Integrated Water Resources Management in Peru – The Long Road Ahead

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LIMA - PERU
GROUNDWATER RESOURCES
Groundwater Resources

- Used intensively and measured in the Coast only.
- Annual potential exploitation 2 700 MCM.
- Use: 1 500 MCM
- Some areas are critical
- Main problems:
  - Overexploitation. (Ica: Villacuri-Ica- Pampas de Lancha and Tacna: La Yarada)
  - Saline intrusion: Tacna: La Yarada (Peru – Chile border)
GW Resources – Ica case

- Agricultural exports: vines and asparagus – great economic value
- Irrigated with GW.
- Near zero unemployment in the region.
- Overexploitation is detected → Continuous lowering the water table at 1.46 m/year.
Actions by ANA – National Water Authority

- Information, sensibilization, communication capacity building.
- Aquifer evaluation.
- Reduction in GW volume exploitation: better irrigation efficiency.
- Control, monitoring and supervision.
- Artificial recharge projects.
- Modernization of IWRM.
- Israeli Cooperation Agency – MASHAV – will help.
And a short note on water and poverty

MUNICIPAL WATER
Largest populated metropolitan areas of Peru.

<table>
<thead>
<tr>
<th>City</th>
<th>Altitude (m)</th>
<th>Basin</th>
<th>Geographical Area</th>
<th>Population (2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lima-Callao</td>
<td>154</td>
<td>Pacific</td>
<td>Coast</td>
<td>8 472 935</td>
</tr>
<tr>
<td>(Downtown Lima)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arequipa</td>
<td>2335</td>
<td>Pacific</td>
<td>Mountains</td>
<td>749 291</td>
</tr>
<tr>
<td>Trujillo</td>
<td>34</td>
<td>Pacific</td>
<td>Coast</td>
<td>682 834</td>
</tr>
<tr>
<td>Chiclayo</td>
<td>29</td>
<td>Pacific</td>
<td>Coast</td>
<td>524 442</td>
</tr>
<tr>
<td>Piura</td>
<td>29</td>
<td>Pacific</td>
<td>Coast</td>
<td>377 496</td>
</tr>
<tr>
<td>Iquitos</td>
<td>106</td>
<td>Amazon</td>
<td>Lower Jungle</td>
<td>370 962</td>
</tr>
<tr>
<td>Cuzco</td>
<td>3399</td>
<td>Amazon</td>
<td>Mountains</td>
<td>348 935</td>
</tr>
</tbody>
</table>
## Coverage of Sanitation Services in Peru

<table>
<thead>
<tr>
<th>Service</th>
<th>1990</th>
<th>2005</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>63</td>
<td>76</td>
<td>82</td>
</tr>
<tr>
<td>Sewage</td>
<td>54</td>
<td>57</td>
<td>77</td>
</tr>
<tr>
<td>Wastewater Treatment</td>
<td>5</td>
<td>22</td>
<td>100</td>
</tr>
</tbody>
</table>
Total annual volumes and percentages of wastewater with and without treatment.

<table>
<thead>
<tr>
<th>Wastewater produced by sanitation services</th>
<th>Volume per year (m³/s)</th>
<th>Q (m³/s)</th>
<th>% Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>With treatment</td>
<td>217253807</td>
<td>6,89</td>
<td>29,10</td>
</tr>
<tr>
<td>Without treatment</td>
<td>530027896</td>
<td>16,81</td>
<td>70,90</td>
</tr>
<tr>
<td>Total</td>
<td>747281703</td>
<td>23,70</td>
<td>100,00</td>
</tr>
<tr>
<td>Metropolitan Area</td>
<td>Number of Connections</td>
<td>Water Coverage (%)</td>
<td>Sewage Coverage (%)</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------</td>
<td>--------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Lima-Callao</td>
<td>1194879</td>
<td>88.1</td>
<td>83.7</td>
</tr>
<tr>
<td>Arequipa</td>
<td>201144</td>
<td>82.2</td>
<td>71.6</td>
</tr>
<tr>
<td>Trujillo</td>
<td>135883</td>
<td>84.1</td>
<td>71.2</td>
</tr>
<tr>
<td>Chiclayo</td>
<td>133767</td>
<td>84.0</td>
<td>75.8</td>
</tr>
<tr>
<td>Piura</td>
<td>163824</td>
<td>82.7</td>
<td>64.9</td>
</tr>
<tr>
<td>Iquitos</td>
<td>56684</td>
<td>68.2</td>
<td>47.5</td>
</tr>
<tr>
<td>Cuzco</td>
<td>57497</td>
<td>96.7</td>
<td>85.8</td>
</tr>
</tbody>
</table>
Potable Water Access and Poverty

- Many people do not have connections to the municipal water.
- It is necessary to consider alternatives to increase water availability for less favored people.
- Price of water for inhabitants of periurban areas is enourmously high and quality is bad.
Potable water and sanitation services varies from US$ 0.52 (S/ 1.35) per m$^3$ to US$ 1.77/m$^3$ (S/4.90 soles/m$^3$) for housing with connection to the municipal water distribution system. In urban areas with no water supply people pay US$ 0.77 per cylinder or US$ 12.69/m$^3$ – 24 times more!!!

Exchange rate 1 US$ = S/. 2.60
ENERGY AND WATER
Energy consumption

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Energy Consumption - TJ</td>
<td>462885</td>
<td>446811</td>
<td>456279</td>
<td>459664</td>
<td>495537</td>
<td>477175</td>
<td>498121</td>
<td>518982</td>
<td>535392</td>
</tr>
<tr>
<td>Per capita energy consumption</td>
<td>17.81</td>
<td>16.95</td>
<td>17.06</td>
<td>16.96</td>
<td>18.05</td>
<td>17.16</td>
<td>17.69</td>
<td>18.22</td>
<td>18.59</td>
</tr>
</tbody>
</table>

Per capita energy consumption rose from $17.81 \times 10^6$ J/person to $18.59 \times 10^6$ J/person, a 4.2% increase.
Notice that Sugarcane bagasse is starting to show as a source of electric power. In addition, use of 7.8 % ethanol in gasoline is mandatory in Peru. There is an increasing trend for Using of agricultural products for energy purposes.
Cases (i) State negligence and (ii) the lesser evil was 1000 times better.

WATER AND ENVIRONMENT
Examples of Severe Environment and Water Degradation

- Environment degradation has occurred in the Madre de Dios region (SE Peru) due to illegal gold mining activities.
  - Deforestation
  - Increase in sediment production
  - Incorporation of mercury and formation of methyl mercury.
  - Three fish species already show above permissible limits contents of mercury.
Illegal Mining Destroys the Amazon Rainforest in SE Peru
Other Impacts

✿ Negative Social Impacts:
  – Affects main source of proteins (fish) of the population → food safety.
  – Unsafe working conditions.
  – People trafficking → semi-slavery
  – Exploitation of minors – all kinds.

✿ Economic Impact
  – Resource
  – Money laundering from illegal activities
  – Tax evasion
The Tambogrande valley case: Wherever you leave a void, it is filled fast –

- **Empresa Minera Manhattan Sechura (EMMS),** a subsidiary of Manhattan Minerals Corporation had a concession for the exploitation of gold and silver.

- **Initial estimates:** 853 Million ounces of gold and 10.2 million ounces of silver.

- **Tambogrande Valley famous for the production of limes and mangoes.**
Farmers protested, even vandalizing EMMS property. Five people died.

Farmers got support from NGOs.


Local farmers and migrant miners started digging for gold in 2005.

Uncontrolled use of sodium cyanide is polluting the Quiroz and Chipilico river.

10,000 Ha of crops have been lost so far.

“The prescription drug was worst than the disease”
MODERNIZATION OF WATER RESOURCES MANAGEMENT
General Water Law (1969)

- Focused only on agriculture.
- Only promoted agriculture in the Pacific Basin → Coast.
- The largest reservoirs were built during the two governments.
- Did not promote an integral approach.
Use priority in GWL (1969)

- Direct Use
- Municipal Water
- Agriculture
- All other uses
Desintegrated Water Management

- Ministry of agriculture → water licenses and permits.
- Ministry of Health → water quality.
- Board of Ministers → Environmental issues.
- Ministry of Energy and Mines → Water licenses and permits for mining.
Water Management according to General Water Law (1969)
Drivers for WRL

- UN Water Conference, Dublin Principles, Rio Declaration – Agenda 21, World Summit Sustainable Development.
- Eventually → Free Trade Agreement with the United States accelerated the process.
- US Environmental Protection Agency requirements were taken into account.
Water Resources Law (2009)

- More integral, basin based approach.
- Priorities:
  - Direct Use.
  - Municipal Water
  - All other uses
- Creation of the National Water Authority – ANA in Spanish.
Water Management according to Water Law (2009)
AN A duties

- Development of Water policy
- Formulate rules and procedures → ensure an integrated approach
- Coordinate and organize actions to implement the National Water Resources System.
- Technical opinion about water availability
ANA duties

- Promote knowledge exchange.
- Jurisdiction
- Impose sanctions.
- Grant water laices
- Develop educational activities
- Promote recognition of economic and environmental value of water.
Conclusions (I)

- Peru is a very uneven country from the geographical, demographical and hydrologic viewpoint. The Pacific Basin is a very dry area, whereas the Jungle is a very humid area. The Sierra (Mountains) is a region with a wide variety of climates. The majority of the people live where water is most scarce, which is near the coastline.

- The birth rate has decreased, especially in Lima, the largest metropolitan area. However, the population growth rate is one of the highest of the nation due to migration from the highlands and the jungle. A similar pattern is observed in other coastal cities. This creates pressure on water consumption in the Pacific Basin.
Conclusions (II)

- Economic growth has also created pressure on food consumption. It has been shown that as the annual per capita income has increased; the per capita consumption of chicken meat has also increased. A similar trend has been observed in other food products.

- Use of blue water is intense along the Peruvian Coast. Rice, a low cost product, is its higher consumer. In some areas, export products of high value are grown and they even use very water efficient irrigation methods. A more rational use of water must be encouraged or even enforced as the water resources are being exhausted along the Pacific Basin.
Conclusions (III)

- Uncontrolled and illegal economic activities, such as illegal gold mining, are destroying the environment and heavily damaging Peru’s water resources. In some cases, damages might be irreversible. It is necessary to enforce rules and regulations especially in the lower Jungle, where negligence from past authorities have allowed the formation of gold mining colonies that are predating the environment. Some measures such as the issuance of certificates of origin for gold products may be necessary in the long term.

- Conflicts between agriculture, farming and other economic activities have occurred in the last years. These conflicts are related to the use and preservation of water. New avenues of communication are needed to avoid conflict which has already caused deaths and serious economic losses.
Conclusions (IV)

- The recent creation of the Water National Authority, ANA, the Ministry of Environment and the publication of new Water Law with new regulations have created a better framework for the integration of water resources management. However, Peru is a vast country and it is necessary to **enforce the new rules and environmental regulations**. There is an urgent need to form new capacities in the people in charge of natural resources management and to enforce laws and regulations.
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Thank you for your attention!

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