



UPDATE EXTRA

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Water in Peru

The aims of the PSG are to promote the rights and interests of the people of Peru and in particular the poorest sectors.

The Great Water Debate:

Cause and Effect in Peru

The purpose of this publication is to highlight the challenges of water provision in Peru, a country widely considered to be one of the most vulnerable in South America to severe water shortages. We will explore the social and economic impact this could have on the urban and rural poor in Peru should these challenges not be met with progressive solutions.

In Peru water is used for domestic, business and industrial purposes, subsistence farming, agribusiness and mining. Agriculture is the largest user of water. Overall, mining does not use much water, but past and present mining activity does generate significant contamination of water courses and of land.

At an international level, many government bodies and non-governmental organisations alike are placing a new emphasis on climate change and how this relates to poverty. In fact, as part of the Millennium Development Goals (MDGs) set by 189 United Nations member states at the Millennium Summit in 2000, one of the targets of Goal 7, to 'Ensure Environmental Sustainability', is to reduce by half the proportion of people without sustainable access to safe drinking water by 2015. Of Peru's 8.9 million rural inhabitants, 3.3 million have no access to drinking water (37%), while 6.2 million (70%)

lack adequate means of eliminating sewage.¹

Many of the concerns over the socio-economic impact of the increasing difficulties surrounding water provision are not exclusive to Peru, and are prevalent throughout Latin America and the rest of the developing world. Although

Peru...a country widely considered to be one of the most vulnerable in South America to severe water shortages

this report does not claim to be exhaustive, we consider some of the key issues related to water in Peru.

Part 1

As a prelude to our consideration of the main water-related issues affecting Peru, we summarise the current legal framework surrounding this theme in Peru. Specifically, we examine the General Water Law (and modifications), which has been in force for almost 40 years.

Inside this issue:

| | |
|-----------------------------------|-------|
| Introduction | 1-2 |
| I Water Legislation in Peru | 3-5 |
| II The 'Moral Economy of Water' | 6-9 |
| III Climate Change & Glacial Melt | 10-13 |
| Case Study 1: Río Santa Valley | 14 |
| IV Adaptation | 15 |
| Case Study 2: Practical Action | 16 |
| Case Study 3: CEDEPAS | 17 |
| V Contamination: Mining & Water | 18-19 |
| Case Study 4: Mantaro River | 20 |
| Concluding Remarks | 21-22 |
| Footnotes | 22 |
| Bibliography | 23 |
| List of Acronyms | 24 |

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The effects of climatic phenomena, particularly glacial melt from the Andes, have an impact on access to water throughout Peru

Part 2

There is great concern amongst campaigners that the privatisation of water in developing countries, and in the Andean region in particular, is untenable and a source of ongoing and future social conflict. In neighbouring Bolivia, for example, local inhabitants of Cochabamba protested against price hikes in their water rates following the privatisation of the local water utility to a foreign company in April 2000. In this instance, the poor were joined by the middle-classes who saw their own water bills increase substantially as any previous subsidies that they had enjoyed were taken away during privatisation.

This issue is addressed in Paul Trawick's article on *The Challenge of Water Reform in Peru: Lessons from the 'Moral Economy of Water'*, which sets forth an alternative approach to policy and resolution of the water crisis in Peru through community-based water management systems. This "third way" contrasts with the more conventional policies of state ownership or privatisation.

Part 3

It is difficult, if not impossible, to separate the debate on water from that on climate change. So we present a summary of James Painter's research for the United Nations Development Programme (UNDP) on the impact of global warming on glacial melt in the Andean region, and the relationship of this phenomenon on water scarcity in Peru.

The effect of climatic phenomena, particularly glacial melt from the Andes, have an impact on access to water throughout Peru, especially in the desert coastal regions where most of the population lives and where most of the agriculture, particularly commercial, occurs. Consequently, there is a real and increasing threat of conflict over the distribution of water in Peru.

Part 4

As a means to reduce the stress on an ever more vulnerable water supply, there is currently much talk in various sectors (such as NGOs, multilateral and government agencies) about adaptation. However, for the purposes of this report, we

mostly limit the definition of adaptation to that of water management in rural communities.

To better illustrate this course of action, we look at two case studies which detail projects that have been supported by British NGOs, Practical Action and Progreso.

Part 5

Martin Scurrah examines the impact of mining on water, in terms of both quantity and quality. He considers the role of civil society organisations in areas where access to water by the local community competes with mining companies.

The legacy of past and current mining activities is examined in a case study on the Mantaro River Valley in the central Andes. This looks specifically at the water quality of the river and details the high levels of mineral contamination throughout its length. This case raises the possibility that there is much more extensive contamination than previously suspected and not only in communities close to currently operating mines.

The water quality of the Mantaro River ...shows extensive and high levels of mineral contamination throughout its length



Map showing Peru's departments.

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History

In Peru, the General Water Law (*Ley General de Aguas* - LGA) was promulgated in July 1969 and revoked the Water Code of 1902.

The military government, which came to power in 1968, began to bring about important changes in Peru. The reform-oriented regime nationalised control over water resources and the law is still in force today.

General Water Law 17752 (July 1969)

When the General Water Law was passed it was considered as complementary to the Agrarian Reform which had been approved a month before.

The LGA established with absolute clarity the 'institutionality' (*institucionalidad*), or public nature of natural resources, in complete contrast to the Water Code of 1902 which it superseded.

In fact, the first article of the 1969 law states:

"Water, with no exception, is the property of the State, and its ownership is inalienable and imprescriptible. There is no private ownership of water or acquired rights over water."

As prescribed by the original law, the LGA is overseen by the Ministries of Agriculture and Health, with the former responsible for quantity and the latter for quality. Currently, eight ministries intervene in one way or another in Peru's water management (Ministries of: Agriculture; Health; Housing, Construction and Sanitation; Foreign Trade; Women and Social Development; and Defence).

Further complications arise in that, aside from their work as part of Central Government, all the ministries and other public entities act at both a regional and local level.

Various modifications of the LGA

Alberto Fujimori

During its first 20 years of life, no significant changes were made to the law. How-

ever, the most radical changes to the legislation were introduced during Alberto Fujimori's government; from 1993 to 2000 some 15 bills to reform the LGA were drafted.

- Fujimori's government aimed eventually to privatise water management in Peru.

- An environmental authority was established in each ministry which further complicated the country's water management.

From the end of 1992, Fujimori made two real, but ultimately unsuccessful, attempts to substitute the 1969 law. In Peru's 1993 Constitution, slight variations were made to deal with natural resources but their status as belonging to the nation remained intact.

Transitional Government and Alejandro Toledo

During President Valentín Paniagua's transitional government (2000-2001), the Ministry of Agriculture encouraged a re-drafting of the law. However, under Alejandro Toledo's subsequent government the same ministry did not consider this a priority; although it did establish a multi-sector commission to study such a reform at the end of 2002.

February 2004 - the National Board of Users of Irrigation Districts (JNUDRP - *Junta Nacional de Usuarios de los Distritos de Riego del Peru*) presented Congress with a new water bill, this coincided with the formation of a National Water Commission (*Comisión Nacional de Aguas*).

February 2005 - this Commission passed a draft bill.

May 2005 - the National Water Commission submitted the draft bill to Congress' Agricultural Commission.

Alan García

May 2007 - a formal presentation of the aforementioned bill was made to the Agricultural Commission. However, it shelved the bill.

Water, with no exception, is the property of the State, and its ownership is inalienable and imprescriptible. There is no private ownership of water or acquired rights over water

Currently, eight ministries intervene in one way or another in Peru's water management

I Water Legislation in Peru

The current General Water Law...co-exists alongside a large number of other laws and supreme decrees which have made it increasingly incoherent and cumbersome

Regionalisation of Peru adds to the complexity of water management

March 2008 - the government creates a National Water Authority (*Autoridad Nacional de Agua* - ANA). This public body functions within the Ministry of Agriculture (MINAG) and replaces the Intendancy of Water Resources, which previously operated under INRENA (*Instituto Nacional de Recursos Naturales*). The ANA is responsible for the design and implementation of procedures for the integrated and sustainable management of water resource and irrigation nationally.

The ANA will be responsible for the realisation of a National Water Resource Modernisation Project, an initiative which will be financed by a US\$30 million (£15 million) loan from the World Bank. This figure corresponds to the initial investment for the implementation of three projects: Water User Association of Chancay-Lambayeque; Ica; and the Water User Association of Valle de Chili (Arequipa).

May 2008 - the government creates Peru's first Ministry of the Environment (MMA).

Current Status

At the end of 2007, the Ministry of Housing, Construction and Sanitation put forward a bill to create a water management system, *Ley SIGA*. However, it was firmly rejected by the JNUDRP and consequently the Ministry of Agriculture was unable to accept it.

In June 2008, the Agricultural Commission passed a bill for a new General Water Law, which rules out the privatisation of the rights to this natural resource. The bill clarifies that the National System for the Management of Water Resources would take charge of planning, running and supervising general administration and the running of the ANA. It would also establish a National Water Resource Tribunal, specify the functions of regional and local government, central government departments, as well as users' organisations. Additionally, a new LGA would include a catalogue of offences and sanctions for poor management of water.

However, the new environmental minister Antonio Brack says that the Agricultural Commission has failed to take into consid-

eration the new environment ministry when drafting this bill.

The proposed legislation has also failed to gain complete cross-party support and as a result is unlikely to see the light of day in the short term. One bone of contention for parliamentarians is that the management of water will be appointed to MINAG when there is already an environment ministry. Members of Congress from the conservative National Unity Party (*Unidad Nacional*) want the opportunity to have greater debate on the issue; while the governing APRA Party favour modifying the existing LGA claiming that it hasn't been questioned by any sector.

What is Wrong with the Current General Water Law?

It is an outdated piece of legislation that was implemented in 1969. It co-exists alongside a large number of other laws and supreme decrees which have made it increasingly incoherent and cumbersome as a piece of legislation in which too many government bodies intervene.

This complexity, coupled with a lack of clarity in the current legislation give an impression of institutional disorder. This is further exacerbated as the institutional framework for water resource management is fragmented at national level.

Regionalisation of Peru adds to the complexity of water management: in 2003, Alejandro Toledo implemented a decentralisation plan which led to the creation of 25 new regional governments. The Decentralisation Law recognises "the sustainable management of natural resources and improvement in the quality of the environment" as one of the shared powers of the regions.

However, this can be problematic for water resource management as the regional boundaries do not coincide with those of the river basins.

As regards Peruvian Law and indigenous peoples, national legislation and public policy regarding water either denies, ignores or barely acknowledges local common law and indigenous norms governing water resources.

I Water Legislation in Peru



CURRENT LEGAL FRAMEWORK

General Water Law (LGA) 17752 (July 1969)

Various modifications of the LGA

Legislative decree 653 (1991)

1993 Constitution

Organic Law for the Sustainable Use of Natural Resources (1997) - This law refers in more detail to Article 66 of the 1993 Constitution, which underlines the principle of the prominent control of the State. The law defines both surface and subsoil natural resources, including water, as part of the Nation's heritage.

Water bill published in April 2003

Water bill published in February 2005

Water bill passed by the Agricultural Commission in June 2008; but yet to be approved by Congress.

It is unclear what will happen to the Ministry of Energy and Mines' (MEM) role in environmental regulation

INSTITUTIONAL FRAMEWORK FOR WATER RESOURCE MANAGEMENT

Ministry of Agriculture (MINAG) - The main government body responsible for water management at national level.

Other Ministries have various inputs on water resources management:

- Agriculture for irrigation
- Housing and Sanitation for domestic water use
- Health for water quality
- Trade and Tourism for hot springs and mineral water
- Energy and Mining for hydropower and mining operations
- Council of Ministries for environmental policy and energy and water tariff and services regulation
- Defence for hydro-climate information

Ministry of the Environment - created in May 2008, this government agency has the power to declare protected areas for water. It brings together a number of institutions (INRENA, INADE, CONAM, PRONAMACHS and DIGESA), but it is unclear what the Ministry of Energy and Mines' (MEM) role will be in environmental regulation. The supervising agency for investment in the energy and mining sector (OSINERGMIN) will continue to operate independently of the Ministry of the Environment (MMA).

Regional Governments - are responsible in each of Peru's 25 departments for coordinating water use management. However, this can be problematic for water resource management as the regional boundaries do not coincide with those of the river basins. Additionally, some of the regions lack basic technical capacity and human resources to undertake such resource management.

Water use management ...can be problematic ...as the regional boundaries do not coincide with those of the river basins

II The Challenge of Water Reform in Peru:

By Paul Trawick, Senior Lecturer in Environmental Anthropology, Cranfield University

Neither of the two conventional policies for water management is entirely acceptable to the majority of the Peruvian people

"The Tragedy of the Commons"... the notable tendency of people to overexploit and abuse any resources that they hold in common

For more than a decade the people of Peru have stood frozen at a major crossroad of development, like their Andean neighbours, contemplating the limited options seemingly available for a much-needed change in the policies governing the ownership and use of water, the most unique and vital natural resource. The lack of serious movement towards reform, although reflecting ideological differences among various segments of the population, is mainly attributable to the fact that neither of the two conventional policies for water management is entirely acceptable to the majority of the Peruvian people, especially the urban and rural poor. Ownership and control of the resource by the State, the policy regime that has long been in place, has proven to be far from adequate on its own, especially for a 'structurally-adjusted' and impoverished government like that of Peru. Meanwhile, privatisation, the alternative that has lately been promoted by the great global 'adjustor', the World Bank, has been rejected emphatically by the masses in Peru, Ecuador and Bolivia. During the last decade, poor people have repeatedly taken to the streets in all three countries in order to demonstrate, sometimes violently, against water privatisation, in the most massive and effective 'anti-globalisation' movement the world has ever seen.

The inadequacies of the two conventional policies for water management reflect their common origin in an abstract, and almost purely academic argument. Both state control of the resource, on the one hand, and the privatisation of it, on the other, were the policies put forward by Garrett Hardin in his famous attempt, in "The Tragedy of the Commons",² to account for the notable tendency of people to overexploit and abuse any resources that they hold in common. He did this by arguing for the existence of an irresolvable conflict in these situations between the interests of the 'inherently selfish' individual and the cooperative needs of the group. Tragic outcomes are, of course, widely evident today in Peru in the local use of a wide array of natural resources - irrigation water, forests, fisheries, and pasturelands - a fact that at first glance seems to support Hardin's argument and suggest that community-based management of such resources, a seemingly obvious alternative approach or "third way" which he did not even consider, is doomed to fail.

Numerous authors and researchers have demonstrated that there is indeed a "third

way", based on studies of communities where local people have effectively managed communal resources cooperatively over long periods of time. This rebuttal has turned attention towards the task of devising an alternative theory to explain how, in such cases, people have been able to overcome their conflict of interest, escape the 'commons dilemma', and pursue the common good.

Progress toward this goal has been especially noteworthy with regard to water, which is encouraging news given the impending water crisis that threatens Peru and nearly every other country in the 'developing' world. Recent research on the use of water for irrigation, some of which was carried out in Peru, has made it possible to refute the conventional theory, which is now undergoing a thorough revision, and to begin to devise viable alternatives to the simplistic and obsolete policies of the past. This research shows that local people in a great many communities in many different parts of the world - including the Peruvian Andes - long ago arrived, quite independently, at a sustainable solution to the 'commons dilemma', creating a set of principles for sharing scarce water in an equitable and efficient manner that minimises social conflict. Wherever people have managed a scarce resource autonomously and effectively over a long period of time - the principles of distribution and use appear to be highly similar if not exactly the same.

This finding could have a major impact on the policies of the World Bank (Bank) and the Inter-American Development Bank (IDB), who are now in search of an alternative, as their effort to impose privatisation in Peru, Ecuador and Bolivia - by offering loans for refinancing the foreign debt, in each case loans that were tied to the adoption of slightly-modified versions of the 1981 Water Code of Chile - has failed. Despite the public's emphatic rejection of that proposal in all three countries, some Bank personnel continue to advocate the creation of water markets on a massive scale.³ My own comparative research on irrigation shows that water markets do not, and indeed cannot, work in the manner that they are widely thought to, at least not in the small-scale 'peasant' type of system that typifies most of the 'developing' world. It also reveals unrecognised commonalities in the dynamics of successful communal and 'market' systems in different parts of the world.

Successful communal management: The 'moral economy of water'

Scholars and scientists have made steady progress in critiquing and revising Hardin's theory of "the tragedy", through comparison of basic design principles that all effective locally-run irrigation systems seem to share. Their focus has been on small-scale canal systems of 1,000 hectares or less operated by small farmers, the type of "indigenous" or peasant-community system that predominates even today throughout much of the 'developing' world. Such limited scale, and the intensive face-to-face interaction among water-users that this makes possible, seems to be a critical factor that all of the systems share. Most of the common principles identified so far remain quite abstract, more suitable for predicting the general conditions under which people will be able to come up with a solution, and be successful at community-based management, than for showing them how to actually manage water effectively in situations where they have failed or lost the ability to do so on their own.

The effort to revise theory and to make new policies based on the recent research has been hindered by the limitations of the primary data, which are typically objective, scientific, and descriptive, without incorporating much of the more subjective and culture-bound perspective of the water-user. Analysts have also emphasised the diversity that exists among local irrigation systems, while not giving enough attention to one important feature that nearly all of them share, at least during certain times of the year, and that is water scarcity. All of this has helped to obscure the fact that the keys to local success in dealing with scarcity - *operating principles* for distributing and using the resource, ones that together create *equity* and thereby instill in people a strong positive incentive to obey the rules and conserve water, rather than a purely negative one that merely rests on punishing infractions - appear to be highly similar if not exactly the same in many parts of the world. Once the principles are identified ethnographically, as I was able to do during several years of fieldwork in the Peruvian Andes, and the way that they work together from the water-users' point of view is understood, the parallels in other countries become evident and a striking pattern is revealed.

The seven principles for successful management of water by local communities, as identified in studies of several peasant villages in the southern Peruvian Andes are the following:⁴

Autonomy: each community has and controls its own flows of water, using them

according to customary rules and procedures;

Contiguity: during each distribution cycle, water is given to sectors of land and to individual fields in a fixed uninterrupted order based on their location along successive canals, starting at one end of the system and moving systematically across it;

Uniformity - among water rights: for each major water source or canal flow, everyone receives water with the same frequency; *in technique:* everyone irrigates in the same basic way;

Proportionality (equity) - among rights: no one can use more water than the proportional amount to which the extent of their land entitles them, nor can they legally get it more often than everyone else; *among duties:* people's contributions to maintenance of the canal system must be proportional to the amount of irrigated land that they have;

Regularity: things are always done in the same way under conditions of scarcity; no exceptions are allowed, and any unauthorised expansion of irrigation is prohibited;

Transparency: everyone knows the rules and has the capacity to confirm, with their own eyes, whether or not the rules are being obeyed, to detect and denounce any violations that occur.

Graduated sanctions: penalties for infractions such as water theft are severe, but vary according to the severity of the offence and the behavioural history of the individual irrigator.

Close examination of the data published in the comparative literature strongly suggests that these principles also exist in successful irrigation communities in many other parts of the world. It seems clear that this solution to the problem of having to share a scarcity of the resource - one that I call the "moral economy of water" - has been worked out by peasants and indigenous people in many parts of Peru, the other Andean countries, Mexico, Spain, India, Nepal, Bali, and the Philippines. Many of these local irrigation systems warrant a second look.

The pattern of these principles must ultimately be confirmed firsthand through fieldwork if it is ever to have an impact on policy, so as to result in the emergence of new and better national water laws. The principles must be shown to be recognised and understood by the farmers themselves, and to be motivating them to cooperate by minimising their temptation to cheat or "free-ride".

During the years 2003-2005, I was able to confirm this through studies of irrigation sys-

The keys to local success in dealing with scarcity ...appear to be highly similar if not exactly the same in many parts of the world

The problem of having to share a scarcity of the resource - ...the "moral economy of water" - has been worked out by peasants and indigenous people in many parts of Peru

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The "moral economy of water" thus appears to have emerged repeatedly...in numerous places all over the world

tems of Islamic origin in the Costa Blanca region of Spain and of twelve indigenous communities in the watershed of San Pedro de Atacama in the northern part of Chile. The same set of principles is indeed operating, or was formerly operating, in all of these systems. Furthermore, it is quite clear that the two great hydraulic traditions that the systems together seem to represent - the Andean and the Moorish or Islamic, respectively - have evolved independently of each other, constituting a case of parallel or convergent social evolution that is unprecedented in the archaeological and historical records.

The "moral economy of water" thus appears to have emerged repeatedly, and often independently, in numerous places all over the world, as local people have responded in the same basic way to the daunting challenge of having to share a water scarcity.

Some Implications for Water Reform

The results of my research, both as an ethnographer and formerly as a consultant on water reform for the World Bank, show that a strong motive for conserving water will not emerge among farmers as a result of privatisation and the creation of water markets, either in the Andean highlands or in other similar parts of the world. The solution to the current water crisis does not lie in the "invisible hand" of the market, in the profit motive and the law of supply and demand, at least not in the small-farmer or 'peasant' type of irrigation system that typifies most of the 'developing' world. Rather, it lies in a direct and obvious link - established by the aforementioned principles and clearly recognised by the irrigators themselves - between the efficiency and orderliness of water use and the duration of the irrigation cycle. The logic and effectiveness of the principles does not depend in any way on water being worth money.

The 'National' Water Market of Chile

A final case worthy of discussion are the peasant communities in northern Chile, the only country in the world that has attempted to privatise all of its water by granting wholly unconditional rights to water-users, both public and private, and the only one that supposedly has a "national" water market. However, contrary to what Bank publications suggest, there have in fact been no significant sales of water between households within that country's peasant communities since the current water law was implemented in 1981. This indicates that there is in fact no national water market in Chile, only a set of rather narrow

and restricted markets where water sales are relatively few, though those may be quite large in terms of total amount of the resource that is transferred.

Moreover, due to widespread resistance by *campesinos* and small farmers against being included in the market - in order to protect what are their communal water rights - the government was forced, in 1989, to adopt a second water law, one which under certain conditions protects the communal rights of indigenous communities. The indigenous law was adopted in response to enormous political pressure applied by indigenous organisations and their leaders, and done in recognition of the serious problems that the 1981 Water Code has created - widespread speculation, monopolisation of the resource, and forced sales as large private and corporate owners have been able to buy up the rights of smaller competitors, especially farmers. Consequently, in Chile today, private water, which is widely bought and sold (although rarely between farmers of any type) coexists, sometimes even peacefully, with communal water, which is managed according to traditional principles. The national system of water ownership and use is in fact a dual one governed by two policies and two water laws, which conflict with each other but coexist in a kind of unholy alliance.

Fieldwork carried out in 2005, in a study of indigenous communities in the northern region of San Pedro de Atacama, revealed that water is used quite efficiently within the surrounding watershed, and with minimal conflict. One of the reasons for this efficiency lies in a process called "regularisation", during which the national government either implemented, or endorsed, practices that manifested the same set of operating principles previously described. This was seen as a necessary first step in regularising water use and clarifying individual rights in communities that were being integrated into the market system, so that those rights could then potentially be bought and sold. However, it was soon discovered that such use was quite 'regular' in the local indigenous communities and that individual water rights were already clearly defined, in an equitable way, under customary systems of water use, which, as I have since shown in the fieldwork, conform to the "moral economy" model. It seems likely that the aforementioned principles already existed locally and are in fact a survival of the much older Andean tradition of water management that I had encountered earlier during my fieldwork in Peru.

In Chile today...the national system of water ownership and use is ...a dual one governed by two policies and two water laws

This "moral economy" tradition rests on the principle of equity, a concept that is often mentioned but is notoriously difficult to define for most natural resources. In the field of irrigation and water rights, however, the concept seems to be easy to define and appears to have been widely defined by people in the same basic way, wherever they have been allowed to do this on their own. It necessarily encompasses both uniformity and proportionality, which are essential components of equity. This finding, although controversial, could ultimately prove to be pivotal in the effort to build more powerful theories of collective action, and to devise policies and laws which strongly encourage such action to take place in existing communities of water-users.

Conclusion: A New Approach to Reform

This brief overview on the successful management of water for irrigation in different parts of the world has revealed the outlines of a superior alternative to the policies that have been tried in the past. A new approach to policy and a resolution of the impending water crisis in Peru and the other Andean countries does not require that we discard those policies, which are not obsolete. Instead, it requires that we supplement them appropriately with insights gained from studies of the successful management of the resource by local water-users themselves - from the "moral economy" model - and combine them in a new way. The outlines of such a synthesis of the three main approaches to management - state control, privatisation, and community-based management - are revealed by what we actually see happening today, on the ground, in Chile. That reality seems to show clearly that none of the three approaches is a panacea capable of solving all problems in all situations, but that each of them has something to offer in formulating a new combined approach.⁵

There appears to be no reason why private water and communal water cannot coexist, even peacefully, under the umbrella of a single new law. Water markets can be created in Peru in regions and areas where those would be appropriate and beneficial - especially in the coastal watersheds containing big corporate users, ones where large-scale agribusiness predominates - but in order to function effectively those markets would have to be well regulated, based on the granting of private rights that are subject to strict and well-designed conditions. This would correct the serious error that was made in Chile and allow the state to play an appropriate role in ensuring that the potential benefits of water trading in those areas are realised, without

allowing speculation and the formation of monopolies. Meanwhile, in other watersheds, where peasant agriculture predominates - still true in most valleys in the Andean highlands - systems of communal management could be shielded from competition by recognising and protecting their traditional communal water rights. Local communities could be given ownership and control over their traditional water sources, and the infrastructure for using them, so that they could formally take over full responsibility for operation and maintenance, a duty which the government has in fact already granted them. Many communities in the Andes are well-prepared to do this and are in fact doing it already, as their remoteness has in the past kept them out of the reach of the state and its bureaucratic interference. They can be, and should be, allowed to continue managing the resource in their traditional manner.

Other communities, however, are poorly prepared due to decades of domination by the state and interference in local hydraulic affairs. In the relatively few parts of the highlands where the existing water law, the General Water Law of 1969, has actually been implemented - generally the provincial capitals and major highland towns - water rights are invariably poorly defined and over-prescribed, theft and waste of the resource are rampant, local distribution systems are flexible, opaque and extremely prone to corruption, and water is extremely scarce as a result. Such communities, if they are to take over responsibility for management and have ownership of the resource as well - whether communal or private, a choice they can and should be allowed to make democratically - are greatly in need of help, which the State has thus far been unable to provide.

Fortunately, the government does not have far to look in its search for models which reveal the relatively simple changes that need to be put in place. The institutions that have the potential to help solve these problems and promote effective local management already exist in Peru, being of Andean origin. Although those institutions, which are moral principles, also emerged independently in many other parts of the world, that fact itself would seem to indicate that ultimately they have the same origin, in human nature, which is surely less selfish and, at least potentially, more cooperative than Hardin and others originally thought.

For a full list of references used for this article, please go to:
www.perusupportgroup.org.uk/resources.html

There appears to be no reason why private water and communal water cannot coexist, even peacefully, under the umbrella of a single new law

The institutions that have the potential to help solve these problems and promote effective local management already exist in Peru, being of Andean origin

III Climate Change and Glacial Melt

Based on James Painter's UNDP research ⁶

South America contains more than 99% of the world's tropical glaciers. Of this, Peru holds more than 71% of the surface area

Peru accommodates 0.4% of the world's population, and accounts for 0.1% of global carbon dioxide (CO₂) emissions - an average of 1.1 tonnes of CO₂ per person, according to the United Nations Human Development Report (2007/08).⁷

Paradoxically, it is the countries and people who have contributed least to climate change who most suffer its impact and consequences. Peru is amongst those countries suffering most and contributing least. This is due largely because much of its economic activity depends directly on water in some form or another. Consequently, climate change could significantly affect the already challenging task of national development.

The impact of the climate on the accelerated melting of the tropical Andean glaciers is well recognised. Rapid glacial melt in the Andean region is threatening long-term economic and human development. This couldn't be more true in Peru, which is thought to be the South American country most vulnerable to water stress in the future; this is acknowledged, in reports by both the British government's Stern Review and the UN's Inter Governmental Panel on Climate Change, in 2006 and 2007, respectively.

South America contains more than 99% of the world's tropical glaciers. Of this, Peru holds more than 71% of the surface area, the largest number of tropical glaciers in the world. They are crucial for slowly releasing water. Apart from drinking water, some 70% of Peru's power comes from hydro-electricity. Consequently, once the flow from glaciers becomes irregular, so will power supply. Additionally, current sectors responsible for Peru's relative economic boom - agro-exports and mining - are hugely water intensive.

Peru's glaciers have acted as a type of buffer, particularly during the dry season when the melt provides water for drinking, irrigation for agriculture, energy and industry. They are the 'water towers of the world', according to Lonnie Thompson, a glaciologist at Ohio State University.

This means that the impact of global warming isn't something that will happen only in the future or that there is time to linger on discussions about the *ifs* and *buts*, the threat is already apparent.

Peru's Geography

Peru is particularly vulnerable to projected water shortages largely due to the peculiar geography of the country.

Most of the Pacific coast would be desert if it were not for the water flowing from the Andes. 70% of the population lives along the coast, where less than 2% of the country's water sources are found. It is also the area where much of the country's economic activity is based.

In contrast, the Atlantic side of the Andes has 98% of the water and about a quarter of the population. As Julio García of Peru's National Council on the Environment (CONAM) has stated, "Much of our water supply is on the wrong side of the wall".

Inevitable water conflicts?

As South America's most "water-stressed" country, Peru is likely to see increasing conflict between different social and economic sectors as water becomes less available. There have already been numerous examples of such conflict, not just in Peru but also in neighbouring Bolivia and Ecuador. There are clear competing demands; inter- and intra departmental; urban versus rural consumers; and competition between different economic sectors - export agriculture, small-scale rural farmers, hydroelectric power and mining companies.

Such conflict is more likely to be seen in glacier-fed areas as water becomes less available in the dry season. Municipal and national authorities in Peru will need to pay considerably

Peru's glaciers have acted as a type of buffer...when the melt provides water for drinking, irrigation for agriculture, energy and industry

more attention to this issue to avoid serious social unrest. Consequently, the funding of adaptation and mitigation measures will become increasingly critical.

Glacial melt threatens macro-economic development

The country also depends upon hydroelectric power, which stands at more than 70% in Peru (although this is already dropping with the coming on-stream of gas-powered stations).

The boom sectors of the Peruvian economy in recent years have been water-intensive. The value of non-traditional agro-exports (e.g. asparagus, artichokes, sugar cane) has risen nearly five-fold from US\$302million (£151 million) in 1998 to US\$ 1,503million (£751 million) (in 2006). Consequently, this has translated into a huge increase in demand for year-round irrigation in the desert coastal strip, an area which already had a precarious water supply.

Another of Peru's boom sectors, mining, has benefited from high world prices driven

by demand principally from China. This has enabled the Peruvian government to court massive foreign direct investment in the sector. In 2006, mining exports accounted for 80% of Peru's traditional export revenue; but mining too demands significant usage of water to wash and treat the minerals.

The impact on poverty and development

There is an abundance of articles on glacial retreat, but only a few studies on the possible impact on the social and economic development of South American countries that are likely to experience water shortages in the dry season, in particular the impact on the rural and urban poor.

Urban Poor

In Lima, about 90% of homes are estimated to have a water connection, but the distribution is unequal and drops in less affluent areas.

The boom sectors of the Peruvian economy in recent years have been water-intensive

GLACIERS - FACTS BOX

Tropical Glaciers are found in low tropical latitudes, but at higher altitudes than glaciers in temperate or polar regions.

South America contains more than 99% of the world's tropical glaciers. Of this, Peru holds over 70% of the surface area.

1970s-2006 the surface area of glaciers in Peru and Bolivia has decreased by 30%.

Scientists say that whatever measures are taken by the international community in the immediate future, lower elevation glaciers will not be able to recover. Once a glacier is lost, it does not come back.

Only glaciers higher than 5,400-5,500 metres are thought to be able to recover their mass.

Cordillera Blanca: this range includes Peru's highest mountain, **Huascarán** (6,768 metres), and holds a glacial area of more than 600km² (a quarter of the world's glaciers).

Cordillera Blanca: Pastoruri Glacier (5240m) - water from the melting glacier is forming lakes, which in turn threaten to flood nearby villages.

Cordillera Vilcanota (Cordillera Oriental): The **Quelccaya ice cap** (5,670m), which is the largest tropical ice cap in the world, has lost 30% of its glacier area since the early 1970s.

Cordillera Vilcanota (Cordillera Oriental): The **Qori Kalis glacier**, which is part of the **Quelccaya ice cap**, is losing its surface area at a rate ten times faster than in the 1970s. The annual retreat of this glacier in the mid-1970s was about 6 metres; in recent years it is over 60 metres.

III Climate Change and Glacial Melt

President Alan García announced plans to start looking into desalinating water from the Pacific Ocean as a response to adapting to decreasing water availability

Climate Change Disasters

According to the Tyndall Centre for Climate Change Research's 2003 report (Working Paper 26), during the period 1991-2000 Peru was in the top ten countries in the world most subject to climate-related disaster. It is also, after Bangladesh and Honduras, the most vulnerable country to the impacts of climate change.⁸

Those who don't have connections have to depend on stand-pipes or trucks that deliver water.

Recent research by the UNDP estimates that those living in Lima's slums or low-income settlements pay on average between five and ten times more for their water than high-income residents. If, as is predicted, water were to become more scarce due to the effects of climate change, then it is the lower income groups which will be less able to pay for extra supplies from bottles or trucks.

Rural Poor

Water scarcity will be felt most by small-scale agricultural producers who provide for both the local and export market, as they are competing with urban consumers, hydroelectric projects, commercial agriculture and mining companies. According to a report by the Peruvian Ombudsman (la Defensoría del Pueblo), some 49% of rural poor are without piped water, compared with 13% of the urban poor. Together with Ecuador, these are the highest rates amongst the rural and urban poor in the Andean region.⁹

Mitigating glacial melt

The long-term effects of the lack of glacial melt can be mitigated by capturing and storing more of the wet season precipitation. But, this would need significant investment in the form of dams, tunnels or reservoirs in an attempt to reduce vulnerability to seasonal variations over the coming decades.

In Peru, there has been a long-standing campaign by engineers and independent consultants urging the local and national

authorities to build a second tunnel through the Andes to capture water from the Atlantic side. However, this would cost a minimum of US\$100 million (£50 million).

Another option would be to consider desalination. At an International Forum on Sea-water Desalination held in Lima in March 2008, President Alan García announced plans to start looking into desalinating water from the Pacific Ocean as a response to adapting to decreasing water availability, which has been exacerbated by glacier retreat.

Although such a project is yet to be confirmed, Doosan Hydro Technology, a subsidiary of South Korean company Doosan Heavy Industries & Construction Co Ltd, is tipped to build up to two desalination plants on Peru's coast, purportedly in Ancón (42km north of Lima) and Pucusana (60km south of Lima). However, the state-owned waterworks company that provides drinking water and sewerage services to the city of Lima and Callao, SEDAPAL, has commented that the construction of a desalination plant would lead to increases in water tariffs.

Currently, Peru's sole desalination plant belongs to mining company Minera Milpo. It was built in 2007, on Jahuai beach, near Chíncha (194 km south of Lima).

The visible impact of climate change, specifically glacial melt, on water provision in Peru is clear. Consequently, it is imperative for the government to incorporate inclusive policies into its environmental agenda. As we highlight, Lima is increasingly vulnerable to water shortages, however it is important not to overlook the country's regions, particularly as water

III Climate Change and Glacial Melt

issues are becoming an increasing catalyst for social conflict, as emphasized in the Peruvian Ombudsman's monthly reports.

must be willing to support the Peruvian government in any effort to mitigate glacial melt for the population at large.

Water issues are becoming an increasing catalyst for social conflict

However, the problem of climate change is global, so the international community

Lima: a city on the edge of a water abyss?⁹

Peru's capital is a huge consumer of water; furthermore, it supports nearly a third of Peru's total population. However, it sits in the desert and receives hardly any rainfall. Consequently, it is extremely vulnerable to water shortages as it lacks sufficient reserves; it is exposed to increasingly more frequent weather extremes (e.g. drought and long-term glacial melt); and it relies upon one 60 km Transandean tunnel which carries water from the eastern side of the Andes.

The city gets its water from three rivers in the *Cordillera Central*. The most important is the Río Rimac. Exact figures are unknown, but it is thought that a significant amount of the water flowing into these three rivers comes from glacial melt. Although estimates suggest that the quantity is a lot less than the Río Santa.

Lima's municipal water company, SEDAPAL, says that Lima is already experiencing a serious water deficit. The shortfall for drinking water alone will continue to increase between now and 2035.

Demand in Lima is set to increase as the city absorbs new arrivals every year.

Alan García's government wants to give water connections to nearly a million more people in the capital, through a project called "*Agua para todos*" (Water for All). A former president of municipal water company, SEDAPAL, has dubbed this "very little water for all".

Lima's municipal water company, SEDAPAL, says that Lima is already experiencing a serious water deficit

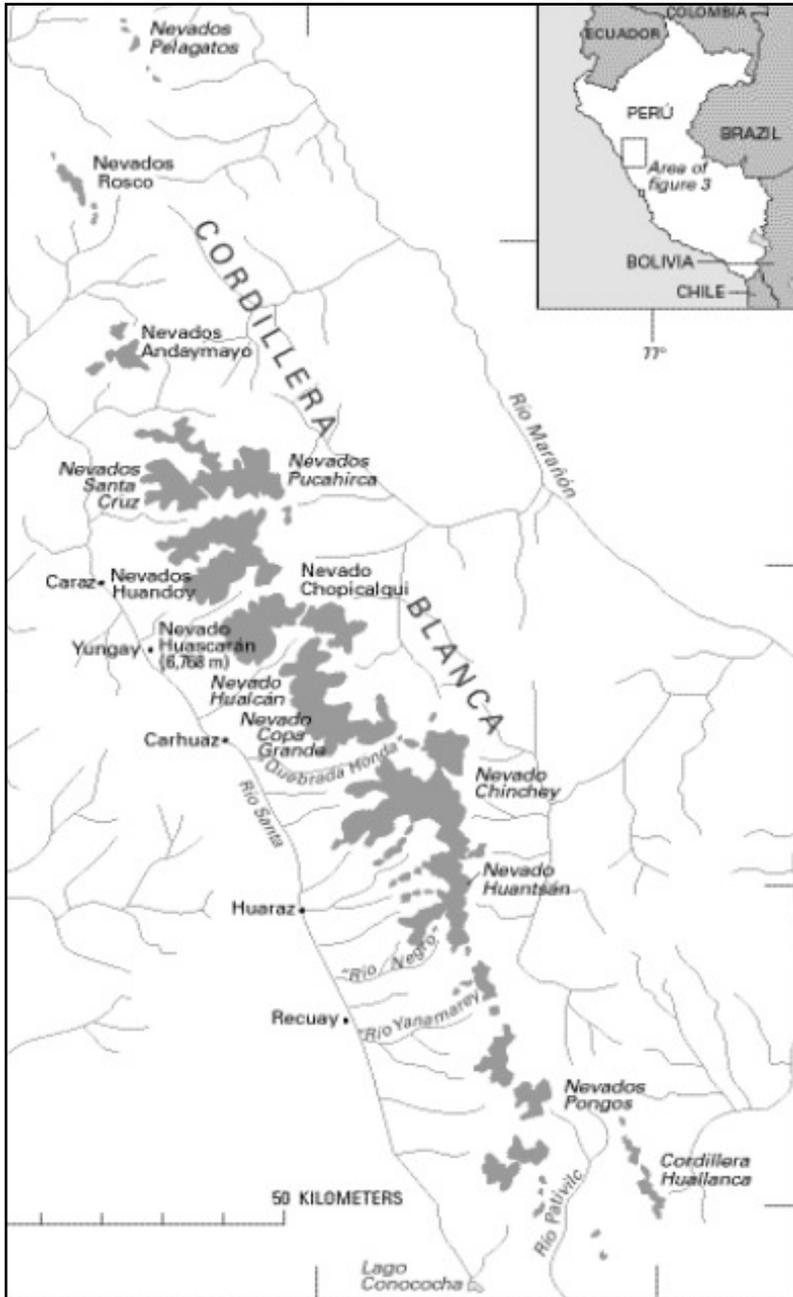


Logo for Lima's 'Water for All' project.

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III Climate Change and Glacial Melt Case Study 1: Economic Impact of Glacial Melt

Río Santa Valley⁹



This map shows the location of the Río Santa Valley in the Cordillera Blanca.

© <http://pubs.usgs.gov/prof/p1386i/peru/occident.html>

The Río Santa valley is illustrative of the enormous pressure on future water supplies that could affect areas of Peru where water supply is in part glacier-fed.

The basin of the river Santa is the most extensive of the watershed of the Pacific Ocean with a total surface of 12,005.50 km². The waters from the *Cordillera Blanca* drain into the Río Santa valley via several tributary valleys which then flow into the Pacific Ocean.

Potentially, up to 40% of the dry season discharge from the river is estimated to come from melting ice (glacial runoff) which is not replenished by annual precipitation. A significant drop in the water availability would massively affect drinking water supplies, hydroelectric power and irrigation for commercial and small-scale agriculture which need a supply of water year-round.

The water from this one river supplies: small-scale, intense agricultural activity at between 2,000 and 4,000 metres; a power production plant representing 5% of Peru's total energy production capacity; large-scale commercial agriculture in the lower valleys including two special irrigation projects for export crops (Chavimochic and Chincenas); and a large part of the drinking water to two major urban areas on the Pacific coast with a combined population of more than one million people (Chimbote and Trujillo).

Potential economic cost of glacial melt is difficult to measure. However, a 2006 World Bank study estimated that the annual cost of reduced glacial melt just for the hydroelectric plant in the Río Santa valley was between US\$6million (£3 million) and US\$72million (£36 million), and for the whole of the country's energy sector the cost was calculated to be between US\$60million and US\$748million (£30 million and £374 million).¹⁰ If there was no glacial melt at all, it is estimated that these figures would rise two-fold.

IV Adaptation

Over the last few decades climate change has started to pose a severe problem to Peru's rural populations. For these mainly agricultural communities, access to water has always been a basic need for the subsistence and production of food for these regions' economies. However, a limited official response towards extreme climate events resulting from changes in the hydrological cycle within the country, have highly affected these activities. Phenomena such as *El Niño* and the Andean glacier retreat have caused massive losses to hydro resources and long periods of droughts, which have threatened to become more frequent and intense.

Due to the central role of agricultural practices in Peru and the negative effects climate change has on these activities, dealing with the problem of water availability has become central to the environmental discussion within the country. Accordingly, recent projects are bringing important changes to the way water problems are managed within these communities. Specifically, an emphasis has been placed on the process of adaptation.

According to Erika Trigoso, in her 2007 Occasional Paper for the United Nations Development Programme, 'Climate Change Impacts and Adaptation in Peru: The Case of Puno and Piura', adaptation projects underline the value of understanding how global economic processes, national policies and local actions interact with each other and with environmental variables to determine the social and physical components of vulnerability and the possible adaptive responses of a population.¹¹ The main goal of these programmes has been to acknowledge the exposure of certain regions and incorporate adaptation measures into their framework of development. Raising the population's awareness in regards to climate change and environmental problems, as well as to the importance of their active participation in the process, has also been essential to these programmes' agenda.

Some UK NGOs, such as Progressio and Practical Action, have already lent their support to the implementation of local projects.

Climate change is still pigeon-holed in the environment community and needs to be considered from a broader perspective... there is a real need to develop clear adaptation policies and execute them

National Adaptation Strategy

A national adaptation strategy is a series of measures that a country incorporates into policy as a means to mitigate the effects of climate change. In order to move towards a national adaptation strategy, Peru needs to: acknowledge its vulnerability; incorporate adaptation measures; raise the population's awareness of these issues so that they can actively participate in the process and thus achieve sustainable development; and increase competitiveness despite reducing greenhouse gas (GHG) emissions.¹² However, the state will need to overcome many challenges including: continued skewed socioeconomic conditions; the country's vulnerability to climate variability; weak existing institutional capabilities to assess Peru's vulnerability and insufficient information and management on how to deal with this. Climate change is still pigeon-holed in the environment community and needs to be considered from a broader perspective. Finally, there is a real need to develop clear adaptation policies and execute them.

PROCLIM Programme¹³

Peru's National Adaptation Strategy has been addressed to a certain extent by PROCLIM (National Capacities Strengthening Programme to Manage Climate Change Impact and Air Pollution), the Peruvian response to reduce the adverse impacts of climatic change.

It targets areas in Peru which have been identified as particularly vulnerable and then it works to improve capabilities which strengthen human, institutional and financial resources. An emphasis is placed on education and public awareness raising.

IV Adaptation Case Study 2: Practical Action

Agricultural practices in Peru employ around 80% of the country's water resources and waste more than 50% of that amount

Participants: Local governments (i.e. mayors), as well as community organisations, such as the *Juntas de Regantes* (Irrigation Users' Boards)

Location: Yungay, Ancash

Duration: March 2006 to January 2008

Programme name: Capacity-building of rural populations to reduce their vulnerability to climate change and adapt their livelihoods.

During the past decades, climate change has posed a serious problem for Peruvian rural populations. As mainly agricultural communities, access to water represents a fundamental factor contributing to these regions' principal economic activity and their production of food. However, as a result of the changes in the hydrological cycle brought by climate change (i.e. receding glaciers and droughts) water resources have been highly affected within these communities, greatly disturbing their agricultural practices and economic subsistence.

The province of Yungay is located in the region of Ancash. Up to 80% of the region's economy relies mainly on agriculture, thus climate change has an important impact on its subsistence and development in two ways: a decrease in water availability due to a declining amount of rain and melting glaciers; and an increase in plants' diseases and plagues. As agricultural practices in Peru employ around 80% of the country's water resources and waste more than 50% of that amount, Practical Action's project has placed water management related problems at the core of its adaptation programme. The project's emphasis has been on environmental risk management and has taken into consideration the social, economic, infrastructural and environmental vulnerability of the region based on current and future climate changes.

Water management issues and adaptation

The aim of the project was to experiment with possible solutions to water management issues and to show local farmers the benefits of a successful water management programme on their daily agricultural practices, as well as addressing future environmental challenges.

The two-year programme comprised two stages. The first stage focused on awareness raising within the rural communities. A preliminary assessment of the population's perception of the problems of climate change and a subsequent process of information

sharing with the participants were the main goals. The second stage focused on the productive processes of the project. It included the implementation of agricultural technological innovations in the traditional cycle of cultivation on small farms. The main processes included within this stage were the evaluation of soil and water sources in the area, the purchase of seeds and fertilisers, the fertilisation of land, the control of plagues, and the successful development and harvest of the crops.

The project's action framework included two different approaches: the supply management approach and the demand management approach:

1. The **supply management approach** is the most traditional one. It is oriented to increase the volume of the water in rural communities. It includes building dams, reservoirs, channels, and other facilities. This type of management used to be employed widely; however, due to the combination of high population growth and the unchanged or decreased availability of water within these communities, Practical Action's project needed to include other methods dealing more specifically with water use efficiency, such as the demand management approach.

2. Today, the **demand management approach** is the most important technique used in water management programmes. It focuses on reducing the amount of water needed for agricultural practices. The use of drip irrigation systems is one of the most efficient methods to achieve this as it involves pressurised irrigation techniques, which provide plants with just the right amount of water to satisfy their need. Consequently, drip irrigation has been the main method employed in Practical Action's adaptation project.

Results

Since the implementation of the project, the amount of water employed in agricultural production in Yungay has decreased by around one-sixth of the previous amount of water used in cultivation.

Following Practical Action's experimental model, *campesinos* (farmers) have been trained to develop and maintain their own irrigation projects. These projects can be financed by their local government, which, as a result of the importance of agricultural practices in the region, allocate 40% of their annual budget to such projects.



Map showing position of Yungay in the department of Ancash.

@http://www.infohuarmey.com/graficos/mapa_ancash.jpg

IV Adaptation

Case Study 3: CEDEPAS - supported by Progressio

Location: Jequetepeque, Cajamarca

Programme name: Capacity-building for natural resources management in Peru and Ecuador's Andean regions.

The Jequetepeque river in the region of Cajamarca in northern Peru empties into the Pacific Ocean. It includes three primary tributaries: Rio Pallac; San Miguel or Puclush; and the Magdalena. In the river valley, which has been affected by a severe four-year drought throughout Peru's Andean region, many large areas are devoted to rice and sugar cane cultivation, activities which are water intensive.

In 2001, with the support of UK NGO Progressio (formerly CIIR), CEDEPAS (Ecu-menical Centre for Social Action) started to work on a natural resource management project; the main goal was to maximise the availability of water in the region. CEDEPAS focuses on improving irrigation techniques and the organisation of water management groups, known as irrigation committees. Its central aim in this project was to improve the technology employed in the irrigation systems and re-organise the community's irrigation committees into more gender-inclusive organisations.

In the Jequetepeque river valley, control of the traditional systems of water management lay with the men and most water-related projects in the region have focused on male heads of household. However, the reality is that the communities' women and children do most of the daily water resources management.

The project's four main goals:

1 To reinforce the beneficiaries' natural resources management skills, with a focus on ethnic and gender equality. In Jequetepeque, the project's emphasis has been on the inclusion of women and children within the communities' traditional irrigation committees.

2 To re-integrate traditional and modern techniques into the management methods of natural resources.

3 To reinforce and strengthen local government and civil society's participation and collaboration in adaptation projects that deal with sustainable development.

4 To create a national information network in order to facilitate the discussion, systematisation and reproduction of new proposals for environmental projects and community participation.

The main challenges of the project have been: to overcome the conflicts surrounding the scarcity of water; the social structures involved in its use; the lack of experience in both civil society and government organisations that are working on these issues; the lack of an institutionalised position and long-term strategy to address the problem of gender inclusion within the project; and geographic (i.e. dispersion of the committees) and cultural factors (i.e. position on gender roles) which undermined the impact of the project.

Today in Jequetepeque, men, women and children have a participatory role in the management of water resources within their community. While many other measures still need to be taken into account in order to combat increasing environmental problems, the experience of CEDEPAS in Peru proves that water management training and strong local organisations can provide important positive changes in Andean communities.

Building upon Practical Action and CEDEPAS' case studies, it is clear that the inclusion of adaptation processes is imperative for the effective implementation of sustainable development programmes in Peru, particularly in rural areas. Establishing a political framework for climate change is crucial for its inclusion in the development agenda.

Important progress regarding the potential of adaptation has been made, as well as great advances concerning public awareness and participation. Despite the achievements and positive results of adaptation projects some difficulties remain, such as a lack of economic, human and technological resources in the regions, as well as the need for a strong institutional framework.

**With the support
of UK NGO
Progressio ...
CEDEPAS
started to work
on a natural
resource
management
project**

**The inclusion of
adaptation
processes is
imperative for
the effective
implementation
of sustainable
development
programmes in
Peru**

V Contamination: Mining & Water

By Martin Scurrah, CEPES (Peruvian Centre of Social Studies)

The impact of mining on water is critical, both in terms of the quantity demanded in areas where the water shortage is acute...and in terms of the quality of water

Although Peru is one of the countries with the greatest volume of water per capita, 97.7% of the water is concentrated on the Atlantic side of the Andes mountain chain where only 26% of the population is to be found. By contrast 70% of the population lives on the Pacific side of the Andes but has available only 1.8% of the water. Thus, it is not surprising that in a recent study the Tyndall Centre in the UK concluded that Peru would be the third most affected country by global warming after Bangladesh and Honduras.

In this context of acute scarcity of water where it is most needed, the demand for water by the mining industry, although growing, is relatively insignificant (less than 5%) in comparison with agriculture (more than 80%). Nevertheless, the impact of mining on water is critical, both in terms of the quantity demanded in areas where the water shortage is acute, such as the southern coastal departments of Arequipa, Moquegua and Tacna, and in terms of the quality of water, especially in areas where mining is located at the headwaters of river basins, such as in Cajamarca, Ancash and Junín. Mining's impacts on the quantity and quality of water in Peru can be illustrated by the cases of Tacna and the Mantaro river valley.

In Peru as a whole 90% of the population lives in arid, semi-arid or sub-humid zones and this is especially the case in the southern coastal departments on the northern edge of the Atacama Desert, the world's driest. In Moquegua there have been conflicts since the 1980s between the Southern Copper Corporation's (SCC) Cuacone and Toquepala mines and the city of Ilo and neighbouring valleys. These have centred on access to surface and underground water for agriculture and human consumption, on the one hand, or mining, on the other and led to an historic decision by the International Water Tribunal (IWT) in The Hague in 1992.¹⁴

Peruvian civil society organisation *Labor*, which has worked for some three decades on environmental and development related issues, played a significant role in bringing the SCC before the IWT. Although not legally binding, the IWT's ruling against the company for the irrational use of water in the region was significant in so much as it pressured the company to take the issue seriously and changed the Peruvian government's attitude, leading it to set up an inter-ministerial commission which forced

the company to undertake a series of investments and changes to address the issues raised.

In addition to these historic conflicts over access to scarce water, proposals for a series of new mining projects, many at the headwaters of the coastal valleys of Tacna, are presenting new challenges. An alliance of municipalities and civil society institutions formed the Broad Front for the Defence of the Environment of Tacna (FADMAT) and held civic strikes and marches in June and July 2007 in protest at the threat to the quality and availability of the city's drinking water posed by the MINSUR mining company's proposed zinc mine, leading the regional government to declare the department's water resources in a state of emergency in August of that year. The FADMAT spokesperson asked: "Is it fair that there are more than 700 mining concessions in the Tacna region where water is scarce?"

As recently as February 2008, 99% of the voters in a referendum in the province of Candarave voted against mining and its access to underground water. In this province 40,000 hectares have been granted in mining concessions and the population is concerned about the potential impacts on their water supplies after observing the impacts of the activities of Southern Copper's mines on the neighbouring districts of Huaytire, Vizcachas and Suchas. Provincial mayor Mario Copa Conde claims that "the flow of the Collazas, Tacalaya and Calientes rivers has diminished and our production is less; the wetlands of Jacopunco and Vizcachas are now dusty plains where the number of llamas and alpacas has fallen". He also claims that over exploitation of water by Southern Copper has led to falls in alfalfa production per hectare from 30,000 kilos to 11,234 kilos between 1998 and 2006 and in oregano production from 16,071 kilos per hectare to 4,000 kilos per hectare over the same period, in addition to the loss of 27,000 hectares of pastures.

Another major concern is that mining, particularly open-cast, generates much residual material. The overburden has to be removed, then some host rock as well as ore-bearing rocks have to be extracted. The ore-bearing rock is then crushed, ground and subject to various chemical separation processes to extract the useful minerals. The useful material is moved from the site and remaining material is left

V Contamination: Mining & Water

on the site in tailings piles. Such pulverised material has a high surface area and the influx of oxygen and water can release naturally occurring sulfides and other chemicals to produce acid in the piles; the acid then releases further chemicals from the piles (this is the so-called Acid Mine Drainage problem. The same process occurs naturally, but more slowly, within rock strata - so-called Acid Rock Drainage). Further, there is the possibility of leakage out of the mine of brought-in processing chemicals. These processing chemicals depend on the nature of the minerals to be extracted; for example, cyanide is often used in gold mining.

The crushed rock left behind after a mine closes will continue to be exposed to these leaching mechanisms for decades and centuries. Further, heavy contamination will be in the materials enclosed by tailings dams which may fail through age, flooding or earthquakes. So the damage to drinking water, aquatic life and habitat continues long after the mine closes.

Historically around the world, legacy problems have been left to governments to handle when mines have been abandoned or a mining company has gone bankrupt. The remediation of old mine sites is both technically and legally difficult. The legal

difficulties are not just associated with trying to determine where the responsibilities lie. In the US, for example, the Clean Water Act of 1971 obliged polluters to reduce pollution to very low levels in any discharge. This obligation then passed to anyone taking over the responsibility to clean up an abandoned mine. In many cases 70% of the pollution can be removed for 30% of the full clean-up costs. However, the Clean Water Act would not allow partial cleaning, so in many cases it was not cost-effective to attempt remediation. Allowing partial clean-up, however, has its own problems. A mine could be allowed to go bankrupt and then a new company could be started to be paid to clear-up the mess using personnel from the old company who obviously have intimate knowledge of the mine; so the effect is that the pollution generators are paid to clean-up their own mess.

The challenge for government at all levels is not only to mediate between poor farmers and wealthy mining companies in their claims to scarce water supplies but also to seek creative solutions whereby the wealth and resources of mining can be used to improve the conditions of water use by neighbouring towns and farmers while at the same time remediating closing and abandoned mine sites.

The challenge for government ...is not only to mediate between poor farmers and wealthy mining companies in their claims to scarce water supplies but also to seek creative solutions ...



Cuajone Mine
© www.mines.utah.edu

V Contamination: Mining & Water

Case Study 4: Mantaro River Valley¹⁵

A recent study by the "Mantaro Revive" project of 53 monitoring points along the river found that...the water does not meet the quality standards of the World Health Organisation

The Mantaro river valley in the central Andes, east of Lima, is impacted by 17 operating mines, the metallurgical complex in La Oroya and 67 abandoned mines. It receives 50,000 cubic metres of waste rock each year. In the river's origins in Lake Junín, 80,000 hectares of pasture lands have been contaminated by the flooding caused by the closure of the Upamayo flood gates. In the Junín National Reserve between 1978 and 1998 the number of flora species declined from 368 to 26 and the number of birds species from 98 to 36, mainly due to copper poisoning from mine wastes. The lake is now considered to be 80% contaminated.

When the University of Saint Louis carried out a study of the levels of heavy metals in the blood of children and expectant mothers in the city of La Oroya they used the city of Concepción, the self-proclaimed "ecological capital" of the region as a control but found similar levels of contamination there, suggesting that contamination from mining extending over many decades may have contaminated the whole region and not only those towns in the immediate vicinity of active mines.

A recent study by the "Mantaro Revive" project of 53 monitoring points along the river found that, in general, the water does not meet the quality standards of the World Health Organisation and often not even the low standards set in the country's General Water Law. The study found that the San Juan, Yauli and Anticona tributaries were the most contaminated and that standards were not met for acidity, turbidity or such

toxic metals as lead, cadmium, chromium and arsenic.

This means not only that the river is virtually "dead" in terms of life forms within it and unsuitable for human or animal consumption but also proposes a threat to agriculture in a region considered to be the "bread basket" of Lima. Each year the irrigation canal along the left bank of the Mantaro, which derives its water from the river, receives 147 tons of copper, 389 tons of iron, 13 tons of lead and 10 tons of arsenic. The levels of lead in soil samples from La Oroya, Pilcomayo and Chupuro, at three points along the river, were 3,010, 2,079 and 1,160 parts per million, in comparison with the maximum allowable level of 230 parts per million.

As a result, artichoke exports, which were to have been the flagship of the current government's "Sierra Exporta" programme, have been affected because they failed to pass quality standards due to the presence of metals, especially lead, and a food packing plant in the valley has been forced to close its operations. The task facing civil society, - organised in the Regional Environmental Dialogue Table - the mining industry and local, regional and national governments is to define responsibilities and obtain the necessary resources both to remedy the environmental "liabilities" inherited from past contamination as well as to regulate and control the activities of currently operating mines.



Map showing Lake Junín, origin of the Mantaro river valley, alongside a photograph of the river.

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Concluding Remarks

The challenge of water provision is a global problem, but Peru's particular geography (highly populated desert coastline) and main economic activities (water intensive agriculture and extractive industries) place it on the frontline in terms of water quantity and quality. In the debate on water resources management and climate change Peru must figure strongly as one of the countries most in need of support and encouragement in the implementation of water-related policy and adaptation programmes.

Peru's vulnerability to severe water shortages have been exacerbated by outdated and increasingly complex legislation surrounding water management. A completely new General Water Law is needed, not just amendments to the current law, in order to reflect the most basic aspects of current realities, both in Peru and worldwide, such as the country's decentralisation and regionalisation processes, water stress, the diverse use of water, conflict and global warming.

It is positive that the Peruvian government created the country's first Ministry of the Environment in May 2008, however, some critics argue that it was a move specifically designed to coincide with the European Union-Latin America and Caribbean (EU-LAC) Summit in Lima on May 16th-17th which focused on climate change as one of the main issues; and to appease the US as part of the negotiations for a bilateral Free Trade Agreement (FTA). Also controversial was the appointment of Peruvian ecologist Antonio Brack as the new Minister of the Environment. He led the group of experts that were tasked with designing the ministry and in recent years has worked as a consultant for various mining companies.

A criticism directed towards the new government department is that it will not have real authority over water management. The agriculture ministry will be responsible for water, through the recently created National Water Authority (ANA). Whilst it is certainly a move in the right direction, the ANA must include sustainable policies with a long-term outlook in order to address: increasing water shortages in the coastal region; water quality; improvements in irrigation in the agricultural sector; and the incoherent institutional framework. It should also be noted that at present the ANA has no presence at the regional level.

As the two case studies on adaptation in this report have illustrated, British NGOs are already involved in helping local organisations

and communities to develop sustainable water management programmes as possible responses to water management issues. This is an area in which UK agencies should be encouraged by donors to continue to play a role with urban and rural poor and agricultural communities.

Whilst considering access to water at community level, it is worth considering Paul Trawick's alternative approach to water management. Conventional policies have proved problematic for many governments, so the "third way" could offer a viable alternative.

During his visit to Peru in September 2007, Kim Howells, Foreign and Commonwealth Office (FCO) Minister for Latin American Affairs spoke of the need to address inadequate water supplies, especially for the irrigation of crops and needs of coastal communities, amongst other concerns such as access to health and education, otherwise "Peru's economic and political development could be in danger". This concern about water supply was reiterated by the British government following the European Union-Latin America and Caribbean (EU-LAC) summit held in Lima in May 2008, where the two key issues of poverty and climate change were addressed.¹⁶

Specifically, through the FCO, the British government is funding a series of studies in Latin America and the Caribbean to assess the economic impact of climate change, and Peru will be a focal point for research on poor people's adaptation to the phenomenon. The government also has a programme on sustainable management of Andean and Amazon ecosystems with an emphasis on alleviating poverty.

The Department for International Development (DfID) closed its Peru office in 2005 and has cut funding throughout the Latin America and Caribbean (LAC) region. The ministry believes that the most effective way for it to have an impact in the region, with a reduced budget and presence, is to channel the majority of its funding through multi-lateral partnerships, primarily the World Bank and the Inter-American Development Bank (IDB), in the belief that it can influence policy. Some of these multilateral projects are supporting water-related work in Peru.

Although there appears to be political will to address the issues highlighted in this report, the hope is that this goes beyond rhetoric and continues to be translated into clear action.

Peru's vulnerability to severe water shortages have been exacerbated by outdated and increasingly complex legislation surrounding water management

The British government is funding a series of studies in Latin America and the Caribbean ...Peru will be a focal point for research on poor people's adaptation to the phenomenon

Concluding Remarks

What is the UK government doing?

Department for International Development (DfID) ¹⁷

DfID closed its office in Peru in 2005 and has cut funding throughout the Latin America and Caribbean (LAC) region. Most of its funding is channelled through multi-lateral partnerships, primarily the World Bank and the Inter-American Development Bank:

- o The UK is the biggest contributor to the GEF (Global Environment Facility)-managed Special Climate Change fund, which is funding a water-related project in Peru;
- o DfID is working closely with the IDB on the Sustainable Energy and Climate Change Initiative, which is supporting some work in Peru. The UK helped with the IDB fund design, and also contributed some £2million (US\$4 million) to the fund itself;
- o DfID is also supporting a range of UK NGO's in Peru who are working on rural livelihoods and sustainable development.

Foreign and Commonwealth Office (FCO) ¹⁶

At a European Union-Latin America and Caribbean Summit held in Lima in May 2008, the two key issues addressed were poverty and climate change.

Following the summit, the British government acknowledged the importance of access to water in Peru:

"In Peru, the most urgent issue is water supply. Andean glaciers, a significant source of water for agriculture, mining and electricity generation, are melting so quickly that in twenty years they will have disappeared completely. Studies show that climate change could cause the *El Niño* phenomenon to occur more regularly."

The UK is funding a series of studies in Latin America and the Caribbean to assess the economic impact of climate change:

- o US\$50 million (£25 million) was earmarked in 2007 for a research programme on poor people's adaptation to climate change in the region. The government states that Peru will be one of the focal points for this research;
- o US\$30 million (£15 million) programme on sustainable management of Andean and Amazon ecosystems to alleviate poverty.
- o US\$800 million (£400 million) towards a new Environmental Trust Fund managed by the World Bank.

FOOTNOTES

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5 Ostrom, E., M. Janssen, and J. Anderies "Going Beyond Panaceas", *Proceedings of the National Academy of Sciences* 104(39) (2007): 15176-78.

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12 Cigarán, M (2005), Towards a National Adaptation Strategy in Peru: Climate Change into Development, Presentation in Paris, CONAM; Cigarán, M (2004), Bridging Gaps in Dealing with Climate Change: The Case of Peru, Presentation in Buenos Aires, CONAM

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| List of Acronyms | |
|------------------|--|
| ANA | Autoridad Nacional de Agua (National Water Authority) |
| APRA | Alianza Popular Revolucionaria Americana (American Popular Revolutionary Alliance) |
| CEDEPAS | Ecumenical Centre for Social Action |
| CEPES | Peruvian Centre of Social Studies |
| CIIR | Catholic Institute for International Relations |
| CONAM | National Council on the Environment |
| DfID | Department for International Development |
| DIGESA | Dirección General de Salud Ambiental (Peruvian General Directorate of Environmental Health) |
| EU-LAC | European Union-Latin America and Caribbean |
| FADMAT | Broad Front for the Defence of the Environment of Tacna |
| FCO | Foreign and Commonwealth Office |
| FTA | Free Trade Agreement |
| GEF | Global Environment Facility |
| GHG | Greenhouse gas |
| IDB | Inter-American Development Bank |
| INADE | Instituto Nacional de Desarrollo (National Development Institute) |
| INRENA | Instituto Nacional de Recursos Naturales (National Institute of Natural Resources) |
| IWT | International Water Tribunal |

| List of Acronyms | |
|------------------|--|
| JNUDRP | Junta Nacional de Usuarios de los Distritos de Riego del Perú (National Board of Users of Irrigation Districts) |
| LAC | Latin America and Caribbean region |
| Ley SIGA | Law to create a water management system |
| LGA | Ley General de Aguas (General Water Law) |
| MDGs | Millennium Development Goals |
| MINAG | Ministry of Agriculture |
| MINEM | Ministry of Energy and Mines |
| MMA | Ministry of the Environment |
| NGO | Non-governmental organisation |
| OSINERGMIN | Supervising agency for investment in the energy and mining sector |
| PROCLIM | National Capacities Strengthening Programme to Manage Climate Change Impact and Air Pollution |
| PRONAMACHS | Programa Nacional de Manejo de Cuenas Hidrográficas y Conservación de Suelos (Basins and Soil Conservation programme) |
| SCC | Southern Copper Corporation |
| SEDAPAL | Lima's municipal water company |
| UNDP | United Nations Development Programme |

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