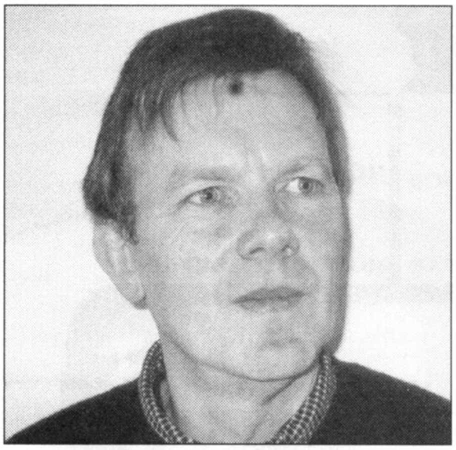
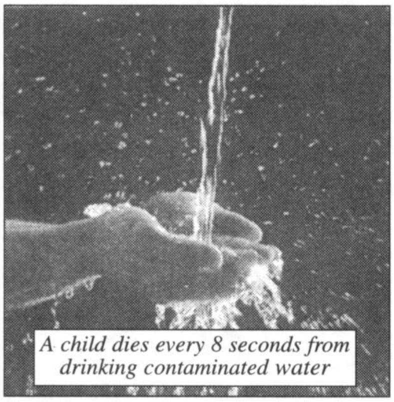


Physical Geographer Roland Wahlgren, B.Sc., M.A.:

"There were haunting images of people starving and without enough water. I tried to think of a way to get water to these people."

Canadians are used to an abundance of natural resources including some of the world's largest supplies of fresh water. But after reports of contaminated municipal water and all the "unfit for swimming" signs around lakes, a safe drinking water supply does not seem to be a given any longer. It seems that just like with the energy crisis, Canadians are no longer immune to the world's water crisis.

In Sweden, the water table is at its lowest in over 30 years thanks to last year's hot summer. Norrland and the area around Stockholm and Uppsala are the hardest hit with many dried up wells. The situation is especially bad for people who have opted to live year round in summer cottages, only to realize that they do not have a reliable water supply. The residents of Stockholm with access to municipal water are doing fine as the city uses Lake Mälaren as its source of water.


A child dies every 8 seconds from drinking contaminated water

Although Sweden's water "problems" are negligible seen from a universal perspective, the country is one of the most innovative when it comes to water supply. Many Swedish scientists specialize in hydrology, and Leif Ohlsson who wrote *Hydropolitics* about the third world's water crisis, and researcher Malin Falkenmark are regarded as trailblazers on this subject. The Global Water Partnership, that together with the World Water Council is the leading international water organization, is based in Stockholm and this is where the Swedish king presents the annual Stockholm Water Prize, that has become the "Nobel Prize for everything in regards to water".

For now the western world has been spared any major water crisis but water has become a precious commodity in Africa, China, Southeast Asia, Southwest America and even in certain parts of Europe.

There are three ways to combat water shortages - war, conservation and technological innovation.

One of the least expensive methods of producing small amounts of water, that has been partly pioneered by Swedes, is dew collection. This is done by setting up a large piece of flat foil in the shade in weak winds where condensed dew is collected in the same way that a legend would have us believe that the ancient Greeks did.

In Vancouver Swedish-Canadian physical geographer Roland Wahlgren has accelerated dew collection, working on developing atmospheric water vapour processing units that "produce water vapour from the air" by making air flow across a cold surface with a temperature lower than the dew point.

Wahlgren's Atmoswater Research water-cooler-sized unit produces 12 liters a day that is then treated by carbon filters and ultra-violet light to maintain purity. The unit would produce three times as much water in a humid climate such as in Southeast Asia, South Asia, the Middle East, Africa, and parts of South and Central America, and the West and East Indies.

Interview:

Swedish Press: How is the world's water situation today?

Roland Wahlgren: There are about 300 million people who are experiencing extreme water scarcity. Canada has the highest per capita consumption of water. 50 liters per person per day is put forth as a standard amount for drinking, cooking, bathing and hygiene. People in Canada use more than 200 liters per day including gardening, washing cars etc.

SP: What are the different ways of getting water and their relative costs?

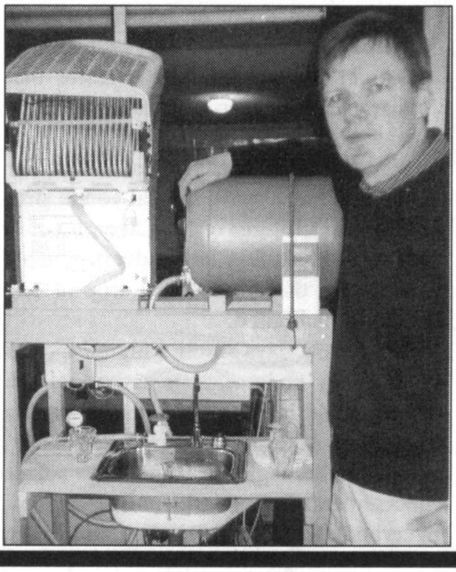
RW: Of course the main sources are surface water from lakes, rivers and streams, and ground water. With surface water the main issue is purification. In places like Vancouver this is a minimal problem. In other places you have to do more cleaning. With ground water you run into the pumping expense and a lot of aquifers are being gradually depleted because they are being pumped out faster than the natural recharge. Desalination is used quite heavily in some countries in the Middle East and some Caribbean countries use a lot of desalination. Florida and California are using more and more desalination. Huge plants are being built there. Especially the type of desalination called reverse osmosis desalination has become a lot more economical as the technology improves. Reverse osmosis is where you use high pressure pumps to force salt water through a membrane and only the water molecules can pass through and the salt gets left behind on the other side. It's like a very fine filter. The only thing that's really wrong with desalination is that by separating the fresh water from the original salt water, you're producing brine, extremely salty water with twice the salinity of sea water, and that has to be disposed of. In a lot of cases it is just let back out into the ocean and the long term effects of extensive desalination could be damage to marine ecosystems. In both Florida and California there actually has been opposition to the more recently proposed projects on that basis. There are several other forms of desalination. The only other method is extracting water from the air.

SP: How did you get involved?
RW: Around 1984 there were news broadcasts about the drought in East Africa. There were haunting images of people starving and without enough water. I tried to think of a way to get water to these people. As a physical geographer, I was aware that there is water in the air. So I began thinking that if you condense the water in the air, you could get drinking water right at the spot where you need it. That might be the ideal solution. I did a literature and patent search and quickly found out that, already at that time, there had been quite a lot of work done on the topic of getting water from air. Some quite interesting attempts were made by European researchers who made small pyramids of rocks to try to capture dew. But these produced very small amounts of water compared to the amount of space that was needed for the device. There was a lot of attention paid to this type of dew collection and there were articles written about how people in the Middle East had been collecting dew in this way. Some of it almost borders on mythology, I think. People are fascinated by the idea of getting water from another source other than surface water or ground water. Especially from the 1970s and onwards surface water and ground water supplies have become polluted or damaged in some way and it all has to do with increasing population and also lack of care of resources. Therefore, now we see an intensification of interest in getting water from the air. I tried to figure out a novel method of getting water from the air that would be different from all the other ways I'd read about, but with really no success. What I began seeing more and more is that nobody was really tying together or looking at the big picture of all these theories. I wrote a short article on this that was published in 1993. After that I kept on doing research and wrote a more extensive review paper. The main thing to come out of that is that getting water out of air is more expensive than any previously known method. It really only makes sense on a larger scale in tropical areas between 30 degrees north and 30 degrees south where the air is twice as humid as it is in temperate zones.

SP: How does one get water out of air?
RW: Perhaps the easiest method, which is used widely in dehumidification technology, uses refrigeration technology to produce cold surfaces. In the atmosphere there is a parameter called the dew point. The dew point is the temperature at which condensation will start to change into liquid. In, for example, the Caribbean, the dew point is quite high, around 20 degrees. If the air is at 25 to 30 degrees, all you have to do is provide a cool surface at say 15 degrees and you'll start getting a lot of condensation. Because you don't have to cool the surface as much in a tropical environment because the dew point is higher, the energy costs for getting water out of the air are lower. Moreover, in the Vancouver area in summer there would be ten grams of water in every cubic metre of air. In a Caribbean country it might be 20 grams of water per cubic metre of air. The method can be used in different scales. The water cooler sized units that are actually starting to appear on the market now, can produce about 20 liters per day.

SP: Is a filtering process necessary ?
RW: The air contains lots of dust and may also contain organic substances that you really wouldn't want to ingest. One of the problems with taking water vapour from the air and turning it into liquid is that you are in effect concentrating the air pollution. So you have to add on standard water filter systems much as you might use at home. What is often done, because it is such readily available technology now, is to use ultra-violet light disinfection as a final stage just in case there is some ecoli bacteria that somehow got into the storage tank of the unit, just to make sure that the water is absolutely pristine.

"People are fascinated by the idea of getting water out of thin air."



SP: Where is your technology at work?
RW: A group of us here in Vancouver became interested in doing what we call a water-producing greenhouse project on the island of Grand Turk. The project that was funded by the Canadian International Development Agency combines greenhouse technology with water from air technology. The greenhouse would be about 3000 square meters. There are coils where the water is being produced and there are evaporative cooling pads with salt water from the ground being used as a natural coolant source to isolate a cool area in the greenhouse so that you can grow lettuce, tomatoes and even strawberries. All high-value crops that would normally be imported. So all of a sudden the island starts becoming more self-sufficient in food and of the 200 000 liters of water produced a day, you need less than 10 percent for the greenhouse operation. In terms of electricity on Grand Turk which is diesel-powered, we'd be using 15 per cent of their current capacity. So it has quite an impact. We looked at using wind power, but we would only be able to use it 40 per cent of the time. The big benefit from our system is that the high quality water we would produce would have no salt at all. Our competitive advantage is that our water needs no further processing and it is healthier to drink than water produced from reverse osmosis. The capital cost is around five million USD. We figure the return on the investment would be around 17 per cent which seems to be lower than what investors like to see, so nothing has been built yet.

SP: What is the future of the technology?
RW: Right now I think that water from air technology is roughly where the computer industry was in the late 70s, early 80s or where the automobile industry was in the early 1900s. There's a lot of development that needs to happen. Commercialization has started. I'm aware of four companies that have household units, which are producing about five gallons a day and are just meant to replace the bottled water coolers and are in the range of 1000 CAD per unit.