



Expedition 2008.

VISION

Dawa Steven Sherpa, Managing Director of Asian Trekking (P) Ltd, made his first ascent of Mt. Everest in the Spring of 2007. A new insight into some of the threats to his roots in the Khumbu inspired him to take up the cause of Global Warming and Glacial Lake Outburst Floods (GLOF) with special focus on the Khumbu. He decided to organize a program with a platform that would attract maximum global attention - the Eco Everest

Dawa Steven wanted to field-test an eco-sensitive approach to climbing in the Himalaya that would be environmentally beneficial and cost effective on a commercial scale.

OBJECTIVES

- ♦ Raise awareness about the impact of climate change and glacier melting in the mountains leading to high risk of Glacial Lake Outburst Floods (GLOFs) affecting the lives of the local people.
- ♦ Bring down and properly dispose garbage and debris not only generated by the Eco Everest Expedition 2008 but also from previous expeditions.
- ♦ Effectively manage the containment and removal of human waste from the mountain produced during the Eco Everest Expedition 2008.
- ♦ Field test renewable energy and environmentally sensitive technology for future expeditions and treks, as well as the feasibility of adopting these technologies and practices within the local communities.
- ♦ Practise responsible climbing to further develop eco-sensitive practices.
- ♦ Raise funds to finance further research and monitoring of glacial lakes, not just in the Everest region but throughout the length and breadth of the Himalayas.
- ♦ Establish an Information Center at base camp with the support of ICIMOD. The Information Center will update visitors on GLOF risks in the Khumbu. The Centre will also provide public toilet facilities to keep Base Camp clean.

THE BEGINNING

When I stood on the summit of Mt. Everest for the first time on 21 May 2007 it seemed the world was at my feet.

It was 24 May 2007 and I was at Base Camp having returned from the summit, ready to go home - but circumstances dictated otherwise.

I had to cross, once again, the notorious Khumbu Icefall. Pemba Doma, a relative of mine, had died while descending from the summit of Lhotse in 2007 Spring. I had promised her husband that I would bring her body down. At that time the other high altitude Sherpas were still on the mountain clearing camp, so I could not seek their support.



As I made my way up, I met my Sherpa team rushing down with their loads, chanting prayers for safety and protection. The Icefall had begun to melt and the slush on the trail was making it very difficult for our crampons to bite into the ice.

This was very unusual for late May. The Sherpas were literally running for their lives. As they passed me they urged me to turn back - I listened to their advice. That same day, from that exact point the entire ice field collapsed! I feared for the lives of the Sherpas still on the mountain. But, there was nothing I could do.

At that time I realised that I had to find out why the ice had collapsed. I began my quest as soon as I returned to Kathmandu.

Most of my findings pointed towards the effects of global warming.

I had read and heard about "global warming." Until then these were just abstract concepts for me. I had never thought that it would affect me, or my home village of Khumjung, or my people the Sherpa's.

My search for an answer led me to ICIMOD, the International Centre for Integrated Mountain Development, a regional research and development agency that has been working towards sustainable mountain development in the Hindu Kush-Himalayan (HKH) region since 1983.



It was logical to seek their assistance in trying to find some answers. At ICIMOD I learnt from experts that the ice on the mountains and glaciers at their bases are melting at unprecedented rates, leaving behind huge glacial lakes.

This realization was the beginning of a new journey with a new meaning. We see the mountains as massive, solid, unchanging, strong and lofty but few of us realize that they are amongst the most threatened environments in the world. After discussions at ICIMOD, I was convinced of the need for efforts to be made to draw the world's

attention to these threats. As a mountaineer I knew that Mt. Everest was a platform that stood above all. I was confident that mountain lovers from around the world would support my efforts and my intentions in every way they could. This was also the beginning of a Campaign:

The Eco Everest Expedition 2008 - in partnership with ICIMOD.



I sought the guidance and advice of Ken Noguchi, an alpinist well-known for his environmental efforts in the Nepal Himalaya - especially the Khumbu region. I made it a point to meet him in Kathmandu in January 2008 before his trek to the Imja Tsho area. He explained in great detail his findings and studies. I requested him to be the Senior Advisor for the Eco Everest Expedition, and he readily agreed.

I wrote to friends and well-wishers in the international climbing community and received tremendous encouragement and support.¹ My plan was to use Eco Everest Expedition 2008 as a platform to talk about the effects of Climate Change on our mountains and the deteriorating mountain environment. On a personal level my bread and butter is the adventure tourism industry of Nepal. So, my attention was largely focused on how the climbing expeditions and treks we organize could be operated in an eco-sensitive manner. My father has always taught me to see our mountains and the natural environment as our assets - it is our responsibility to take care of them.



In the past mountaineering was filled with accounts of heroism, dedication and determination, and pushing human endurance to extreme limits. Climbing in the Himalaya was simply magic!

In recent times, popular mountains, like Everest, are becoming increasingly crowded. Fragile mountain environments in Nepal have little or no facilities or infrastructure to minimize the impact the crowds have on our mountains. Thus over the years, with the increase of large commercial expeditions, Mt. Everest and other mountains have started becoming large dumping sites for garbage and debris and human waste.

¹ Please see Annex pages 01 to 05

Although the disposal of garbage and debris has been hugely reduced in the last years, the problem still remains with the tons of garbage and debris left behind by previous expeditions. Towards the warmer season, when the ice melts, it is amazing to see how much garbage and debris lies underneath all the snow covering.

While there is a system at Base Camp in which the Sagarmatha Pollution Control Committee (SPCC) removes human waste to be properly disposed off in an area set aside by the SPCC, there is a need to set up a system to regularly remove human waste from above Base Camp. Above Base Camp, it is common for mountaineers relieve themselves behind rocks and ice. At these extreme altitudes and cold temperatures, the waste never decomposes and will remain intact for years. Climbers have used the crevasses at Camp 2 to dispose of waste. The movement and ablation of the glacier due to glacier and ice melt exposes them on the surface after some time. The problem is not only displeasing to the senses but a real health risk to both mountaineers and downstream communities.

The other issue is that of fossil fuel. While the local population in the Himalaya has traditionally relied on using firewood and other forest products for fuel, the additional demand created by expeditions and trekkers visiting these regions greatly increases the pressure on frail forests. When expeditions began to bring in compressed cooking gas, the expensive trend caught on with the local people also. I saw the opportunity to use the Eco Everest Expedition as a platform to test different forms of renewable energy that could replace imported fuels and firewood. This would allow the communities of the Khumbu region to preserve their environment as well as save money.



On the Eco Everest Expedition 2008 I intended to do our best to fulfil all the recommendations of the UIAA "Environmental Objectives and Guidelines" in the Kathmandu Declaration (www.theuiaa.org/act_environment.html). I wanted to "field test" the practicality of commercial expeditions being both eco-sensitive and profitable for the expedition organisers.



It is my belief that to make an effort sustainable, not only should it be ethically sound but should also address the financial motivations of organizations and individuals.

This combination was the key to making Eco Everest Expedition 2008 a success.¹

*Dawa Steven Sherpa
Kathmandu, July 2008*

¹ Please see Annex pages 06 and 07



PREPARATION:

Imja Tsho Reconnaissance with Ken Noguchi

In order to gain first-hand experience from an expert, Dawa Steven joined Ken Noguchi at Imja Lake in January of 2008. Naga Dorji Sherpa and

Pemba Tenzing Sherpa joined Dawa Steven on the recce. Later, Naga Dorji was the Sardar and Pemba Tenzing one of the HA Sherpas with the Eco Everest Expedition. The trip to Imja was primarily for Dawa Steven to see for himself the fastest growing glacial lake in the world (74 meters per year) and to understand the threat it posed on the land, property and lives of those living in the Khumbu region. He also wanted to make a documentary to promote the objectives of the Eco Everest Expedition 2008.

On the trek to Imja, Dawa Steven spent time talking to the local residents to find out what they understood about global warming and glacial melt. He found that while many of them knew about GLOFs, some even had had previous experience of GLOFs, as far as Imja was concerned they believed that firstly, enough prayers had been offered to protect them and, secondly, the foreign research teams had not shared their findings about any possible risks. Dawa Steven not sharing research findings at the local level not only left the people in the dark, but also created a kind of resentment towards research teams - resentment that the research was not really for the benefit of local residents.



ICIMOD partnership



Dawa Steven Sherpa, as organizer and leader of the Eco Everest Expedition, contacted ICIMOD in August of 2007. ICIMOD has well researched, expert knowledge on climate change in the Himalaya. Initially Dawa Steven's proposal was for ICIMOD to use part of the Bakery space at Everest Base Camp as an Information Centre and photo exhibition to cover the last 50 years of glacial melt on the

Himalayas. A broader based partnership was formed with ICIMOD following further discussions and exchange of ideas with the MENRIS Team at ICIMOD.

ICIMOD developed the Eco Everest Expedition 2008 website (www.ecoeverest.net.np), with input from Dawa Steven. This website became featured on Google Earth and was able to raise a wider global awareness about the glacial lakes.

Dr Andreas Schild, Director General of ICIMOD as well as representatives of UNEP visited the Eco Everest Expedition Base Camp on 18 April 2008 to participate in the traditional Buddhist religious ceremony, to mark the start of their climb. Dr. Schild handed the ICIMOD Silver Jubilee flag to Dawa Steven to take to the summit. Dr. Schild said climate change is affecting people around the globe, and is especially evident on and around Mount Everest and other great peaks of the Himalayas. Shrinking glaciers are leaving behind glacial lakes with massive amounts of water threatening people and land downstream. The loss of ice and snow heralds water problems for the 1.45 billion people living in the great water basins of the Himalayan rivers.



The photo exhibition, ***50 Years of Change - Glaciers, Landscapes, People and Resilience in the Mount Everest Region, Nepal*** - was unveiled at Base Camp for the duration of the expedition. The exhibition included a unique collection of repeat panoramas of mountains, valleys and glaciers taken in the 1950s, and retaken in the past few years. These photographs demonstrated the changes in the climatic, cultural and physical landscape of the Khumbu over the past half century. The exhibition is expected to tour several European countries. Dawa Steven reports that while viewing the exhibition elderly Sherpas and local porters, seeing a graphic display of the changes that had taken place in the area, were awed and expressed concern.

Parallel to the climbing expedition, a research team led by Basanta Shrestha of ICIMOD, visited Base Camp and the area to monitor glaciers and glacial lakes in the region and gather information to help communities and develop early warning systems. A pilot early warning system has been implemented for Imja lake, one of the fastest growing lakes in the region, in collaboration with the Department of National Parks and Wildlife Conservation and Keio University of Japan.

THE ECO EVEREST TRUST FUND

A Trust Fund¹ was set up to fund various local level activities such as incentives to remove waste materials from the high slopes of Mt. Everest and also help set up early warning systems for glacial lake outburst floods in close consultations with the local community. The Eco Everest Expedition contributed \$2,000 per foreign climber to the fund - a total of US\$ 20,000. Amongst many other contributors, ICIMOD staff and Asian Trekking staff, and Apa Sherpa (summitting Mt. Everest for the 18th time as a member of the Eco Everest Expedition 2008).²

UNDERSTANDING THE MOUNTAIN



At Base Camp the base of the mountain shows a distinct line of older dark grey rock at the top and the newly exposed white rock - an indication of glacial melt. Most of the garbage and debris on Everest is found at Base Camp and the four high Camps. Base Camp is located at the bottom of the Khumbu icefall. It is from here that all climbing logistics are planned and prepared. As such **all** food fuel, equipment, material and tents are brought into Base Camp before High Altitude Climbing Sherpas carry them to the appropriate Camps according to the expedition's strategy. Furthermore, thousands of

trekkers, local residents, porters, traders and yak caravans visit Base Camp during the climbing season. Base Camp now has the reputation of being called the largest "village" in the Khumbu region.

The meltdown is seen more prominently at Base Camp as the expedition progresses and one sees the effects of rising temperatures. Tents at Base Camp are set up on ground appearing firm and solid. After some weeks the ice sheltered by the tents remain frozen while the surrounding ice melts - by the end of the expeditions the tents are on platforms - some more than a metre high!

Camp 2 is the most polluted of the four camps as it is used as an advanced Base Camp complete with kitchen tents and dining tent facilities. Most of the old garbage and debris is frozen into the ice or snow and it is very difficult to dig out. Later on during the expedition, in the warmer month of May, the ice starts to melt and the Eco Everest Expedition team found it easier to collect the garbage and debris. Ironically the very melting helped the Eco Everest Expedition team in cleaning up!



¹ Please see Annex page 08

² Please see Annex page 08

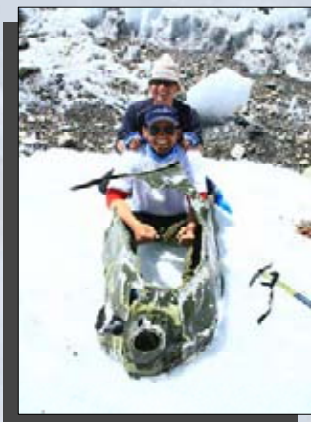


ACTION

Garbage and Debris

The Eco Everest Expedition 2008 collected a total of **965 kilos**¹ of garbage and debris by the end of the expedition - **665 kilos** of garbage and debris was collected from around Base Camp including 200 kilos collected by Ken Noguchi, Senior Advisor, and his team from the bottom of the Khumbu ice fall during one afternoon's clean up when he visited the Eco Everest Expedition Camp. **300 kilos** of garbage and debris was collected on the mountain, mostly from Camps 1, 2, and 3².

Additionally, the expedition also recovered the remains of a dead climber at the bottom of the Khumbu Icefall. The remains were taken off the glacier and given a formal burial on the moraine near the village of Gorakshep. Pertemba Sherpa identified the remnants of the clothes and the climbing harness being from a 1972 British Expedition on which he was Sardar.



Of the 965 kilos, 340 kilos were non-biodegradable and was brought to Kathmandu for disposal.

Dawa Steven and Ken Noguchi even salvaged parts of the Italian Army's helicopter that had crashed at Camp 1 during the 1973 Everest Expedition. The helicopter parts had been swallowed into the ice and transported down the mountain to near Base Camp by the downward movement of the icefall, and this year due to the increasing glacial melt had thrown up more debris.

Mechanism

The mechanism to make the clean up happen was very simple: cash for garbage and debris. The Eco Everest Expedition 2008 offered Rs. 50 (± US\$ 0.75) per kilo to anyone who brought down from the mountain garbage and debris left by previous expeditions, and a similar amount to anyone who collected garbage and debris left by previous expeditions at Base Camp . It was necessary to emphasize that money would only be given for garbage and debris from **previous** expeditions. Garbage and debris from ongoing expeditions would strictly be the responsibility of that same expedition to dispose properly.

¹ Please see Annexe page 09

² Please see marked image Annexe page 09 for reference.

At Camp 1 garbage and debris is not as visible in large quantities, because Camp 1 is located on a snow field at the edge of the Western Cwm and at the top of the infamous Khumbu Icefall. Garbage and debris, including destroyed tents, tend to be covered by snow fall and are carried down the icefall by the natural process of the glacier's downward movement due to gravity before the next climbing season making Camp 1 seem clean.

The garbage and debris however is transported all the way down to Base Camp and starts to become visible. In fact members of the Eco Everest Expedition found an American tin can from a 1962 expedition, and even the remains of a corpse from the 1972 British Expedition. This particular climber had disappeared somewhere between Camp 1 and Base Camp.

At Camp 2 the garbage and debris tends to be found in clusters around Camp, most likely sites used by previous expeditions to dump their rubbish. Camp 3, located on an incremental slope of 45-60 degrees, is also one of the most exposed to wind and threatened by avalanches. During periods of high winds and storms, expeditions may find all their tents ripped, tent poles broken, and the inside contents scattered over the slopes. Heavy snowfall can cause avalanches. Although a serious and deadly avalanche at Camp 3 has not been reported yet, the small avalanches are enough to cover and crush the tents. This happened to three of the five tents at Camp 3 of the Eco Everest Expedition, nearly trapping one Sherpa who was resting. Either useless or extremely difficult to excavate, the tents are usually abandoned, but remain firmly anchored. To the credit of Naga Dorji, the Eco Everest Expedition Sardar, and Dendi they spent an entire day digging out the destroyed tents so that they would not be left behind as debris.



Camp 4 is the final Camp before the summit and is located on the South Col at nearly 8000m. Even Sherpas use supplemental oxygen at this altitude. As the final launch



pad for the summit, a lot of material, equipment, food and fuel is used and consumed at Camp 4. However, once used, the climbers are unable to carry the waste back down due to fatigue and the high altitude. As such there is a lot of garbage and debris at Camp 4. The South Col is rocky and all the garbage and debris remains on the surface. While high winds have blown much of the garbage and debris off the mountain, the South Col is one of the most visibly polluted places on the mountain.

The Balcony (a small ledge used as a point of rest) and the South Summit are names given to certain landmarks on the final approach to the summit of Everest. These places are littered with oxygen bottles. In recent times, oxygen bottles have gained commercial importance as they can be refilled. These days climbing Sherpa's carry down the oxygen cylinders that they use as well as any empty bottles that are accessible. As a result the Balcony has very few oxygen bottles left lying around. The South Summit still remains littered with oxygen bottles. This is most likely because the bottles are frozen into the ice, and the high altitude and the extreme conditions makes it dangerous to spend time digging these out, especially if fatigued when returning from the summit.



Clean Up Process

Eco Everest Expedition used 50-litre nylon sacks to collect the garbage and debris. These sacks were also used to line the insides of the collector's backpack while ferrying the garbage and debris down to Base Camp. Due to the cold temperatures, the garbage and debris was frozen when being transported down off the mountain and so there were no odours.

The garbage and debris carried down to Base Camp by the High Altitude Sherpas was weighed and logged at Base Camp by Pertemba Sherpa, Senior Technical Coordinator and Base Camp Manager of the Eco Everest Expedition. The garbage and debris was properly stored ready to be taken down later.

As soon as enough garbage and debris was collected to make up porter loads, it was sent down to avoid a possible shortage of porters at the end of the climbing season when all the expeditions start packing out. The sacks of accumulated debris and garbage and debris were carried down in wicker baskets by local porters.



There it was sorted into biodegradable and non-biodegradable waste in the compound of the Eco Everest Representative. The biodegradable waste was handed over to the SPCC¹ office at Namche for proper disposal, and the non-biodegradable waste was carried down by porters to Lukla, and then flown to Kathmandu.

The Eco Everest Expedition bought empty oxygen bottles at US\$ 75 for a three litre bottle, and US\$ 80 for a four litre bottle. We collected 67 empty oxygen bottles in total and 2 full bottles. These bottles can be sent back to the factory in Russia and refilled at a discounted rate. Re-using these oxygen bottles on an expedition the following season becomes cost-effective for the expedition organiser.



Observations:

Only Eco Everest Expedition Sherpas participated in the garbage and debris collection and removal, even though Dawa Steven Sherpa had personally approached the Sherpas, Sirdars, and expedition leaders to participate in this initiative. They had seemed keen at the time. Either the time constraints or the financial incentive being too low could have been the reasons for the Sherpas from other expeditions not joining in the effort. It was noted that in order to achieve an eco-sensitive climb the

following should be seriously considered by the expedition organizers:

- ♦ The need for a very strong team of the expedition's own climbers to lead the initiative.
- ♦ The need to increase the cash incentive to attract more High Altitude Sherpas to join in the effort.
- ♦ Provision needs to be made for funds for collecting and transporting the garbage and debris. This cost can be offset by the goodwill generated by the expedition and also by attracting more clients who are environmentally conscious.
- ♦ It is advisable to have the garbage sorted into bio-degradable and non-bio-degradable at base camp itself. When taken down to lower altitudes for sorting, the garbage begins to emit foul odours and attracts flies as it begins to decompose.
- ♦ Care needs to be taken to ensure that the mouths of the nylon sacks are properly closed and fastened to prevent the contents from being scattered by the ever present high wind and rough handling while being carried down by porters.
- ♦ High Altitude Sherpas showed signs of weakness at later stages of the expedition and tend to conserve their energy and strength for those final days for a push to the summit, rather than collect and carry down garbage.

¹ Sagarmatha Pollution Control Committee

HUMAN WASTE MANAGEMENT

The Eco Everest Expedition brought down to Base Camp a total of **65 kilos of human waste from Camps 1 to 4.**

Process

In order to prevent human waste from being left on the mountain, the Eco Everest Expedition 2008 field-tested two well-known products; the Clean Mountain Can (CMC)¹ and Restop®². The CMC is a plastic bucket with a lid that can be tightly sealed and is used like a regular western toilet. The Eco Everest Expedition used a Restop® bag to line the CMC so that it could remain at Camp 2 throughout the expedition. Restop® bags are designed to safely contain and neutralize human waste and keep in the odour as well as the waste providing a user-friendly and convenient means to pack out solid waste. Ample toilet paper and a moist antiseptic towellettes are included with the Restop® bags.



The CMC's were used only at Camp 2 as it remains a more permanent Camp throughout the expedition. For Camps 1, 3 and 4 only the Restop® bags were used. The CMCs were found to be bulky and heavy and impractical to be carried at high altitudes. After use, the bags were sealed and stored just outside the toilet tent or in one location in places where there was no tent. The bags were then carried back in bulk to Base Camp by the Eco Everest Expedition Sherpas.

At Base Camp the human waste was collected by the SPCC and transported off the glacier to Gorakshap for proper disposal. As there are no proper toilet facilities at Base Camp, many trekkers visiting Base Camp use open ground or hunch behind rocks. The Eco Everest Expedition set up toilet tents near The Bakery area to provide toilet facilities for public use, thus limiting the human waste to a specific area.

¹ Please see Annex page 10

² Please see Annex page 11.



Observations:

- ♦ Sherpas had no problems removing collectively produced human waste, as they were keen to be part of conserving the mountain area. Before it has not been possible as it was not contained, however with the Restop® it became easy and not an unpleasant task.
- ♦ The Restop® bags prove to be hygienic as they come with both toilet paper and sterilizing wet-wipes for hands.
- ♦ Greater privacy as the Restop® bags can be used inside the tent or tent vestibule.
- ♦ Greater safety for the climber (especially at night), as they do not have to move away from the tent to use the toilet. This reduces the risk of slipping and falling off a slope or injuring themselves.
- ♦ The Restop® bags release no odour even when the contents are disturbed around while being carried down the mountain.
- ♦ When windy, the Restop® bags need to be weighed down with rocks if being used without the CMC.
- ♦ In high altitude the body produces a large amount of fluid. The sheer weight and volume of the urine made it difficult to collect and transport out urine.
- ♦ At present the collected human waste from Base Camp is taken in plastic bags to pits in Gorakshep. Left in the open, it takes more than 3 years for the waste to decompose. Packed in the plastics bags it will take longer. An effort needs to be made to open these bags once in the pit to allow for faster decomposition.

RENEWABLE ENERGY COOKING

Throughout the season one expedition will use up to twenty LPG cooking gas cylinders of 30 kilos each. Not only does it release harmful gases into the atmosphere in the process of cooking, it is also expensive - costs and porter wages amounting to nearly Rs. 10,000 (± US\$ 150) for one cylinder to reach Base Camp. During Dawa Steven's Eco Everest Expedition 2008 presentation at the Annual Dinner of the American Alpine Club in February 2008 in

Denver, Colorado, Bill Putnam, Past President of the American Alpine Club raised the issue of fossil fuel being used by expeditions. As a result, the Eco Everest Expedition 2008 field tested a number of different technologies on Mt. Everest - a parabolic solar cooker (PSC) contributed by the Centre for Rural Technology (CRT), a portable parabolic solar cooker contributed by Allart Ligtenberg, and a heat retaining box and briquettes contributed by the Foundation for Sustainable Technology (FoST).





Process

In a PSC the power of the sun is focused onto a small area in which a pot or other non-plastic utensil is placed. It weighs 28 kilos - one porter load. At Base Camp the large PSC could boil 10 litres of water every 35 minutes, although almost twice as slow in comparison to a gas cooker, it was ample for cooking,

washing and laundry. On a normal sunny day it was possible to heat 90 litres of water. A portable PSC was taken and tested at Camp 2 and it worked well.

Dawa Steven took a PSC to the summit to create international attention and awareness on environmentally friendly technologies. Images were taken for later publication.



A heat retaining box is a rectangular shaped, internally reflective box, which acts not only as a thermos but also as a slow cooker. This technology was tested at Base Camp and although effective in retaining heat, it was too small for the large volume of food that was cooked. However, it was perfect to store fluids that freeze at this altitude, such as sauces.

The biomass briquettes made from agricultural and other waste materials was not used at the Base Camp as it produces large amounts of ash that would settle on the snowfields and catalyzing the melting process of the ice. The briquettes were tested in Lobuche, a village three hours walk from Base Camp and was found to be effective. The briquettes were also test-demonstrated in Khumjung - the local residents were impressed by the briquettes as being an efficient and cost-effective fuel source using garbage.



Observations:

The use of renewable energy cooking proved over the couple of months in the region to be effective and resourceful. The technology is simple and can be used both on expeditions and for normal life up in the Khumbu region. However, it is also important to highlight that there are a number of safety and function issues that need to be addressed while using the technology in its present state.

- ◆ A PSC can heat up to 90 litres of water in a day, thus large thermoses are needed to store the excess hot water, particularly for use from the evening onwards.
- ◆ The number and size of PSC's to be taken to Base Camp and to Camp 2 depend on the needs of an expedition.
- ◆ The Parabolic Solar Cooker (PSC) is highly cost effective in comparison to other alternatives. This is a solution that can be utilized very effectively for everyday use in the Khumbu region and elsewhere.
- ◆ The panels of the PSC need to be scratch-free and care must be taken when transporting it to Base Camp.
- ◆ Some of the edges on the equipment are increase the risk of cuts and other accidents. Care needs to be taken near the PSC as down clothing tends to snag on the wires used to tie the solar panels to the frame.
- ◆ As the solar cookers needs to be physically rotated from time to time to follow the path of the sun during the day, there is an increased risk of feet slipping on the ice and causing injuries or accidents.
- ◆ The entire unit needs to be weighed down and anchored properly to prevent it from being blown over by high winds and damaging the unit.
- ◆ A portable PSC is adequate for an expedition's needs. Therefore, a large PSC is required on the mountain and at Camp 2 as well.
- ◆ The hotbox would be very effective in lodges and homes throughout the region as it is uncomplicated to use, has varying capacities, saves cooking fuel, and there is no need to re-heat cooked food as it retains heat for a long time .

SAFE DRINKING WATER

The SteriPEN¹ uses ultraviolet (UV) light to destroy waterborne microbes. It is up to 160 times faster than chemicals and weighs less than 225 g (8 ounces) with batteries. A SteriPEN was donated by Peak Promotion Trading, Kathmandu. The technology is simple to use - just push the button once for a litre (or quart) or twice for half a litre (or pint) then put it in the water until the indicator turns green. SteriPEN's integrated temperature sensor and microprocessor determine the duration of the exposure.



This technology is scientifically proven to be effective and safe; however as it is a new technology, and takes time and many uses before the user begins to trust it. It took just 90 seconds for one litre of water to be sterilized into safe drinking water. This is especially recommended for high camps.

Solar Tukki (Lamps)

UNDP donated two solar lamps (locally called solar *Tukki* after the small wick lamps used by the Nepalese in villages). A portable solar panel is connected to a battery that powers the lamps. On one charge the lamps lasted approximately ten continuous hours. Unlike previous solar lamps, these lamps provided not only bright lighting but even sufficiently bright enough to read by. R5

THE BAKERY

In 2006 while climbing Cho Oyu, Dawa Steven realised the need to make Base Camps a more social environment. Many of the teams did not visit each others' camps and were in fact suspicious of others. Blair Falahey, a member on the team and a personal friend, was always demanding bread and suggested to Dawa Steven that he should open a Bakery.

Created in spring 2007 as a brain-child of Dawa Steven, The Bakery was designed to be a social hub at the Base Camp. With limited activities and plenty of 'down time' the Bakery became a venue where people could gather.

¹ Please see Appendix page 11

During the Dream Everest Expedition 2007, a Sherpa would wake up at 6 a.m. to start baking for the day. He had been trained over past expeditions as a baker and had received some guidance in baking from a restaurant in Kathmandu,. Baking at high altitudes took twice as long as in Kathmandu, taking 2 hours to bake an apple pie. Two, sometimes three pies were baked everyday alongside cookies, croissants, and brownies.



The kitchen was set up with two stainless steel gas ovens, built specially to weigh no more, and be no larger, than one Sherpa load of 30 kilos. The kitchen tent contained barrels stocked up with ingredients once a week from the Namche market.

Dawa Steven soon found that most climbers and trekkers who reached Base Camp would visit the Bakery. With nightly movie screenings and hot coffee, the Bakery was

constantly busy. He realised that this was also an opportunity to inform people about the mountain environment.

Due to the huge success of the previous year it was apparent that it was the perfect location not only for socialising but also an opportunity to educate climbers, trekkers, and other locals on the effects of climate change, the responsibilities and simple solutions that can be put into practice by each individual. This was the basis for Dawa Steven's concept for the Information Centre proposed to and accepted by ICIMOD during Eco Everest Expedition 2008.

In Spring of 2008 the Bakery concept was taken one step further. ICIMOD used the Bakery to set up the **50 Years of Change - Glaciers, Landscapes, People and Resilience in the Mount Everest Region, Nepal** photo exhibition. The photo exhibition was taken on a world tour after the expedition.



Process

At the beginning of the Spring mountaineering season, two Eco Everest Expedition 2008 staff members set up The Bakery. The Bakery consisted of two double layered (canvas with waterproofing) dining tents (28 feet by 13 feet) joined together. Although this year it was not possible to operate The Bakery using only renewable energy sources, every effort was made to produce only bio-degradable waste.



The entrance brought one immediately into the bakery area. Baked items were displayed on a stone counter built from rocks collected from the Base Camp area. Some of the delicacies were cookies, flavoured bread, apple pie, yak cheese cake, croissants, and of course, steaming mugs of tea and coffee.

The first tent led into a 16 panel photo exhibition showing 50 years of climate change created by ICIMOD. The tent was carpeted and warm encouraging people to spend more time, converse and become more aware of the impact of climate change by viewing the photo exhibit. The Bakery was a convenient method to provide awareness information to a "captive audience."



Observations:

- ♦ The success of the Bakery as a "preferred place to gather" needs to be continued every year. In the future The Bakery can provide more awareness information, and the film screening can also feature awareness documentaries produced by experts such as ICIMOD.
- ♦ The information handed out this year was general. There is a need to provide more specific information on how an individual can help preserve the Himalayan environment. These information need to focus on encouraging the local people for their participation in preserving the environment.
- ♦ The Bakery also set up toilet facilities that helped towards localizing human waste for ease of collection and proper disposal. Many visitors to Base Camp do not normally have access to toilet facilities and use open ground.

SUGGESTIONS FOR AN ECO-SENSITIVE APPROACH

01. The management of human waste is one of the easiest ways in which a person can help in the preservation of the mountain environment. It is also one of the most damaging if left unmanaged. The organization making arrangements and providing services need to ensure proper human waste management facilities as part of their services. Local residents also need to implement proper human waste management.
02. The use of solar energy developed by modern solar technology is lightweight, affordable and effective. Using this renewable technology will allow expeditions to cut costs and utilize natural energy sources.
03. The SteriPEN saves time and energy. Being both light weight and easy to use for safe drinking water, it is a must have for all climbers and trekkers.
04. While increased financial incentives and on the spot payments would help, an effort to involve the Sherpas in a way that would give them more ownership in the project would be beneficial. One way would be the use of a communal garbage tent/store.
05. At present the collected human waste at Base Camp is taken in plastic bags to pits in Gorakshep. Left in the open, it takes more than 3 years for the waste to decompose. Packed in the plastics bags it will take longer. An effort needs to be made to open these bags once in the pit and remove the plastic bags for faster decomposition.
06. The very first step that can be taken is to educate trekking guides to carry small cotton bags to pick up trash (candy wrappers, empty instant noodle packets, biscuit wrappers, etc.) along the trail and empty the bag into the SPCC containers placed at various points along the Everest Trail. The cotton bags can be washed and used again.



A small, but very significant beginning.....

SPECIAL THANKS TO:

The Eco Everest Expedition 2008 would not have been able to accomplish its objectives without the support of institutions, organizations, and individuals from around the world.

*This support has encouraged me to keep striving to expand this vision to other parts of the Himalaya and to seek and support Eco-sensitive practices where it matters the most -
In our daily lives and in our communities*

*Dawa Steven Sherpa,
Leader, Eco Everest Expedition 2008
email: dawasteven@asian-trekking.com
www.ecoeverest.net.np*

PHOTO CREDITS: Charles Haviland; Dawa Steven Sherpa; Christian Anzeux; David L Gonzalez; Ken Noguchi; Paribesh Pradhan

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EDITING AND DESIGN: Prithivi Raj (Bobby)

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Dawa Steven Sherpa (email: dawasteven@asian-trekking.com).

To DAWA-Sarpa and your
ECO-Everest Expedition!

I wish all of you a
successful and good
Expedition to Sagarmatha
Tsydand, but yet be
careful!

yours, Peter Habler

PRAGUE, 26/11/07

Glaciers are more than scenic backdrops for the majestic Himalaya. They are the key repository of water and a fount of cultural and spiritual well being. With a warming planet these glaciers are the first to register increased temperatures. The Eco Everest Expedition will bring much needed awareness to this most important subject.

Conrad Anker

Reinhold Messner

Best wishes to the
ECO Everest Expedition 2008.
I fully support this important
mission, which will bring
a lot of information, hope
and inspiration to all the
Himalayan regions.

Global warming is a fact and
it is affecting the Himalayas
extremely. Especially the danger
of breaking off glacier sees
has to be studied to avoid
futures catastrophes.

A. Lamyelo from

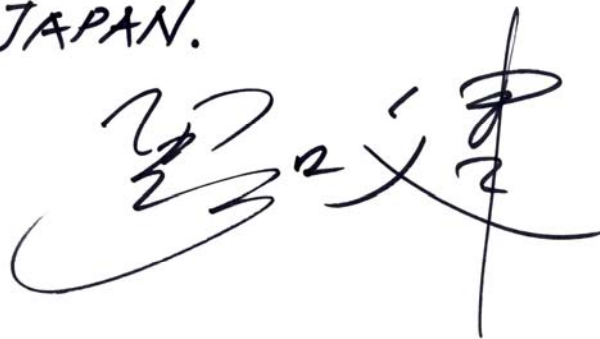
D. Messner

12 / 2 / 2008

DEAR MANASTEVEN SHERPA
LEADER: ECO EVEREST
EXPEDITION 2008.

WISHING YOU SUCCESS WITH
YOUR ECO EVEREST EXPEDITION
2008.

KEN NOGUCHI
JAPAN.



To
Dawa Steven Sherpa
& ECO EVEREST TEAM 2008

Dear Dawa Sherpa,

I wish you a safe climbing. I am sure
you will succeed with your enthusiasm,
knowledge and power. Keep out the
politics from the mountain

My best wishes to you and all the team members!

Yours Wolfgang Naudy

ACKNOWLEDGEMENTS

Advisors/ Coordinators:

Ken Noguchi (Senior Advisor)

Conrad Anker (Senior Advisor)

Pertemba Sherpa (Base Camp Manager & Senior Technical Coordinator)

Apa Sherpa (18th summit of Mt. Everest Eco Everest Expedition 2008) for his invaluable personal support and participation

THE SHERPA TEAM:

01	Dawa Steven Sherpa	Organizer & Climbing Leader SUMMIT EVEREST (2nd time) and Mt. Lhotse	Kathmandu, Nepal
01.	Naga Dorjee Sherpa	Sardar	Khumjung, Khumbu
02.	Nima Kanchha Sherpa	High Altitude Sherpa (also SUMMIT LHOTSE)	Khumjung, Khumbu
03.	Ang Mingma Sherpa	High Altitude Sherpa	Thame, Khumbu
04.	Phurba Sherpa	High Altitude Sherpa	Thamo, Khumbu
05.	Pemba Tenzing Sherpa	High Altitude Sherpa	Khumjung, Khumbu
06.	Mingma Sherpa	High Altitude Sherpa SUMMIT EVEREST	Thamo, Khumbu
07.	Tshering Thundu Sherpa	High Altitude Sherpa	Khumjung, Khumbu
08.	Thukten Dorjee Sherpa	High Altitude Sherpa	Thame, Khumbu
09.	Pasang Sherpa	High Altitude Sherpa SUMMIT EVEREST	Siddipokhari, Sankhuwasabha
10.	Tenzing Dorjee Sherpa	High Altitude Sherpa	Phortse, Khumbu
11.	Lakpa Nuru Sherpa	High Altitude Sherpa	Namche, Khumbu
12.	Rita Dorjee Sherpa	High Altitude Sherpa SUMMIT EVEREST	Phortse, Khumbu
13.	Palden Nagi Sherpa	High Altitude Sherpa (also Summit LHOTSE)	Phortse, Khumbu
14.	Nawangle Sherpa	High Altitude Sherpa (also Summit LHOTSE)	Phortse, Khumbu
15.	Pemba Tshering Sherpa	High Altitude Sherpa (also Summit LHOTSE)	Khumjung, Khumbu
16.	Ang Pemba Sherpa	Camp 2 Cook	Khumjung, Khumbu
17.	Tenzing Chhetan Sherpa	Camp 2 Kitchen Boy	Khumjung, Khumbu
18.	Dendi Bhote	Camp 2 Kitchen Boy	Oakhaldhunga,
19.	Shere Sherpa	Base Camp Baker	Tapting, Solu
20.	Bir Bal Tamang	Base Camp Head Cook	Gorakhani, Solu
21.	Dil Bahadur Magar	Base Camp Cook	Tamakhani, Solu
22.	Bhala Kaji Tamang	Base Camp Kitchen Boy	Gorakhani, Solu
23.	Sarba Bahadur Thapa Magar	Base Camp Kitchen Boy	Okhaldhunga
24.	Nuri Sherpa	Base Camp Kitchen Boy	Patle, Okhaldhunga

FELLOW EXPEDITION MEMBERS

	David L. Gonzalez	Summit	Mexico
	Seung-Hyun Choi		South Korea
	Tatsuo Matsumoto		Japan
	Ms. Helena G.P.P. Ceolho		Brazil
	Tejvir S. Khurana		USA
	Gabriel Willmann		German
	Walter Laserer	Summit	Austria
	Helmut Linzbichler	Summit	Austria
	Quang T. Than		USA
	Manuel S. Lara		Spain

*A special mention also goes to **Will Cross, Stuart Smith, Brian Oestrike and Constantin Lacatuse** who adopted the Eco Everest 2008 model on their climb on the Asian Trekking International Lhotse Expedition 2008.*

***And, a very special "Thank You"
to the many porters who helped us
reach Base Camp to begin our climb of Everest.***

We also wish to thank:

- *Our Partners ICIMOD and the MENRIS team for their patience in providing answers to my many questions and sharing their knowledge and expertise.*
- *UNEP*
- *American Alpine Club - for donating 3 Clean Mountain Cans for field testing*
- *Restop® - for donating 200 Restop® bags for field testing*
- *FoST - for donating one Hot Case and briquettes for field testing*
- *The North Face- for donating 14 sets of high altitude clothing for the High Altitude Sherpas*
- *CRT - for donating portable and fixed parabolic solar cookers for field testing*
- *Department of National Park and Wildlife Conservation, Nepal*
- *EvK2CNR – Pyramid- for assistance in communication*
- *Peak Gear - SteriPen*
- *Russian Service Center(P) Ltd.*
- *Sagarmatha Pollution Control Committee*

My personal thanks to:

Conrad Anker, Alton Byers, Bryon Smith, Jim Donini, Jerry Mika, Judith Safford, Ken Noguchi, Linda McMillan, Loveraj Dharmshaktu, Peter Habelar, Peter Hillary, Reinhold Messner, Robert Pettigrew, Roger Robinson, Sir Chris Bonnington, Wolfgang Nairz

***And, my many friends and well-wishers
for their invaluable guidance and advice.....***

*Dawa Steven Sherpa
Kathmandu, Nepal*

Eco Everest Trust Fund

A Trust Fund has been set up, managed by ICIMOD, which will be used to support development of early warning systems for the local communities, scientific investigations that will help assess risks, monitoring of the melting glaciers, and removal and disposal of waste in eco friendly ways. Every single climber on the expedition has contributed to the fund and contributions are now being solicited from any interested individuals and organisations, with the aim of ensuring the continuity of the project in the years to come. As little as \$10 would pay for clearance of one kilo of waste from high altitudes, and its proper disposal.

To join the Eco Everest effort, and contribute directly to the initiatives please visit:
<http://www.ecoeverest.net.np/donate.php>

Institutional Contributions

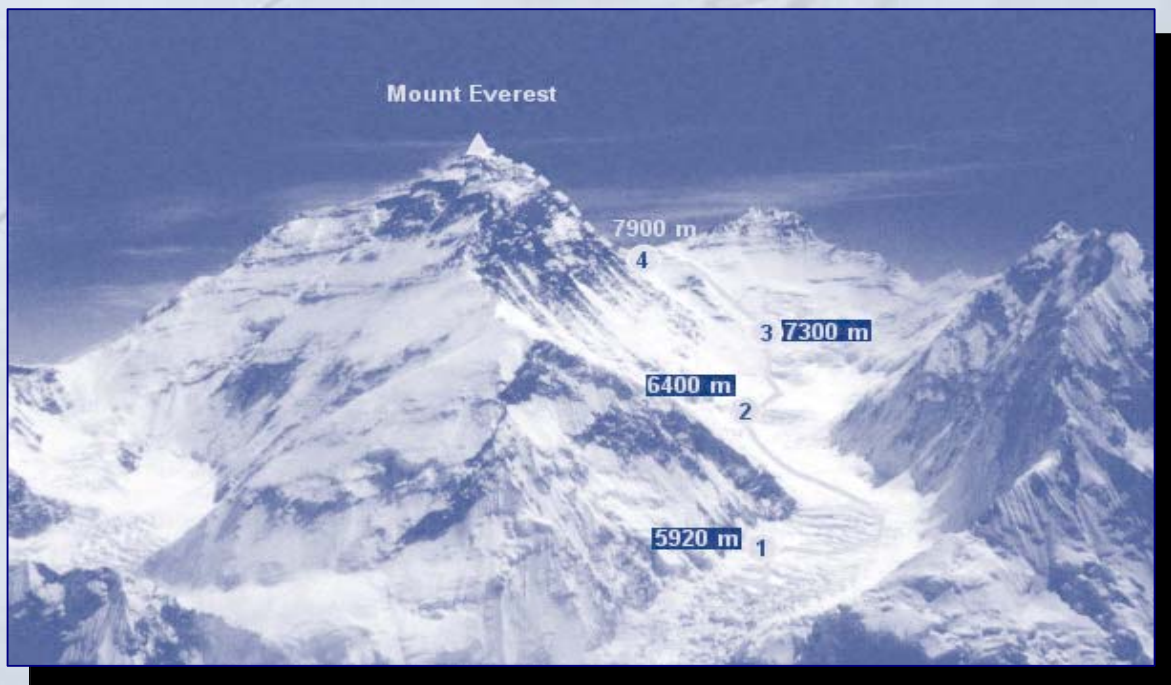
Asian Trekking (P) Ltd.	US\$ 20,000
ICIMOD	US\$ 1200
GIS Development	US\$ 1,000
Apa Sherpa, Director of Outdoor Diamond Mold, Inc.	US\$ 1,000

Individual Contributions

Andreas Schild	US\$ 1500	Verena Schild	US\$ 1500
Asian Trekking Staff	US\$ 500	Madhav Bahadur Karki	US\$ 100
Basanta Shrestha	US\$ 100	Milan Raj Tuladhar	US\$ 100
Micheal Ishayik	100	Diederik Prakke	US\$ 100
Dr. Kamal Banskota	100	Mr. Pradeep Mool	US\$100
Isabelle Providoli	US\$ 50	Alton Byers	US\$ 50
Birendra Bajracharya	US\$ 50	Lies Kerkhoff	US\$ 30
Shreemani Amatya	US\$ 20	Nira Gurung	US\$ 20
Kiran Shakya	US\$ 20	Kabir Udin	US\$ 20
Rajendra Silpakar	US\$ 20	Lokap Rajbhandari	US\$ 20
Govinda Joshi	US\$ 20	Pradeep Dangol	US\$ 20
Sudip Pradhan	US\$ 20	Rajan Bajracharya	US\$ 20
Yan Zhaoli	US\$ 20	Chandra Bir Singh Kansakar	US\$ 20
Chodok	US\$ 15	Gauri Dangol	US\$ 20
Deo Raj Gurung	US\$ 20	Rajesh Thapa	EURO 10
Nani K. Bajracharya	US\$ 10	Ayushma	US\$ 10
Rejina Maskey	US\$ 10	Angeli Shrestha	US\$ 10
Samjhana Thapa	US\$ 10	Prerna Thapa	US\$ 10
Monica Moktan	US\$ 10	Saisab Pradhan	US\$ 10
Paribesh Pradhan	US\$ 10		

Garbage and Debris Collection Log:

Name	In and around Everest Base Camp (kilos)	Brought down from higher camps to Base Camp (kilos)	Total Kilos
Dendi Bhote Sherpa		15	15
Thukten Dorji Sherpa	91	49	140
Pasang Sherpa	45	22	67
Rita Dorji Sherpa	25	55	80
Tenzing Dorji Sherpa	15	17	32
Mingma Sherpa	10	20	30
Phurba Sherpa	90	78	168
Pemba Tenzing Sherpa	11	5	16
Lhakpa Nuru Sherpa	0	4	4
Pemba Tshering Sherpa	60	18	78
Ang Samduk	15	0	15
Palden Namgya	15	0	15
Naga Dorji Sherpa	14	0	14
Ang Mingma Sherpa	13	0	13
Nawangle Sherpa	16	7	23
Karchen Dawa	0	10	10
Pertemba	45	0	45
Ken Noguchi and team	200	0	200
Totals	665	300	965



CMC : Clean Mountain Cans :

Clean climbing practices (aka 'Leave No Trace Mountaineering') on Mt. McKinley have evolved over the past thirty years. A successfully enforced "pack in-pack out" policy began in the late 1970's, with climbers removing all their garbage from the Alaska Range. Today we take this program one step further by mandating the removal of human waste from historically contaminated areas such as the West Buttress high camp at 17,200-feet. These problem locations have not only been unsightly, but often the source of polluted snow linked to gastrointestinal illness.

The Denali mountaineering rangers attempted various innovative measures to solve the human waste issue over the years. Conceived by mountaineering ranger Roger Robinson, the Clean Mountain Can (CMC) is a portable toilet designed to address Denali's remote, rugged environment and the unique logistical challenges presented by a 3-week long expedition. In 2000, a 24-day ranger patrol led by Robinson proved it was feasible to completely remove an expedition's human waste from the mountain using commercially designed river toilet boxes. Robinson then worked with the manufacturer of this toilet to create a smaller, lighter version. A grant from the American Alpine Club (AAC) in 2001 enabled the purchase of 50 of these prototype toilets which were used voluntarily by climbers with favorable results.

Robinson continued to work with the same manufacturer to enhance the can design, and through grants from both the AAC and the Access Fund, 220 newly designed Clean Mountain Cans were purchased for a large scale trial in 2002. Over 500 climbers used the CMC's, successfully removing their human waste from the polluted 17,200-foot high camp. Response from the more widespread trial was again favorable. (*See Annual Mountaineering Summaries 2000 through 2004 for more information on these trials*). Climbers and park management alike were pleased with the voluntary compliance, the ease of using the CMC, and most importantly, a noticeable improvement in cleanliness and hygienic safety of the 17,200-foot camp.

In order to assist expeditions in successfully preparing for a 'clean climb', Denali's mountaineering rangers created the brochure [Trash and Waste Policies for Glacier Environments](#). This helpful planning information is sent to registered mountaineers and other prospective visitors to the glaciated backcountry areas of the park.

To address impacts in other heavily used areas of the Alaska Range, in 2006 Denali National Park and Preserve required the removal of human waste from within half mile of all glacier landing strips. The following year, the park established the formal requirement that all human waste be removed from the high camp on Mt. McKinley with CMC's. These two new regulations, based on recommendations contained in the park's Backcountry Management Plan, were major milestones for the clean climbing effort. Keeping pace with the program, the Denali National Park and Preserve has gradually increased its inventory of Clean Mountain Cans to 1,100 units in circulation as of 2007, funded in part by a portion of climber's \$200 Special Use Fee. Of note, use of the CMC remains voluntary for travel in other glaciated areas of the Park, though all human waste must be crevasse with a biodegradable plastic bag.

In 2007, Denali National Park and Preserve began a multi-year research project tracking waste movement within the Kahiltna Glacier from popular camp locations. Further research will focus on the degradation of human waste once it surfaces.

CMC SPECIFICATIONS

The Clean Mountain Can is manufactured by Geo Toilet Systems. To date, no other container designed for human waste exists in this size, weight, or strength. The durable CMC comes with a harness system that can lock the lid down and is sturdy enough to strap on a pack or sled. The CMC capacity is 10 to 14 uses (approximately one-half pound per use) including the addition of some toilet paper. The current model Clean Mountain Can (CMC) is designed to hold 1.88 gallons of human waste and has a U.S. Department of Transportation-approved two-way vent. This Gortex vent allows for the release of gases through the screw down lid and enables air to enter when upon descent from higher elevations. The #2 polyethylene container is cylindrical in shape, measures 11 inches tall with an 8 inch diameter opening, and weighs 2.4 pounds. The 8 inch opening has a half inch flange that functions as the seat and the seal for the lid. The sturdy can is recommended to be sat on when in use. In five testing trials, a CMC was filled three-quarters full with solid

ice and dropped four feet onto concrete at an outdoor temperature of zero degrees Fahrenheit. The CMC was not damaged in these drop tests. Several CMC's have even been accidentally dropped off the West Buttress, tumbling over 2,000 feet without damage! The CMC is designed to have its contents dumped directly out or lined with a biodegradable bag and then rinsed for final cleaning. Currently, the CMC's are manually cleaned by a local septic pumping company using several washes of soap and bleach.

The Restop®

The Restop® 2 uses a patented "bag within a bag" design to safely contain and neutralize human waste. Restop contains the odor as well as the waste. The outer bag is a Mylar gas-impervious bag. The same polymers and deodorizers used in the RS1 are inside, with a slightly different set of enzymes for solid waste. The Restop 2 system contains the odor as well as the waste, providing a user-friendly and pleasant means to pack out solid waste. Ample toilet paper and a moist antiseptic towlette are included.

The Restop 2 is designed to be used with any commode system or can be used directly on the ground in wilderness situations. To use with a commode system, simply insert the Restop 2 into the commode bucket and fold the upper bag over the foam toilet seat (bucket and seat sold separately). When done, the upper bag folds into the lower triple layer barrier bag which then zip locks closed for complete containment. Now the waste is safe for disposal in any trash container.

SteriPen

SteriPEN® water purifiers are fast. They are proven to eliminate viruses, bacteria and protozoa in 0.5 liters (16 oz) in 48 seconds. Compare this to chemicals like chlorine that take up to 4 hours to do this job or iodine, which can't eliminate some protozoa at all.

SteriPEN® water purifiers are light. The SteriPEN Classic weighs less than 225 g (8 ounces) with batteries and the Adventurer/Traveller family weighs less than 110 g (4 ounces). SteriPEN's light weight makes it easy to pack and carry in everything from a purse to an expedition pack. SteriPEN® water purifiers are easy to use. Just push the button once for a litre (or quart) or twice for half a litre (or pint) then put it in water until the indicator turns green. SteriPEN's integrated temperature sensor and microprocessor determine the duration of the exposure. SteriPEN's liquid sensors insure that the timer administers the correct duration. It's all automatic after you push the button.

PHOTO CREDITS: Charles Haviland; Dawa Steven Sherpa; Christian Anseeno;
David L Gonzalez; Ken Noguchi; Paribesh Pradhan

COMPILED BY: Ms. Rachael Manley & Michael Irwin

EDITING AND DESIGN: Prithvi Raj (Bobby)

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