobi (USP) has been elected representative of universities in the Alto-Tietê catchment committee.
- Yara Carvalho (APTA-IEA) is one of the representative of the scientific community in the Biosphere Reserve of São Paulo' Green Belt council and board of directors

## 2.7 References

Dare, 2005 : Comportements des acteurs dans le jeu et dans la réalité : indépendance ou correspondance ? Analyse sociologique de l'utilisation de jeux de rôles en aide à la concertation. These de Doctorat. ENGREF, CEMAGREF. 332 p + Annexes.

Peñarietta (2005) : Evaluation of the use of an RPG in Linde and Kanarancho, Working papers Negowat.

Quiroz (2005) : Evaluation of the use of an RPG in the Villa Oruro drinking water committee. Working papers. Negowat.

P. Maurel, F. Cernessona, N. Ferrand, M. Craps, P. Valkering. 2004 Some Methodological Concepts to Analyse the Role of IC-tools in Social Learning Processes. Conference "Complexity and Integrated Resources Management" Osnabruck, Germany, 14-17 june 2004 [www.iemss.org/iemss2004/pdf/dss2/maursome.pdf](http://www.iemss.org/iemss2004/pdf/dss2/maursome.pdf) (accessed 20/01/2006).



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

**Contract number: ICA4-CT-2002-10061**

### **3. MANAGEMENT REPORT 2005**

**Covering period from 1<sup>st</sup> January 2005  
to 31<sup>st</sup> of December 2005**

## **Project NEGOWAT**

***Facilitating Negotiations Over Land And Water Conflicts In  
Latin American Peri-urban Upstream Catchment:  
Combining Agent-Based Modelling With Role Playing  
Game***





### **3 MANAGEMENT REPORT 2005**

#### **3.1 Team management**

##### **In Bolivia**

- Bernardo Paz has resigned from the project from 1/07/05. The coordination of the Bolivian team is carried out by Dr Alfredo Duran (UMSS) with the support of Dr Nicolas Faysse (CIRAD) whose work contract in Bolivia has been extended (till the end of the Bolivian activities) by CIRAD. The budget was adapted in order to hire two young engineers to take over some of the activities carried out by Dr Paz and complete the team.
- For administrative reasons, Ceres is ending its activities in the project at the end of December 2005.

##### **In Brazil**

- Pierre Bommel (CIRAD) has been posted in Brasilia (Brazil) which is facilitating its support to the Negowat team.
- The master student M.E Camargo left the project in September 2005 (before the official ending of her master) as she has found a long term job. Her participation in the project activities has been reduced since May 2005 (phase of thesis redaction) .
- A young geographer Vinicius Madazio has joined the Apta team end of November 2005. He will work in close relationship with Instituto POLIS and USP to support the implementation of the intervention sessions and game sessions.
- The PROCAM team was completed by the involvement of a PhD student (Sandra Ines Granja) in June 2005 and a Msc student (Marialina Lima) in December 2005. A MSc student (Mariana Guterries Arteiro) joined the FSP-POLI team at the beginning of 2005.
- A long term Msc student , Lucie Clavel from France joined the Negowat PROCAM team from April to December 2005, to help on the development of the AguAloca game.
- For internal reason, AIEGEA is ending its activity in the project in December 2005. Dino Vannucci left AIEGEA during the year. UNICAMP ended its activity end of 2004 with the departure of Dr Reydon from the University. However in 2005, Dr Reydon and K Bueno has finalized various texts, participated to the elaboration of one powerpoint via internet contact, and indicated willingness to participate to joint publications with Negowat scientist.

#### **3.2 Scientific exchanges between teams and organization of the collaboration**

Two NEGOWAT meetings were held in 2005 that gathered the Bolivian and Brazilian team in 2005:

- The training course about "Role Playing Game for natural resources management in companion modeling approach" (the outcomes are presented in the scientific part of this report) The course was a first step to present Bolivian and Brazilian advances and methodological references in game development and intervention processes. It was an important step for the development of WP4.
- The NEGOWAT meeting –December 12-14<sup>th</sup>, São Paulo, co-organized by PROCAM and CIRAD. The first day presented the state of advancement of the results of the project while the second and third days were dedicated to joint work on two issues: role playing games and training materials. The program of the workshop is presented in annex. The presentations are available in the internal part of the Negowat website.

The outcomes of these meetings are:

- A detailed program for the elaboration of training material (WP5).
- A comparison of the context of interventions in both countries and their consequences on methodological choice for intervention processes and simulation tools.
- The initiation of a comparison of the intervention processes in term of methodology, game structure and development.
- A discussion about lessons learnt on game development and implementation.

These different discussions have been summarized in the present report. They will be the basis of joint publications.

However, the discrepancies in work advance between both teams have made difficult at this stage the elaboration of the publications that were discussed in previous meeting. There has been no advance in 2005 in this aspect. The elaboration of the powerpoint modules (WP5-Training materials) has permitted limited exchanges on the comparison methodology and approach developed in both country. These exchanges should be reinforced in 2006 with the finalization of the powerpoint.

Exchanges of personnel between team are summarized in the following table.

**Table 3 : Exchange of personnel and visits in 2005**

to From	BOLIVIA	BRESIL	FRANCE	ENGLAND
<b>BOLIVIA</b>		W Cossio (3 days, april 2005) N. Faysse, A. Duran, R Penareta, V Cossio, F Quizoz 1 week dezembro 2005	B Paz (10 days 1 week 2005) N. Faysse (Cirad Funding, 1 week january 2005)	
<b>BRESIL</b>	P. Jacobi, W Gunther, Y Carvalho, M Camargo, L Clavel, V Barban (1 week, May 2005) – RPG Training course C Rabak (POLI-USP) (January 2005 1 week) R Ducrot (April 2005- 10 days- May 2005 – 10 days – November 2005, 3 days) P Bommel (May 2005 5 days),		R Ducrot (1 week, January 2005 CIRAD Funding)	
<b>FRANCE</b>	M Etienne (INRA-CIRAD) , May 2005 1 week			
<b>ENGLAND</b>	J Butterworth (10 days – April 2005)	J Butterworth (3 days april 2005) J Butterworth (5 days, December 2005)		

### 3.3 Administrative and financial aspects: adaptations made

Important time was devoted to the elaboration of the detailed activity program for 2005 and the corresponding budget for the different partners.

After finalization this program and budget, it appeared necessary to provide cash advances to various partners in order to compensate for the delay of payment. This was negotiated between CIRAD and USP and CIRAD and POLIS in Brazil, CIRAD and UMSS and NRI and CERES in Bolivia.

Various partners, more specifically Apta and AIIEGEA have faced important difficulties in 2005 linked to misunderstanding of E.C financial functioning and payment delay.

Due to internal reorganization within APTA and problem of cash, no activities have been carried out during the first 8 months of 2005 in this institution. After various meetings, it has been possible to propose a negotiated program and budget which allow finalizing the work initiated, carry out some complementary studies depending of Apta expertise and allow the participation of the APTA in WP4 and WP5. The negotiation also included the transfer to CIRAD and POLIS a small part of the initial budget of Apta in order to finalize WP4 activities. The final amount is being negotiated.

The remaining budget Unicamp that was initially affected to participation to WP4 will be transferred if possible to Polis to support the finalization of the game and implementation of the test session (WP4).

An internal agreement allowed the transfer of the remaining budget of CERES, (mainly allocated for diffusion of the results and outcomes and WP5) to UMSS to carry on the activities of WP5 that was supposed of CERES responsibility.

The total of all transfer will be inferior of 20 % of partners' budget and total budget.

### **3.5 Development of related project**

The ALFA project GovAgua contract ("Environmental Governance in Peri-urban Water Basin Management in Metropolitan Areas – social, environmental, territorial and institutional dynamics" of a duration of 36 months between USP and The European Commission have been signed. It gathers 1 academic institutions among which 5 are participating in the Negowat project.

In 2005, Cirad has been initiating a project (GRENAT) about the pollution impact of agricultural practices in 3 sub regions of Brazil (Mato Grosso, Nordeste, and Metropolitan Region of Sao Paulo). The activities of the Grenat project in Sao Paulo are being developed in collaboration with APTA and in strong interrelation with the Negowat activities.

The French Ministry of Foreign Affairs also supported some collaborative activities between CIRAD and APTA on the issue of quality and marketing organization in horticulture crop.

A French research project (« la modélisation d'accompagnement : une pratique de recherché en appui au développement durable comMod ») have been approved in 2005 and will be funded by ANR (Agence National ede la Recherche). This project proposes to assess the comMod approach as a whole, by comparing various experiences developed over the world by the comMod group (Cirad, Inra, Cemagref). The Negowat activities are part of the interventions that will be monitored and compared in 2006 and 2007.

### **3.6 Outline plans for next years**

Elaboration of the final reports of the project and organization of the final NEGOWAT meeting in September 2006 to end the project.

- In Brazil, field activities will end at the end of September 2006, final report of each institution. The institution final report will have to be provided end of October 2006.
- Scientific activities in Bolivia will end of April with completion of the report end of May. A detailed work plan to end the activities in Bolivia have been agreed?



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## **4. Annual Report 2005**

# **PARTNERS' CONTRIBUTIONS**

**Covering period from 1<sup>st</sup> January 2005  
to 31<sup>st</sup> of December 2005**

## **Project NEGOWAT**

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## 4 PARTNERS CONTRIBUTION

### 4.1 CIRAD Annual scientific report (2005)

The CIRAD Negowat team includes Dr Raphaële Ducrot, posted in USP-Brazil, Dr Nicolas Faysse posted in Centro-Agua UMSS in Bolivia, Pierre Bommel based in Brasilia.

In the project, CIRAD is responsible for the general scientific coordination in Brazil and Bolivia. It provides methodological support in the different work-packages and tasks.

In 2005, the Cirad scientists have been more precisely involved in 3 main activities:

- Finalization and diffusion of the WP3 report: In the initial work plan, this WP was to be coordinated by Apta, but given the internal difficulty of this partner, the finalization and edition of the report was transferred to the responsibility of the project coordinator.
- Elaboration of the simulation and discussion tools and method. In Brazil, the coordinator of the project and Pierre Bommel were directly involved in the elaboration and development of 3 tools. In Bolivia, Dr Nicolas Faysse was more specifically involved in the development of the tools and method concerning support to potable water committee.

Organization of the test of the tools and monitoring program (WP4). In Bolivia, Dr Nicolas Faysse also coordinated the elaboration of method of assessment and monitoring of the intervention. He was more specifically involved in the intervention "support to potable water committee" and supervised the work related to the "mitigation of urbanization impact in irrigation schemes". Dr Faysse is also coordinating the replication work of the approach in other situations. In Brazil, the coordinator is participating to the planning of activities for the implementation of both processes.

#### **4.1.1 CIRAD in Work Package "Collect Complementary Data – conduct complementary field studies" WP 3 –Brazil and Bolivia: Finalizing edition of WP3 synthesis report.**

The field studies aimed to synthesize existing information and provide complementary data to back intervention. The report have been elaborated and diffused, in a paper and CD format.

R Ducrot. 2005 ed. WP3 report. Brazil 242 pages ; Bolivia. 142 pages + CD.

In Brazil, a common publication that will summarize the main results of field research and its consequences for catchment management and tools development have been initialised, under Dr Ducrot's coordination. The objective is to publish this paper in a Brazilian Journal.

In collaboration with Apta, Cirad was involved in the development of a specific diagnostic concerning the impact of agricultural activities on water quality. This work had not been initially planned in the project work-plan but appears to be strategic in the negotiation within Cabeiceras-Tietê catchment committee. Complementary funding from Cirad permitted to implement this preliminary study.

This 6 months study aimed to (i) assess available information on the issue (ii) identify farming practices in order to propose a realistic methodology for the assessment of water pollution (water analysis) and monitoring of farming practices at catchment level. The methodology relies on (i) interviews of main leaders (ii) gathering existing secondary data (especially water analysis results), (iii) interviews of 30 farmers. The main difficulty was to quantify the practices, in a context where more that 170 crop are being cultivated. The study proposed an interview guideline that permitted to identify the main products used and quantify their use.

The study underlined the huge variability of products and related practices in the area. This variability raises various methodological questions for further work (What products have to be looked for in water analysis? How to organise the sampling strategy? ). We were not able to identify recent water data and analysis, and only came across data published in 2000.

The results were presented to the main agricultural actors and representative of the catchment committee in November 2005. The actors have underlined their interest to get updated information and organise their own monitoring activities on this issue. They were willing to support a specific research action that would contribute to develop a methodology for monitoring the impact of agricultural practices on water quality. It has been proposed to develop the basis of such a project in 2006, by completing some information. In 2006, Cirad will participate to the elaboration of the new research project (to be coordinated by Apta) along with the other actors (FSP, APTA, local actors). (This activity will be developed with Cirad financial funding).

In Bolivia, Dr Faysse coordinated a study that reviewed the institutional models for water supply and sanitation in Latin America and Central America per urban areas where water is supplied by community-based drinking water committees (Courivaud, A, 2006).

#### **4.1.2 CIRAD in Work package "Tools and models design and development" WP2.**

##### ***Cirad in Task 2.2 Develop simulation tools in Brazil***

###### *Objectives and methods*

Our work plan initially included the development of one model by catchment. It was adapted to the situation chosen to be dealt with: 4 tools are thus being currently being developed:

- a) The role playing game JOGOMAN, viewed as a prototype to capacitate the team on the development, building and implementation of a simulated role playing game and related session (especially animation and debriefing aspects). This prototype evolved in an academic training tool, aiming at introducing discussions about objectives, potentialities and functioning difficulties of a catchment committee.
- b) A computerized game named TER'AGUAS, that aims to discuss the impact of land use changes, land speculation and urban planning (including urban infrastructure development) on water quality at local level (a territory of 10km<sup>2</sup>).
- c) This game is completed by a non-computerized tool (JOGOPOL) focusing on water pollution dynamic. This game is more oriented toward environmental education of local communities than discussion/concertation.
- d) A multi-agent model is being developed in order to represent land and water management at catchment level (1500 km<sup>2</sup>) and introduce discussion on the evolution of agriculture in the Cabeceiras-Tietê (SPATMAS)
- e) AGUALOCA is a computerized game that aims to discuss multi-uses of water at catchment level from a double perspective: water allocation and pollution management.

R Ducrot is directly involved in this work package and coordinates and orients the development the tools.

###### *State of advancement and main achievement for 2005*

###### **JOGOMAN**

R Ducrot has participated to implementation 5 test sessions of the JogoMan games implemented organized by Procam. These tests were monitored following the monitoring proposal of Procam.

A master thesis analyzing the potential and limits of this game, testing this methodology, and comparing various local experiences on role playing games is currently being finalized (M;E Camargo's Master thesis coorientation Dr Jacobi and Dr Ducrot)

###### **AGUALOCA**

Four meetings were held between May and July 2005 to define the game structure: the meetings gathered specialists in hydrology and water quality (Suzana Sendacz, Wanda Gunther, Lucie Clavel) of agriculture (Yara Carvalho, Terezinha Franca). They help to define the game basis. The game was then developed by Lucie Clavel (CIRAD-Procam) with support of Poli-USP (Cesar Rabak and Danilo Figueredo) for computing development. The work was supervised by R Ducrot.

A specific effort was made to represent the water dynamic and integrate various aspects of water quality in the model, in relation with actors activities. But limited available information, that was spread among various institutions were responsible for important delay in the development of this task..

A first version is to be provided at the end of January. The final version, after integrating actors commentaries is expected end of march. A first internal test of the material and game has been implemented (15 December 2005). It led to simplification of the game materials and supports.

## SPATMAS

In 2005, the work focused on the representation of water allocation and integration of quality functions in the model. R Ducrot supervised this part of the work with important inputs from Lucie Clavel. The development of the model has been stopped in order to first finalize the AguAloca model.

## JOGOPOL

The work carried out by a student (Camille Rojot) integrated in the Polis institute was co-orientated by R Ducrot and Dr Barban. A first version of the game has been tested with some actors. Results of the test are presented in part 4.3 of the main report. The final version must be finalized by end of February 2006.

## TERAGUAS

Various meetings were held between February and June 2005 in order to elaborate the game basis. These meetings gathered various specialists of the project (Maria Eugenia Camargo, Pedro Jacobi, Wanda Gunther, Terezinha Franca, Vilma Barban). The computer version was implemented by Raphaële Ducrot (Cirad). A first version has been elaborated. The game is being calibrated. A first test of the game (with student of the project) have led to amelioration of some functions.

### *Results and outcomes*

#### *Method for the development of the tools*

The development method is inspired from the companion modelling approach and aims to use tool development as a mean (i) to discuss articulation between disciplines and integrate thematic knowledge (ii) to discuss differences and integrate technical and non technical knowledge and representation (scientific and non scientific knowledge). The workshop with thematic specialists aims to propose the game basis which is then developed and implemented by modellers. Tests within the team and with students aim to validate the representation proposed and the "feasibility" of the game (ability to be played). It is then tested by a small group of actors that validates (or not) the representation proposed by "experts". The game might be readapted to integrate representation or interests that were not adequately taken into account or integrated in the version of the game"

The detailed methodology is presented and discusses in the main report.

#### *The specificities of the Negowat games compared to other Brazilian experiences.*

In Brazil, games have been used as environmental education tools for local communities (Camargo and al, in press) or as tools to train decision makers of government agencies in negotiation techniques ("governance games"). The Brazilian Negowat games aim to facilitate the discussions between both types of actors as well as help them facilitate their understanding of the relationship between institutional background, and the dynamic of the resources, and its management process.

The development of this type of game relies on the identification of actors, the identification of the resources dealt with, the characterization of the dynamics of the resources, the characterisation of interactions between actors and resources, and between actors, the clarification of spatial and temporal scale of the different interaction and dynamics. While the development of governance game gives a strong emphasis on identifying and characterizing actors interaction, the development of the Negowat games focuses on the interaction between actors and resources.

Other differences lies the timing of the game (much shorter for Negowat games, but longer than educational games), the preparation material given to the players, the spatial support, the sequences within game rounds (with succession of individual decision making phase and collective decision making phase, implementation of decision phase, diffusion of results to actors by specific indicators. Information is disclosed regarding specific interests of actors.

### *Cirad in Task 2.2 Develop simulation tools in Bolivia*

Two games were designed: SosteniCAP for the process with drinking water committees, and Larq'asninchej for the process on the impacts of urbanization (for more details, see the Centro AGUA annual report). Dr Faysse was more specifically involved in the design of the first RPG.

During 2005, SosteniCAP was played 7 times with local stakeholders, and Larq'asninchej 10 times. Moreover, a simple RPG was designed and played once with local organizations in Sucre (for more information on the use of these 3 RPGs, see Centro AGUA annual report).

## Results and outcomes

### *Calibration and test of the game*

The design of SosteniCAP led to an interesting choice in terms of calibration. Initially, the game was played with around 15 players, each of them playing a family of a theoretical drinking water committee. The committee would be thus a committee of 15 members (or families). Its account would be simple, but far from the actual accounts of any committee of the peri-urban area of Cochabamba. The average number of members per committee is indeed around 100 families. This lack of realism was mentioned by some persons in the Villa Oruro, the first drinking water committee where SosteniCAP was played.

Given this, in Barrios Unidos it was decided to try another type of calibration: each player would play a family, but this family would itself "represent" 10 families (i.e., a block within the committee area). This led to drinking water committee's account very close to the real ones. It appeared that the benefits of capacitating the players about the accounts of the real committee outweighed the difficulty of increasing per 10 the results of any action of a player.

The test of the RPGs, previous to being played with local stakeholders, was undertaken in two ways: with students and with local leaders. It appeared that the sessions with students are really different from the ones with stakeholders. Students do not know the local context and issues, therefore they focus on the rules of the game, the quantitative elements, and how to maximise their revenue or points in the game. On the other hand, local stakeholders focus on the qualitative side of the game and do not pay much attention to the quantitative elements. Therefore, it appeared very important not to limit calibration to sessions with students.

### *Difficulties for the convocation*

Convocation to the RPG sessions was difficult, since first grassroots members of periurban community have a weaker sense of the group than in more rural areas, and many of them are not ready anymore to spend time in setting up collective action. Moreover, in Barrios Unidos and Villa Oruro, community members have informal trading activities, and they travel often: It proved difficult to find moments in the week where they would be present in the community and available for participating in a collective workshop.

Though the use of the RPG was overall a success, it proved difficult to monitor the exact contribution of the game sessions within the whole process, in terms of capacitating local stakeholders and motivating them into modifying their opinions regarding other stakeholders' claims.

### *Possibilities to scale-up the use of these RPGs.*

Two different games have been designed: On the one hand, Larq'asninchej is a game where the rules are fully adapted to the local communities where it was used. Much attention was devoted to the game part, in particular the graphic interface. A limitation is that this well-developed game would not be easily transferred to other context. On the other hand, the SosteniCAP game is more generic, with much fewer graphic interfaces. However, its generic structure would enable to play it with most of the drinking water committees of the Cochabamba Valley.

Though these games are all in all specific to the context in which they were used, the Negowat team was well capacitated in the design and use of these RPGs. Practical experience was acquired. As a consequence, most probably, the design of a new RPG for a completely different process would be much quicker.

### *Distance with reality*

The two games were designed so as being at a medium distance with reality. The game needed to be close enough from reality to enable players to use elements of the reality in the game (for instance, rules to take decisions, or elements to justify his actions). In the same time, the game needed to be far enough from reality in order to prevent a situation where real local conflicts between players would destroy the game dynamics.

## **4.1.3 CIRAD in Work package "Develop and test an approach to facilitate negotiation combining various tools"- WP 4-**

Given the very different state of advancement and methodological focus in Brazil and Bolivia, the Cirad activities and scientific report in this work-package is presented in different parts.

### **COMMON ACTIVITIES**

#### *Task 4.1.1: Training course "development of role playing game for natural resources management"*

The objective of this task was to organise and implement a course in order to capacitate scientists of the project in the elaboration of role playing game for research-intervention for natural resources management.

The session was coordinated by Dr Michel Etienne from INRA-CIRAD (France). The trainers were Dr Pierre Bommel, Dr R Ducrot, Dr N Faysse from CIRAD and Dr B Paz from UMSS-Centro Agua. It has been

organised by Dr Paz, with the support of Dr R Etienne and Dr R Ducrot. In order to organization this specific Latin-American session, the trainers participated to a first course organized by Cirad/INRA/Cemagre in January 2005.

The course was organized in Bolivia from the 23 to the 28 of May 2005. Six person of the Brazilian team (4 senior scientists, 2 students), 5 person of the Bolivian team and 6 persons of UMSS and Ceres participated to this training course.

The training was a fundamental task for the participant to enable their active participation in WP4. Details of the outcomes of the course and critical analysis are provided in the main scientific report

#### *Task 4.2 Development of a monitoring method for RPG and agreement building*

The objective of this task is to design a method to monitor and assess discussion during the simulation – role game playing session. Each team have elaborated its own proposal taking into account the main focus of the tools (game or other) used, their integration in the global intervention process and the different referential basis used.

**In Bolivia**, the work was coordinated/supported by Dr Nicolas Faysse. The method has been used to monitor various game sessions in Bolivia. This ex post evaluation was based on 1) the written notes, audio records and video records from the RPG sessions; 2) ex post interviews with people that came to play as well as people who decided not to participate in the RPG. The last evaluation of SosteniCAP, held in Barrios Unidos, was complemented by an ex ante analysis of the knowledge and opinion water users had of their water committee.

In order to evaluate the RPG tool, several hypothesis and objectives were defined (i) Hypothesis 1. The stakeholders invited to played do accept to take time to play and enter in the game dynamics. (ii) Hypothesis 2. The players understand the game and can participate actively (iii) Hypothesis 3. The players accept the game as a representation of the reality.

In order to undertake the evaluation of the game, three main hypotheses were developed and tested.

**In Brazil**, this task is coordinated by Procama with the participation of Dr Raphaële Ducrot. The method is still being discussed. A first draft has been tested to monitor the academic session of JogoMan The analysis are part of a master thesis, in finalization coordinated by Dr Pedro Jacobi and Dr Raphaële Ducrot.

The method proposed (i) a rapid assessment of 5 simple questions answered by all players at the beginning of the game (reason of participation, main representation on the problem) (ii) 5 questions answered by the players at the end of the question (what did they learn about the issue studied, about negotiation (iii) a monitoring guidelines with a synthesis to be provided at the end of the game (iv) a more detailed interview to analysis game impact after some times (this part has not been tested yet).

The different approaches, the state of advancement, the different theoretical background made difficult the elaboration of common method and framework analysis. Coordination between both teams (Bolivia, Brazil) is mainly done through discussion between Cirad scientists. This discussion benefits from the support of an internal discussion- research activity of the commo group (Cirad, Cemagref, Inra) about this question.

End of 2006, beginning of 2007, Cirad will fund specific investigation monitor a-posteriori (after a couple of months) the impact of the method for local stakeholders.

### **BRAZIL**

#### *Cirad in Task 4.2 : Design method for discussion session implementation in Brazil*

The objective of this task is to design methodological steps of the intervention processes with the stakeholders, with use of the one or various modelling tools.

In Brazil, two processes are to be implemented: (i) negotiation between local actors, mayors and catchment committee about local land planning (and its relation with specific local legislation for water protection) (ii) internal discussion within the committee about joint management of water allocation and water quality, with a specific attention of discussion of the evolution of agriculture in the catchment.

In each line of action, the main intervention framework have been delineated but there has been little advance in the definition of a precise strategy for each intervention process.

An "organization committee" has been created in the Cabeceiras-Tiete sub catchment to elaborate a complete strategy. The committee has asked for a rapid test of the game in order to define a local implementation strategy



and articulate the intervention with their own plan of activities. They have also asked for implementation of the game in some training activities where they are being involved.

R Ducrot is coordinating the definition of the strategy in both cases, and is specifically involved in the organization of the articulation and links between the activities carried out by the different partners in each line of action. A lot of work is devoted to help the partner to understand the links between activities and partners, to underline bridges and similarities of conceptual framework supporting analysis, tools and activities. This demand for coordination is important as each main partner tends to favour his "traditional clients" (actors with whom they are used to work with: for example Procarn with the sub-catchment committee, FSP with local actors and municipalities (especially health service), Apta with agricultural stakeholders, Polis with district leaders). This results in difficulties between partners, a global feeling that each other interests are not properly taken into consideration by the other partners and difficulties to keep a global vision of the ultimate objective of the work. There is thus a strong centrifugal force that limit the articulation between partners and facilitate the scattering of activities between them, each one their own work method and specific approach. The spatial repartition of the partners (Sao Paulo is a huge city) and the peripheral situation of the areas studied do not help to organize the coordination and articulation. This difficulty is accentuated by insufficient human resource in coordination (the coordinator is also very much mobilized in modelling activities) and the limited availability of the senior scientists to accompany the whole process of method definition, tool elaboration and field work. They thus fail to see the articulation between the different activities and their full contribution to each part of the work. The articulation is not intense enough to compensate for all this centrifugal tendencies. In 2006, we will try to intensify communication between partners to try to solve this difficulty. However, better communication will not entirely resolve it: Given the complexity of the whole process, it seems difficult have a complete grasp and control of the activities unless dedicating a full time research activity to the process.

In Bolivia, the same problems has ended in concentration of the work within a small group of people (Negowat group of Centro-Agua), the other scientists (non part of the group) not being very active in the activities of the project.

#### *Cirad in Task 4.3 Organize validation workshop in Brazil.*

In Brazil, Dr Raphaële Ducrot is being involved in the design of the validation workshop and analysis of the session and validation, jointly with other partners (Instituto Polis and Procarn-Usp).

Only one workshop was implemented in 2005 to validate the JogoPol game, oriented toward environmental education on water pollution dynamics for local actors (part of the Teraguas process). The test was implemented the 17<sup>th</sup> of December 2005. The test planned for the 21<sup>st</sup> of December with the management Cabeiceras-Tiete committee had to be postpone because delays in game development.

The Jogopol game session underlined the necessity to reorganise a more playful game, to introduce subterranean water in the possible resources for domestic supply (a major failure in the conceptual background of the game). It also indicated that this environmental education type of game is little adapted to a public of local district leaders which are looking for constructive discussions with Sabesp and mayors on land use planning. Thus, the TerAgua game could better answer to their preoccupation as it more clearly deals with this issue. JogoPol seems more adapted for community level activities, eventually supported by local leaders, and completed by a complete set of educational booklet (information of legal and institutional background)

A complete strategy of implementation will to be defined at the beginning of 2006. It will necessitate contact with the Catchment Agency, municipalities, technical body of planning of sub-catchment, Sabesp and related project.

The planning of work with Cabeiceras Tiete will be elaborated in collaboration with the small committee elaborated.

### **BOLIVIA**

#### *Cirad in Task 4.2 Design method for discussion session implementation in Bolivia*

The method is presented in the Centro Agua report. Important differences between Bolivia and Brazil led to specific methodological choices and types of RPG. It is possible to single out three main differences.

- 1) In Bolivia, there was no negotiation process within which it appeared possible to use RPGs. There are very few formal multi-stakeholder processes in Bolivia: Negotiations are taking place always in an informal way, which entails that it may be difficult for an external institution to enter as Facilitator of the process. This is especially valid for the Tiquipaya Municipality. Consequently, the Bolivian



Negowat team had to design two specific intervention processes in which it could be possible to insert RPG sessions. An interesting outcome of this situation is that it was possible to design simultaneously the whole process and the RPG, i.e., it was possible to decide where to position the RPG within the whole process, how linkages could be thought from the outset between both, etc. On the contrary, in Brazil, the games are thought to be inserted in already existing multi-stakeholder processes, e.g., the Catchment Councils.

- 2) In Bolivia, the zone initially chosen for the Negowat project was the Tiquipaya Municipality. There are many problems and conflicts related to natural resource management in this area, especially related to water resources. However, it was evaluated that it was not possible to support any discussion on this topic. As a consequence, two other intervention processes were designed. The first one deals with the management of drinking water committees. The second one is about the problems of impact of urbanization on irrigation canals. Since the first one dealt with only relation among stakeholders, and the second one only needed a simplified vision of the water resource, it appeared that there was no need to have a computerized model of the natural resource dynamics. Therefore, no Multi Agent System was used in Bolivia. On the contrary, in Brazil, many efforts were devoted to the design of computer-models that would be able to represent the dynamics of water (quantity, quality) within an RPG.
- 3) In both Bolivian processes, the RPGs were designed to be used with grassroots' stakeholders, which entailed specific attention to make sure that persons with little formal education could participate in the game. The counting activities to be undertaken by the players were simplified to the maximum. On the contrary, in Brazil, almost all the games are designed to be played by persons who have more than average formal education (with the exception of Jogopol).

*Cirad in Task 4.4 : implementation of intervention process to support negotiation Bolivia.*

Result and outcomes

*Fulfilment of the hypothesis for use of the RPG*

The detailed evaluation of the completion of these hypothesis are in Peñarietta (2005) y Quiroz (2005).

*Fulfilment of initial objectives*

Three objectives were defined initially: 1) capacity-building, 2) motivation vis-à-vis the whole intervention process and ice-breaking between stakeholders; and 3) discussions of possible solutions.

In both cases of SosteniCAP and Larq'asninchej, the RPG was evaluated as a powerful tool to do capacity-building and enable better dialogue between local stakeholders. Larq'asninchej proved also useful to motivate local community-members in entering the intervention process. The discussion of possible solutions to the problems addressed in the game were mainly on the principles themselves, and not on technical details, since the games did not enabled detailed technical discussions of solutions. However, in some specific cases, the RPG did lead to proposals that could be implemented in reality. It was the case for instance of a definition of a tax to be paid by water committee members with delays in the payment of their water tariff in the Barrios Unidos water committee. Another example was the proposal to deviate the canals to the streets, in order to not having them passing by private properties, in several sessions of the Larq'asninchej game.

All in all, the RPG is a very interesting tool to capacitate and promote discussion. It was nevertheless evaluated that playing RPGs sessions with all grassroots stakeholders is costly in terms of time spent in inviting community members.

#### **4.1.4 CIRAD in Work package "scaling up"- WP 5-**

*Cirad in Task 5.1 Training Material development*

R Ducrot and N Faysse were involved in the elaboration of various drafts of slides to be elaborated and participated to the various meetings of WP5 preparation coordinated by NRI. .

More specifically, CIRAD is involved in the elaboration of the following slides :

Title of the slide	Scientist of Cirad involved (with others)	State of elaboration
global overview of periurban area	R Ducrot	1 <sup>st</sup> draft
Multi-agent system	R Ducrot, P Bommel	
Monitoring and evaluation of intervention in negotiation processes	N Faysse, R Ducrot	
Facilitation and mediation skills	R Ducrot	
Potable water committee : how to analyse and build capaciteu in community managed periurban system	N Faysse	2 <sup>nd</sup> draft submitted
Role playing games use and assessment Bolivia and brasil	N Faysse, R Ducrot	1 <sup>st</sup> draft for Bolivia
Role playing games introduction	R Ducrot, N Faysse	1 <sup>st</sup> draft
Multi-stakeholders plateforme	N Faysse	Done
Overview framework for using tools and methodologies	N Faysse, R ducrot	1 <sup>st</sup> draft
presentation of the Sao Paulo Context	R Ducrot	1 <sup>st</sup> Draft

A majority of the slides will be finalized by end of April 2006. They will be tested in short course that will be developed in each country (in UMSS for Bolivia, in USP for Brazil)

#### 4.1.5 Product and outcomes

##### Publications

##### Publication in refereed journal

Raphaëlle Ducrot, Ana Karina S. Bueno, Bastiaan Philip Reydon, 2005. Institutional arrangements for articulating land and water management in peri-urban catchment: example of the metropolitan region of São Paulo, Brazil. *International Journal of Water*, Vol. 3, No. 2, 2005, 186-203

Mya Bouzid, Raphaëlle Ducrot, Yara M. Chagas de Carvalho, Rosely Aparecida Liguori Imbernon. 2005. Dynamiques agricoles périurbaines et gestion intégrée de l'eau, Cas d'un bassin-versant producteur d'eau dans la région métropolitaine de São Paulo (Brésil). *Cahiers agricultures*, Cahiers Agricultures vol. 14, n° 1, janvier-fevrier 2005, 131-137.

Mya Bouzid, Raphaëlle Ducrot, Yara M. Chagas de Carvalho, Rosely Aparecida Liguori Imbernon. Dinâmicas agrícolas peri-urbanas e gestão integrada da água : Caso de uma bacia produtora de água na Região Metropolitana de São Paulo. *CADERNOS DE CIÊNCIA & TECNOLOGIA*, In press.

M.E Camargo, R Ducrot, P Jacobi. Using role-playing game for capacity building on water and land management: comparing some Brazilian experiences. *Simulation and Gaming*, in press.

##### Seminar and conferences

Ducrot R., Paz B., Pouget J.C, Tundisi J.G.. Le développement d'outils de simulation pour faciliter les consultations concertations dans pour la gestion de bassins versants peri-urbains: exemple de São Paulo, Brésil. Eds. D.V Savic, M.A Marino, H H. G. Savenije, J.C Bertoni. *Sustainable Water Management Solutions for Large Cities. Proceedings of symposium S2 held during the Seventh IAHS Scientific Assembly at Foz do Iguaçu, Brazil, 3-9 April 2005. IAHS Publ. 293, 2005. 132-140.*

##### Others (internet, on line report, etc)

CD : Material do Curso Taller : Enfoques e instrumentos de negociacion para la gestion integral de recursos hidricos. 25 -29 Abril 2005. Cochabamba. Bolivia. UMSS Centro-Agua, LA-WETnet, PROMIC, WALIR, NEGOWAT, CAPNET, GWP SAMTAC.

CD : Material do Curso "enfoque de juego de roles en la modelacion de acompanamiento. 23-27 de mayo 2005, Cochabamba Bolivia. Proyecto Negowat. CIRAD, INRA, Centro Agua-UMSS,

Adamatti, D.F.; Sichman, J.S.; Bommel, P.; Ducrot, R.; Rabak, C.; Camargo, M.E.S.A\*. JogoMan: A Prototype Using Multi-Agent-Based Simulation and Role-Playing Games in Water Management. \*CABM-HEMA-SMAGET, Bourg-Saint-Maurice, Les Arcs, France, 2005.

Nicolás Faysse, Vladimir Cossío, Bernardo Paz, Franz Quiroz, Raúl Ampuero. 2005. Use of a methodology to support the design of a short-term Multi-Stakeholder platform: the case of a water and sanitation project in Tiquipaya (Bolivia). NEGOWAT, Cochabamba - Bolivia ([pdf file](#) 207 Kb). Spanish version ([pdf file](#) 144 Kb). Accessible in the website :

Nicolás Faysse, Vladimir Cossío, Bernardo Paz, Franz Quiroz, Raúl Ampuero. 2005. A Methodology for intervention in the design and evaluation of a short-term Multi-Stakeholder Platform. NEGOWAT, Cochabamba - Bolivia ([pdf file](#) 112 Kb). Spanish version ([pdf file](#) 144 Kb). Accessible in the website.

#### *Project reports*

Ducrot R ed. 2005. Second Annual Report covering period 01/01/04 to 31/12/04. Project Negowat. Report CIRAD n° 62/04. 120 p. + annexes. CD

Ducrot R. ed. WP3 Report. Bresil. + CD.

Ducrot R ed. WP3 report Bolivia

#### *Publication in preparation (submitted)*

Anne Chohin-Kuper, Raphaële Ducrot, Jean-Philippe Tonneau and Edolnice da Rocha Barros. Role-playing game development in irrigation management: a social learning approach. Chapitre d'ouvrage, Ed. S. Perret, In press.

#### *Visiting scientists and Exchanges of scientists*

- Raphaële Ducrot : Coordination visit in Bolivia – 25-29 abril 2005, 21st-23rd November 2005, 17th-27th May and participation to the training course as teaching professor “Methodologies for negotiation on water management” organized by LA Web-net, Negowat and PROMIC (april 2005) and organization and implementation of the training course of Role Playing games
- Pierre Bommel : teaching professors fo the Negowat training course on Role Playing Games (23-27 May 2005)
- Nicolas Faysse and Raphaelae Ducrot : 1 week, January 2005 CIRAD Funding : to participate to the Commod training course on RPG for natural resources in order to prepare the organization of the Negowat training course.
- Nicolas Faysse, Brazil, Sao Paulo 10 – 15<sup>th</sup> December 2005. participation to the Negowat meeting.



## 4.2 NRI Annual scientific report (2005)

### ANNUAL SCIENTIFIC REPORT OF PARTNER : NATURAL RESOURCES INSTITUTE



Natural  
Resources  
Institute

#### NRI in work package 4

##### **Objectives and methods**

The fourth work package focused on facilitating negotiations over peri-urban land and water conflicts. NRI's role involved supporting the Bolivian partners, especially Centro AGUA.

##### **State of advancement**

NRI's role in this activity was limited to commenting on reports and papers, and supporting documentation by Centro AGUA in relation to the 'Mesa Tecnica' process, and the process of negotiation/ capacity building for locally-managed domestic water supply systems in Tiquipaya and Colcapirhua, Bolivia.

##### **Results**

Results are reported by Centro AGUA.

##### **Deliverables and outcomes**

See Centro AGUA part of this report

##### **Links with other task or work developed by other partner**

This work was implemented by Centro AGUA

##### **Difficulties and problems**

None

##### **Outline for next year**

These activities are complete, although we expect to be asked to comment on and help edit further documentation

#### NRI in work package 5

##### **Objectives and methods**

This work package involves the validation of methodologies (testing the methodologies in other catchments) and the development of training materials. NRI are coordinating the development of training materials.

##### **State of advancement**

During 2005:

- Detailed outlines were developed for the training materials with involvement of all partners in Bolivia and Brasil.
- A detailed plan for completion of the training materials was developed during and following visits by John Butterworth to Bolivia and Brasil in April including workshops with the team focused on training materials on 11 April (Cochabamba, Bolivia) and 15 April (Brasil). Activities are coordinated by institutes Centro-Agua and CERES in Bolivia and POLIS in Brasil. Modules from India (linked to related DFID supported research) will subsequently be added.
- Initial training modules were tested as part of the LA-WETNET (the Latin American partner of the CAP-NET network for capacity building in integrated water resources management) training course/ workshop in conflict resolution held in Cochabamba in May 2005.
- John Butterworth visited Bolivia in August 2005 focusing on supporting the Bolivian team in further development of training materials, and he visited Brasil in December 2005 for a joint meeting of Bolivia and Brasil research teams where a further one-day workshop was held on the training materials as part of the team meeting

## Results

- The agreed detailed plan for the training materials is to produce, test, finalise and disseminate training materials that can be used by the research partners and other organisations to strengthen capacities in the main focus of the project: methodologies for negotiating peri-urban land and water conflicts. These training materials are targeted at middle-level professionals and students (e.g. NGOs, regional and local government staff, University staff and researchers) involved in the management of land and water resources. Training is focused on transferring and developing knowledge in appropriate methodologies for use in different situations on potential and actual conflict. The training materials are made up of a series of modules (see list below for proposed list of modules). Each module includes a powerpoint presentation, and one or more supporting documents/ papers providing further information. All these materials will be made available on a CD and the project website. The modules are:

### *Contexts: an introduction to peri-urban land and water conflicts*

- A global overview
- Cochabamba, Bolivia
- Sao Paulo, Brasil
- Chennai, India
- Governance and negotiation processes: characteristics and frameworks

### *Methodologies and tools for negotiations*

- Overview framework for using tools and methodologies (e.g. companion modelling approach) within negotiation processes
- (Short-term) multi-stakeholder platforms
- Role playing games: an introduction
- Role playing games: use and assessment within intervention processes in Bolivia
- Role playing games: use and assessment within intervention processes in Brasil
- Multi-agent systems
- Bayesian networks
- Scenario-based planning
- Monitoring and evaluation of interventions/tools in negotiation processes
- Facilitation and mediation skills
- Negotiation strategies and techniques

### *Other methodologies to support negotiation processes in peri-urban zones*

- Stakeholder analysis
- Drinking Water Committees: How to analyse and build capacity in community-managed peri-urban systems
- River Basin Committees: building on social capital and networks
- Statistics and surveys: How to analyse and use statistics on urbanisation and to undertake household surveys in peri-urban zones
- Land use: How to analyse land use in peri-urban zones
- Land Markets: How to investigate land markets in peri-urban zones
- Water Rights: How to investigate water rights in peri-urban zones
- Multiple Water Use: How to understand multiple uses of water in peri-urban zones
- Hydrology of peri-urban catchments (quantity and quality)
- Agricultural change in peri-urban catchments
- Mitigating impacts of urbanisation on irrigation systems
- Analysing health impacts of water and sanitation access in peri-urban areas
- Development processes to build upon recreation and environmental value of mixed land use in peri-urban areas



**Deliverables and outcomes**

- 19 draft training modules out of (now) 29 have been completed. These are in various stages of testing, approval, editing and translation (into English, Spanish and Portuguese).

**Links with other task or work developed by other partner**

The major inputs to this task have been made by Centro AGUA (Vladimir Cossio) working closely with NRI. All other partners have also been involved in the development of modules.

**Difficulties and problems**

It has been difficult to mobilise the inputs of all the partners in a timely fashion and some modules are still only partially completed and need some improvement. Other researchers have been reluctant to rapidly develop 'draft' training modules based on our existing knowledge (for subsequent later improvement) preferring to wait to until other research activities have been completed.

**Outline for next year**

- Planned training courses in November/ December 2005 coordinated by Centro AGUA in Bolivia, but have now been rescheduled for March 2006. Training programmes and most of the materials are already developed.
- To publish draft training modules on website after approval
- Over the coming months further content from Brasil and India will be included in modified training modules which are currently biased towards approaches and examples from Bolivia
- Book/ final scientific report proposal to be developed and chapters developed (Bolivia chapter likely to be completed by June 2006, India and Brasil chapters will be slightly later)



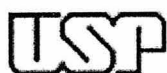
4.3 USP Annual scientific report (2005)

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

**Contract number: ICA4-CT-2002-10061**

*Facilitating Negotiations Over Land And Water Conflicts In  
Latin- American Peri-Urban Upstream Catchment:  
Combining Agent-Based Modelling With Role Playing Game*

**NEGOWAT Project  
Annual Scientific Report  
Partner n° 3 : USP**



**Universidade de São Paulo**  
B R A S I L

Prof. Pedro R. Jacobi

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December 2005

## USP – Annual Scientific Report 2005 – Negowat Project

### 4.3.1 POLI GROUP

Components: Prof. Jaime S. Sichman; Cesar S. Rabak; Danilo Z. Figueiredo.

#### *Project Negowat USP in work package WP3 – task Jogoman*

##### *State of advancement*

First, we can cite that two more tests of the game were performed, in different environments other than the Project staff.

Moreover, additional scenarios were implemented to allow the RPG to be played with a richer mix of roles modelled in the system.

Perhaps the most important additional facility that was developed was the one that enables logging and replaying parts of the game. This facility was both implemented and tested. This added functionality has brought more dynamism to the RPG sessions, as mistakes in the players' moves can be corrected more easily; on the other hand, this facility made a "what-if analysis" possible in real time, during the debriefing sessions. Finally, this feature has brought the possibility of continuing partially played games, thus increasing the number of rounds for the game, since these are not obliged to be played in one single session.

A specific version of Jogoman has been fitted with Web services (using the SOAP protocols), using the facilities available in the programming environment (VisualWorks). This facility will enable in the future a certain number of players to be replaced/simulated by another multi-agent environment. This feature will be used in the Phd thesis of Diana Adamatti, a former collaborator of the project.

##### *Main results and outcomes:*

The Jogoman system has been put in use in RPG sessions.

The logging code has been successfully re-used in another task's project (Teraguas).

#### *Project Negowat USP in work package WP3 – task SPATMAS*

A meeting in Bolivia, from January 10<sup>th</sup> to 14<sup>th</sup> was carried out to gather the modelling of the catchment's area (Cabeceiras-Tietê). The participants of this meeting were Bernardo Paz Betancourt and Cesar S. Rabak.

##### *Objectives and methods*

SPATMAS is a simulator of the hydrological behaviour of a basin (Alto Tietê). It was implemented in CORMAS platform. It uses historical data from rain regimes and simulates twelve catchment areas (that are functionally equivalent to the eighteen physical ones) that supply water to the rivers of the basin. The network consists of natural rivers and artificial canals, dams, sew treatment plants, water treatment plants, pumping stations, etc, which supply water to the consumption nodes. These are represented in the demand side, based on historical data from consumption areas.

##### *State of advancement*

An appropriate algorithm from Graph Theory in the platform's language (Smalltalk) was implemented.

The integration of GIS (Geographical Information Systems) data with CORMAS platform was put to use in the SPATMAS model. Several layers for the same region were used to reflect the different changes in the basin during the years.

Moreover, means for replacing the maps as the model simulation advances in time were provisioned.

##### *Main results and outcomes:*

Parts of the simulation engine were used to develop another project's (Aqualoca).

### ***Project Negowat USP in work package WP3 – task Agualoca***

#### ***Objectives and methods***

Within the Agualoca task, which consists of a RPG, our group has developed a simulator whose objective is to make all the hydraulic and environmental simulations for the game.

Briefly, Agualoca animates a synthetic basin, and a set of screens allows the different users to take several actions, thus modifying the environment. The simulator computes the impact in the basin in two aspects: the hydrological regime and the quality of water thorough the basin.

Agualoca construction employed the techniques already mastered by the group, namely the use of the CORMAS platform, Object Oriented Analysis (OOA) and Object Oriented Design (OOD).

In this task, our group has introduced a software development process called **Concurrent Engineering** to expedite the construction of the software and its ancillary artefacts, thus reducing the delivery time of the project.

#### ***State of advancement***

Agualoca is currently in the calibration and beta testing phase. First live tests are expected to occur in the second half of this December.

### ***4.3.2 PROCAM group***

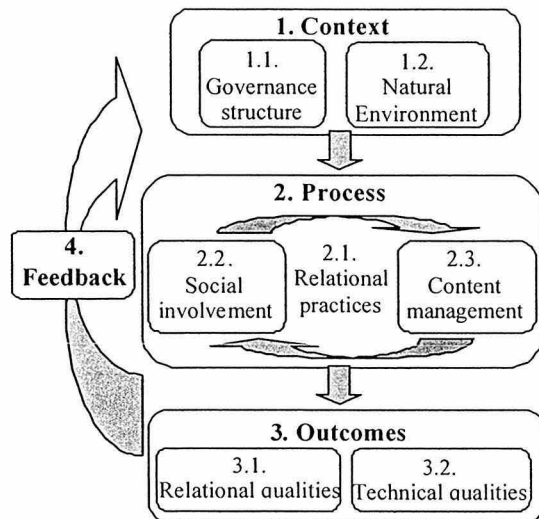
The PROCAM group is composed in 2004 by Prof. Pedro Jacobi (coordinator), Maria Eugênia Camargo (MsC student), Sandra Ines Granja (PhD student) and Marialina Lima (MsC student).

#### ***PROCAM/USP in WP4.1 and 4.2: Complementation of Project Bibliographic work on conflict negotiation and consensus building methodologies , in depth study of conceptual framework on “Social Learning for water Management” and development of evaluation and monitoring tools 4 WP4– task 4.1(PROCAM)***

#### ***Objectives and method***

The PROCAM team has as its objective to elaborate, structure and test a methodology to evaluate the methods combining multi-agent added to role playing games. The instrument is designed to evaluate if the game allowed the players to be clear about strengths and limits that a simulation can do.

To know the theoretical framework on Social Learning, based on the idea of learning together by doing together. This approach has been very useful to develop the monitoring and evaluation tools. It relates according to Harmonicop document (Dec. 2003) “to the growing capacity of social entities to perform common tasks related to a river basin. It is both a process and an outcome”. It deals mainly with changes in attitudes, beliefs, skills, capacities and actions. what was done in urban and environmental area about Role playing games and to analyze the limits and potentialities of role playing games in capacity building processes of stakeholders with low education level on environmental management.



Source: Harmonicop- Social Learning in RBM - Dec. 2003

#### *State of advancement*

First we developed a bibliographic work on Social Learning, developed by Harmonicop. The group developed a reflexion based in the outcomes of the research in development, combining the theoretical scope of the project and the application of games emphasizing the negotiation (construction of gradual consensus, consensus building) and Social learning, analyzing how a succession of negotiations has to be a permanent and continuous, always turned to the future, to the rationality of a collective decision making process and to the selection of alternatives to define the desired scenario for peri-urban basins.

#### *Main results and outcomes*

The mains outcomes are preliminary working papers to be improved on Social learning in the peri-urban basins of the MRSP. The analysis of the brazilian experiences of role playing games has been concluded and the comparison with one of the role playing games of Negowat project- Jogoman has also been concluded. This outcome is the Master Thesis of Maria Eugenia Camargo to be concluded until February 2006. New students have been engaged at PhD the development of methodologies applied to the mediation of conflicts and a systematization and analysis of the interdisciplinarity of the Negowat project and Master level (networking of social practices of the agriculture segment in Cabeceiras).

The group has also developed three different instruments to evaluate the games that are being developed and tested. The group has been involved in both the development of the new games participated in the meetings of Negowat to build the game Ter Aguas and Agualoca.

The group also concluded the study of the social practices in Tiete- Cabeceiras, and is presently working on a final text.

#### *Links with other tasks and work developed by other partners*

These activities have been closely linked to Instituto Polis, partner of Negowat project, due to the important articulation linked to the stakeholder analysis. The group has had also important links with the group of Centro Agua in the discussion of the theoretical framework on water governance. The analysis of the material had a support from Raphaele Ducrot, Negowat coordinator.

#### *Plan for next year*

Development of the theoretical references of Consensus Building and Social Learning and its application to the river basins.

In 2006 the group will concentrate its activities in the monitoring of the application of role playing games and its respective simulations. To invest in scenarios of negotiation that may approximate an equation that combines improvements in management of river basins and participation in River basins committees.

Organize a Seminar on Negotiation and mediation of conflicts associated to river basin management to take place at USP. Presentation of texts in ANPPAS Congress in Brasilia and in other Seminars on Social Learning in River Basin Management. Preparation of articles to be sent to scientific journals on 1) Social Learning in River Basin Management, 2) Negotiation and mediation as tools of social learning.

Participation in World Congress of Sociology – with accepted paper on Water Management in MRSP in Durban. Participation in World Water Congress in Mexico.



***PROCAM/USP in WP4: Project 2. Jogoman: Training material development, Testing sessions at local universities and Evaluation in WP4 - task 4.1***

*Objectives and methods*

Development and adaptation for an academic public of the role playing game called Jogoman tested process at the Negowat Project scope. The game represents a simplification of the real phenomena of interaction between several actors to discuss the pollution problem of a reservoir. The main goal was to evaluate the limits and the potentials of these kind of tools.

*State of advancement*

The testing sessions that began in 2004 were concluded in 2005.

*Main results and outcomes*

The game *Jogoman* is a good tool to illustrate how the Water Committee works in Brazil and how the water legislation was implemented in the country. It is also a good way to train people for the interactions between the stakeholders on the water management. During the year the game was improved with the suggestions given by the players.

Links with other tasks and work developed by other partners

This task is closely linked to POLI group and to Raphaële Ducrot, Negowat coordinator

***PROCAM/USP in WP5:***

Preparation of Training Material on Negotiation and Mediation of Conflicts, Stakeholder Analysis, Water Management in River Basins in SPMR

***PROCAM/USP in WP6:***

Coordination of Alfa Project –GovAgua- Prof. Pedro Jacobi – organized the first meeting of a network of 10 institutions- six from LA and four European to exchange experience between LA and Europe an Water Governance, and many issue are directly linked to Negowat outcomes.

Participation in Workshop on Methodologies of Role Playing Games in Bolívia in may 2005- Pedro Jacobi e Maria Eugenia Camargo.

Organization of Negowat Workshop Negowat in December 2005 with Raphaele Ducrot –Pedro Jacobi and Sandra Ines Granja.

***Publications***

a.1. Pedro Jacobi and Sandra Ines Granja- Paper for the Seminar “ Encuentro por una Nueva Cultura del Agua en América Latina, em Fortaleza: "APRENDIZAGEM SOCIAL NA GESTÃO COMPARTILHADA DE BACIAS HIDROGRÁFICAS EM ÁREAS PERIURBANAS NA AMÉRICA LATINA". Published Cd and site.

a. 2. Article to be published in Simulation and Gaming produced in co-autorship between Maria Eugenia Camargo, Raphaele Ducrot and Pedro Jacobi - “Using role-playing game for capacity building process on water and land management: comparing some Brazilian experiences”

***4.3.3 School of Public Health group***

The team of the Faculdade de Saúde Pública (School of Public Health), coordinated by Professor Doctor Wanda Maria Risso Günther and the Master student Mariana Gutierrez Arteiro.

***USP in WP3 Mapping of sanitary conditions of three cities in Tiete Cabeceiras sub- basin***

*Objectives and methods*

The objectives of this research stage had been to identify the sanitary conditions of population health's in cities of Tietê Cabeceiras catchments and to verify the existence of interference of sanitation services in the quality of life of the population.

To identify the conditions of public health some indicators have been selected that can be correlated with the sanitary conditions of a place, being these: infant mortality rate and infant mortality by infectious and parasitic illnesses.

#### *State of advancement*

The FSP group concluded its analysis of the outcomes of the field work on urban expansion and access to water services and sewage in the sub-basin of Tietê Cabeceiras. The research is based in documental and bibliographical analysis of the available data obtained from the municipalities and from the state company of basic sanitation. It indicates that the municipalities of the sub-basin, had between 2003 and 2005, an urban growth above the average of the São Paulo Metropolitan Region of São Paulo (1,39% per year) and the state (1,72% per year). Several municipalities have had a growth over 4,5% per year. However, most of the municipalities indicated a decrease in the public water provision in this period, and the development of new irregular settlements without basic sanitation infrastructure.

The main issue of these municipalities is about the collection and treatment of sewage, because of them do not even reach 30%, and others do not treat the collected sewage, throwing to the rivers the totality of the sewage and this contributes to the pollution of Tiete River.

The precarious conditions of basic sanitation has an impact in the health conditions of the population of the areas under study, observing an inverse relation between coverage of attention of basic sanitation systems and infant mortality due to infectious and parasitic illnesses.

The group has also participated in the meetings to discuss and elaborate two JdRs – TerAguas and AguaAloca and also to Jogopol test, besides all meetings of Negowat Project. It also contributed with specific data to compose the informations of these role playing games developed by the brazilian Negowat team.

#### *Main results and outcomes*

The outcomes of research were presented and the abstract published in the annals of the international seminar that took place in São Paulo in November 2005:

Arteiro, MG Günther, WMR Expansão urbana, acesso aos serviços de saneamento e impactos à saúde na sub-bacia Tietê Cabeceiras. In: Conferência Regional sobre Mudanças Globais: América do Sul, II. São Paulo: IEA/USP. 2005.

An article was produced and sent to the XXIII Brazilian Congress of Sanitary and Environmental Engineering: Günther, W. M. R., Arteiro, M. G., Freitas, S. M. Acesso à água e afastamento de esgotos na sub-bacia Tietê Cabeceiras: Condições e Implicações Sanitárias e Ambientais. In: 23o Congresso Brasileiro de Engenharia Sanitária e Ambiental, September, 2005, Campo Grande, MS, Brasil.

#### *Plan for next year*

The group will conclude its analysis of the outcomes of the field work taking place in Tietê Cabeceiras on sanitary conditions. It will engage itself in the different activities of Role Playing Games.

4.4 APTA Annual scientific report (2005)



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

**SCIENTIFIC REPORT**

Dra. Yara M. Chagas de Carvalho

January – 2006

## ANNUAL SCIENTIFIC REPORT OF PARTNER: AGÊNCIA PAULISTA DE TECNOLOGIA DOS AGRONEGÓCIOS-APTA

APTA's activities for 2005-2006 were organised in six blocks, related to previously defined tasks, under NEGOWAT: 1. WP3-Ending research work; 2. WP3-Ending research work: complementary issues; 3. WP4-Testing farmers' empowering tools for water use negotiation; 4. WP4-Appling NEGOWAT tools with different stakeholders; 5. WP4-Developing instruments for water conflict negotiation; 6. WP5-Disseminating information to stakeholders.

### **4.4.1 Task : WP3 - Ending research work: integrating contributions**

The lack of financial resources and the incapacity of APTA's administrative body to understand the European Community disbursement system led to the need of finishing Balainho's land use maps. The activities developed in WP3 (2004) identified new topics for research, integrating the work of different APTA's (IEA's) researchers.

It has been developed four studies: 1) Production systems in Alto Tiete Cabeceiras and Guarapiranga: a statistical analysis departing from the field work; 2) Agriculture in urban water supply watershed: its water demand compromises its multifunctionality role? ; 3) Agriculture in Alto Tiete water basin: a statistical evaluation in other two water supply sub-basins; 4) The rural tourism policy in Alto Tietê basin.

#### **Objectives and methods**

The first three studies are mainly statistical. The major objective is to have a more general evaluation of the agricultural activity in the watershed processing the statistical data available according to the systems of production typology, identified previously. The data base considered is Levantamento das Unidades de Produção Agropecuária-LUPA realised by the Agriculture Department of São Paulo State and the Cadastro dos Irrigantes (irrigators survey) under the responsibility of SABESP. Clusters are defined through a set of variables. In the first case the identified region is the two sub-basins where agriculture is more relevant. The third study considers the whole basin. The second aims to refine water demand evaluation in cabeceiras sub-basin considering microcatchments and irrigation practices identified through field work and local workshops.

The perspectives for rural tourism are dependent of local policy and local social organisations. The main objective is to identify the "state of the art" through county agencies and private organisations working in the field.

#### **State of advancement**

The first two statistical studies have been processed and results are being analysed. The third will be started in march. Field work in the tourism project has just started.

#### **Results**

Not available.

#### **Deliverables and outcomes**

Four papers. Knowledge about regional agriculture is necessary for water negotiation in the water committee and also to craft the perspective of agriculture as an environmental service to be promoted through Reserva da Biosfera do Cinturão Verde de São Paulo.

#### **Links with other task or other partners**

The results are necessary for task 3.

#### **Difficulties and problems**

Lack of resources and institutional commitment with the project, along 2005, set a burden on researchers. The work has to be developed through Christmas holiday, summer vacation and Carnaval (end of february).

#### **Outline for next year**

There is now a strong institutional effort to overcome the problem increasing the number of researchers involved and establishing great flexibility to accomplish the necessary administrative procedures in order to fulfill the projects's new time table.

#### **4.4.2 Task : : WP3 - Ending research work: complementary issues**

Activities developed in WP3 (2004) highlighted some new topics for research to enhance farmers in the water negotiation process: 1) Economic aspects of the agricultural production in the Alto Tietê-Cabeceiras and 2) Rural social organisations and the viability of crafting a local sustainable development contract.

##### ***Objectives and methods***

The economic aspects of production is oriented to obtain production cost, the imaginary perspectives underlining technological options in four microcatchments, and the trade conditions in order to discuss, at the microcatchment level, the possibility and interest of developing a environmental label associated to adequate water use (workshops from march to september task 3). The microcatchment selection has considered the diversity of productive systems in Alto Tietê basin and the availability of public technical assistance to farmers. Trade conditions is being evaluated through interviews in local retail and large scale sellers appointed by interviewed farmers. The objective is to characterise the product flow through the production chain and their relative benefit, considering the traditional and the differentiated quality product.

The objective of the second project is to evaluate the existent rural social organisations and their interest and possibility for engaging in crafting a local sustainable development project. A field research will be conducted considering their recent evolution (from the increasing urbanisation process of the 70's through the more recent economic globalization) using the "snow ball" strategy. The considered organisations are related to agriculture, tourism or other rural related uses and there is an approximate number of 40 entities, identified by previous research work in the area.

##### ***State of advancement***

Field work and data being processed.

##### ***Results:***

Not available

##### ***Deliverables and outcomes***

Three sectors' report by the contracted students and two articles discussing: 1) Is the economic perspective a strategy to discuss an environmental label for agricultural products, in São Paulo-Brasil; Is there a social organisation net compatible with the objective of developing a public action towards local sustainable development?

Organise farmers, at the microcatchment level, to work with the State Extension Service and the local Union, to adopt an adequate environmental technology and an associated label. Strength rural social organisations to work with the water committee.

##### ***Links with other task or other partners***

The first project is an input to task 3. The second is related to WP4 still in process in NEGOWAT

##### ***Difficulties and problems***

Number, variety and always variable market opportunities for horticulture products is associated to the lack of farmers' economic accountability and make the field research complex. It has been identified a large farmer (employs 60 workers and the cultivated land is 260 ha) with 60 different horticulture products.

Short and inadequate period to develop the research.

##### ***Outline for next year***

Finish no late than march 2006.

#### **4.4.3 Task : WP4 - Testing farmers' empowering tools for water use negotiation: an environmental label**

Workshops oriented to crafting an environmental label for agricultural production in water supply areas: water quantity

##### ***Objectives and methods***

It will be discussed with farmers, through their neighbourhood associations, their actual and potential water demand and economic conditions (cost and revenue) related to environmental practices. The objective is to evaluate the possibilities of crafting a set of "good practices rules" that can be identified with a "friendly quantity of water environmental label". Considering the data obtained in task 2: economic aspects of the agricultural production in the Alto Tietê-Cabeceiras and the water demand by production system, a first workshops will be organised: presentation of 10 system of production cost and identification of new necessary

systems. Others workshops will be: trade conditions and alternative markets; developing a working sheet for volunteer farmers' work on new cost systems; irrigation: equipment and energy cost; irrigation: soil coverage and riparian forest; low water demanding production systems and better irrigation system practices is proposed.

***State of advancement***

Organising the research group.

***Results***

Not available

***Deliverables and outcomes***

Two booklets for farmers: 1) How farmers can develop an environmental label; 2) Caring for water: a set of good practices for Alto Tietê farmers. This material is a demand from : Câmara Setorial de Horticultura and it will also be made available for the State Extension Service and Farmers Union, besides the associations directly involved.

***Links with other task or other partners***

Role Playing Game developed under NEGOWAT (WP4) will consider two types of agriculture: traditional and as an environmental services. This activity will be developed in partnership with Claire Cerdan from CIRAD. Some resources from Ministry of Foreign Affairs-MAE, from France, will finance her participation.

***Difficulties and problems***

The activity will be developed in a tight prevision of time and resources.

***Outline for next year***

It will be developed from March to August 2006.

**4.4.4 Task : WP4 - Applying NEGOWAT tools with different stakeholders**

Multiple Stakeholders Platform: treating water as a common good

***Objectives and methods***

To develop a common proposal of how to use the scarce water for the necessary multiple uses identified in a Baquiruvu river's microcatchment, in Guarulhos county. The County Labour Department is working with a farmers that are suffering urban population pressure for building a public school and a soccer field in their land. In the microcatchment, there is also scarcity associated to over use from farmers, during the dry season. The objective is to develop a consensual project re-defining alternative land use, the irrigation tank water system, the most adequate systems of production, particularly with best practices for water saving techniques and irrigation.

The methodology used will be the one developed by the Bolivian Negowat team (WP4), based on Multiple Stakeholders Platform developed by Wageningen University.

***State of advancement***

Organising the research group.

***Results***

Not available

***Deliverables and outcomes***

Two booklets for Agriculture Department of County (or State but working at the County level) Governments and/or Water Committee: 1) Negotiating a multiple land use project: water as a common good; 2) Crafting the technical project: step by step.

***Links with other task or other partners***

WP4 developed by UMSS-Bolivia

***Difficulties and problems***

The activity will be developed in a tight prevision of time and resources.

***Outline for next year***

It will be developed from March to August 2006.



#### **4.4.5 Task : WP4 – Developing instruments for water conflict negotiation**

Participation in the activities proposed by the NEGOWAT co-ordination:

Role Playing Game: training in Bolivia (one researcher from APTA);

elaboration and test of the different games being developed by the Brazilian team: JOGOMAN; TERAGUAS, AGUALOCA e AGUAPOL ( three researchers):

#### **4.4.6 Task : WP5 - Dissminating information to stakeholders**

##### ***Objectives and methods***

Development of joint power point presentations about: The Alto Tietê basin: an overview; methodology to work with peri-urban agriculture; methodology to work with rural development in peri-urban areas etc

##### ***State of advancement***

Some have been started

##### ***Results***

Not available

##### ***Deliverables and outcomes***

Power point presentations

##### ***Links with other task or other partners***

APTA's results for WP3. It will be jointly developed with partners in Bolivia and/or within APTA's researchers.

##### ***Difficulties and problems***

Time scarcity.

##### ***Outline for next year***

To be developed along the year.

#### **4.4.7 Publications**

##### ***Dissemination activities***

##### ***Publication in refereed journals***

BOUZID, M., DUCROT, R. CARVALHO, Y. M. C. , IMBERNON, R.A L. 2005 Dynamiques agricoles périurbaines et gestion intégrée de l'eau: cas d'un bassin-versant producteur d'eau dans la région métropolitaine de São Paulo (Brésil). Cahiers Agricultures v.14(1).p.131-138.

CASTRO, P. M. G.; MARUYAMA, L. S.; MERCANTE, C. T. J.; BEZERRA DE MENEZES, L. C. .2005. Perspectivas da atividade pesqueira no Alto Tietê: contribuição à gestão de usos múltiplos da água. São Paulo, Boletim do Instituto de Pesca, (prelo)

##### ***Other articles***

SENDACZ, S.; MONTEIRO, A.J.; MERCANTE, C.T.J.; MONTEIRO, A.J.; MENEZES, L.C.B.; MORAES, J.F. 2005 Sistemas em cascata: concentrações e cargas de nutrientes no Sistema Produtor Alto Tietê, São Paulo. in Nogueira, M.G.; Henry, R. & Jorcin, A..(eds) Ecologia de Reservatórios: Impactos Potenciais, Ações de Manejo e Sistemas em Cascata. p.417-434.

##### ***Communication in conferences***

CARVALHO, Y. M.C.; FRANCA, T. J. F.; BARBAN, V.; VICENTI, M. C.; FRANCISCO, V. L.a F.S. 2005. The São Paulo's Metropolitan area: environmental protection and poverty alleviation. XI World congress of

Rural Sociology. Trondheim, Norway. July, 25-30, 2004. (available <http://www.irsaworld.org/XI/papers/groups.html> group 18; captured 31/12/2005)

CARVALHO, Y.M.C ;FRANCA, T.J.F. 2005. A preservação dos mananciais da região metropolitana de São Paulo e a multifuncionalidade. IN: VI Simposio Latino Americano sobre investigación Y Extensión en Sistemas Agropecuarios (IESA-AL-VI). Colombia, 20-22 /07/2005. Proceeds.... (and CD-ROM).

CARVALHO, Y. M. C.; ZUCHIWSCHI, E.; FERREIRA, S. E.; FRABETTI, G. L. 2005. Perspectivas para a Agricultura da Bacia do Alto Tietê. IN: VI Simposio Latino Americano sobre investigación Y Extensión en Sistemas Agropecuarios (IESA-AL-VI). Colombia, 20-22 /07/2005. Proceeds.... (and CD-ROM).

CARVALHO, Y.M.C ;FRANCA, T.J.F. 2005. A preservação dos mananciais da região metropolitana de São Paulo e a multifuncionalidade. IN: XLIII Congresso da Sociedade Brasileira de Economia e Sociologia Rural – SOBER / 2005 FEA Ribeirão Preto-USP. Ribeirão Preto, 24 a 27/07/2005. Proceeds.... (and CD-ROM)

CASTRO, P. M. G.; MARUYAMA, L. S.; MERCANTE, C. T. J.; BEZERRA DE MENEZES, L. 2005. Diagnóstico da atividade pesqueira no Alto Tietê (São Paulo, Brasil): contribuição à gestão de usos múltiplos da água. IN: XVI Encontro Brasileiro de Ictiologia . João Pessoa, Jan. 2005. Proceeds....

CASTRO, P. M. G.; MARUYAMA, L. S.; MERCANTE, C. T. J.; BEZERRA DE MENEZES, L. C. 2005. Perspectivas da atividade pesqueira no Alto Tietê, São Paulo: contribuição à gestão de usos múltiplos da água. IN: XIV Congresso Brasileiro de Engenharia de Pesca. Fortaleza, 18-22/10/2005. Proceeds....

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#### *Communication in other media*

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#### *Training activities*

##### *MScs*

VIÉGAS, J. F.. Turismo em áreas de Manancial: Uma Análise da Vocação Turística na Região de Parelheiros, RMSP, 2005. São Paulo, Universidade São Marcos-USM, 159p.(dissertação)

BRIGNOL, V. Polution from agriculture in Cabeceiras do Alto Tietê bas in: data from São Paulo's Mtropolitan Region. French scholar visiting Instituto Biológico and Instituto de Economia Agrícola. Oriented by Serge Marlet and Raphaelle Ducrot. Co-oriented by Luiz Luchini and Mara DAndrea, researchers from Instituto Biológico's (APTA).

Laura Barcelos. Systems of production's cost. Graduate student at Escola de Agronomia Luiz de Queiroz-ESALQ/USP.

##### *Other trainees*

Tania Oshiro Nosse. Systems of production's cost. Undergraduate at Faculdade de Agronomia de Ilha Solteira-UNESP.

Rodrigo Pinheiro Cunha. Trade conditions in Alto Tietê Cabeceiras. Undergraduate at Faculdade de Agronomia de Botucatu-UNESP.

#### *NEGOWAT training course*

Role Playing Games in monitoring modelation. Chapare, Cochabamba, March, 23-27, 2005.

Participation in several role playing game sections organised by the Brazilian team, to test instruments being developed.

#### *Exchange of scientists*

MARLET, Serge. CIRAD. November, 16, 2005. Meeting with scientific partners and stakeholders . Presentation: BRIGNOL, V. Water pollution from agriculture in Cabeceiras Tietê.

#### *Intervention in existing training course*

Instituto de Pesca' Graduate School. Course: Fishing, Sustainability and Scientific Research.

CARVALHO, Y.M.C. Aspectos da sócio economia pesqueira: o caso do Alto Tietê. 03/05/2005.

CASTRO, P.M.G.. Perspectivas da atividade pesqueira no Alto Tietê: contribuição à gestão de usos múltiplos da água. August/2005

#### **Contract**

##### *Research contract*

Two new partnerships with CIRAD are being developed.

Financial support from Department of Foreign Affairs-France (MAE) for Claire Cerdan (CIRAD) to develop quality economics' project, to be started in 2006, under NEGOWAT.

Initial financial support from CIRAD to stimulate a new research group related to water pollution from agriculture. Serge Marlet (CIRAD) will co-ordinate researchers from APTA and USP.

##### *Expertise and technical support to decision makers*

NEGOWAT' development lead to an increased relation with county governments: Suzano and Guarulhos, but also with the São Paulo's Urban Agriculture Forum to develop an urban agriculture project. During 2005 there was continuous demand for consultancy in different issues. The sub-project platform is a demand from Guarulhos' Labour Department.

The State Horticulture Chamber, integrates public and private sector, is expecting contributions, in term of environmental rules, to the label being developed. The sub-projects: Economic aspects of the agricultural production in the Alto Tietê-Cabeceiras and the following workshops will initiate discussing issues related to quantity of water.

The extension service demanded integration with their microcatchment project financed by World Bank. The field work and the workshops will be realised in four microcatchments, one at each county.

At present time, NEGOWAT-APTA's coordinator is a representative of the scientific community in the Biosphere Reserve of São Paulo' Green Belt council and board of directors. This is related to the importance given to agriculture as an environmental service and particularly to its role in protecting the area. Currently, is engaged in discussing mitigating actions related to the Beltway that will cross Guarapiranga, Billing and Cabeceiras including the demand for a Fund to be created to invest in local sustainable development, particularly for the rural area.



4.5 IIE Annual scientific report (2005)



**PROJECT:**

**FACILITATING NEGOTIATIONS OVER LAND AND WATER CONFLICTS IN LATIN AMERICAN  
PERIURBAN UPSTREAM CATCHMENTS:**

**COMBINING MULTI AGENT MODELING WITH ROLE GAME PLAYING (CIRAD- FRANCE)**

**SCIENTIFIC REPORT**

**INTERNATIONAL INSTITUTE OF ECOLOGY (IIE)**

**INTERNATIONAL INSTITUTE OF ECOLOGY AND  
ENVIRONMENTAL MANAGEMENT (IEGA)**

**FINAL REPORT**

**Prof. Dr. José Galizia Tundisi**

**January, 4, 2006**

**SECTION I-**

## 1. INTRODUCTION AND GENERAL OBJECTIVES OF THE RESEARCH

The availability of freshwater plays a vital role in the economy of the society as well as in the hydrosocial cycle. In many metropolitan regions water quantity is fundamental to supply the urban population as well as for the necessary multiple uses such as recreation, irrigation, industrial uses. The conservation of water in metropolitan regions as well as the need to maintain a good water quality in the sources is a matter of public health security for the large metropolitan populations. (Gleick, 1998).

In the Metropolitan Region of São Paulo, water quantity and water quality are a critical issue. The region has only a maximum of 5 to 10% capacity to manage and transfer the total water volume available that is around 75 m<sup>3</sup>/s. Many sources of water are contaminated and polluted demanding enormous expenses for treatment of water, specially in those areas where eutrophication and non point sources of Nitrogen, Phosphorous and other elements and substances are discharged into the rivers and reservoirs such as the lower Cotia (Baixo Cotia Watershed). A relationship was shown (Tundisi, 2006 in press) between eutrophication of reservoirs and cost of water treatment.

An unknown contribution of atmospheric deposition (dry or wet) is also a matter of concern, considering the air pollution in the Metropolitan Region or pollution carried by air masses from external sources located in the interior of São Paulo, State.

Therefore mechanisms, projects and programs of management of water quantity and water quality in the Metropolitan Region of São Paulo have a considerable strategic importance due to the accumulation of urban population (22 million inhabitants – 12% of the Brazilian population in 1% of the territory of Brazil – 8.000 km<sup>2</sup>).

The participation of IIE and IIEGA in the NEGOWAT project – hydrological processes – is part of a large scale effort of these two institutions in other regions of Brazil. Therefore three other projects have an interface with NEGOWAT utilizing the same methodology to approach problems of water quality and water quantity providing a basis for public policies and management initiatives. These projects and their connections and interfaces with the NEGOWAT project will be described in the end of this report (Section IV).

In this report IIEGA and IIE describe the scientific activities developed and the tasks performed in the year 2005 for the NEGOWAT project. Four main scientific activities were developed with methodology already established in the past years which are also utilized in other projects that interface with NEGOWAT.

- a) The determination of the hydrological dynamics and the water availability in the sub-basins of the Cabeceiras do Tietê basin.
- b) The application of the model MQUAL for the estimation of non point sources of phosphorous and nitrogen for the reservoirs, and rivers of the Cabeceiras Tietê sub-basins.
- c) The role of wetlands in the control of the biogeochemical cycles in the Cabeceiras Tietê sub-basins and other sub-basins of the São Paulo Metropolitan Region. The role of vegetation of the Biosphere Reserve of the Metropolitan Region in the control of eutrophication.
- d) The status of eutrophication of reservoirs of the Cabeceiras Tietê sub-basin and other reservoirs of the Metropolitan Region of São Paulo.

These four topics encompass a series of problems related to: water quantity and its availability, water quality, sources of pollution and contamination and natural mechanisms of feedback and control. The development of the four topics is fundamental for the application of management alternatives including negotiations over water uses and allocation of water resources to the components of the society and water users.



## SECTION II -

### 1. WATER AVAILABILITY AND WATER QUANTITY IN THE CABECEIRAS ALTO TIETÊ SUB-BASINS

**1.1-Objectives** – To analyze the rainfall, and stream flow using a data set of information from 1970 – 2000. To describe the relationship between rainfall and flow in the 18 hydrological units – sub-basins – in order to facilitate the simulation and organization of scenarios, for future management purposes and control.

**1.2-Methodology** – 22 pluviometric stations are in operation for the Cabeceiras Alto Tietê watershed. This region was divided in 18 sub-basins and the historical data set was analyzed. Not all stations are in operation; therefore the most reliable series of data were obtained for 12 pluviometric stations. A correlation at analysis was established to compare the data of this 12 stations and high correlation was obtained with a confirmation of accuracy and reliability. An analysis of the flushing for the 18 sub-basins was performed utilizing data accumulated in the DAEE data bank. For each pluviometric station the surface drainage was obtained. The flushing related for each of the 18 sub-basins was determined taking into account the discharge for each sub-basin, the surface drainage and rainfall.

**1.3-Results** – Table 1 shows the average rainfall for the period 1970 /2000 and the number of monthly data obtained for each station. Besides this the average rainfall for the driest and wettest year was analyzed (Table 2).

The complete set of results was presented in a report (Tundisi,J.G.; Vannucci, D.; Abe, D.S.; Tundisi, J.E.M., 2005) to NEGOWAT.

An advance for this research is to estimate the contribution of each sub-basin related to suspended matter transport as a consequence of watershed occupation and erosion. The question is which volume of sediment is removed from the soil and transported to rivers and reservoirs. Experimental work performed at IIE (Matsumura-Tundisi et al, 2005) showed that 20 tons of top soil / hectare are removed yearly from the Tietê / Jacaré watershed located in the center of São Paulo State. Next stage of this work is to estimate this contribution in the Metropolitan Region of São Paulo.

**1.4-Comments / difficulties / future work** – The data bank and the number of stations operating effectively was difficult to access. There are few data on sediment transport and erosion for the Metropolitan Region of São Paulo. The only large scale evaluation was made by Campagnoli (2002). *Future work should concentrate on the integration of water quantity / water quality data and sediment transport once the two last processes are related to land use / water use.*

**Table 1** – Number of monthly rainfall data and average rainfall - 1970/2000

Pluviometric station	Number of monthly data	Average rainfall
Usina Salesópolis	360	1487,7
Itaquaquecetuba	357	1475,8
Estaleiro	356	1458,4
Carmelina	307	1451,3
Sertãozinho	340	1499,0
Capixinga	337	1366,2
Santo Ângelo	369	1492,1
Taiacupeba	362	1656,8
Salesópolis	366	1227,6
Casa Grande	365	1999,4
Ribeirão do Campo	363	2209,3
Suzano	369	1498,1

**Table 2** – Rainfall in the pluviometric stations for 10 wettest and driest month

Pluviometric station	Average rainfall (1970 – 2000)	Average rainfall 10 years	Yearly rainfall ((average)
1- Usina Salesópolis	1488,6	1227,2	1844,4
2- Itaquaquecetuba	1458,4	1125,3	1760,1
3- Estaleiro	1434,8	1098,1	1771,4
4 – Carmelina	1430,9	1223,0	1670,9
5- Sertãozinho	1528,0	1198,7	1908,2
6 – Capixinga	1354,4	1024,4	1757,4
7 - Santo Ângelo	1490,1	1179,3	1781,7
8 – Taiaçupeba	1661,9	1307,3	2012,1
9 – Salesópolis	1207,8	989,5	1411,0
10 - Casa Grande	1989,0	1511,5	2494,1
11 - Ribeirão do Campo	2213,8	1897,9	2575,0
12 – Suzano	1461,5	1288,9	1481,4

### SECTION III –

#### 1. EVALUATION OF THE WETLANDS OF THE METROPOLITAN REGION OF SÃO PAULO IN THE RECYCLING OF N, P, AND HEAVY METALS

##### 1.1 Objectives

The capacity of the wetlands to interfere with biogeochemical cycles, reducing N by denitrification and fixing P in the roots of vegetation and associated bacteria, fungus, periphyton is well documented (Zalewski et al, 2004).

The Metropolitan Region of São Paulo specially at the Cabeceiras Alto do Tietê watershed has many wetlands which are important components of the mosaic of vegetation and natural ecosystem.

##### 1.2 Methods

Methodology utilized is at current use at IIE and IIEGA laboratories. Collection of samples and their treatment followed the standard techniques for evaluation of N<sub>2</sub>O emission, P and N concentration and other chemical and physical parameters (Abe et al, 2003).

##### 1.3 Results

Results show that capacity of nitrogen removal at Parelheiros wetland (taken as an example for the MRSP) is approximately 5 Kg of nitrogen m<sup>2</sup>/year. Therefore 1 km<sup>2</sup> of wetlands would remove approximately 5 tons of N/year.

##### 1.4 Comments / further work

Estimations of the whole area of wetlands in the MRSP are in progress in order to evaluate their ecological role in the whole process. This is a valuable tool for water purification based on natural processes and should be an important basis for negotiations / solution of conflicts of land / use water uses in the MRSP. Comparative work with the Tietê / Jacaré watershed and the urban / rural area of São Carlos municipality is in progress. The evaluation of the capacity of wetlands to remove heavy metals is in progress.

## 2. APPLICATION OF MODELLING PROCEDURES FOR TO ESTIMATION OF THE NON POINT SOURCES TO RIVERS AND RESERVOIRS

### 2.1 Objectives

Simple models for estimation of non point sources to aquatic systems and for management of rivers, lakes and reservoirs were utilized in several instances (Young et al, 1989; Corwn & Waggoner, 1991; Chapman et al, 1995). Load coefficients are estimated based on land use, soil types, soil uses. Models for water quality are several in use such as the Pamolare (UNEP, 2002) ou QUAL 2E.

### 2

We have applied the MQUAL model by utilizing the information on land use and the water quality. This model was adapted by IIE/IIEGA in several research works such as in the São Francisco River Basin (Technical Report, IIEGA, 2005) or in the Tietê / Jacaré watershed study (Matsumura-Tundisi et al, 2005). The models consist of:

- a) Simplified models of hydrologic simulation and water quality.
- b) Ecological model of eutrophication risk
- c) Evaluation of contribution of each component of land use / soil type as a non point source.
- d) Tools for data treatment
- e) Statistical analysis and graphic production

Contribution of urban and rural areas was considered for non point sources:

- ♦ Primary forest
- ♦ Agricultural area (permanent)
- ♦ Agricultural area (temporary)
- ♦ Urban area
- ♦ Periurban area
- ♦ Industrial and commercial area

Point sources were considered as load capacity per person per year (1 Kg. person<sup>-1</sup>.year<sup>-1</sup> for the phosphorous contribution).

Export coefficients for the above areas were calculated accordingly to Salas & Martino (1991), for tropical lakes & reservoirs.

Phosphorous concentrations in the reservoirs was estimated as:

$$M_b = K_i.A_i + \dots K_j.A_j + \frac{K_L.P_L}{\text{population}} + \frac{I_n}{\text{point sources}}$$

rural areas, use and occupation of soil

Where:

$M_b$  = load generated in the watershed

$K_i \dots K_j$  = export coefficient

$A_i \dots A_j$  = area in hectares. Division by 100 corrects hectares in km<sup>2</sup>.

$K_L$  = export coefficient due to population (kg<sup>-1</sup>.person.day<sup>-1</sup>)

$P_L$  = total population with direct wastewater discharge

$I_n$ : all point sources (sum up)

For the phosphorous concentration in the reservoirs. Salas and Martino, 1991, formula was used:

$$P = \frac{L}{V \left( \frac{1}{t} + \frac{z}{vt} \right)}$$

Where:

$P$  = Phosphorous concentration

$L$  = Load : g / year

$V$  = Volume (m<sup>3</sup>)

$t$  = Retention time

$z$  = Sedimentation coefficient

vt

### 2.3 – Results

The non point source input from the soil / land uses, was estimated for several units in the MRSP specially at Cabeceiras Alto Tietê watershed .Results obtained demonstrated the relationships of soil uses / conservation areas with phosphorus inputs.

## 3. EUTROPHICATION OF RESERVOIRS OF THE MRSP

### 3.1. Objectives

The Metropolitan Region of São Paulo has 22 shallow reservoirs (< 30 m depth).

The evaluation of eutrophication process was part of a large scale strategic study for these reservoirs.

Frequent water blooms of cyanobacteria occur as a consequence of eutrophication.

### 3.2. Methodology

Trophic state index utilized the Carlson Index Formula (1977) consisting of

$$TSI = 10 \times 6 \frac{(\ln(48 / Pt))}{\ln^2}$$

### 3.3. Results

Most of the reservoirs of the Cabeceiras Alto Tietê watersheds are mesotrophic to eutrophic. In order to control the progress of eutrophication the following measures were recommended: **wastewater treatment, protection / conservation of forests and wetlands in the MRSP, reforestation, construction of pre reservoirs and education of public and authorities on the problems generated by eutrophication.**

### 3.4. Comments / Future Work

A relationship between eutrophication and costs of water treatment for public use was shown. (Tundisi, 2005 a,b; Tundisi et al, 2006 in press). The impact of cold fronts in the reduction of the frequency of water blooms was demonstrated (Tundisi et al, 2004; Tundisi 2005 in press).

Eutrophication has an economic, social impact and it is a matter of concern for public health / collective security of the population. Future work will continue to monitor eutrophication processes. (Tundisi et al, 2006 in press).

The calibration of these models is a matter of concern and future work; validation is under way using data of recent field work and better estimates of load with more details included, such as aerial non point sources (Jorgensen, 2004). The estimative of emission of greenhouse gases (CH<sub>4</sub>, CO<sub>2</sub>, CO, N<sub>2</sub>O) by eutrophic reservoirs is in progress ( Abe *et al* 2006, in press). A model of frequency of water blooms and cold fronts,/periods of stability of the water column is in progress with a collaboration IIEGA/University of Copenhagen(prof. J.E. Jorgensen and is modeling team)

## SECTION IV - INTERRELATED PROJECTS

### 1. RESEARCH PROJECTS

#### 1.1 Introduction

In section I it was stated that the participation of IIE and IIEGA in the NEGOWAT project is part of a larger scale effort in projects of water availability / water demand, water quality carried out in other regions of São Paulo State. Therefore a **comparative** data set is being established integrating scientific information from other watersheds with varying degrees of impacts and multiple uses. These projects utilize the same methodology applied in the NEGOWAT project, therefore a **comparative** approach is possible and feasible.

## 1.2 Projects in progress

**1.2.1** – Present and potential soil use for the São Carlos town watershed – a basis for public policies for urban and rural planning sponsor: FAPESP (Public Policies Program- Process number 98/10924-3 – second phase), principal investigator José Galizia Tundisi. This project utilizes the study of the urban and rural watersheds at São Carlos municipality in order to provide a scientific and technological background for planning. The cartographic basis was digitalized, geology, pedology and topology were studied as well as soil use and water availability. Water quality, biotic integrity, areas of potential impacts, areas for water conservation were established and certainly will be a useful tool for planning and management. Soil use and occupation studies will sponsor new public policies for this urban and rural area. One of the proposals of IIEGA for the São Carlos municipality is to develop the concept of the “water farms”. This concept is as follows: the rural areas in the headwaters will be protected from agricultural development by paying off the farmers not to use the land adjacent to the water sources. In this way a substantial portion of the water sources will be protected, and water quality will be secured.

**1.2.2** – Project 2 – Development of indicators of the watershed quality of Tietê / Jacaré (SP) and Miranda River (Mato Grosso) for the classification of the water quality and scenarios for future development. Sponsor (FINEP Proc. 01040999-00). Principal investigator Dr. Takako Matsumura-Tundisi. This project is part of a strategic plan of actions for management two watersheds: one in the Tietê / Jacaré in the center of São Paulo State and one in Rio Miranda (Mato Grosso State). Water availability for the last 30 years was obtained from existing data sources. The water quality for rivers and reservoirs of sub-basins is obtained from several sources and field work. Soil uses and water uses are obtained with the use of satellite images, information from the municipal sources and local/regional data sources. Scenarios and mathematical modeling by using the MQUAL model will be applied for the two watersheds. Scenarios will include land use, water uses, population growth and economic development of the two watersheds.

**1.2.3** – Project 3 – Eutrophication of the six reservoirs of the Tietê River watersheds: technologies for management. Principal investigator: Prof. Takako Matsumura-Tundisi. Partners: IIE, IIEGA, ILEC. Sponsors: FAPESP, FINEP, CNPq (several research projects). In this project the status of eutrophication of six reservoirs of the Middle Tietê River is being studied and the impacts of watershed uses (water uses, land uses, deforestation) are quantified. Interrelationships with the emission of greenhouse gases and eutrophication are developed in a corresponding project sponsored by FAPESP (Proc. Number 04/13782-8) – Dr. Donato Seiji Abe – Principal Investigator. A management plan for the six reservoirs and their watersheds is in progress.

## 2. CAPACITY BUILDING PROJECTS

### 2.1 – International projects

International Institute of Ecology is in charge of a large scale project of implementing 6 centers of innovation, research and capacity building for managers in the following countries: Brazil, China, Kazakhstan, Jordan, Poland and South Africa. This program is sponsored by the IAP (Inter Academy Panel an association of 96 Academies of Science). Centers in Brazil, China, South Africa and Poland are in advanced stage of implementation. This project is financed by IAP and several local / regional / international funding agencies. Capacity building of water resources managers will be one of the priorities of this project.

### 2.2 – National / Local / Regional Projects

A training course for 30 managers of SABESP was given in October 2005. This is a joint venture between the Corporate University of SABESP and IIEGA. The program developed theory, practice in field work, description and discussion of strategic water plans for the Metropolitan Region of São Paulo. Next programmed activity for 30 managers is to be developed in February, 2006. During 2006 and 2007 capacity building activities for 60 managers of the Tietê / Jacaré watershed will be developed with support of CTHidro – CNPq. The capacity building activities promote a focus on water quality / water quantity / water availability / water uses / legislation / watershed management and technological developments (real time monitoring; mathematical modeling) and mechanisms of interaction and negotiation in the watershed committees.

## SECTION V – SUMMARY AND CONCLUSIONS

The evaluation and characterization of the quantitative / qualitative problem of the water cycle is a matter of worldwide concern. Considering that 60% of the world human population is concentrated in urban / metropolitan regions it is fundamental to estimate the water availability, and quality as well as the human impact on both. The comparative study that IIE / IIEGA is carrying out in watersheds of São Paulo State is fundamental to design public policies and mechanisms of management that include negotiations on water uses / water users, watershed

committees and legislation. Perspectives for this work are including studies on climatic changes and their impacts on the water cycle / water availability / water quality / human health / economy.

Preliminary information by Salati (E. Salati personal information to J.G.Tundisi) shows that approximately 30% less water will be available for the Tietê / Jacaré watershed by 2020 considering a 2°C increase in air temperature. This will change the perspectives on water availability and water quality, and water uses.

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## ANNEX I

### Published papers, and papers in press



This list of published papers and papers in press includes scientific papers published in 2003 ,2004 and 2005 directly related to the project or in projects that interface with NEGOWAT.

- 01) 2003 – THOMAZ A.A. ROCHA-E-SILVA; RANTIM, F.T.; MATSUMURA-TUNDISI, J.E.; MATSUMURA-TUNDISI, T.; TUNDISI, J.G. and DEGTEREV, I.A. – Dynamics of cytochrome P450 inducers in polluted sites of São Paulo city reservoir. *Environmental Ecotoxicology Elsevier Sciences (USA)*. Vol. 59/1 - 109-115 pp.
- 02) 2004 - TUNDISI, J.G.; MATSUMURA-TUNDISI, T.; ARANTES JUNIOR, J.D.; TUNDISI, J.E.M.; MANZINI, N.F. AND DUCROT, T.  
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* 64(1). 177-186 pp.
- 03) 2004 – TUNDISI, J.G.; ABE, D.S.; MATSUMURA-TUNDISI, T.; SIDAGIS-GALLI, C.; TUNDISI, J.E.M.  
Water quality and greenhouse gas production in hydroelectric reservoirs. *Greenhouse Gas Emission from Hydropower Reservoirs and Water Quality* (Editors – Luiz Pinguelli Rosa; Marco Aurélio dos Santos; José Galizia Tundisi) – COPPE-UFRJ. 109 -119 pp.
- 04) 2004 – TUNDISI, J.G.; MATSUMURA-TUNDISI, T.; ABE, D.S.; TUNDISI, J.E.M.  
Ecological impacts of hydroelectric reservoirs and perspectives for their integrated management. *Greenhouse Gas Emission from Hydropower Reservoirs and Water Quality* (Editors – Luiz Pinguelli Rosa; Marco Aurélio dos Santos; José Galizia Tundisi) – COPPE-UFRJ. 67 - 81 pp
- 05) 2005 – ABE, D.S.; ADAMS, D.D.; GALLI, C.V.S.; SIKAR, E. AND TUNDISI J.G. – Sediment greenhouse gases (methane and carbon dioxide) in the Lobo-Broa Reservoir, São Paulo State, Brazil: Concentration and diffuse emission fluxes for carbon budget considerations. *Lakes & Reservoirs Research and Management* 10: 201-209 pp. Blackwell Publishing Ásia Pty Lt.
- 06) 2005 – ABE,D.S.; TUNDISI, J.G.; MATSUMURA-TUNDISI, T.; TUNDISI, J.E.M.; GALLI-SIDAGIS, C. – Impacts during the filling phase in reservoirs: case studies in Brazil. In: *Global warming and hydroelectric reservoirs (COPPE/UFRJ)*. 109-116 pp.
- 07) 2005 – ABE, D.S.; GALLI-SIDAGIS C.; ADAMS, D.D.; CIMBLERIS, A.C.P.; BARROS, P.R.H.B.; TUNDISI, J.G.; MATSUMURA-TUNDISI, T.; TUNDISI, J.E.M. – Carbon gas emission from the sediments of reservoirs of different ages in central Brazil. In: *Global warming and hydroelectric reservoirs (COPPE/UFRJ)*. 101-108 pp
- 08) 2005 - TUNDISI,J.G.; MATSUMURA-TUNDISI, T.; PARESCHI, D.C.; DUPAS, F.A.; SOUZA, A.T.S. & SHIBATA, O.A. – Diagnóstico e prognóstico da qualidade da água dos rios que compõe as bacias hidrográficas do município de São Carlos-SP relacionados ao uso e ocupação do solo. *Anais da I Mostra de Ciência e Tecnologia em Políticas Públicas Municipais – Unidade Temática de Ciência, Tecnologia e Capacitação da Rede de Mercocidades (26 a 29 agosto/2004)* – São Carlos – SP. Suprema Gráfica e Editora. 69-72 pp.
- 09) 2005 – TUNDISI, J.G. – Recursos Hídricos. Parcerias Estratégicas – CGEE. N. 20 (parte 2). Brasília-DF. 727 – 746 pp.
- 10) 2005 – TUNDISI, J.G. – Nature Makes a Difference in the City – SCIENCE – Letter to the Editor. September – 2005. Vol. 309. No. 5740. 1489 – 1490 pp.
- 11) 2005 – TUNDISI,J.G.; DUPAS, F.A.; ROHM, S.A.; POLI, M.N.; MATSUMURA-TUNDISI, T.; PARESCHI, D.C.; SOUZA, A.T.S. & SHIBATA, O.A. – Uso atual e uso potencial do solo no município de São Carlos-SP – base do planejamento urbano e rural. *Anais da I Mostra de Ciência e Tecnologia em Políticas Públicas Municipais – Unidade Temática de Ciência, Tecnologia e Capacitação da Rede de Mercocidades (26 a 29 agosto/2004)* – São Carlos – SP. Suprema Gráfica e Editora. 46-53 pp.
- 12) 2005 - TUNDISI, J.G. - As árvores e a conta da água. *Scientific American,Brasil* nº. 36..... Maio, pp 30.
- 13) 2005 – TUNDISI, J.G. – Gerenciamento integrado de bacias hidrográficas e reservatórios – Estudos de caso e perspectivas. In: *Ecologia de Reservatórios – Impactos Potenciais, ações de manejo e sistemas em cascata*. Organizadores – Marcos Gomes Nogueira, Raoul Henry e Adriana Jorcin.UNESP/ Rima Editora. pp 1 – 21 .
- 14) 2006) – TUNDISI, J.G. – A qualidade ambiental e os impactos sobre a saúde. FIOCRUZ (no prelo).

- 15) 2006 - ABE, D.S.; TUNDISI, J.G.; VANNUCCI, D. & SIDAGIS-GALLI, C.

Avaliação da capacidade de remoção de nitrogênio em uma várzea da Cabeceira do reservatório de Guarapiranga, Região Metropolitana de São Paulo. In: Tundisi, J.G. et al (Editores). Eutrofização na América do Sul: causas, conseqüências e tecnologias para o gerenciamento e controle. IIE/CNPq/PROSUL (in press).

- 16) 2006 – TUNDISI, J.G.; ABE, D.S.; MATSUMURA-TUNDISI, T.; TUNDISI, J.E.M & VANNUCCI, D. - Reservatórios da Região Metropolitana de São Paulo: conseqüências e impactos da eutrofização e perspectivas para o gerenciamento e recuperação. In: Tundisi, J.G. et al (Editores). Eutrofização na América do Sul: causas, conseqüências e tecnologias para o gerenciamento e controle. IIE/CNPq/PROSUL (no prelo).
- 17) 2006 – TUNDISI, J.G.; SEBASTIEN, N.Y. MATSUMURA-TUNDISI, T.; TUNDISI, J.E.M. & MANZINI, N.F. – The response of reservoirs of Southeastern Brazil to the passage of cold fronts as reflected by physical, chemical and biological variables. SIL. Int. Verh. Verein. Limnol (in press).

Book in press

- 18) 2006 – TUNDISI, J. G.; MATSUMURA-TUNDISI, T.; SIDAGIS, C. – Eutrophication in South America: causes, consequences and technologies for control and management. IIE / IIEGA, CNPq / PROSUL / Brazilian Academy of Sciences, 590 pp. (in Portuguese Spanish and English).

## ANNEX II

### PDF version of published papers, papers in press

## ANNEX III

### Lectures presented in international meetings

#### NEGOWAT PROJECT WAS MENTIONED.

1. *Tundisi, J.G.*

2005. The water program for the Americas: new steps towards the integration of science and management. Invited Lecture. Bogotá, March 10-11<sup>th</sup>. Meeting of the Inter American Network of Academies of Sciences.

2. *Tundisi, J.G.*

2005. A world wide program for capacity building of managers: a proposal from 96 Academies of Science. Invited lecture. Trieste, Italy, 27-28 May, International Center for Theoretical and Applied Physics. Third World Academy of Sciences. Inter Academy Panel.

3. *Tundisi, J.G.*

2005. Water management: new steps for capacity building of managers. Invited Lecture. Meeting of the Asian Association of Academies of Science. Seoul (Korea), 8 – 14 October.

4. *Tundisi, J.G.*

2005. New steps towards integrated management: integrating Science with Management. Plenary lecture. 11<sup>th</sup> World Lakes Conference. October 31<sup>st</sup> – 4<sup>th</sup> November, Nairobi – Kenya.

5. *Tundisi, J.G.; Matsumura-Tundisi, T.; Abe, D.S.; Vannucci, D. and Tundisi, M.J.E.*

2005. The reservoirs of the Metropolitan Region of São Paulo: water quality and challenges for management. 12<sup>th</sup> World Lakes Conference. October, 31<sup>st</sup> – 4<sup>th</sup> November, Nairobi – Kenya.

6. *Tundisi, J.G.*

2005. Water management: a world wide program for capacity building of managers. Invited lecture. OECD meeting / South Africa Ministry of Science and Tecnology. Johannesburg, 21-24 November.

7. *Tundisi, J.G.*

2005. Water management in the Metropolitan Region of São Paulo: challenges and perspectives. Invited lecture. Argentina, Concordia, 27 – 3<sup>rd</sup> December. UNEP, RIGA, Argentinian Institute of Water Resources (IV Taller, La Plata Basin).



#### **4.6 UNICAMP Annual scientific report (2005)**

No specific partner report were provided by this partner as there has been no activity of this group apart finalization of the on going publication.





#### 4.7 Instituto POLIS Annual scientific report (2005)



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

NEGOWAT Project - 2005

**PhD. Vilma Barban (coord)**

**Cecília de Moraes Kayano (graduate student) 1**

**Camille Rojot (student trainee) 2**

**Vinicius Madazio (technician)<sup>3</sup>**

PÓLIS main subjects in the NEGOWAT Project are:

1. Social actors: Identification and analysis of the conflicts within the water and land management/use at the Guarapiranga and Tietê-Cabeceiras sub-catchments.
2. Organise and animate the workshop with stakeholder and monitor the session and observe the process following the methodology proposed.
3. Coordination, conjointly with NRI and Centro Água, of the development of the project's products (games, publications).

#### **1 - Polis' Team Activities**

Task 1 - During this year, Polis' Team organized the material developed with Parelheiros social organizations and the creation of educative games about the occupation of catchment areas and their social and environmental consequences (JOGOPOL e JogAtores, which will be described ahead)

To do so, Polis counted on the participation of the student Cecilia Kayano de Moraes, and Camille Rojot (foreign trainee from INAPG – France).

##### Objectives

Conception of tools and materials that can help social organizations on improving their abilities and participation when discussing about water and soil management and facilitate negotiation on dealing with water and soil related problems, besides environmental education and conservation.

The reference group to the work was the field research universe (according to the 2004 annual report), in other words, representatives from the local social actors, including the ones from the public sphere, from the water company, etc.

##### Methods:

##### Participatory work

It's taken that the conception of the tools has been given from the results of the research done with the local social organizations, in Parelheiros/SP and in Balainho/Suzano and from the meetings with the representatives of those organizations in Parelheiros, to configure of the several sceneries of local occupation, access and scaping of water, usual ways to steering demands and negotiation with the public sphere.

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1 Student at Uninove/SP – Trainee at Polis Institute.

2 Student at INA-PG Agronomic National Institute - Paris Grignon. Trainee at Polis Institute – Negowat Project.

3 Project Technician, since November, 21 - 2005

The mentioned games were being organized from the results of the research and several tests were done with Polis and Negowat partners' teams. Only after that, tests with local actors were done. From the results of the filed research, a group was formed conjointly to produce the materials of the games. The report of the meetings with local organizations follows attached.

Following, it is presented a synthesis of the role playing games.

#### JogAtores – Local actors in negotiation

This is a role playing game that stimulates, at local scale, the negotiation about the access to water and water management and also land use in peri-urban areas from São Paulo Metropolitan Region.

##### Objectives:

Explicit and list the involved local actors, the roles that they represent in negotiation about the related issues, actions and strategies adopted; the game propose an interaction between the actors and an investigation of the consequences of territorial occupation and their relations to lack or presence of sanitation.

Social agents: state and local governments, water company, agricultors, land owner, industrials and business man, local social organizations.

Scenery: a board divided into squares, that represent the plots occupied by local agents. There is also a representation of BOA ÁGUA dam and the river called RIO DA BOA, which extends through the whole board.

Game: describe to the participants who are the actors involved to the water and land tasks, the functions they perform and the possible actions from each one.

Actions: The participants negotiate the land occupation and the access to the water and infrastructure, involving values in money.

According to their goals, the players will negotiate proper infrastructure to the plots, buy or sell plots or even modify their land use and the activity developed in each one. The negotiation will be given between local actors, government and water company, who are the responsible actors in charging taxes and tributes and defining infrastructure implementation, etc.

Mediator: the mediator directs the game, solves doubts, controls time, takes care of the values involved according to the situations and tries to get the game dynamic.

#### JOGOPOL – Water pollution and conservation

This game has got its main focus on access to the water and pollution of potable water, putting in evidence the essential problems related to environmental degradation, in the view from civil society, obtained by Polis through the research, which were: health, sanitation and plots regularization.

The first goal is environmental education, explaining and submitting to negotiation: a) hydrological cycle and changes occasioned by human activities at the environment, through the unplanned occupation of the catchment areas, as well as the consequences of water pollution; b) functioning and costs of the sanitation and water supply systems.

The game seeks to involve players on the comprehension of these processes and searching possible solutions, through discussions by simulating of a real basin situation, through a model and allows to negotiate the decision making about potable water, approaching the game of the reality on every round.

Scenery: The support of the game is a board with a river on it, a dam and sixteen pieces of land representing plots, with several possible land uses (Mata Atlântica, Industry, Agriculture, countryside houses, Urban Zone and unplanned or disordered occupation)

Mediators: The game counts on a mediator and a point controller.

Actors: eight players who are responsible for the plots and the water supply of their families; a player responsible for the water company and a player representing the local social organization.

Actions:

1. simulation of diffuse pollution processes (after the rain) and supply pollution processes, both represented by coloured balls;
2. changing of land use and activities uses (Mata Atlântica, Industry, Agriculture, countryside houses, Urban Zone and unplanned or disordered occupation)
3. arrival of families, that can go to the urban zones or occupy the plots deliberately
4. water supply of the players' families and of the industrial activities
5. treatment of potable water and sewer
6. negotiating to extend the connection of water supply and sewer
7. potable water distribution and sewer collection
8. environmental evaluation of the basin
9. health evaluation of the players through the supply water quality
10. decision making: possible solutions to get situation better: sanitation, protected areas

In parallel with the development of the work, Polis Team's coordinator was responsible for:

α) Co - orientation of Luiz Sertório Teixeira's concluding paper at university, entitled: Water and the development of the metropolitan region of São Paulo – south vector. USP-FFLCH – Geography Department. SP, 2005. Defended on March 2005.

β) Orientation of Camille Rojot – student at INA – PG (Agronomic National Institute – Paris Grignon. Trainee at Polis Institute / Negowat Project. Conception, development and testing of the role playing game called JOGOPOL. From July to December 2005.

χ) Orientation of the student Cecília Kayano de Moraes for the conception, development and testing of a role playing game called JogAtores. From January to December 2005.

Task 2 - Organization of the workshops for testing and presenting the games to the local social actors:

Workshops of the games: workshops occurred in Polis (with Polis technicians) and in IEA/USP, from June to November 2005, for testing and discussions about the games JogAtores and Jogopol.

Workshops with local actors (Parelheiros) for testing the game Jogopol – November and December 2005.

A- For the workshops with the actors, it was developed a basic program with an agenda, containing:

- a) Presentation of the proposal, group integration exercise and pointing of the activities of the day.
- b) Proposition of challenges regarding water and land issues in that specific area, being the participants stimulated to think about the concept of pollution...
- c) A debate to develop a conjoint comprehension of the concept of pollution and an attempt to classify the types of pollution.
- d) Definition of the next workshop's agenda, survey about necessary information, etc.

B- each workshop's data are subsequently discussed by the Negowat team for the gradual development of the games and definition of the next event's program.

1. Stage of progress: the workshop sessions took place in 03 and 17 December/05, with activities:

Date	Objective	No. of participants	No. of local organizations represented
September	JogAtores' test Polis Institute team		
November	JogoPol's test Polis Institute Team		
October	JogAtores' test Negowat team		
28 November	JogoPol's test Negowat team	07	
03 December	JogoPol workshop - Parelheiros local organizations	06 + 05 (Negowat team)	05
17 December	JogoPol workshop - Parelheiros local organizations	06 + 05 (Negowat team)	05

1. 03 December 2005

Presents:

Polis' team

Associação Santa Fé do Jardim Novo Parelheiros,  
CEDECA do Jardim Novo Parelheiros,  
Associação de Bairro Itaim,  
Movimento Social de Cidadania do Balneário São José e  
Associação do Jardim Paulo Afonso.

Program:

- Negowat project, CIRAD and Polis presentation.
- Introduction of the participants and their local actions.
- Revisiting the research results and the process developed together with Parelheiros organizations.
- Questions related to the water supply, quality of the water they consume, water treatment and types of pollution processes which contaminate the water

Results:

In general, it was perceived that, to the participants, the pollution concept is straightly connected to health problem. However, the link the participants establish between them is too weak. It was common for them to mention the link between 'pollution' and words like 'rats' and 'floods'.

The relation between pollution of the rivers and Guarapiranga dam water, for instance, it was not pointed out by the participants.

In the evaluation of this activity, the participants said the problems for them are normally related to their necessities as residents living in precarious conditions, with lack of basic services

## 2. 17 November 2005

### Presents:

Associação Condominial São Francisco de Assis  
Associação de Amigos de Bairro Parque Recreio  
Movimento Social pela Cidadania – Balneário São José  
Associação do Jardim dos Álamos  
Associação do Jardim São Nicolau.

### Program:

- Introduction of the participants
- Presentation of the actual context of the Project and also of the meeting held on 03/12/05.
- JOGOPOL's presentation: the board, the rules, the roles, etc.

In this session, the players could deal with the following aspects:

- Rain water pollution process;
- Arrival of new residents at the plots, both in urban zones and in plots which became 'disordered occupations';
- Supplying the plots with potable water;
- Pollution occasioned by the use of potable water and the several land uses of the plots;
- Environmental evaluation and its relation with human health;

### Speechs / evaluation of the players

At the end of the session, the players did not evaluate the tool by itself, jogopol as a possibility to improve the players' awareness of the process. The players ended talking about the situations they usually face on reality, more than commenting on the game process.

### Results:

The game showed up as a rich process and offered didatic moments to the participants, reaching its original goal as an educative game.

There were some difficulties in infra-structure to the session.

It was considered that this educative game would be more adequate to the participants if it could be replayed in their communities and also on school presentations, local non-governmental organizations, etc.

Task 3 - Colaboration to part of the brasilian team involved in the conception and development of the role playing games (CIRAD, APTA, PROCAM/USP, Faculdade de Saúde Pública /USP).

### Objectives:

Building the tools of Negowat Project, on a participatory basis.

### Methods:

During the whole year, three meetings were carried out for discussions about the contributions of the Project partners teams and the conception of the games – Jogo-Man, Ter'Águas and AguaLoca.

As soon as the games were being produced, internal meetings were carried out for previous tests, and just after that the workshops with local social actors from Parelheiros / Gurapiranga and also from Tietê Cabeceiras sub-basin took place.

Results: : In process.

Task 4- Texts production of all partners of the Project

Objectives:

Organization and coordination, together with Brazilian team partners, of the production of the accessible texts about the research done specifically to a publication focused on local social actors, leaderships and interested people in working this theme.

Methods:

A meeting with all available partners from Negowat Brazilian team was carried out on 31/03/2005, to follow this goal.

Results: in process

**2 - Common activities with project partners**

- a) Participation in Negowat Brasil Project meetings;
- b) Meetings with Dr. John A. Butterworth and Vladimir Cossio to formulate programs:

- International meeting with Dr. John A. Butterworth, from Natural Resources Institute (England), and Vladimir Cossio Rojas from Water Centre (Bolivia), carried out on 15/04/2005 in Polis Institute, to the definition of the material production which would be integrated in a CD Rom with the theme products of Negowat research.

- International meeting with Dr. John A. Butterworth, from Natural Resources Institute (England), and Vladimir Cossio Rojas from Water Centre (Bolivia), carried out on 12/12/2005.

**Courses and congresses**

1. ... Participation in a Methodology Course in Bolivia

ENFOQUE DE JUEGO DE ROLES EN LA MODELACIÓN DE ACOMPAÑAMIENTO

Period: 22 to 28/05/05 Promoters: CIRAD- INRA - UMSS- CENTRO AGUA Supporters: PROJETO NEGOWAT

2. Participation in EFFICIENT 2005 - 3rd Conference on Efficient Use and Management of Water

Theme: "Management and efficient water use and sustainability"

SANTIAGO- CHILE Period: from 14 to 19/03/2005

Estimated number of participants: 500

Text presentation - Spring Areas in the Metropolis of São Paulo/Brazil: the Residents, their Organizations and Social Participation.

Pannel presentation – "Conflicts and participatory management in Alto Tietê Water Basin Regions".

Available at sites: <http://www.ita.upv.es/efficient/> <http://www.efficient2005.com/>

3. Participation in "Meeting for a New Water Culture in Latin America"

Themes: Water Basins Management, education, capacity-building, social mobilization and information. FORTALEZA- Brasil Period: 05 to 09 December, 2005

Speech presentation: 'Shared Management: information and formation for a citizen participation'; Authors: Dra. Vilma Barban (coordinator), Camile Rojot and Cecília Kayano Moraes. Available at site <http://www.unizar.es/fncea/america>

4. Participation in "First International Conference – Governance and environmental sustainability – The water question, carried out by Senac São Paulo, from 19 to 21 August / 2005.

Book launch – Managing water as if it was important: environmental management and sustainability. São Paulo: Senac São Paulo, 2005. (with Vilma Barban's article)

**Seminars and meetings**

Seminar developed at PUC – Campinas about Environmental Sustainability and the water question. Presentation: State and society – rethinking Public Politics – December 2004.

Seminar developed at UNICAMP – about Negowat Project and the research and interference possibilities on water and land management. December 2004.

Workshop with post graduate students from UMG (University of Mogi das Cruzes) to the development of the role playing game: Water game – 02/04/2005.

Workshops carried out between Negowat project and the Participatory Project on Monitoring Water Quality of the Alto Tietê Water Basin, developed by SOS Mata Atlântica Foundation.

Preparatory meeting to the Rodoanel Public Audience, which took place at SOS Mata Atlântica Foundation – 10/04/2005.

Rodoanel Public Audiences with civil society proposals presentation, modifying the governmental project

#### ***Links with other tasks and work developed by other partners***

Polis' work at this fase is related straight to all partners of the project, especially with APTA, PROCAM, Faculdade de Saúde Pública (USP), Centro Agua e CERES, NRI e CIRAD.

The texts production as a result of the research of the teams for the CDRom, needs the involvement of all teams.

#### ***Plan for next year - 2006***

- 1- Finishing and testing the games Jogopol and Jogadores - and the promotion of workshops with the local social actors - March / April;
- 2- Organization of the workshops for testing and presenting the games (Agualoca e Ter'Agua) to the local social actors - June / July;
- 3- Texts production about Polis' work for a CDRom – June;
- 4- Organization and coordination of the texts production of all partners of the Project – with Centro Agua and NRI.
- 5- Creation and writing of the final report – October.

#### **Publications**

Barban, V. *Spring Areas in the Metropolis of São Paulo/Brazil: the Residents, their Organizations and Social Participation*. EFFICIENT 2005 - 3rd Conference on Efficient Use and Manangement of Water, Chile, 14 a 19/03/2005

\_\_\_\_\_. Between the legal and the real – the necessity of information to the citizen participation. In, Dowbor, L. e Tagnin, R. A. (org) *Managing water as if it was important: environmental management and sustainability*. São Paulo: Ed. Senac São Paulo, 2005.

\_\_\_\_\_, Rojot, C. e Morais, C.K. 'Shared Management: information and formation for the citizen participation'

Teixeira, Luiz Sertório. *Water and the development of the metropolitan region of São Paulo – south vector*. USP-FFLCH – Geography Department. SP, 2005.

#### **Polis Team**

Coordinator PhD. Vilma Barban

Cecília Kayano de Morais – undergraduate student in Pedagogy.

Camille Rojot. Student at INA-PG Agronomic National Institute - Paris Grignon. Trainee at Polis Institute Negowat Project.

Vinicius Madazio. Technician of the Project, since November 2005.



## Attachments

### Attachment I – JogAtores



#### Os Atores

##### MEDIADOR

PROPRIETARIOS	ASSOCIAÇÕES
SITIANTES	ÁGUA PURA
EMPRESÁRIOS	AGRICULTORES

#### Representações

Represa Boa Água e Rio da Boa

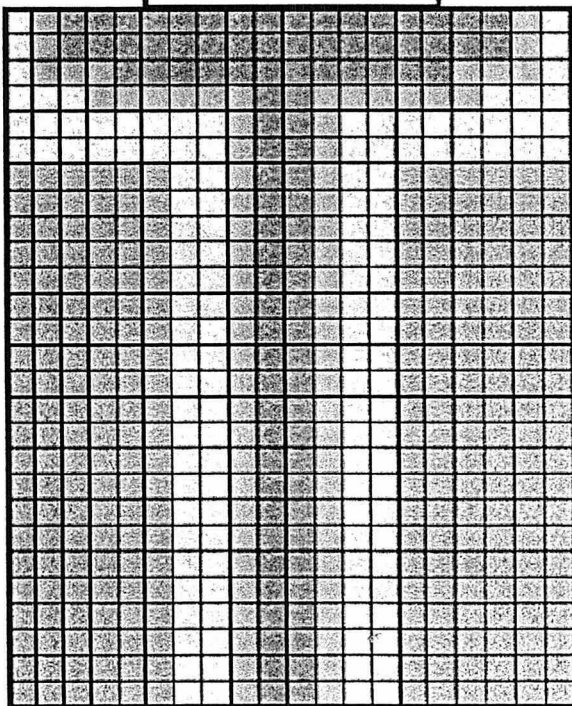
Z1 – Várzea da Boa

Z2 – Zona Urbana

Z3 – Residencial/Comercial/Rural

Z3 – Residencial/Comercial/Rural

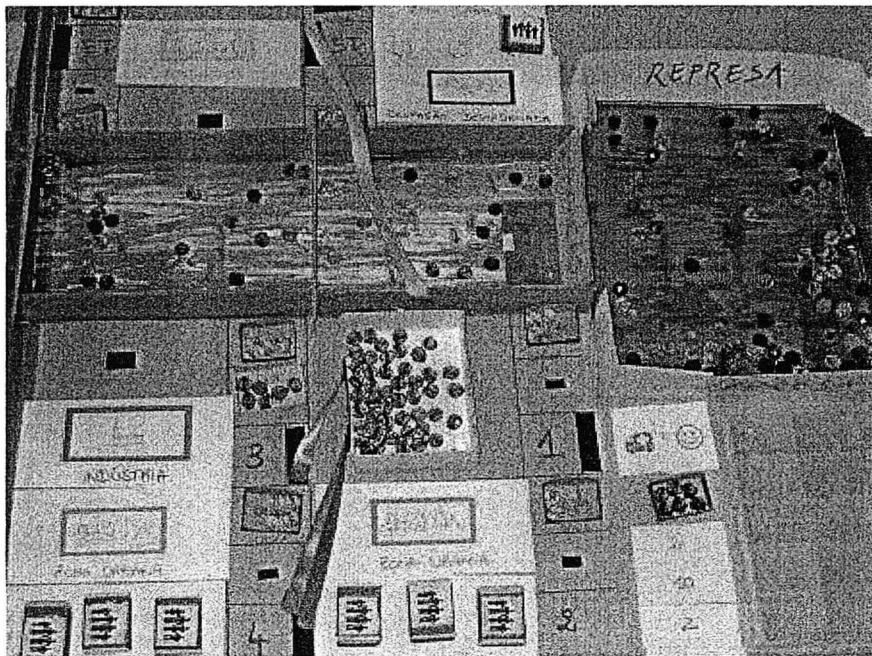
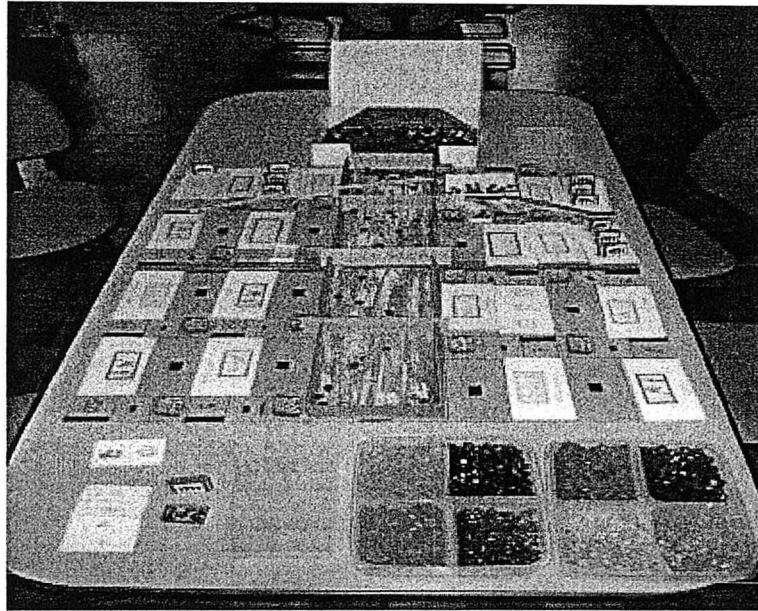
#### O Tabuleiro



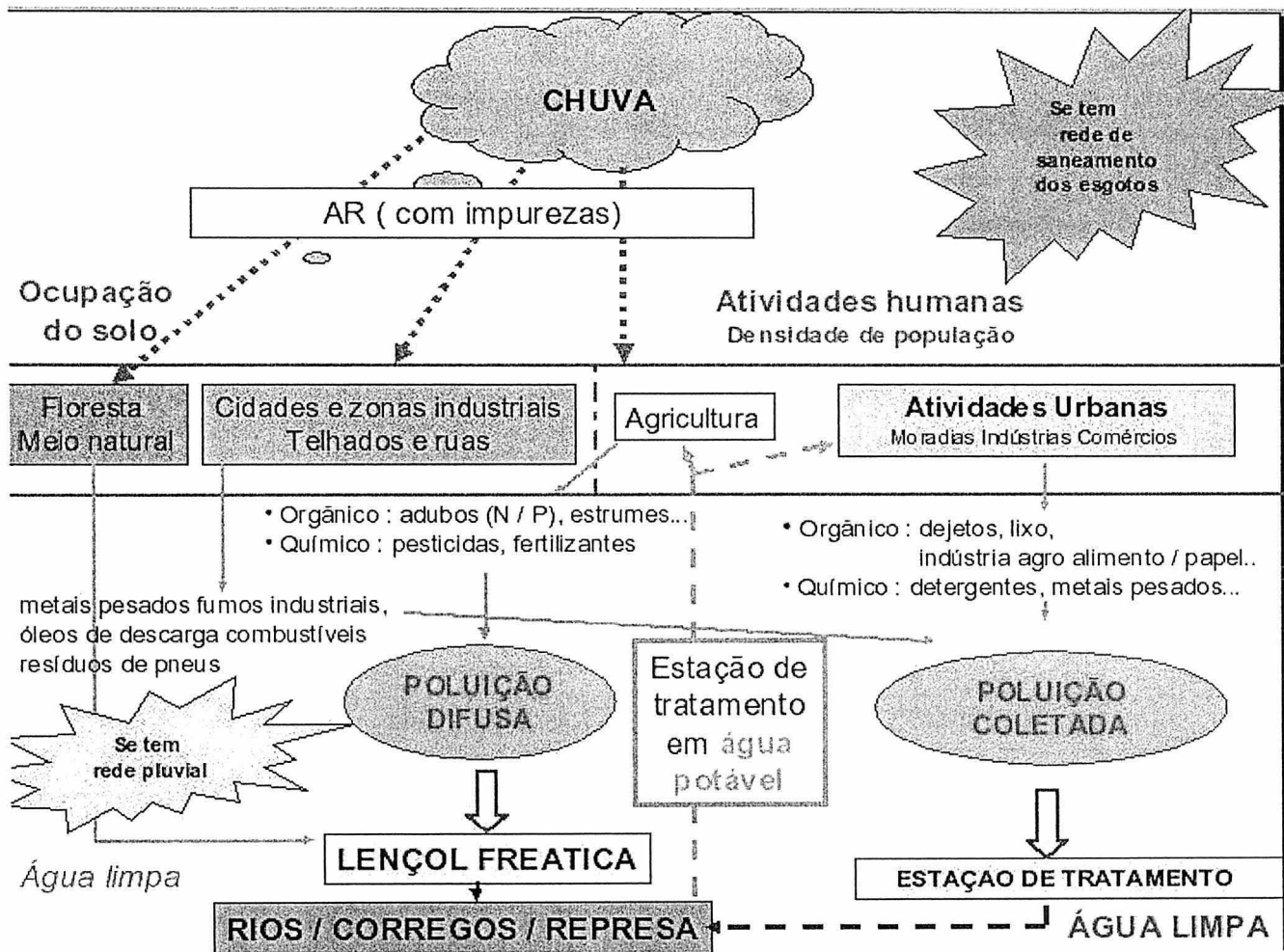
#### A Moeda Corrente

1	N\$	1	5	N\$
10	N\$	10	50	N\$
100	N\$	100	250	N\$
500	N\$	500	1.000	N\$
5.000	N\$	5.000	10.000	N\$

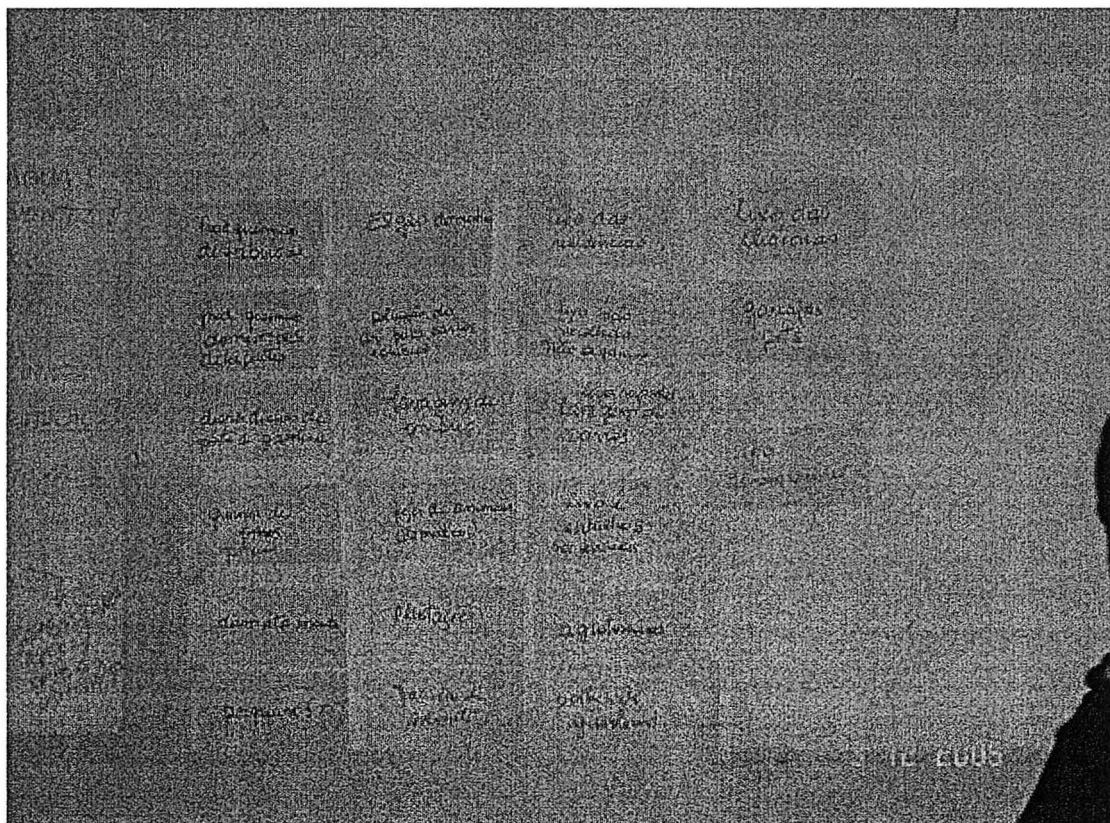
Attachment II - JOGOPOL : photos of the game



## Attachment III - JOGOPOL: Water pollution diagram



Attachment IV – Workshop's photos with local actors







#### 4.8 CENTRO AGUA-UMSS Annual scientific report (2005)



#### **1.1 Work Package 4: Development and Test of the Discussion Methodology**

##### **1.1.1 Objectives and methods of WP4**

As evaluated in 2004 (see previous annual report), no possibility was seen to support an existing negotiation process with the Negowat methodological approach, therefore it was decided to design specific intervention processes. In Tiquipaya, three intervention processes were scheduled, in order to develop and test methodologies for negotiation: 1) the Technical Roundtable on the MACOTI water and sanitation project; 2) impacts of urbanization on irrigation canals in the Linde and Kanarancho local communities; and 3) support in the functioning of community-managed drinking water committees.

The focus on 2005 was on the design and test of Role Playing Games (RPG). In the peri-urban areas where the Bolivian Negowat team works, there was no opportunity to design a negotiation process dealing with natural resource management. Therefore, the two designed RPGs deal with more social aspects and the one about impacts of urbanization uses a very simple way of representing the dynamics of the water resource. As a consequence, no Multi Agent System was used in Bolivia. Also, in both processes, the RPG was designed to be used with grassroots' stakeholders, which entailed specific attention to make sure that persons with little formal education could participate in the game.

##### **1.1.2 State of advancement**

Due to lack of financial means of the Bolivian partner CERES, Centro AGUA took the responsibility to lead these three intervention processes. Basically, the first intervention process was completed at the end of 2004. The second and third ones were set up at the beginning of 2005 and were completed in December 2005.

##### **1) Technical Roundtable**

The Technical Roundtable process was completed at the end of 2004. At the end of 2004, the newly elected municipality won the elections by a large margin. This new municipality initiated a Committee for the Social Control of the MACOTI project, elected by the OTBs. The Negowat team was officially recognized as the facilitator of this social Control Committee. However, the Committee found itself with no support from the municipality (which was ultimately uninterested in social control), nor from the OTBs, and finally waned. Anyway, the Negowat team did not invest many efforts in this follow-up, the core of the work being the second and third processes presented hereafter.

##### **2) Impacts of urbanization on irrigation canals**

As analyzed in 2004 (see previous report), in two communities of Tiquipaya, Linde and Kanarancho, the chaotic urbanization process jeopardizes the maintenance of local irrigation canals. For instance, urban dwellers build their walls very close to the irrigation canals, in such a way that it is difficult for irrigation farmers to go and clean them. These two communities are also located in a wet area, with many local springs, and the canals have also a function of drainage, which is of importance for both irrigation farmer and new urban dwellers. Against this background, intervention was organised in 2005 to lead to local agreements between irrigation farmers and urban dwellers in order to ensure a protection of the canals (Figure 1).

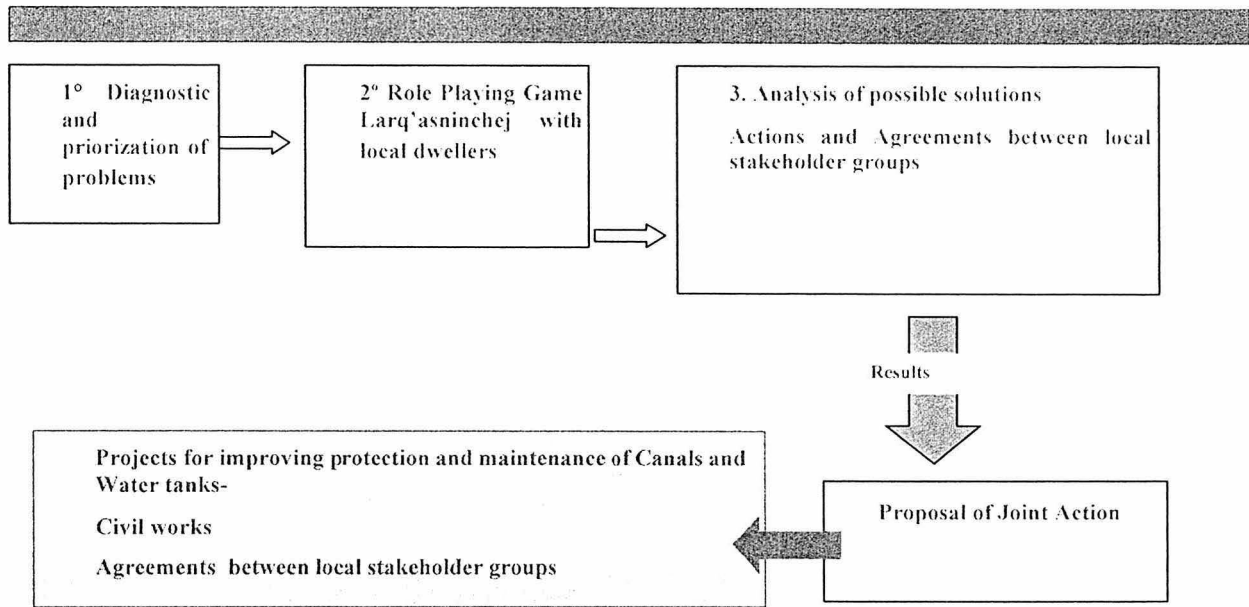
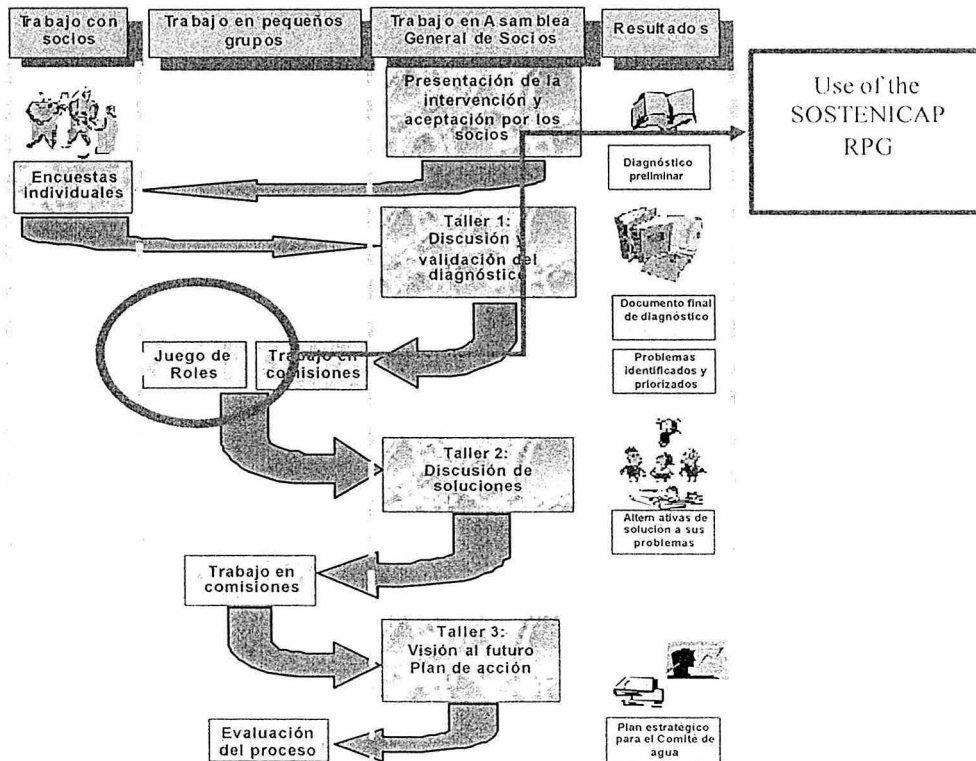


Figure 1. Intervention process to deal with impacts of urbanization on irrigation canals

### 3) Support in the functioning of community-based drinking water committees

The third process revolved around the development and test of a methodology to support management of community-based drinking water committees. This methodology aims at improving the management of these water committees. In Tiquipaya, efforts were put on the internal management issues: definition of by-laws, tariffs, management of user debts. In the South Zone of Cochabamba, work was also done in supporting the committees' dialogue with external institutions.

Part of the methodology considers using an RPG to discuss specific themes in a group of drinking water committee members (Figure 2).





**Figure 2. Use of the SosteniCAP RPG as a step of the whole intervention process with drinking water committees.**

### 1.1.3 Results

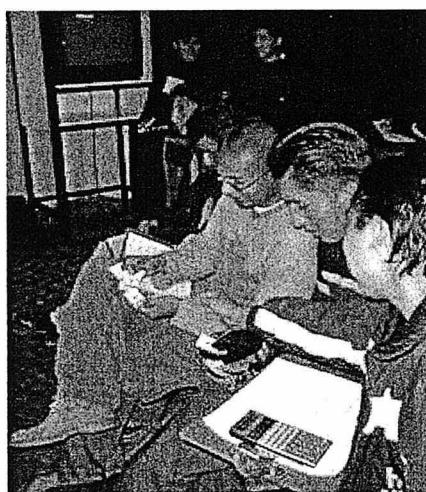
The development of the games, especially Lark'asnincej, took around 2 months. The games changed many times, as the team tried to get them more dynamic and easier to understand for players with low formal education.

#### 1) Impacts of urbanization on irrigation canals.

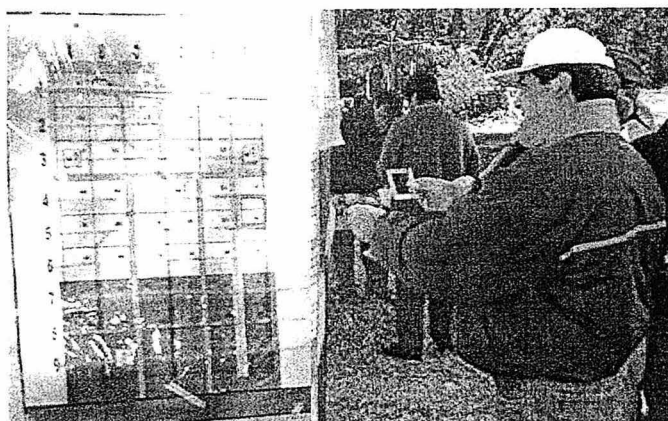
The process went well in the two local communities, and led to a proposal of investment to protect canals and to local agreements between irrigation farmers, the local community organization and the Tiquipaya Municipality. For the first time in Kanarancho, the urban dwellers participated in the maintenance of the canals.

The RPG Larq'asnincej (*Nuestras acequias* in quechua) was developed to specifically support this process. It shows the local interactions between urban dwellers' decisions to build walls without paying attention to the canals, and the farmers' capacity to get water for irrigation. Larq'asnincej was used in **10 sessions** overall with local actors, with one session previously played with students (Figures 3 and 4). First, the RPG was played with local leaders. Then, each of the 2 communities of Linde and Kanarancho was divided into 4 zones. When Larq'asnincej was played with irrigation farmers and urban dwellers, all participants had to swap their role in the game, i.e., an urban dweller played an irrigation farmer in the game.

An ex-post evaluation of the use of the RPG was undertaken, based on the analysis of the sessions and ex post interviews with community members who participated in the game or who decided not to participate (cf. the evaluation document, Peñarrieta, 2005).



**Figure 3. Calibration session with students**



**Figure 4. Game sessions with Lark'asnincej RPG**



## 2) Support in the functioning of community-based drinking water committees

The methodology was implemented in 4 drinking water committees: in Tiquipaya, the Villa Oruro and COMAPHA committees; and in the South zone of Cochabamba, the Alto Pagador and Barrios Unidos water committees.

In the 3 cases where the whole methodology was used (Villa Oruro, COMAPHA, Barrios Unidos), the SosteniCAP RPG was used. SosteniCAP stands for *Sostenibilidad de Comités de Agua Potable*, i.e., Sustainability of Drinking Water committee. The game is a very generic representation of a community-based drinking water committees, which is then adapted to the context of each committee in which it is played. In the 3 committees where it was played, the game tackled most of all the issue of user debt in paying the water tariff.

The SosteniCAP RPG was played in 7 sessions overall with local actors, in the Villa Oruro, COMAPHA and Barrios Unidos water committees (and previously 1 session with university students) (Figure 5). An *ex-post* evaluation of the use of the RPG was conducted in Villa Oruro, based on the analysis of the sessions and *ex post* interviews with community members who participated in the game or who decided not to participate (cf. the evaluation document, Quiroz, 2005). The evaluation of the RPG sessions played in Barrios Unidos will be completed in January 2005. In Barrios Unidos in December 2005, an *ex ante* evaluation of the knowledge community members had of their water committee was undertaken to permit comparison with the *ex post* evaluation.

In both cases of SosteniCAP and Larq'asninchej, the RPG was evaluated as a powerful tool to do capacity-building and enable better dialogue between local stakeholders. Larq'asninchej proved also useful to motivate local community-members in entering the intervention process. The discussion of possible solutions to the problems addressed in the game were mainly on the principles themselves, and not on technical details, since the games did not enabled detailed technical discussions of solutions. It was nevertheless evaluated that playing RPGs sessions with all grassroots stakeholders is costly in terms of time spent in inviting community members.

Two different games have been designed: On the one hand, Larq'asninchej is a game where the rules are fully adapted to the local communities where it was used. Much attention was devoted to the game part, in particular the graphic interface. A limitation is that this well-developed game will not be easily transferred to other context. On the other hand, the SosteniCAP game is more generic, with much fewer graphic interfaces. However, its generic structure would enable to play it with most of the drinking water committees of the Cochabamba Valley.



Figure 5. Game sessions with SosteniCAP RPG

### 1.1.6 Difficulties and problems

At the end of June 2005, Dr. Bernardo Paz left the project. This did not harm the whole functioning of the project.

Convocation to the RPG sessions was difficult, since first grassroots members of periurban community have a weaker sense of the group than in more rural areas, and many of them are not ready anymore to spend time in setting up collective action. Moreover, in Barrios Unidos and Villa Oruro, community members have informal trading activities, and they travel often: It proved difficult to find moments in the week where they would be present in the community and available for participating in a collective workshop.

Though the use of the RPG was overall a success, it proved difficult to monitor the exact contribution of the game sessions within the whole process, in terms of capacitating local stakeholders and motivating them into modifying their opinions regarding other stakeholders' claims.

### 1.1.7 Outline for next year

The intervention processes were completed in December 2005. The very rich data and experience gathered from 17 sessions with local stakeholders (not mentioning the ones with students) will be used in the first trimester of 2006 to write the **Deliverable R15** (Assessment of the method), which will be an assessment of the use of RPG in Negowat Bolivia, and **Guidelines G6** (Two toolkits: one to develop RPG and another one to design multi stakeholder platforms).

## **1.2 Work Package 5: Validad Method and prepare diffusion**

### **1.1.1 Objectives and methods of WP5**

The WP5 is two-pronged: first, validate the experiences in other areas, second disseminate the knowledge produced by the Negowat team.

### **1.1.2 State of advancement**

#### **1) Impacts of urbanization on irrigation canals.**

In order to disseminate the experience of Negowat in Linde and Tiquipaya, a one-day workshop was organized on October, 28th, in Tiquipaya. The theme of the workshop was the impacts of urbanization in the valley of Cochabamba. The attendance was of 80 members, from irrigation associations of the Cochabamba Valley and Municipalities. Moreover, Marwan Ladki, a French researcher from CEMAGREF, came to present similar issues taking place in South of France (for a summary of the workshop, cf. Vega, 2005).

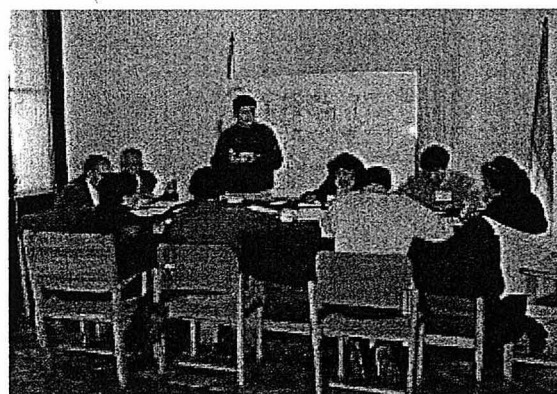
#### **2) Support in the functioning of community-based drinking water committees**

In order to test the possibility of replicating the methodology, during the second semester of 2005, use of the methodology was tested in two drinking water committees of the South Zone of Cochabamba, where committees are different for not having local water resources. This zone is important since it encompasses more than 150 drinking water committees.

In this South Zone also, two French students, Julien Cognac and Federico Zammito, designed a video on water use and issues of water access. This video was then showed to local actors during several workshops, as well as international seminars in Fortaleza (Brazil) and London.

In order to support the discussions on institutional models in the Tiquipaya – Colcapirhua and the South Zone of Cochabamba, a French student, Alix Courivaud, undertook a review of the institutional models for water supply and sanitation in Latin American and Central American peri urban areas where water is supplied by community-based drinking water committees. She particularly analyzed the relationship between the central municipal water entity or company and these drinking water committees.

Moreover, in December a workshop was organized in Sucre (capital of the Chuquisaca Region) to show the results and experiences of the Negowat project to local professionals involved in water supply and sanitation. A RPG called Dialagua was developed specifically for this workshop, to quickly present the RPG tool. It was developed in coordination with a staff member of the Chuquisaca Prefecture and deals with the conflicts between Municipalities and drinking water cooperatives specific to the Chuquisaca region. During the workshop, two sessions of the game were held in parallel (Figure 6).



**Figure 6. Parallel game sessions for the Dialagua RPG**

Moreover, during the work it appeared that there are many practical experiences in supporting community-based drinking water committee management in South America, but few of them have been documented. Therefore,

the Negowat team took the initiative to coordinate a Book on “experiences in supporting water committees”, where several institutions are invited to write a chapter about their own experiences on this topic.

### 1.1.3 Results and deliverables

Finally, a list of Powerpoint presentations was defined as a way to disseminate the knowledge produced from the Negowat experience. This list was defined in coordination with NRI. Centro AGUA is responsible for the follow-up of all presentations scheduled, both in Brazil and Bolivia. This corresponds to **Deliverables T5** (Academic training tools) and **T6** (Training materials for professionals).

The Negowat website was updated and made more accessible for Latin American visitors not fluent in English. The Powerpoint presentations will be fully accessible from the website.

A 10-page document was written on the legal issues for community-based drinking water committees with drawings, to be used by drinking water committees' management committees.

### 1.1.6 Difficulties and problems

No difficulty was met (a large part of this WP is still to be completed in 2006).

### 1.1.7 Outline for next year

The Centro AGUA involvement in the Negowat project is scheduled to finish in May, 2006. Since the intervention processes have been completed in December 2005, the first 5 months of 2006 will be dedicated to dissemination, with the following activities.

- Training course in San Simon University. Three 3-days modules will be organized on: 1) methods for diagnostic of land and water uses in peri-urban areas; 2) tools to support multi stakeholder platforms; 3) use of RPGs to support negotiation processes. This training course is already fully recognized by the University, and in 2006 will evolve into a future permanent graduation course.
- The Negowat training materials will also be used during the Centro AGUA Master Course on Integrated Water Resource Management from January 23<sup>rd</sup> to 28<sup>th</sup>.
- A book will be written on the experience of the Negowat project in Bolivia. It will contain the most salient articles, as well as an assessment of the way the project was designed and modified during its period of existence.
- A CD will also be designed and distributed to Bolivian Institutions involved into water management and local government. This CD will contain all the published documents of interest for these institutions.
- Three final workshops are scheduled: 1) with local stakeholders in Tiquipaya; 2) with academics and professional in Cochabamba; and 3) a presentation of the whole project in La Paz for rational organizations and international cooperation, which will be organized hopefully in coordination with the local office of the European Union.
- The book on capitalizing experiences of organizations in terms of supporting community-based drinking water committees should be edited and published by May, 2006.
- Two other short documents to capacitate the management of drinking water committees will be published: one on tariffs, and another one on methods for the financial management. This will be part of **Deliverable T6** (Training materials for professionals).

## 1.3 Publications

### 1.3.1 Dissemination activities

#### a.3 Communication in conferences (published)

Cossio, V. *Use of a methodology to support the design of a short-term multi-stakeholder platform in a water and sanitation project in Tiquipaya (Bolivia)*. Paper presented at the Stockholm World Water week, Sweden, 21-27 August 2005.

Ampuero, R., Faysse, N., Quiroz, F. *Metodología de apoyo a Comités de Agua Potable*. Paper presented at the seminar Agua 2005, CINARA, Cali, November 2nd – 4th, 2005.

Quiroz, F., Ampuero, R., Faysse, N. *Metodología de fortalecimiento a comités de agua potable en zonas peri urbanas. Desarrollo y validación en base a experiencias de Cochabamba, Bolivia*. Paper presented at the conference “encuentro por una nueva cultura del agua en América Latina”, Fortaleza, Ceara, Brasil, 5-9 December, 2005.



Peñarietta, R. *Facilitando procesos de dialogo sobre el problema de la invasión urbana en zonas agrícolas bajo riego*. Paper presented at the conference “encuentro por una nueva cultura del agua en América Latina”, Fortaleza, Ceara, Brasil, 5-9 December, 2005.

Durán, A. *Lineamientos de una política de concertación para la gestión multisectorial del agua en los Andes*. Paper presented at the conference “encuentro por una nueva cultura del agua en América Latina”, Fortaleza, Ceara, Brasil, 5-9 December, 2005.

#### **a.4 Communication in other media (internet, video, etc)**

Article in a Newsletter on water and sanitation issues, edited in French by the PsEau NGO. *Organisations communautaires et entreprises de distribution d'eau en Amérique Latine. Typologie d'une coexistence aux modalités varies. Letter no. 49, December 2005.*

A video on water use and water access problems in the South Zone of Cochabamba, realized by two French students: Julien Cognac et Federico Zammito, from November 2004 to August 2005.

#### **a.4 Other publication (posters, dissemination documents etc).**

Cossio, V. Design of a booklet on the legal issues for community-based drinking water committees with drawings, to be used by drinking water committees' management committees.

Peñarietta, R. *Evaluation of the use of an RPG in Linde and Kanarancho*. Internal Negowat Report.

Quiroz, F. *Evaluation of the use of an RPG in the Villa Oruro drinking water committee*. Internal Negowat Report.

Quiroz, F. *Revista de literature sobre metodologias de apoyo a Comités de Agua Potable*. Internal Negowat Report.

Vega, D. Summary of the workshop of impacts of urbanization on irrigation schemes in Cochabamba valley.

#### **1.3.2. Training**

##### **b.2 : MScs**

Alix Courivaud. June to September 2005. *Relaciones entre las organizaciones comunitarias de agua potable, empresas municipales y el Estado en zonas periurbanas de América Latina. Aplicación al caso de Cochabamba*. Practical period on the evaluation of community-based drinking water committees in periurban areas of Latin America.

##### **b.3 : Visiting scientists**

Butterworth J. (NRI - England), April, 4th to 15th 2005. Definition of the workplan for the preparation of training materials.

Raphaële Ducrot (CIRAD), del 25 al 29 de abril 2005. Participation as a teaching profesor for the training course on *Methodologies for negotiation on water management*, organized by LA Wet-Net, Negowat and PROMIC.

Raphaële Ducrot (CIRAD), November, 21st – 23<sup>rd</sup> 2005. Visit for the evaluation of the work achieved in 2005 and the workplan for 2006.

Michel Etienne (INRA), Pierre Bomel y Raphaële Ducrot (CIRAD). Teaching professors for the training course *Use of Role playing Games for companion modelling*. Organized by Centro AGUA and CIRAD. Villa Tunari, May, 23<sup>rd</sup> - 27<sup>th</sup>

#### **Travel periods abroad for the coordination of the Negowat project**

Vladimir Cossio. Visit to Sao Paolo to discuss the training materials with Brazilian Negowat partners and NRI. Sao Paolo, April, 14<sup>th</sup> - 16<sup>th</sup>, 2005.

Alfredo Duran, Ronald Peñarietta, Vladimir Cossio, Franz Quiroz. Participation to the Negowat meeting in Sao Paolo, Brazil, December 12<sup>th</sup>, 14<sup>th</sup>, 2005.

#### **b.5 : Organization of training course module**

Training course on *Use of Role playing Games for companion modelling*. Organized by Centro AGUA and CIRAD. Villa Tunari, May, 23<sup>rd</sup>- 27<sup>th</sup>. One-week course for the local team and institutions involved in the Negowat project, on the use of Role Playing Games. Attendance: 20 people.

Training Course: *Methodologies for negotiation on water management*. Organized by LA Wet-Net, Negowat (Centro AGUA) and PROMIC. Cochabamba, April, 25-29. The Negowat team gave 10 hours of presentation during the 1 week course, about Negowat experiences. Attendance: 30 academics, NGO and professional from various Latin American countries.

Seminar of presentation of **methodologies and result of the Negowat project in Sucre** (department of Chuquisaca, Bolivia). December, 6<sup>th</sup>. Organized by the Chuquisaca Prefecture and the SNV (Dutch Cooperation). 8 hour training course, 25 participants (local water companies, Prefecture, NGOs, Municipalities).

#### **b.6 intervention in existing training course**

Seminar of presentation **of methodologies and result of the Negowat project in Cochabamba**. September, 29<sup>th</sup> -30<sup>th</sup>. 14 hours of presentation of Negowat experiences and results. Attendance: 15 people, mainly academics from the San Simon University and the CERES NGO.

#### **List of publications in Appendix**

Cossio, V. *Use of a methodology to support the design of a short-term multi-stakeholder platform in a water and sanitation project in Tiquipaya (Bolivia)*.

Ampuero, R. Faysse, N., Quiroz, F. *Metodología de apoyo a Comités de Agua Potable*.

Quiroz, F., Ampuero, R., Faysse, N. *Metodología de fortalecimiento a comités de agua potable en zonas peri urbanas. Desarrollo y validación en base a experiencias de Cochabamba, Bolivia*.

Peñarrietta, R. *Facilitando procesos de dialogo sobre el problema de la invasión urbana en zonas agrícolas bajo riego*.

Durán, A. *Lineamientos de una política de concertación para la gestión multisectorial del agua en los Andes*.

Peñarrietta, R. *Evaluation of the use of an RPG in Linde and Kanarancho*.

Quiroz, F. *Evaluation of the use of an RPG in the Villa Oruro drinking water committee*.

Quiroz, F. *Revista de literature sobre metodologias de apoyo a Comités de Agua Potable*.

Vega, D. *Summary of the workshop of impacts of urbanization on irrigation schemes in Cochabamba valley*.

Alix Courivaud. *Relaciones entre las organizaciones comunitarias de agua potable, empresas municipales y el Estado en zonas periurbanas de América Latina. Aplicación al caso de Cochabamba*.

Faysse, N., Courivaud, A. *Organisations communautaires et entreprises de distribution d'eau en Amérique Latine. Typologie d'une coexistence aux modalités varies*.

Cossio, V. *Booklet on the legal issues for community-based drinking water committees with drawings, to be used by drinking water committees' management committees*

## 4.9 CERES Annual scientific report (2005)



### 1.2 Work Package 5: Validate Method and prepare diffusion

#### 1.1.1 Objectives and methods of WP5

CERES was in charge of the diffusion of several documents related to Negowat experience, as well as the organization of two workshops.

#### 1.1.3 Results and deliverables

As part of an agreement with NRI, the CERES took the responsibility to coordinate the contracting of several authors for the design of Powerpoint presentations that will constitute one of the main ways of organize teaching regarding Negowat experience and results.

CERES organized in Cochabamba a seminar of presentation **of methodologies and result of the Negowat project** in September, 29<sup>th</sup> -30<sup>th</sup>. The two-day seminar presented: the Multi Stakeholder Platform methodology, the application of this methodology in the case of the *Mesa Técnica* regarding the MACOTI project, the theory of Role Laying Game. The RPG Larq'asninchej designed by the Negowat team in Bolivia was also played with the participants in the workshop. The attendance was 15 persons, mainly academics from the San Simon University and the CERES NGO (cf. assessment of the workshop in appendix).

Another training workshop was organized in Cliza on December, 9<sup>th</sup>, but due to the national elections, there was no attendance.

CERES participated in the preparation of the training course in February 2006 at the San Simon University on Negowat result, by financing the printing of the Information Posters.

#### 1.1.6 Difficulties and problems

Due to the European Union refusal of some expenses in 2004, CERES had liquidity problems to comply with the tasks initially scheduled.

#### 1.1.7 Outline for next year

In such a context of financial problems, CERES decided to end its participation in the Negowat project at the end of 2005. It will be asked later in 2006 to shift the unused part of the budget to Centro AGUA

### 1.3 Publications

#### 1.3.1 Dissemination activities

##### **a.4 Other publication (posters, dissemination documents etc).**

1. Design and publication of a series of 3 short-term capacity-building booklets, to be read by local leaders. the themes of the 3 documents are the following:

- 1: the urbanization issue in Tiquipaya
- 2: water resources and water use in Tiquipaya
- 3: the water and sanitation MACOTI project and the conflicts it led to.

These booklets contain both text and pictures that help the understanding for people lacking formal education.

2. Design and publication of 4 CERES methodological short-texts summarizing for a broad public 4 researches undertaken by Negowat:

- 1: Stakeholder analysis
- 2: Dynamics of land and water in Tiquipaya
- 3: The experience of the Technical Roundtable in Tiquipaya, on the MACOTI water and sanitation project
- 4: Methodology to support the management of community-based drinking water committees.

3. Design and publication of CERES institutional newsletter *Parlakuyupaj* on the "experience of Negowat in terms of negotiation", edition of January –February 2005. Themes: the 3 intervention processes: Technical Roundtable, support of water committees, intervention on the impact of urbanization on irrigation schemes. In particular, diffusion to 5 Municipalities of Cochabamba valley.



### **Travel periods abroad for the coordination of the Negowat project**

Pablo Cuba. Participation to the Negowat meeting in Sao Paolo, Brazil, December 12<sup>th</sup>, 14<sup>th</sup>, 2005.

Two junior staff members of CERES team participated in the 1-week course on *Use of Role playing Games for companion modelling*. Organized by Centro AGUA and CIRAD. Villa Tunari, May, 23<sup>rd</sup>- 27<sup>th</sup>.

### **b.5 : Organization of training course module**

Seminar of presentation of methodologies and result of the Negowat project in Cochabamba. September, 29<sup>th</sup> -30<sup>th</sup>. 14 hours of presentation of Negowat experiences and results. Attendance: 15 people, mainly academics from the San Simon University and the CERES NGO.

CERES institutional workshop on May, 31<sup>st</sup>, 2005. Theme: presentation and discussion of the strategy to disseminate the results and experiences of the Negowat project. Participation of Centro AGUA and CERES staff members.

CERES institutional workshop on September, 21<sup>st</sup>, 2005. Theme: presentation of the internship period results of Alix Courivaud, about "management models for water supply in sanitation in Latin American peri-urban areas, involving community-based drinking water committees". Attendance of 30 persons, from Centro AGUA, Pro-Habitat, CIRAD, CEPLAG y CERES.

### **List of publications in Appendix**

- CERES. *Memoria del taller del 29 y 30 de Septiembre*. Summary of the Septiembre workshop.
- Short-sized capacitating booklets for public: 1, 2 and 3.
- 4 CERES methodological short-texts
- *Parlakuyypaj* newsletter.

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

**Contract number: ICA4-CT-2002-10061**

## **5. Annual Report 2005**

# **PARTNERS' CONTRIBUTIONS**

**Covering period from 1<sup>st</sup> January 2005  
to 31<sup>st</sup> of December 2005**

## **Project NEGOWAT**

***Facilitating Negotiations Over Land And Water Conflicts In  
Latin American Peri-urban Upstream Catchment :  
Combining Agent-Based Modelling With Role Playing  
Game***



## 5 APPENDIX

### 5.1 Data sheet for annual report

Contract number : IC...-CT-Erreur ! Source du renvoi introuvable.

Year :

#### Data sheet for annual report

(to be completed by the co-ordinator at 12-monthly intervals from start of contract. Figures to be up-dated cumulatively throughout project lifetime)

#### 1. Dissemination activities

Totals (cumulative)

Number of communications in conferences (published)

29

Number of communications in other media (internet, video, ...)

21

Number of publications in refereed journals (published)

5

Number of articles/books (published)

4

Number of other publications

11

#### 2. Training

Number of PhDs

0

Number of MScs

5

Number of visiting scientists

29

Number of exchanges of scientists (stays longer than 3 months)

2

#### 3. Achieved results

Number of patent applications

Number of patents granted

Number of companies created

Number of new prototypes/products developed

Number of new tests/methods developed

Number of new norms/standards developed

Number of new softwares/codes developed

Number of production processes

4

4

3

#### 4. Industrial aspects

Industrial contacts

yes ☐ no ☒

Financial contribution by industry

yes ☐ no ☒

Industrial partners : - Large

yes ☐ no ☒

- SME<sup>4</sup>

yes ☐ no ☒

<sup>4</sup> Less than 500 employees.

## *5. Comments*

*Product and prototype: 4 Role playing games tested : JogoMan, JogoMan, JogoPol, SosteniCAP, Larquaseinj*

*Tests/method : implementation of role playing game in intervention processes : Mesa tecnica, support to water drinking committee, support to local agreement on urbanization impact; academic training session based on jogoMan*

*New softwares : JogoMan, AguAloca, Teraguas*

*Research contract : GovAgua*

**5.2 Assessment of the training course “use of role playing game in companion modeling”, Vila Tunari, Bolivia 23-27 may 2005**



Journal National de la Recherche Agronomique FORMASCIENCES



Département SAD

Sciences pour l'Action et le Développement



**EVALUATION : SYNTHÈSE**

**ÉCOLE - CHERCHEURS**

« Usage des jeux de rôles en modélisation d'accompagnement : Mettre des acteurs en situation pour partager des représentations et simuler des dynamiques »

23-27 mai 2005, Villa Tunari, Bolivie

**EN RESUME**

**L'ÉCOLE-CHERCHEURS DANS SON ENSEMBLE**

Quelle est votre perception générale de l'école- chercheurs ?

Les 16 (sur 17 !) participants ayant répondu au questionnaire d'évaluation, ont une perception excellente de l'école.

« Très riche. Façon d'enseigner divertissante, bonne transmission de l'expérience acquise ».

« Superbe façon de stimuler l'apprentissage et la réflexion »

« C'est vraiment la formation que j'attendais depuis que je suis dans ce projet »

A-t-elle répondu à vos attentes/besoins? Précisez ?

Tout à fait	Plutôt oui	Plutôt non	Pas du tout
xxxxxxxxxx	xxxxx		

L'école a bien répondu aux attentes/besoins des participants ayant répondu au questionnaire d'évaluation.

« Je n'avais pas vraiment d'attente mais j'ai découvert un outil super intéressant, et une façon d'enseigner très divertissante ».

« Je vais pouvoir directement me servir de ce que j'ai appris dans mon travail. La partie débriefing du jeu Sylvopast a été une révélation pour moi »

« J'aurai bien aimé un avis sur les possibilités d'utilisation des JdR pour l'éducation de groupes »

« Je pensais savoir ce qu'était un jeu de rôles mais c'est maintenant que je pense avoir appris ce que c'est »

« Parce que je repars avec un outil que je ne connaissais pas du tout et qui me semble être l'outil idéal pour prendre en compte la réalité des gens »

Selon vous, les objectifs de l'action de formation affichés par les organisateurs -

(i) Sensibiliser et initier les participants à l'usage des jeux de rôles en modélisation d'accompagnement, (ii) Expliciter les conditions d'utilisation des jeux de rôles pour l'appui aux processus de décision territoriaux et

environnementaux, (iii) Illustrer l'usage de la démarche à partir d'applications concrètes et diversifiées, (iv) Fournir les bases méthodologiques de conception de ce type de jeu de rôles. - ont-ils été atteints ?

Tout à fait	Plutôt oui	Plutôt non	Pas du tout
xxxxxxxxxxx	xxx	x	
Tout à fait	Plutôt oui	Plutôt non	Pas du tout
xxxxx	xxxxxxxxxxx		
Tout à fait	Plutôt oui	Plutôt non	Pas du tout
xxxxxxxxxxx	xxxxxxx	x	
Tout à fait	Plutôt oui	Plutôt non	Pas du tout
xxxxxxxxxxx	xxx		

Les objectifs de sensibilisation et de bases méthodologiques de conception sont largement atteints. La façon dont les conditions d'utilisation des jeux de rôles sont traitées laissent partiellement les participants sur leur faim.

Selon vous, le fait que les différents participants étaient rattachés à différents organismes (CEMAGREF, CIRAD, INRA, ..) et appartenaient à différentes disciplines était-il un avantage ou un inconvénient ? Pourquoi ?

Plutôt un avantage	Plutôt un inconvénient
XXXXXXXXXXXXXXXXX	

A l'unanimité, la diversité disciplinaire ou des organismes de rattachement des participants est un avantage. La complémentarité des formateurs est plusieurs fois soulignée.  
« Essentiel pour échanger des idées et mieux connaître ce qui se fait dans d'autres pays ».

Suite à cette action de formation, Quels sont vos principaux acquis ?

De nombreux acquis sont évoqués par les participants. Sont régulièrement mentionnés l'apprentissage d'un outil original, l'approfondissement des connaissances techniques sur les JdR, l'importance du débriefing et de se donner les moyens de bien le valoriser, avoir repéré les points faibles de son propre jeu et avoir les moyens de les corriger.

Diriez vous que (choisir parmi les 3 réponses suivantes) :

- (i)- vous comprenez mieux ce qu'est un jeu de rôles et ses applications mais que vous ne pensez pas concevoir prochainement ce type d'outil
  - (ii)\* vous souhaitez concevoir prochainement un jeu de rôles sans avoir à en porter le développement
  - (iii)\* vous souhaitez concevoir prochainement un jeu de rôles et en assurer le développement
- \* merci d'indiquer sur quelle thématique, avec quels objectifs et dans quel délai vous pensez concevoir votre jeu de rôles

i	ii	iii	Ne se prononce pas
xx		xxxxxxxxxxxxxxxxx	

La grande majorité des participants ont en projet la conception d'un jeu de rôles et beaucoup comptent en assurer le développement, et l'école leur a donné les moyens d'aller plus loin.

Pensez-vous que certains de vos collègues pourraient être intéressés par cette formation ?

Oui	Non	Ne se prononce pas
XXXXXXXXXXXXXXXXX		

Si oui, lesquels ?

ONG, collègues, éducateurs, étudiants, techniciens, enseignants, thésards, responsables institutionnels

Pensez-vous leur en parler ?



Oui	Non
XXXXXXXXXXXXXX	x

*Quelles suites, quelles perspectives (à court et moyen termes) pour continuer la réflexion autour des jeux de rôles et de leur utilisation dans la modélisation d'accompagnement ?*

Parmi les suites envisagées :

Approfondir la bibliographie

Se mettre à Cormas

Appliquer la méthodologie en Bolivie

Mettre en place un projet de formation

Essayer d'utiliser cet outil en fonction de l'offre de travail

Maintenir le contact avec les participants à cette formation, pour partager mes futures expériences avec eux

LE DEROULE DE L'ECOLE-CHERCHEURS DANS LE DETAIL

6 - Le Jeux de rôles « CherIng » → mise en situation et fil rouge de l'école

**Globalement, ce jeu a-t-il répondu à ce que vous attendiez ?**

Tout à fait	Plutôt oui	Plutôt non	Pas du tout	Ne se prononce pas
Xxxx	xxxxxxxxxxx	x		

**Globalement, ce jeu vous a-t-il paru ... ?**

Indispensable	Plutôt utile	Plutôt peu utile	Sans intérêt	Ne se prononce pas
Xxxx	xxxxxxxxxxx			

7- Posture et principes de la modélisation d'accompagnement : Interventions de M. Etienne (Référénts théoriques de la modélisation d'accompagnement : Implications méthodologiques)

**Globalement, ces interventions ont-elles répondu à ce que vous attendiez ?**

Tout à fait	Plutôt oui	Plutôt non	Pas du tout	Ne se prononce pas
XXXXXXXXXXXXXX	xxx	x		

**Globalement, ces interventions vous ont-elles paru ... ?**

Indispensable	Plutôt utile	Plutôt peu utile	Sans intérêt	Ne se prononce pas
XXXXXXXXXXXXXX	xxxxxx			

8- Les jeux de rôles dans la modélisation d'accompagnement : Interventions de N.Faysse (Les différents types de jeux de rôles) et R. Ducrot (les particularités du jeu de rôles en modélisation d'accompagnement)

**Globalement, ces interventions ont-t-elles répondu à ce que vous attendiez ?**

Tout à fait	Plutôt oui	Plutôt non	Pas du tout	Ne se prononce pas
Xx	xxxxxxxxxxx	xxx		

**Globalement, ces interventions vous ont-t-elles paru ... ?**

Indispensable	Plutôt utile	Plutôt peu utile	Sans intérêt	Ne se prononce pas
Xxxx	xxxxxxxxxx	xxx		

9- Les jeux de rôles et l'éducation à l'environnement : Intervention de M.Camargo

**Globalement, ces interventions ont-t-elles répondu à ce que vous attendiez ?**

Tout à fait	Plutôt oui	Plutôt non	Pas du tout	Ne se prononce pas
X	xxxxxxxxxxx	xxx		

**Globalement, ces interventions vous ont-t-elles paru ... ?**

Indispensable	Plutôt utile	Plutôt peu utile	Sans intérêt	Ne se prononce pas
X	xxxxxxxxxxx	xx		

10- Les étapes de la conception d'un jeu de rôle : Interventions de M.Etienne (Les étapes de la conception d'un jeu), de M.Etienne (l'exemple de MejanJeu) et de N Faysse (Outils d'évaluation d'un jeu de rôles)

**Globalement, ces interventions ont-t-elles répondu à ce que vous attendiez ?**

Tout à fait	Plutôt oui	Plutôt non	Pas du tout	Ne se prononce pas
xxxxxxxxxx	xxxxxx			

**Globalement, ces interventions vous ont-t-elles paru ... ?**

Indispensable	Plutôt utile	Plutôt peu utile	Sans intérêt	Ne se prononce pas
xxxxxxxxxxxx	xxxxxx			

#### 11 - Le Jeux de rôles « Sylvopast » → mise en situation et débriefing

**Globalement, cette séquence a-t-elle répondu à ce que vous attendiez ?**

Tout à fait	Plutôt oui	Plutôt non	Pas du tout	Ne se prononce pas
xxxxxx	xxxxxxxxxx			

**Globalement, cette séquence vous a-t-elle paru ... ?**

Indispensable	Plutôt utile	Plutôt peu utile	Sans intérêt	Ne se prononce pas
xxxxxx	xxxxxxxxxx			

#### 12- Conception et test d'un jeu sur une question simple

**Globalement, cette séquence a-t-elle répondu à ce que vous attendiez ?**

Tout à fait	Plutôt oui	Plutôt non	Pas du tout	Ne se prononce pas
xxxxxxxxxx	xxxxxxxxxx			

**Globalement, cette séquence vous a-t-elle paru ... ?**

Indispensable	Plutôt utile	Plutôt peu utile	Sans intérêt	Ne se prononce pas
xxxxxxxxxxxxxx	xxx	x		

#### Commentaires, remarques, suggestions sur l'ensemble de ces interventions

Formation intense, il va falloir assimiler tout ça, sinon difficile de faire mieux.

Laisser plus de temps sur les aspects théoriques

Il faudrait plus de temps sur les aspects pratiques

Mieux préciser le contexte des exemples présentés

Un des participants a été déstabilisé par le fait de travailler sur un atoll micronésien

Problèmes de compréhension du portugais pour certains (surtout au débit de Raphaële)

#### LA PEDAGOGIE, ORGANISATION DE CETTE ECOLE-CHERCHEURS

13- Lors des différentes sessions, les modalités de discussion (interventions, rapport) vous ont-elles paru favorables....

**A l'expression du plus grand nombre ?**

Tout à fait	Plutôt oui	Pas vraiment	Pas du tout	Ne se prononce pas
Xxx	xxxxxxxxxxxxxx	x		

**A l'émergence de questions intéressantes et en lien avec les préoccupations scientifiques des participants ?**

Tout à fait	Plutôt oui	Pas vraiment	Pas du tout	Ne se prononce pas
xxxxxx	xxxxxxxxxx	xx		

**A l'appropriation des concepts, des méthodes et des projets présentés lors des conférences ?**

Tout à fait	Plutôt oui	Pas vraiment	Pas du tout	Ne se prononce pas
xxxxxx	xxxxxxxxxxxx	x		

Les participants ont pu bien s'exprimer et discuter lors de cette école aussi bien sur les aspects théoriques que sur les méthodes et les exemples proposés. Certains ont trouvé les temps de discussion un peu courts, ou n'ont pas osé poser des questions qui maintenant leur brûlent la langue

*« Malgré le volume des activités réalisées, les organisateurs ont su toujours garantir un temps de débat et stimuler les échanges d'idées »*

14 - L'articulation globale et l'ordre des différentes séquences (présentations, ateliers, temps libres.... ) vous ont-elles paru ?

Pertinent	A revoir
xxxxxxxxx	xxxxxx

Parmi les critiques récurrentes, on peut relever :

Manque de respect des horaires, peu de temps libre

Exposés trop en continu, pas assez de temps morts pour respirer ... et revenir en forme pour l'exposé suivant

15 - Les interventions vous ont-elles semblé satisfaisantes en termes de pédagogie ?

(qualité des exposés, qualités des animations, réponses aux questions, adaptation en fonction des participants, durée, ...)

Totalement	Partiellement	Insuffisamment	Pas du tout	Ne se prononce pas
xxxxxxx	xxxxxxxxxxx			

L'effort des intervenants a été largement apprécié et leur capacité à faire partager leur vécu est souvent mise en avant. Les critiques portent seulement sur les difficultés de compréhension quand l'exposé était en brésilien et le manque de temps pour assimiler la théorie.

16- La documentation qui vous a été remise était-elle...

Claire	Suffisante	Adaptée	Autre	Ne se prononce pas
xxxxxxxxxxx	xxxxxxx	x	x	

De quel type d'information auriez-vous besoin aujourd'hui ?

Certaines feuilles manquaient dans certains classeurs

Pensez-vous qu'un document écrit résumant cette école et présentant de façon synthétique les exemples mobilisés serait un complément utile aux documents que vous avez reçus ?

Tout à fait	Plutôt oui	Pas vraiment	Pas du tout	Ne se prononce pas
xxxxxxxxxxx	xxxxxxx	x		

17 - A propos des conditions matérielles (hébergement, restauration, salles, environnement...) diriez vous qu'elle étaient...

Excellentes	Satisfaisantes	Correctes	Insuffisantes	Ne se prononce pas
	xxxxxxxxxxx	xxxx		

« Ni téléphone, ni internet ... coupés du monde »

« De la yucca tous les jours ça finit par lasser »

« Côté bouffe, on peut mieux faire »

18 - La durée de cette école- chercheurs était-elle adaptée ?

Oui	Non	Ne se prononce pas
xxxxxxxxxxx	xxx	

Les horaires vous convenaient-ils ?

Oui	Non	Ne se prononce pas
xxxxxxxxxxx	xxxxx	

Unanimité sur le fait que l'on ne peut pas faire plus court, même si c'est fatigant.

D'autres se plaignent du non respect chronique des horaires

Jeudi vraiment très lourd

#### COMMENTAIRES ET SUGGESTIONS

19 - Quels commentaires et suggestions feriez-vous pour améliorer et prolonger ce type d'initiatives ?

Voici l'ensemble des commentaires/suggestions reçus :

Mettre en place une session avancée qui complète la dernière partie de cette formation

Faire connaître cet outil aux responsables institutionnels

Rajouter une demi-journée

Organiser de temps en temps une réunion des utilisateurs de jeux de rôles (colloque ?)  
Monter un projet sur l'utilisation de l'outil JdR avec plusieurs des participants à la formation  
Faire d'autres sessions de cette excellente formation pour toucher davantage de personnes  
Davantage de travail de groupe

5.3 Planning for the Negowat meeting in Sao Paulo, December 12th-14th 2005

**REUNIÃO NEGOWAT**  
**NEGOWAT MEETING**  
**12 - 14 DE DEZEMBRO 2005**

**PROGRAMA**

**Local : IEA / USP**

- (0xx11) 3091-3919 Av. Prof. Luciano Gualberto, Travessa J, 374, Térreo – Cidade Universitária

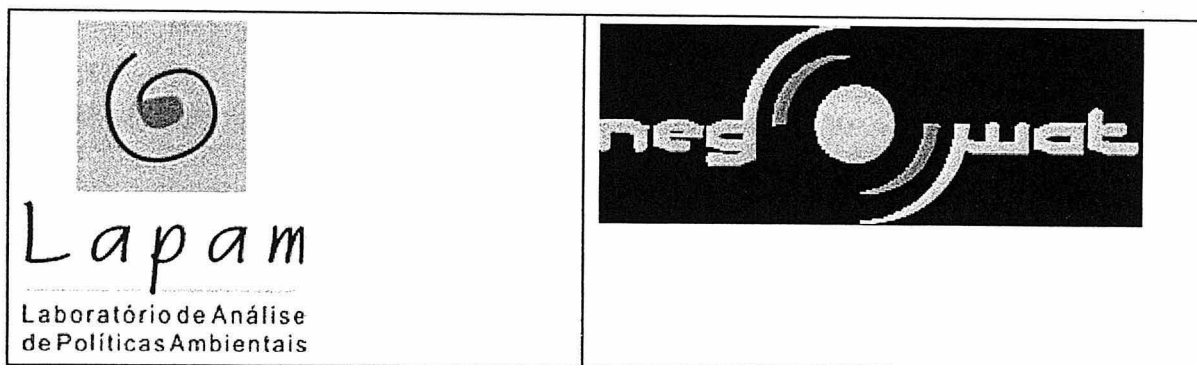
Butantã- SP

<b>Monday 12</b> <b>Segunda-feira 12</b>	Am	Oficina Negowat Workshop Negowat (cf convite)
	Pm	Oficina Negowat Workshop Negowat (cf convite)

<b>Tuesday 13</b> <b>Terça Feira 13</b>		<b>Training Material development (coordination J. Butterworth)</b>
	9 h 00 – 9 h 30	1. An overview of the Negowat training materials concept and progress to date (John with Vlady and Vilma) [30 mins incl discussion]
	9 h 30 – 11 h 30	2. Pilot training sessions [2 hours, 0.5 hours for each presentation and 0.5 for discussion]. The idea here is that we present two of the complete modules in plenary as mock training of trainers sessions. After the sessions we should be able to go away and be informed on these topics, and use the modules
	11 h 30 – 12 h 30	3. Overview of other modules a rapid not full presentation of all the other modules [1 hour including discussion]
	<b>12 h 30 – 14 h 00</b>	<b>Lunch</b>
	14 h – 15 h 00	4. How we are going to use the modules: a planning session based upon reviewing existing plans and other opportunities (Bolivia, Brasil, India) [1 hour]
	15 h – 17 h 30	5. Groupwork on developing specific modules: work in pairs or small groups focusing on adding material (e.g. from Brasil) to existing modules or developing the outline material for missing modules [2 hours]

<b>Quarta Feira 14</b>		<b>Refinando a intervenção Negowat no Brasil</b>
	9 h 00	1. Presentation stakeholder analysis Sao Paulo (Pedro Jacobi)
	9 h 30 – 9 h 45	2. Que aprendimos nos 3 anos passados ? Consequência para intervenção.
	9 h 45 – 10 h 15	3. apresentação MSP irrigação em Guarulhos (15 mn” apresentação / 15’ discussão)
	10 h 30 – 11h	4. Presentation JogoPol e Teraguas. (Raphaële e Vilma)
	11 h – 11 h 30	5. Presentation AguaLoca e processo com comitê (Lucie, Cesar e Vinicius)
	11 h 30 – 12 h 30	6. lessons learned in the use of role playing games (Nicolas) : consecuencias para o Brasil (discussao)
	<b>12 h 30 - 14 h 00</b>	<b>Almoço</b>
	14 h	Apresentação programa atividades 2006 Bolívia (20 mn + 10 mn discussão)
	14 h 30 h	Finalização programa atividade 2006 Brasil
	15 h 15	Pausa
	15 h 30	Steering Committee

<b>Quinta Feira 15</b>	<b>9 h 00</b>	<i>Teste AguaLoca (sob reserva confirmação ) Obrigada para confirmar</i>
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**FACILITAÇÃO DE CONCERTAÇÃO COM COMUNIDADES LOCAIS PARA A GESTÃO  
INTEGRADA DAS ÁGUAS EM BACIAS PERIURBANAS:  
EXPERIÊNCIAS DE SÃO PAULO E COCHABAMBA (BOLÍVIA)**

**CONVITE**

Data: 12 de dezembro de 2005, das 9h00 às 18h00

Local: USP – Instituto de Estudos Avançados - IEA – Auditório

<http://www.usp.br/iea/>

(0xx11) 3091-3919

Av. Prof. Luciano Gualberto, Travessa J, 374, Térreo – Butantã- SP

A gestão integrada dos recursos hídricos em bacias periurbanas apresenta problemas específicos, como sua disponibilidade para os vários usuários, num contexto de degradação de sua qualidade em função da urbanização. Agregado a este cenário, a necessidade de articulação entre a gestão do solo (seu uso e a política fundiária) e das águas e o desafio da expansão e sustentabilidade dos serviços de água num contexto de rápido crescimento populacional, consequências do desenvolvimento de novas infra-estruturas nas organizações sociais locais, suas competências, funcionamento, papel e evolução dos usos e modos tradicionais de gestão das águas e solos, e suas interfaces.

A implementação de uma política de gestão territorial e participativa das águas sofre processo crescente de fragilização pelas fortes ilegalidade social, assimetrias de poder, informações não isonômicas dos atores e a representação limitada das comunidades locais.

Diante deste contexto, os objetivos do evento é compreender como facilitar o diálogo e a concertação sobre a gestão das águas entre os diferentes atores envolvidos. O projeto Negowat financiado pela Comunidade Européia e pela Fapesp, no seu desenvolvimento, está testando metodologia para facilitar as concertações necessárias, baseado na utilização de jogo de papeis. E por fim, discutir os resultados parciais do projeto, refletindo sob a luz das experiências nacional e internacional.



## **Programa**

9h00 – Abertura: Raphaële Ducrot - CIRAD – Projeto Negowat e José Galiziano Tundisi

9h30 – O diálogo entre sociedade civil e a Agência de Bacia do Alto Tietê: facilidades e dificuldades: Marcos Palermo – Agência de Bacia do Alto Tietê – FABH-AT

10h15 – Social Learning e a Gestão Integrada das Águas – Pedro R. Jacobi – USP-PROCAM-LAPAM

11h00 – Uso de Plataformas de Múltiplos Grupos de Interesse: interesse e dificuldades: experiências de Bolívia e África do Sul de Nicolas Faysse.

11h35 – Coffee Break

11h45 – 12h30 – Debate

12h45 – Almoço

14h00 – Metodologia para melhorar o funcionamento dos comitês local de abastecimento de água potável na região peri-urbana de Cochabamba: Franz Quiroz

14h45 – A mudança do uso do espaço a partir do acesso aos serviços de infra-estrutura: Valentina Denizo – CDHU – GESP.

15h30 – Implementação de um processo de negociação sobre a gestão de canais de irrigação entre irrigadores e moradores urbanos

16h15 – Coffee Break

16h30 - As Experiências brasileiras de usos Jogos de Papéis para educação ambiental relacionado à gestão integrada das águas – Marô Camargo e Sandra Inês B. Granja – USP-PROCAM-LAPAM

17h15 – 18h00 – Debates

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### ***Orientações Gerais:***

**Inscrições:** gratuitas.

**Local:** USP – Instituto de Estudos Avançados - IEA – Auditório

(0xx11) 3091-3919 - Av. Prof. Luciano Gualberto, Travessa J, 374, – Butantã- SP

**Exposições:** 20 minutos e 25 minutos para debates.

**Almoço:** FEA-USP (gasto aproximado: R\$20,00/pessoa)

## 5.4 Publications

### BRAZIL

**AX1** R DUCROT, A. K. S. BUENO, B. P. REYDON, 2005. Institutional arrangements for articulating land and water management in peri-urban catchment: example of the metropolitan region of São Paulo, Brazil. *International Journal of Water*, Vol. 3, No. 2, 2005, 186-203

**AX2** M. BOUZID, R. DUCROT, Y. M. CHAGAS DE CARVALHO, R. A. L. IMBERNON. 2005. Dynamiques agricoles périurbaines et gestion intégrée de l'eau, Cas d'un bassin-versant producteur d'eau dans la région métropolitaine de São Paulo (Brésil). *Cahiers agricultures*, Cahiers Agricultures vol. 14, n° 1, janvier-fevrier 2005, 131-137.

**AX3** TUNDISI, J.G. 2005 - As árvores e a conta da água. *Scientific American*, Brasil n° 36..... Maio, pp 30.

**AX4** Barban V. Between the legal and the real – the necessity of information to the citizen participation. In, Dowbor, L. e Tagnin, R. A. (org) *Managing water as if it was important: environmental management and sustainability*. São Paulo: Ed. Senac São Paulo, 2005. pp173-181.

**AX5** Jacobi P. Comitê de Bacias hidrográficas. O que esta em jogo na gestão compartilhada e participativa. In, Dowbor, L. e Tagnin, R. A. (org) *Managing water as if it was important: environmental management and sustainability*. São Paulo: Ed. Senac São Paulo, 2005. pp81-88

**AX6** SENDACZ, S.; MONTEIRO, A.J.; MERCANTE, C.T.J.; MONTEIRO, A.J.; MENEZES, L.C.B.; MORAES, J.F. 2005 Sistemas em cascata: concentrações e cargas de nutrientes no Sistema Produtor Alto Tietê, São Paulo. in Nogueira, M.G.; Henry, R. & Jorcin, A. (eds) *Ecologia de Reservatórios: Impactos Potenciais, Ações de Manejo e Sistemas em Cascata*. p.417-434

**AX7** TUNDISI, J.G. 2005 – Gerenciamento integrado de bacias hidrográficas e reservatórios – Estudos de caso e perspectivas. In: *Ecologia de Reservatórios – Impactos Potenciais, ações de manejo e sistemas em cascata*. Organizadores – Marcos Gomes Nogueira, Raoul Henry e Adriana Jorcin. UNESP/ Rima Editora. pp 1 – 21

**AX8** BARBAN V. , ROJOT, C. E MORAIS, C.K. 'Shared Management: information and formation for the citizen participation'. "Encuentro por una Nueva Cultura del Agua en América Latina", Fortaleza, Ceara, Brazil 05 a 09/12/2005. Cd (available: <http://www.unizar.es/fnca/america/index2.php?idioma=pt&x=0512>, capture 20/01/2006)

**AX9** CARVALHO, Y. M.C.; FRANCA, T. J. F.; BARBAN, V.; VICENTI, M. C.; FRANCISCO, V. L. a F.S. 2005. The São Paulo's Metropolitan area: environmental protection and poverty alleviation. XI World congress of Rural Sociology. Trondheim, Norway. July, 25-30, 2004. (available <http://www.irsaworld.org/XI/papers/groups.html> group 18; captured 31/12/2005)

**AX10** FRANCA. T.J.F. ; CARVALHO, Y.M.C. ; ANDRADE, J.P.; VIÉGAS, J. .2005. Turismo e lazer em áreas periurbanas de proteção de mananciais: território, paisagem e multifuncionalidade. IN: VI Simposio Latino Americano sobre Investigación y Extensión en Sistemas Agropecuarios (IESA-AL-VI). Colombia, 20-22 /07/2005. (summary) *Proceeds (and CD-ROM)*

**AX11** CARVALHO, Y. M. C.; ZUCHIWSCHI, E.; FERREIRA, S. E.; FRABETTI, G. L. 2005. Perspectivas para a Agricultura da Bacia do Alto Tietê. IN: VI Simposio Latino Americano sobre investigación Y Extensión en Sistemas Agropecuarios (IESA-AL-VI). Colombia, 20-22 /07/2005. *Summary Proceeds.... (and CD-ROM)*.

**AX12** CARVALHO, Y.M.C ;FRANCA, T.J.F. 2005. A preservação dos mananciais da região metropolitana de São Paulo e a multifuncionalidade. IN: XLIII Congresso da Sociedade Brasileira de Economia e Sociologia Rural – SOBER / 2005 FEA Ribeirão Preto-USP. Ribeirão Preto, 24 a 27/07/2005. *Proceeds.... (and CD-ROM)*

**AX13** FRANCA. T.J.F. ; CARVALHO, Y.M.C. ; ANDRADE, J.P.; VIÉGAS, J. .2005.Turismo e lazer em áreas periurbanas de proteção de mananciais: território, paisagem e multifuncionalidade. IN: XLIII Congresso da Sociedade Brasileira de Economia e Sociologia Rural – SOBER. Universidade de São Paulo-USP-Ribeirão Preto–SP, 24-27/07/2005. *Proceeds....(CD-ROM)*

**AX14** CASTRO, P. M. G.; MARUYAMA, L. S.; MERCANTE, C. T. J.; BEZERRA DE MENEZES, L. 2005. Diagnóstico da atividade pesqueira no Alto Tietê (São Paulo, Brasil): contribuição à gestão de usos múltiplos da água. IN: XVI Encontro Brasileiro de Ictiologia . João Pessoa, Jan. 2005. (summary) *Proceeds....*

**AX15** CASTRO, P. M. G.; MARUYAMA, L. S.; MERCANTE, C. T. J.; BEZERRA DE MENEZES, L. C. 2005. Perspectivas da atividade pesqueira no Alto Tietê, São Paulo: contribuição à gestão de usos múltiplos da água. IN: XIV Congresso Brasileiro de Engenharia de Pesca. Fortaleza, 18-22/10/2005. *Proceeds....*

**AX16** DUCROT R., PAZ B., POUGET J.C, TUNDISI J.G.. Le développement d'outils de simulation pour faciliter les consultations concertations dans pour la gestion de bassins versants peri-urbains: exemple de São Paulo, Brésil. Eds. D.V Savic, M.A Marino, H H. G. Savenije, J.C Bertoni. Sustainable Water Management Solutions for Large Cities. Proceedings of symposium S2 held during the Seventh IAHS Scientific Assembly at Foz do Iguaçu, Brazil, 3-9 April 2005. IAHS Publ. 293, 2005. 132-140

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