

# BEYOND FRONTIERS

## *A look into the world of Science & Technology*

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Lightning has become one of the gravest threats for the smooth operation of industries and services in many part of the world. In Sri Lanka, lightning has not only caused heavy economical losses to a number of industries, banks, communication and power sectors, it has also cost some engineers their jobs. Lightning, was able to keep the entire country in darkness for few hours, not only once but several times in the last couple of years, an act that even the deadly terrorists could not do so far. Lightning ignites fires that may bring your entire building or house down to ashes. At a lower degree of damage, the lightning current may destroy your electrical, electronic and communication equipment beyond repair. However one of the most significant losses that lightning may cause as far as industries are concerned is the downtime. A couple of hours of standstill of normal operation or a loss of some important data stored in a computer may cause a company an economical loss of several millions, and irreparable damage to the reputation.

The lightning threat is not common only in Sri Lanka. Industries and services in many parts of India, Bangladesh, Bhutan, Nepal, Pakistan and Maldives in the South Asian region, many of the Central African countries, South America and the far eastern region suffer from lightning related damages. Most of the European countries and USA have well developed technology and know-how regarding the lightning protection. Other than that, South Africa, Brazil and Japan have developed their own technology to cater the needs of the country. Singapore, one of the countries with severest thunderstorms in the world has been blessed by the American and Japanese technology.

Lightning related research started in Sri Lanka about 35 years ago. Thus at the University of Colombo, we have one of the oldest such research team in Asia. However, for decades our think tanks produced much essential basic scientific knowledge which contributed immensely to boost the lightning protection manufacturing industry in Europe. The European manufacturers were attracted towards the South Asian market very recently, so that our industries did not get the benefits of the technological development, even at a high price, until recent times. In the late nineties the European manufacturers on lightning protection sense and anticipated the growing need of lightning protection in this part of the world and soon India and Sri Lanka were flooded with all sorts

of products ranging from those are in compliance with reputed standards to those which are totally rejected by many standards. As we have a lack of experts in the subject in this region and also due to the reluctance of our industries in hiring a consultant or a knowledgeable person, some vendors on

Lanka, Sri Lanka Institute for Development of Administration (SLIDA), Sri Lanka Association for Advancement of Science (SLAAS), Postgraduate Institute of Science/Peradeniya University and several other institutions have sponsored these events.

The pioneering work of Sri

Bangladesh and Bhutan was treated as platforms for building Lightning Research and Awareness centres in these two countries. These centres have already launched educational and awareness programs in the respective countries with a trained local team who get regular

engineering community from the industrial and defence sectors. In Nepal, two workshops will be conducted in the near future, organised jointly by the Nepal Lightning Awareness Centre, Society of Environmental Journalists, and National Institute of Science and

important role in developing a national policy on lightning protection, which is yet to be finalised. The study group was much boosted by the invitation that they have received from the Non-Aligned movement, S&T Centre to conduct the International Roundtable on Lightning Protection. This International event is taking place at Global Tower Hotel, Colombo 06, from 22nd to 25th of May 2007. It will be participated by about 20 foreign experts and several local experts. At the end of the program the participants will sign the Colombo Declaration on Lightning Protection, which will be implemented in many countries.

## A pre-cursor to International Roundtable on Lightning Protection

# Lightning protection: An area where Sri Lankans pioneer

lightning protection business had (and have) a merry time in selling anything that has been dumped to our part of the world from developing countries. To be fair for the genuine businessmen on the industry, it should be stated that few companies worked hard to educate the engineering community in advance, to make their products being used in sensible ways. Bangladesh, Pakistan, Nepal and Bhutan (and some parts of India) are huge potential markets in South Asia, yet to be tapped.

Interestingly, Sri Lanka has been in the frontiers of the research on Lightning Physics for the last 30 years, due to the scientific work at international level that has been done by the Department of Physics, University of Colombo. The Colombo University has close collaborations with the Lightning Research groups at Uppsala University, Sweden and several other international institutions. The members of this Lightning Research group have launched a number of lightning protection awareness programs during the last ten years. In addition The meteorology Department of Sri Lanka, University of Moratuwa, Ceylon Electricity Board, Sri Lanka telecom and Sri Lanka Standard Institution and several others have conducted awareness and training programs on lightning protection in Sri Lanka. UNESCO, USAID, IEE Sri Lanka Branch, Institute of Physics/Sri

Lanka in disseminating and promoting the technological know-how of lightning protection in the South Asian Region started in year 2003 by organizing a Regional conference on Lightning Protection in Sri Lanka, which was participated by over 15 delegates from all the SAARC countries and several far eastern countries. This was the first such event in South Asia.

In the year 2004, the University of Colombo pioneered in launching South Asian Lightning Awareness Program (SALAP) which was funded by UNESCO, New Delhi and SARI/Energy Program. It was conducted with the objectives of educating the general public and engineering community in South Asia regarding the basics of lightning, lightning related hazards and lightning protection. The aims of the program were to minimize the lightning related deaths and injuries and to curb the lightning caused hazards and property damages to a minimum level so that the quality of communication and power sectors in the region could be improved. Under phase 1 of this program, workshops were conducted by University of Colombo, Sri Lanka, Technical Assistance for Rural Advancement (TARA) and Jahangirnagar University, Bangladesh and Royal Institute of Technology, Bhutan. All these events were initiated under the leadership of Sri Lanka. The initial programs conducted in



support from international experts.

Under SALAP Phase-2, awareness a large number of programs was conducted in India, Bangladesh, Pakistan and Sri Lanka. In India 6 programs have been conducted so far, (in Kerala, Trevendrum, Chennai, Bangalore and Guwahati). In Bangladesh, over 50 programs have been conducted so far under the leadership of TARA. These programs have mostly been targeted at improving the standards of understanding of the common people on lightning safety. Being a country with a very low level of literacy and wide spread lightning related incidents, the lightning safety promotion in Bangladesh has been done with properly tailored programs which requires a great deal of planning and thinking. The two workshops conducted in Pakistan so far were targeted at high level

Technology (NIST).

Most of the above programs were funded by the private sector, apart from the programs in Bangladesh where NGOs sponsored all the programs. The private sector in these countries and the lightning protection industries based in the developed countries has understood that there is a huge potential in this part of the world with regard to lightning protection. However, it is the prime duty of the SALP team to make the public in the South Asian region knows the correct and standard practises of lightning protection.

For the last three years, the Expert Study Group on Lightning Protection, formed under National Science and Technology Commission, comprised of 10 members, each expertised in one or more different sub-areas of lightning science, played an

### What is Lightning?

A lightning flash originates inside a cloud, several kilometres above the ground level. Except for ball lightning, which is a very rare phenomenon that we will discuss later, lightning is simply an electric spark between a cloud and ground, between two clouds or between two parts of a cloud. The spark that jumps between the ends of two wires, which are connected to the terminals of a car battery, is a very basic form of lightning.

In the first stage of the lightning strike, a channel of charge flows towards ground from the cloud. When this channel is about 50-100 metres above, earthbound objects in the vicinity (eg. trees, buildings, human beings, animals etc.) start sending upward channels of opposite charge to meet the downward channel from the cloud. One of these upward channels succeeds in meeting the downward channel first. Subsequently a large current will flow through the object, which sent that upward channel. Then we say that the object is lightning struck. If your building is a tall protrusion in a certain landscape it may be the unfortunate object that sends the first upward channel that meets the downward stream of charge from the cloud.

### How does lightning cause damages?

Lightning may cause damages to your building and equipment in three ways. When your building attracts a downward lightning leader (direct strike) or attract a part of a lightning flash that hit another structure in the near proximity (side flash) you will get the maximum damage. The lightning current reaches a maximum value of about 30,000 Amperes on average but currents in the range of 300,000 Amperes are also reported. Simply compare this value with the current drawn by your refrigerator, which is about 10 Amperes. The lightning current heats its path to a temperature of about 40,000 Celcius. Compare this value with the temperature on the surface of the sun, which is about 5000 Celcius.

Continued on next week

# No more kindergarten approach to climate

by Sunita Narain

My worst fears are coming true; and that has more to do with the politics of climate change than its reality. While concern on global warming reaches a crescendo, the world, instead of finding resolutions, is hurtling towards discord and dispute. Let us be clear: we do not have time to waste on bad politics and bad politicians.

Currently, two things are happening. One, China and India are being projected as the new villains—they pollute; they will increase emissions; they don't want legally binding commitments and are, therefore, blocking global negotiations. Two, the climate-profligate and renegade nations—the US and Australia—are being treated with kid gloves.

They, we are told, want to work in global interests but their efforts will be negated by the growth of emissions from dirty China and India.

In this, Europe and Japan are playing mediator-bringing warring sides together; asking China to relent so the US can bend. Little is said of how Europe's emissions have risen in the past year.

If China raises equity issues—saying how the rich world is responsible for climate change—it is told it is obstructing action; that the time for this blame game

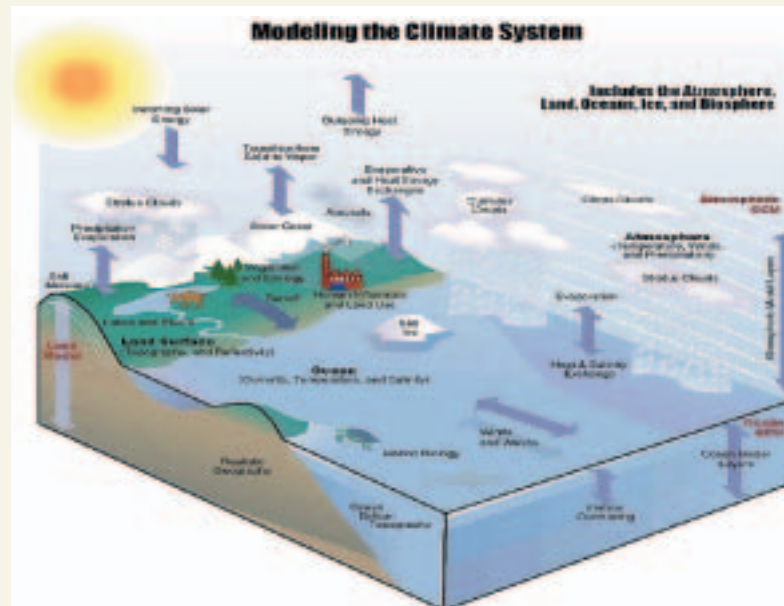
is past; that the world must act decisively. In other words, what we did, we did for our growth, but you must not do the same in the interest of the planet. It is forgotten that China will also be a victim of climate change. It is forgotten that this is not a problem it created.

If we had time for games, this shadow boxing would be entertaining. But we are running out of time. What we need is politicians to lead us out of this mess. We need leadership and sagacity; not shenanigans and procrastination.

I believe we have a basic frame within which we can move ahead. First, we need to agree once and for all that the industrialised world is responsible for climate change. The facts are clear. There is a stock of greenhouse gases in the atmosphere, built up over centuries in the process of creating a few people's wealth. This has already made climate unstable. Poorer nations will now add to this stock through their drive for economic growth. But that is not an excuse for the us (and the rest of the rich world) not to take on tough and deep binding emission reduction targets.

The second part of this agreement is China and India need to grow.

Their engagement will not be legally binding but based on national targets and programmes. We know it is in our interest



not to first pollute, then clean up; or first to be inefficient, then save energy. The question is to find low-carbon growth strategies for emerging countries, without compromising their right to develop.

This can be done. But it will need much, much more than the pusillanimous and politically naïve report released by the Intergovernmental Panel on Climate Change on mitigation. The report gives a

menu of options—nuclear power, biofuel, carbon storage and others—to save the world. In addition, it mouths platitudes about the need to change consumption patterns. We don't need a bunch of top economists and scientists telling us something school kids know better.

The fact is that the world knows what needs to be done to combat climate change. The question is why this is not

happening. This is what we need to address, this is what we need to resolve.

There are two problems. One, technologies exist, but they are costly.

It is not as if China and India are bent on first investing in dirty and fuel-inefficient technologies. They invest in these because they cannot afford high-end technologies. They will do what the rich world has done: first add to emissions; make money; then invest in efficiency.

This is not rocket science. The question is why the world is not able to find ways to fund these technologies in the emerging world? Why is it that it talks big but gives small change? The clean development mechanism was purportedly set up to do just this. But the rules, designed by rich governments, industry and civil society, have ensured that this mechanism is cheap, corrupt and ineffective in making the transition in the South. This mechanism has been designed to get the cheapest emission reduction options for the rich world; and to be profitable for some industries in the rich and emerging rich world. It promotes the mutual self-interest of polluters. This must change and it can.

The second problem is more difficult. The already rich world has filled up the available atmospheric space with pollution, now there is little room left for the

rest of the world to grow. Just consider this: carbon dioxide concentration in the atmosphere has increased from a pre-industrial value of 280 parts per million (ppm) to 379 ppm in 2005.

Scientists tell us that the remaining budget is 450 ppm (to keep risks as low as possible) and 550 ppm to be adventurous. The only way the poorer world can take up this remaining carbon budget is if the entire emissions of the industrialised world stop now.

The question is how we will share this space. This requires us to find ways of reducing our emissions by changing the way we do business. It is not enough to talk glibly about efficiency and technology. It is important to restructure economies so that consumption is cut.

Sufficiency is as important as efficiency.

Again, this can be done. For instance, we know we have to invest in public transport and restrict cars. Singapore has done it. It is neither poor, nor stupid. The question is why London, New York or any rich world city hasn't made a serious dent in numbers of vehicles?

Perhaps they don't because the victims of climate change can't force them to. This is what we have to remember. This is what we have to change.