Technologies for Water Recycling and Reuse in Latin American Context:

Assessment, Decision Tools and Implementable Strategies under an Uncertain Future

Final publishable summary report
Figures and Tables

December 2015
Figure 1. Interrelationship between the Project WPs leading to the Conceptual representation of the work plan.
Figure 2. Interrelationship between the Project WPs including WP coordinators and participating partners.

Table 1. The main results of the COROADO project and their components

<table>
<thead>
<tr>
<th>Main Results</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web – Service Toolbox</td>
<td>Geographical database design and Web GIS system development</td>
</tr>
<tr>
<td>Scientific Workshops</td>
<td>Development and application of a web-based geographical tool</td>
</tr>
<tr>
<td>Design and development of the web-based DSS</td>
<td>Report on a tool for assessing change of irrigation practices due to water scarcity and climate change</td>
</tr>
<tr>
<td></td>
<td>Tools and instruments for supporting decision-making for water R&amp;R scenarios and strategies</td>
</tr>
<tr>
<td></td>
<td>Guidelines of Management Strategies and Policies on Reuse and</td>
</tr>
<tr>
<td>Case Studies (Beneficiary)</td>
<td>First Series of Workshops</td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Brazil (USP)</td>
<td>June 27, 2012</td>
</tr>
<tr>
<td>Chile (PUC)</td>
<td>August 8, 2012</td>
</tr>
<tr>
<td>Argentina (UC)</td>
<td>August 31, 2012</td>
</tr>
<tr>
<td>Mexico (TDC)</td>
<td>July 5, 2012</td>
</tr>
</tbody>
</table>

**Figure 3.** COROADO DSS structure
1.1 - Study Area Definition + Characterization

import from WebGIS or mark the study area:

Study Area definitions:

By asking the end user what are the major problems/vulnerabilities to assess in the area, the web tool can choose / filter the appropriate indicators (for the next steps).
Each study point may represent the area of influence of an existing/future treatment plant.

The end-user must now characterize the sub-area.

Each vulnerability indices (stress, scarcity, drought) requires a set of information (indicators).

Each indicator complies to a set of predefined options.

PS: The indicators presented are fictitious.
1.2 - Sub-Areas Indicator Characterization

Repeat the characterization process for other study points, spread across the whole study area.

1.3 - Calculation + Visualization

The results for the whole study area can then be represented on the visualization platform (e.g., using Kriging - regression).
After this initial analysis, the web tool will allow the end-user to deeply analyze/improve the vulnerable subareas, towards possible WR&R:

2.1 - Pollutant data collection

The initial data is now detailed by the end-user, towards WR characterization:

<table>
<thead>
<tr>
<th>Pollutant Concentration - Point #1:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> New city treatment plant</td>
</tr>
<tr>
<td><strong>Quantity / Flow:</strong> 200 m³/hour</td>
</tr>
<tr>
<td><strong>Turb:</strong> 225 NTU</td>
</tr>
<tr>
<td><strong>TSS:</strong> 250 mg/L</td>
</tr>
<tr>
<td><strong>BOD:</strong> 225 mg/L</td>
</tr>
<tr>
<td><strong>COD:</strong> 600 mg/L</td>
</tr>
<tr>
<td><strong>TN:</strong> 85 mg/L</td>
</tr>
<tr>
<td><strong>TP:</strong> 9 mg/L</td>
</tr>
<tr>
<td><strong>Fe:</strong> 900 mg/L</td>
</tr>
<tr>
<td><strong>TC:</strong> 800 Nol/100ml</td>
</tr>
</tbody>
</table>
The end-user is invited to start by characterizing the **existent situation**: if no water treatment exists, all processes can simply be defined as “None”.

Other trains can be further added, allowing simulation and comparison capabilities.

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**Results** are calculated instantly (based on formulation and criteria provided by WP4);

**Regulation compliance** will be met if final pollutant concentration is lower than the chosen requirements.
2.2 - Treatment Train selection/simulation

The end-user is invited to start by characterizing the **existent situation**: if no water treatment exists, all processes can simply be defined as “None”.

Other trains can be further added, allowing simulation and comparison capabilities.

**Results** are calculated instantly (based on formulation and criteria provided by WP4);

**Regulation compliance** will be met if final pollutant concentrations lower than the chosen requirements.
After definition of the existent treatment train, the end-user can now start simulating possible alternatives towards WR&R evaluation;

A list of several typical trains (provided by WP4) can be available, allowing comparison and study baselines;

Figure 3.1. DSS screens progressively portraying the procedure of the application.

Results also include the overall improvement (when compared to the existing train).

This improvement calculation can be expressed as a weighted average of all results.

Figure 3.2. DSS screen portraying results for a typical (basic) application.
Figure 3.3. DSS screen portraying results for the optimum (most appropriate) application.

Comparison - Results for the different Treatment Trains:

- Existent
- Typical: High Quality
- Typical: Only disinfection
- Typical: Soil Treatment
- Typical: Local NBR
- Typical: Wetlands
- Optimal

Figure 3.4. DSS screen portraying comparative results for the various treatments application.
Figure 4. The COROADO Website
In order to be able to maximise the benefits from recent and ongoing technological progress in the area of monitoring, decision-making and management approaches, and a growing awareness to disease monitoring associated with media objects, public awareness and multi-sectoral contributions, new models for decision-making and control should be developed. These models need to be effective and efficient and should be incorporated into the already existing control and management systems.

Thus, the COROADO model will focus on:

- Developing tools for measuring, monitoring and controlling technologies and systems
- Developing new techniques and technologies
- Integrating and organizing existing information about vulnerabilities and capacity building efforts.

The web-based Coroado, Building and Development Tool will present a richer view of present and future developments, situations and solutions. The project will be presented as a web-based system for information on monitoring and effective management, offering an engaging learning experience. The project will include: detailed analysis to measure vulnerability and generate information between the current state and among other scenarios. Information and allows users of the world changing conditions. Its objective is to provide a comprehensive basis for decision-making in the four main areas and potential audiences with a broad range of users and stakeholders.

The effort may develop an understanding of social responses to governance and policy decisions in order to maintain a small number of systems and technologies. The implementation of these tools will provide a comprehensive and systematic set of guidelines, and it will require that policy makers consider the needs of stakeholders who are affected by and benefit from the implementation of COROADO without any further assistance.

**Figure 5.** The COROADO Dissemination Site

**Figure 6.** Schematic Procedure of the development of the Indices