



Registered in U.K: 5474724

## Linking Local Health Tradition with Biodiversity, Conservation and Sustainable Development

**Authors:** Stella Joy and Tara Joy, Directors of Active Remedy Ltd, U.K, Reg. No. 5474724

**Address:** 16 Selwood Road, Glastonbury, Somerset, BA6 8HN, U.K

**U.K Telephone:** 0044-1458 835300

**India Mobile:** 0091-09736335143

**Email:** enquiries@activeremedy.org.uk

**Website:** www.activeremedy.org.uk

**ABSTRACT:** Every day the hazards and disasters caused by Climate Change, ranging from droughts, flooding and extreme monsoons, to the melting of glaciers become more apparent. The global hydrological (fresh water) cycle is one of the primary systems that is most detrimentally affected by these changes and which has become seriously imbalanced. This threatens the future of all of Earth's ecological systems along with humanity. These threats have prompted greater awareness and global interest in sustainable development, which has led to many questions concerning how this can feasibly be achieved. Fresh water is vital for all of life on Earth and is therefore, a fundamental issue for consideration. In relation to this, the connection between mountain regions, Earth's climates and the hydrological cycle is crucial. High altitude forests play a huge part in the maintenance of this cycle. Over the last few decades huge deforestation throughout Earth's mountain regions has taken place. This is detrimentally affecting all watersheds and river sources. The prompt reforestation of these areas is of paramount importance. An integrated solution is required, involving both governments and grass root communities. Traditional knowledge in conservation could potentially provide the solution needed and be utilized in restoring and preserving biodiversity in mountain regions. This is conceivably a way of re-balancing the hydrological cycle and helping to mitigate the negative impacts of Climate Change.

**KEY WORDS:** Sustainable Development, Climate Change, Mountains, Fresh Water, Reforestation, Biodiversity, Traditional- Knowledge, Conservation.

**Sustainable Development and Climate Change:** Sustainable development is a way of using resources, with the aim of meeting human needs while preserving the environment. This is so that these needs can be met, not only in the present, but also in the indefinite future. This is famously referred to by the Brundtland Commission as, development which:

*"Meets the needs of the present without compromising the ability of future generations to meet their own needs"* (U.N, 1987).

In 1992 at the United Nations Conference on the 'Environment and Development' it was agreed that the protection of the environment and social and economic development are fundamental to sustainable development. In these times of 'Climate- Change'/'Global- Warming' and diminishing natural resources, it is essential to consider sustainable development in relation to environmental sustainability and to place emphases on the long term implications of any development. Nowadays the harms caused by unsustainable development are starkly apparent. They can be clearly seen in the cases of 'Climate Change' and the disruptions in the global hydrological cycle (Houghton, 1997). Environmental sustainability has been ignored and postponed for too long and it is now crucial that fast, effective, united global action is taken. Many resolutions have been made concerning this, but now, due to present environmental conditions, these resolutions need to be acted upon. This attitude is shared by members of the United Nations.

*"Climate change would be a less immediate threat, if we had kept pace with commitments to sustainable development enunciated again and again over the years." (U.N Millennium Development Goals Report, 2008)*

The climate influences every aspect of life on Earth, from our capacity to grow food to the level of biodiversity that exists globally. Every day the hazards and disasters caused by 'Climate Change', from freak hurricanes to extreme monsoons, become more apparent .The global hydrological cycle is one of the primary systems that are most detrimentally affected by the changes brought about by 'Global Warming'. Many indicators of this disruption are already evident in the increasing incidences of droughts, floods, storms and the devastation that these events cause (Houghton, 1997).

*"The U.N expresses its deep concern at the number and scale of disasters and their increasing impact within recent years, which have resulted in massive loss of life and long-term negative social, economic and environmental consequences for vulnerable societies throughout the world, in particular in mountain regions." (United Nations, 2006)*

World environmental scientists; who have been informing world governments since the 1980's about these issues, warned that global warming would melt ice and snows in the mountains leading to glacial lake outbursts and land slides and disrupt the amount and timing of fresh water released to the lowlands (UNESCOMAB). This situation causes problems with the quality and quantity of fresh water available everywhere (U.N.U Tokyo, 2002). This is the case regardless of contaminated water supplies. In 2005 United Nations experts warned:

*"Little was being done to monitor the state of glaciers in the Himalayas, which were melting due to global warming and thereby increasing the risk of major floods." (UN, 2005)*

In a recent article published in 'Nature' a British scientific journal, it was stated that the Tibetan plateau is Earth's largest store of ice apart from the Arctic and Antarctic and that this ice is melting very fast. It also states that a large-scale thaw of permafrost would melt its water content and bring about ecological catastrophes.

*"In the past half-century, 82% of the plateau's glaciers have retreated. In the past decade, 10% of its permafrost has degraded. As the changes continue, or even accelerate, their effects will resonate far beyond the isolated plateau, changing the water supply for billions of people and altering the atmospheric circulation over half the planet." (Qui, Nature, 2008)*

The Article discusses the fact that this will threaten the Asian monsoon and severely disrupt the water supplies of billions of people. Tibet is the source of the largest rivers in South East Asia, including the Ganges, Indus, Brahmaputra and Mekong. Research has shown that the environment of the Tibetan plateau, high in the Himalayas, at an average altitude of 4,000 metres above sea level, affects the global jet-streams. These in turn affect Pacific typhoons, the El Niño phenomenon (an oscillation of the ocean-atmosphere system in the tropical Pacific) and monsoon patterns. These patterns affect all of Earth's weather systems and climates (TPPRC, 2003).

**Mountains Regions:** Mountain regions cover approximately 25% of the Earth's land surface and source most of the Earth's fresh water repositories (U.N General Assembly 29/9/05). They have been referred to as *"the water towers of Earth"* (Bandyopadhyay, 1995). All of Earth's rivers originate in the Mountains and flow to the oceans. This sustains the life of all beings and all ways of life (UNCED, 1992).

*"As a major ecosystem representing the complex and interrelated ecology of our planet, mountain environments are essential to the survival of the global ecosystem. Mountains are highly vulnerable to human and natural ecological imbalance. Mountains are the areas most sensitive to all climatic changes in the atmosphere." (UNCED, 1992)*

Research confirms that mountain regions are critically important for the balance of Earth's climates and fresh water cycles. In these times of 'Climate Change', Earth's hydrological cycle has become seriously imbalanced. This threatens the lives of all living beings (UNCED, 1992). In South America, Andean cloud forests are also vanishing and this environmental degradation is destabilizing the hydrological cycle, increasing the seasonal fluctuations in river flows and disturbances such as landslides and floods. In the northern region of Peru, these problems are increasing vulnerability to the El Niño phenomenon which has important consequences for weather around the globe (INRENA, 2005).

*"Due to an increasing demographic pressure on the earth's ecosystems, the demand on mountain resources (e.g. on water) will increase in future and the potential for conflicts over their use will grow. To avoid severe conflicts as well as to conserve and sustainably develop one of the most precious environments on earth, it is crucial to improve the management and protection of mountain ecosystems, to deepen observations as well as to link networks. In addition, mountains are considered early warning systems and accordingly mountain research is crucial for the prediction of global change." (UNCED, 1992)*

**Mountain Forests and Fresh Water:** When considering sustainable development, fresh water is of paramount importance and needs serious attention. Fresh water is fundamental for all life regardless of species, culture or economic status. In relationship to Earth's fresh water, it is vital to consider forests, especially mountain forests, as they play a major role in the global Hydrological cycle (INRENA, 2005). Humanity and the majority of other life forms derive enormous benefits from mountain forests. They slow the rate of run-off in watersheds, which ensures the base flow and minimizes flooding. Furthermore, they reduce soil erosion and increase water quality. They are therefore of immense importance in terms of soil and watershed protection (Bishkek, *Global Mountain Summit. 2002*).

On a global scale, all forests play a crucial role in climate regulation and constitute one of the major carbon sinks on Earth (UNECE/FAO, 2000). They are one of the most valuable ecosystems in the world, containing over 60% of the world's biodiversity and humanity is utterly dependent upon them for well being. Unfortunately too much of the world's forests have been cut for short term profits. (Bishkek, Global Mountain Summit. 2002)

*"Mountain areas hold a rich variety of ecological systems. Because of their vertical dimensions, they create gradients of temperature, precipitation and insulation. A given mountain slope may include several climatic systems - such as tropical, subtropical, temperate and alpine, each of which represents a microcosm of a larger habitat diversity." (UNCED, 1992)*

In mountain regions cloud forests are particularly valuable for their capture of water that is combed from mists and moving clouds. They are also of immense importance in maintaining a steady supply of fresh water to all the lowlands and downstream areas (Hamilton, L.S. 1996). All of these waters finally feed into and clean the oceans. Without a steady flow of clean fresh water they become too high in salts and become too imbalanced to adequately maintain marine life.

*"Mountains have higher precipitation than adjacent lowlands...They are rich in water resources, blocking and re-channeling regional cloud masses that shed their moisture to form the headwaters of valuable surface streams."(Hamilton, L.S. 1996)*

Intact forest ecosystems buffer intense rainfall with their canopy and under story, regulate overland flows to streams with their humus-covered floors and hold shallow mountain soils in place (Hamilton, L.S.1996). Without these forests there is nothing to protect the mountain slopes from erosion, hence causing great devastation as the streams and rivers fill with rocks and silt and flood the lands lower down (Bishkek, Global Mountain Summit. 2002). The severe floods in Bihar in N. India in 2004 and 2008 are but some of the extreme examples of this and there have been many more globally in recent years. Because of the complex root system of forests, they help to channel the fresh waters, high up in the mountain areas into the underground aquifers and underground rivers which then feed into all of Earth's water tables (Hamilton, LS. 1996). When these forests are extensively cut, massive problems occur and the water tables diminish.

*"The results of mountain ecosystem degradation through clear-cuts and unsustainable forestry and agricultural practices are tremendous and costly to downstream water users. They include drier aquifers and wells, siltation of hydropower and irrigation reservoirs through hillside erosion, and less water in the dry season." (Bishkek, Global Mountain Summit.2002)*

These high altitude forests, through the action of precipitation and transpiration, are also responsible for the creation of mountain snow (Bandyopadhyay, J. 1995). During the winter seasons rain falls as snow at high altitudes. As mountain forests disappear there is less precipitation and transpiration, hence less snow is made, land drains more quickly and soil temperatures rise. In 1945 ancient forests covered 25.2 million hectares of the high Tibetan plateau. Tibet covers an area of approximately 2.5 million square kilometers. By 1985 the forests had been reduced to 134, 000 square kilometres (TPPRC, 2003). They have undoubtedly been reduced even more since then. This is an enormous loss of high altitude cloud forests and yet it is only a fraction of what has been happening globally.

*"Despite all of the great benefits that mountain forests provide they have been disappearing at a startling rate in the last decade." (Bishkek, Global Mountain Summit, 2002).*

This is proving to be very dangerous to global stability and undermines all long term sustainable development. It is an enormous loss and surely adds to the problems of global warming, considering that these forests are the natural mechanism, which would normally be making the mountain snows. They would also normally be feeding the waters into the underground aquifers, absorbing carbons and producing oxygen. The stability of Earth's fresh water system depends upon maintaining the integrity of watersheds. These, in turn, depend upon the health of the high altitude indigenous forests. When these are so seriously damaged and reduced, all of life on Earth is threatened. Mountain snows are important for keeping Earth's climates regular. Nowadays there is an enormous reduction in mountain snows and glaciers throughout the World. This is highly exacerbating the problems of 'Global Warming'. With such a massive reduction in biodiversity in mountain regions globally, there is bound to be a huge increase in the impact that this has on the global climate. It has been recognized that the protective function of stable forest cover is vital for the safeguarding of mountainous settlements and infrastructure  
(U.N, 1995).

*"Despite mounting efforts over the past 20 years, the loss of the world's biological diversity, mainly from habitat destruction, over-harvesting, pollution and the inappropriate introduction of foreign plants and animals has continued." (UNCED, 1992)*

Research confirms that it is critical that the biodiversity of mountain regions is preserved and restored. This work needs to be done recognizing the severity of the situation and the huge loss that will be suffered if it is not effectively done rapidly. Bearing this in mind it is essential to look at what can realistically be done to restore the high altitude forests as fast as possible and to safeguard and preserve those which currently exist.

**Traditional Knowledge:** Any action that is taken needs to involve all levels of society. Co-operation is necessary to enable the long-term sustainability and effectiveness of an endeavor of this magnitude and importance. Thus it needs to involve governments, scientists and equally importantly, the rural grass-root communities. The involvement of mountain communities is fundamental. Therefore, the methods used to address this critical situation needs to fit with the requirements and traditions of these different social groups. In consideration of this let us look at the ways traditional knowledge has been utilized historically in relation with environmental conservation. The motivations for traditional methods of conservation have not simply been based on superstition. They have, by a cumulative process, been developed over centuries of adapting for survival. These are based on well founded observations that documented the most effective methods to sustain the required resources and have been transmitted to future generations (Ohmagari and Berkes, 1997). It may be said that traditional knowledge is a knowledge-practice-belief complex (Berkes, 1999). The need for food, medicine, fibre (cloth, paper, building materials etc.), natural resources and habitats that biodiversity provides, has created and sustained the practice of traditional conservation methods. These methods provide a set of guidelines by which societies can produce a livelihood from their surrounding environment (Berkes, 1989).

*"Indigenous cultures, traditions and knowledge, including in the field of medicine, are to be fully considered, respected and promoted in development policy and planning in mountain regions, and underlines the importance of integrating indigenous knowledge, heritage and values in all development initiatives."(U.N, 2006)*

There are certain traditional knowledge systems that could be very useful in helping to regenerate global mountain regions. Restoring new mountain forests is a very difficult job when the old forests have been so severely diminished and when there is very little top soil remaining, leaving behind arid lands. This also applies when the remaining soil is too acidic or compacted. To grow a forest in these conditions, one has to reestablish the complex root structures and canopies, to resemble that of a mature forest. Young plants cannot be expected to grow in bare, exposed land. They are too fragile and vulnerable. They need shelter from the harsh weather condition such as strong winds, heavy rains and intense sunshine, which are common to mountain regions.

A traditional knowledge system, which could be very useful in helping solve these enormous environmental problems, is the Ayurvedic medicine system which has been developed over many thousands of years in India. This system of knowledge, usually used for human ailments, can also provide us with knowledge for environmental restoration. There are many different kinds of medicinal plants, indigenous to the Himalayas and to all mountain regions of the world which will grow in arid lands and which possess properties that can be utilized to solve environmental problems (FAO. 2001). Between the rich varieties of species are many plants potentially capable of providing all that is needed for re-establishing indigenous mountain forests fast (Hamilton, 2003). These plants are capable of growing in some of the most badly eroded and degraded soils (Dhar, 2002) and some that are even capable of cleaning the land by removing toxins. This process is known as Phytoremediation. This is a way of using plants to clean up pollution in the environment (Mark, 2003). Certain plants can help clean up many kinds of pollution including metals, pesticides, and oil. The plants also help prevent wind, rain, and groundwater from carrying pollution away from sites to other areas (Shimp, et al, 1993).

Some of these plants have strong, fast growing root systems. These are capable of holding together the loose earth, so allowing other, slower growing plants such as oak, to connect their tender roots in with a strong web of roots. This root system helps to prevent land erosion by holding the soils together on the slopes. By using a combination of fast growing plants, it could be possible to synthesise a natural forest. This would act like a nursery for the young plants and make it possible to introduce many varieties, so encouraging high levels of biodiversity. These kinds of considerations make it conceivable for young plants to be able to establish themselves and become forests relatively fast. Speed is of the essence and of utter importance in this endeavor. Every time heavy rains fall precious soil is washed away. Once an area becomes rock, it is no longer possible to introduce plants and all that is left is arid land and desert (FAO. 2001). Some of the environmental problems being faced have occurred due to the introduction of foreign plants into a given area. Although many foreign plants may have some useful qualities, too often they have proven to be invasive and have wiped out local plants, which are vital for the health of the overall general environment. Therefore the plants which have already evolved in local environmental conditions are the ones that will be the most successful for fast land reclamation and regeneration. In this respect indigenous plants are vital for a successful outcome. One way to re-establish biodiversity is to give the local communities the right to look after it. This gives a direct bond and attachment between them and the surrounding environment.

A way that past generations have successfully done this was by declaring some areas as 'Sacred Groves'. People still living in remote rural areas, following traditional customs, understand these ways much more than many urban dwelling people, regardless of academic education. This is part of the rich, generally unspoken knowledge of Earths' mountain communities, which needs to be honored and respected, especially in these times. When considering mountain communities, it has to be understood that, due to severe erosion and disruption to the ecology in mountain regions, mountain communities are some of the poorest on Earth. Five hundred million people, which is approximately 80% of the world's mountain population, live below the poverty line (U.N, Tokyo 2002). Poor people are obliged to exploit whatever resources they may have access to for survival.

*"Nor do mountain communities normally participate in decisions to grant timber licenses to log the remaining 25% of the world's forests that grow in upland areas."* (Maggio, Gregory F. and Owen J. Lynch. 1996)

This suggests that mountain regions could have been deforested by as much as seventy five percent. Mountain people also, generally, keep grazing animals, which roam the mountains and eat most plants that they can find. In regard to this it is of utmost importance to find a re-forestation method which could fit with their ways of life. It has to be a way which can help these communities by bringing new wealth and vitality to their lives. It is important to both re-educate them and the people of the lowlands of the vital part that healthy mountain environments play in Earths' fresh water system and climatic conditions. The participation of the people who live in the lowlands; that depend upon healthy forested mountain regions for their fresh water and livelihoods, is also essential for this enterprise to be successful. It is imperative to recognize how important the health of mountain communities is to the rest of the world. All of these factors need to be considered, when contemplating sustainable development and the possibility of a healthy future on Earth.

*"Food security and alleviation of poverty in mountain livelihoods based on agriculture can only be achieved if the natural resource base is preserved and the services of mountain ecosystems are ensured in the long term. This also calls for a reevaluation of natural resources by society. Recognizing the multiple functions of natural resources, and compensating mountain dwellers for their endeavors to ensure the services of mountain ecosystems by managing the land in a sustainable manner, is a first step."* (The Millennium Development Goals Report, 2008)

So long as local communities are involved in the management of the land and the natural resources, traditional conservation techniques are still capable of protecting the surrounding biodiversity (Dei 1993; Williams and Baines, 1993).

**Sacred Groves:** One traditional knowledge system which has been invaluable in environmental conservation is the tradition of Sacred Groves. They are a recognized traditional method of biodiversity conservation (Kosambi, 1962; Gadgil and Vartak, 1976; Haridasan and Rao, 1985; Khan *et al.* 1997). They serve as a refuge to threatened species and many are homes to species no longer existing anywhere else on Earth (The Journal of American Science, 2006). Many contain water resources that are important for local communities and ecology. The ground cover vegetation in these sacred groves contributes to this, as it can absorb water during rainy seasons and release it during times of drought. The combination of the trees and the various medicinal plants found in them, have been shown to improve soil stability, prevent topsoil erosion and provide irrigation for agriculture in dry, arid climates (FAO, 2001.)

Sacred Groves are often the remnants of the primary forest, which have been cared for and protected by the local communities. They provide us with a reminder that human cultures and biodiversity have evolved together and that the encouragement of such a link is likely to be a key element in an ecologically and socially secure sustainable future (Hughes and Chandran, 1997). This is an incredibly old tradition and may have originated among the hunter-gathering communities long before humans started settled agriculture (Gadgil and Vartak, 1973). Sacred Groves still exist in many countries around the world (Hughes and Chandran, 1997) but nowadays they are scarce. However the tradition has been well preserved throughout India and the Himalayan regions. Experts estimate that there are many thousands of Sacred Groves in India (Hughes and Chandran, 1997). Throughout India, designating areas of forest as Sacred Groves/Forest Temples has been the predominant traditional method of environmental conservation. Many scholars have been studying them in relation to socio-cultural practices of traditional people (Boojh and Ramakrishnan, 1983; Khiewtam and Ramakrishnan, 1989; Basu, 2000; Kushalapa *et al.*, 2001). This model of conservation may be one that can be adopted in present times for saving and restoring Earth's natural environments and biodiversity (Gadgil M. and Vartak V.D. 1975). Sacred Groves are forest patches which are conserved by the local people and which are intertwined with their traditional, cultural and religious practices. Local traditional communities protect such groves usually through customary taboos and sanctions. Well preserved Sacred Groves are storehouses of valuable medicinal and other plants which have high land restorative and economic value. Sacred groves can benefit local agriculture by preserving a habitat for birds that control insect outbreaks in adjacent crop fields and may also serve as seed banks for locally adapted crop varieties and medicinal plants. Even small groves can be surprisingly effective in conserving biodiversity (Warren and Pinkston 1998). This has proved to be a well tried and tested method over thousands of years and provides valuable traditional wisdom, which could be utilized to help solve present environmental problems and potentially make sustainable development realizable.

*“A scientific understanding of the sacred groves would be significantly important for designing strategies for rehabilitation of degraded landscapes, involving local people’s participation, and training for promotion of traditional and social norms” (Gadgil and Berkes, 1991)*

In consideration of this knowledge, it is possible that the tradition of Sacred Groves could be utilized as a method of land reclamation and regeneration throughout mountain regions. This would involve the creation of new Sacred Groves and the preservation and restoration of existing ones. It could provide a way of linking mountain communities throughout large areas of mountainous regions and even the world. It is very important that the connecting of different areas of land, communities, cultures and knowledge systems takes place. This is because isolated patches of biodiversity and local preservation do not have a very large environmental impact on a global scale. They also do not have real long-term sustainability, when considering the present fragility of Earths' fresh water and cooling systems. The regeneration of high altitude forests needs to take place in a connected manner, both locally and globally, to be truly effective in this issue. It is a matter for serious deliberation, so every effort should be employed. It is possible that if numerous new small groves were created throughout the mountain regions, linking village communities and creating networks across these areas, that the impact would be much greater. Each grove could be planted in such a way, as that every village had a five to ten acre grove within its vicinity. Each village could potentially form a local group to care for and manage these new groves. In India and other places where they still exist, new ones could be planted alongside the existing ones. Linking new groves with existing groves; the latter being already significantly important for local communities, would mean that these communities would feel more devoted and protective towards the new ones. This would be a way of uniting the old and the new together and would therefore give these groves greater cultural stability.

The fact that the tradition of Sacred Groves has been global, gives it the capacity to potentially fit with many different cultures, landscapes and situations. These newly established groves could range from religious groves of any faith, to simply being naturally beautiful, peaceful and invigorating forest gardens. They could be community managed and so bring members of local communities together through education and mutual effort. Involving children and students in this could be a very good way of educating them about the benefits of conservation, from a young age. In this way fast, active, community based programs could be initiated and set in motion.

**Green Corridors/Green Belts:** The impact of these new Sacred Groves would be greatly amplified, if created in combination with the cultivation of different kinds of medicinal plants for cottage industry. This cultivation would preferably take place outside of the groves, in designated strips of land linking the individual groves. They could even potentially serve as important green corridors between larger, officially protected areas such as national parks (*Hughes and Chandran, 1997*). Green corridors and green belts have proven to be very effective in the reclamation of severe, environmentally damaged landscapes throughout a number of countries in recent years and have proven to be a way which enables much biodiversity to spread and flourish (*M. Malagnoux, E.H. Sène and N. Atzmon, 2007*). ‘The Green Belt Movement’ in Kenya and other countries in Africa, founded by Wangari Maathai, has facilitated in the planting of approximately 30 million trees. By planting trees in groupings of 1,000 or more, these green belts have begun to reclaim the ecosystems of Kenya that were rapidly eroding (*McLaughlin, The Christian Science Monitor, 2004*). There are a few conservation systems that have been developed in the last century, that are inspired by traditional conservation methods. ‘Permaculture’ and ‘Forest Gardening’ are two examples of these. Both of these contain methods, which could prove to be very useful for creating and sustaining groves and corridors which fit with the needs and traditions of the local communities. Forest gardening is a food production and land management system based on replicating woodland ecosystems, but substituting some usual forest trees with fruit trees, bushes, shrubs, herbs, medicinal plants and vegetables which have yields directly useful to humans. By exploiting the premise of companion planting, these can be intermixed to grow on multiple levels in the same area, as do the plants in a forest (*Jacke and Toensmeier, ‘Edible Forest Gardening’, 2005*). Permaculture means permanent agriculture and is a way of observing the dynamics of natural ecosystems. This knowledge can be applied in designing and constructing ecosystems that serve the needs of human populations without degrading our natural environment. Permaculture systems are proving to be successful in every ecosystem, including the tropics, deserts, mountains and oceans (*Bill Mollison and Reny Mia Slay, 1991*).

**Payment for Environmental services:** To conserve the natural environments already existing on Earth, fresh water is vital. It has already been agreed by world governments that high levels of funding, investment and greater support are required in mountain areas. This is essential for the survival of both highland and lowland communities (U.N,General Assembly, 29 September 2005). In this respect it would be of benefit for downstream communities to invest in mountain region rehabilitation, as, through watershed protection, they provide direct economic benefits and ensure necessary environmental services such as protecting fresh water supplies (*Bishkek, Global Mountain Summit, 2002*). This system of payment for environmental services (PES) is already being explored for protection of watersheds in the Andean regions of Peru (*Martínez de Anguita et al., 2006*).

**Conclusion:** From our research we conclude that because, all of life on Earth is threatened by 'Climate Change' and the imbalances in Earth's hydrological cycle, it is imperative to try and remedy the situation. It would seem that the way to potentially do this lies in the reforestation of high altitude regions promptly. Unless a substantial percentage of mountain forests can be restored globally, fresh waters could become so scarce, as to make life on Earth almost impossible. By using a combination of methods ranging from local traditional knowledge, forest garden and permaculture techniques for establishing high altitude forests fast, it might still be possible to rebalance Earths' fresh water and cooling systems. This could conceivably work as a global environmental restoration and conservation program. Sometimes it is important to not only ask the question of "what can be made from a venture" but also "what can be saved?" In these circumstances there is much to be saved.

If the Earths' fresh water system can be re-balanced, then life on Earth can potentially still be saved. This way sustainable development is possible. Something needs doing swiftly and we do not have time for further long discussions and deliberations. According to principles agreed upon by governments of the United Nations in Rio de Janeiro in 1992:

*"Where there are threats of serious or irreversible damage; lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."*  
(UNCED, 1992 .Principle 15)

With this in mind and with concerted effort and action on the part of governments and ordinary people, it might yet be possible to someday achieve the Millennium Development Goals agreed upon by the United Nations in the year 2,000 A.D.

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