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Harnessing tidal power

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High tide

Low tide

BANGLADESH faces acute power shortages, as everyone can see the hourly switching-off of the lights and fans in the simmering summer. What is the way out ? One important way is to look for green and renewable sources the solar energy, hydroelectricity, geothermal energies and the tidal energy.

Tidal energy is an energy that could be obtained from the changing sea levels. It is a direct result of tide shifting from low to high. It is a form of green energy and is also considered to be inexhaustible because tides always rise and fall due to the gravitational tug-of-war between the Earth, the Moon and the Sun. Tidal power does however have great potential for future power and electricity generation because of the massive size of the oceans and the initiatives for cleaner energy sources. Tidal power can be classified into three types depending how one extracts the energy: Tidal Barrage, Tidal Fence, Tidal Turbine. Tidal energy technology is in the practice with a 240 MW commercial unit operating successfully since 1966 at La Rance in France. A few other countries have also installed or are installing tidal power units with different capacities. Notably amongst them are: Kislo Guskaya Tidal Power Station and Lumkara Plant (300 MW) in Russia, Bay of Fundy in Canada, Jianagxia in China. The Severn Estuary UK plant is the biggest ever project being planned (for a 8640 MW capacity).

Except for the fact that it involves massive capital outlays, tidal power can result in extremely low costs per kilowatt-hour once it is built. The technology is very simple and has a potential life of more than 40 years. It is a highly efficient (coal/oil efficiency = 30%, tidal power efficiency = 80%) source of power. This potential of the tidal power has not been realized yet, due to two major problems-high capital costs and environmental concerns. Bangladesh has a long coastal area with 2~5 meter tidal head/height rise and fall. Some of the coastal area is protected against flooding by embankment and sluice gates. These barrages, necessary for controlled flow through turbines (to tap tidal power), are also needed for flood control. This avoids the problem of high capital cost as the engineering is either already there or is needed for cyclone and tidal surge protection. Bangladesh has some large tidal sites and many channels of low tidal range in a large number of deltaic islands, where barrages and sluice gates already exist. Analysis of the given sites indicates that Sandwip has a very good prospect for tidal energy. The 5 meter tides experienced at Sandwip results in poor accessibility, with the island constantly surrounded by mud flats, except during high tides. Bangladesh may harness energy from coastal tidal resources by applying two technologies: Low head tidal movements (2~5 m head) & Medium head tidal movements (> 5 m head). Low head tidal movements are Coastal Bangladesh, particularly Khulna, Barisal, Bagerhat, Satkhira and Cox's Bazar regions are, geographically extensively deltaic with levees and sluice gates. These areas are protected by embankments, which had been constructed during 1960s for protection from natural disasters like flooding and tidal surges. Therefore, the infrastructure needed for barrages and sluice gates is already present in these regions. These barrages and sluice gates may be used for electricity generation by applying simple technology. The most favorable locations for tidal power application of this type are on the eastern side of the delta region (e.g. Sandwip). The height tidal ranges occur at the following tidal measurement stations: BIWTA Gauge No 32 : Satalkhal - Sandwip Mean Spring Range = 5.73 meters (as of February 2010). It is hoped that the project will provide an integrated approach to island development where the tidal power outcome is part of a bigger concept involving aquaculture and water management.

This is a powerful motivation for developing tidal power as it promises sustainable energy for Bangladesh. The tides in Sandwip demonstrate roughly a 5 hour 'in' and 7 hour 'out' cycle. Traditional tidal technology would generate large quantities of energy during approximately 6 hours of this cycle. Generation occurs when the water is flowing both in and out, with the change in rotation occurring during a flowing tide. The inconvenience of the loss of electricity experienced when the turbines are in a stalled state will be diminished through the grid connection of a series of power generators around the island. During the night the excess power produced can be directed into battery charging. These batteries can be provided for households living off the grid. The installation of 75 KW turbines, generating 80% of full capacity for 23 hours per day, equates to the production of approximately 1,380 KW-hr per day. It is proposed that the manufacture and installation costs for one site will be in the order of 35 lakh Taka.

In a society with increasing energy demand and decreasing supplies, we must look to the future and develop our best potential renewable and green resources. Tidal power fits the bill as a natural source of energy with many long-term socio-economic benefits.

The authors are graduating students of International Islamic University Chittagong and are researching on tidal energies.

ACT OF DISCOVERY

Group stimulus

The following makes the 7th instalment of Dr. M Ali Asgar's original article titled "Establishment of an Interactive science discovery centre in Asia-Pacific region."

Although one could argue that poor countires can make use of the sotck of world scientific knowledge, it is not tenable. Because the precise composition of the scientific knowledge is such that there are large gaps between this knowledge and the knowledge that would be particularly relevant to the developing countries. The discrepancy between the resource mix for which modern technology is increasingly designed, and the actual resource mix in the developing countiries places them at increasing disadvantages. A very great deal of world scientific and technological effort is concentrated in industries which simply do not exist and will not come to exit in near future. Thus it is not the total stock of knowledge whcih determines the progress but the rate of growth of new knowledge coming from new discoveries that is more relevant to economic growth. Robert Solow attributed only 12.5% of the growth or output per man-hour to increased use of capital and the remaining 87.5% to technical change. Moreover the fact is that a potential for original technological innovation is necessary in order to get the proper benefit from other people's innovation.

The Need For Regional Cooperation:

For creating the microscopic and macroscopic conditions for discovery, motivation, mutual stimulation and judgment is essential. In some ways the economy of a nation, a region and the economy of the world at large form systems, these systems ought to be optimised anew every time new innovation and communication come about. There is also the threshold size below which research programmes and production units are not functional or profitable. Out of this realisation international and regional scientific relations have developed considerably since the nineteenth century, and have taken many forms. In fact since renaissance, the spread of scientific ideas and methods has always surmounted frontiers, often even when the nations concerned were in war.

In the European sector we see the creation of organisations whose essential or even only task is research. CERN in 1953, Euratom in 1958, ECMB in 1970 are a few examples. One of the most effective agents of motivation for discovery is mutual stimulation which arises from the interaction of two or more individuals or even between groups belonging to different nations. Given the right circumstances, human beings can interact in extremely constructive, useful ways. The interaction can induce enhanced motivation as well as corrective judgments. Most of us are responsive to our environment, and group stimulus seems to be one or the best ways of enhancing creativity.

TO BE CONTINUED

The author is President Bangladesh Physical Society and Fellow Bangladesh Academy of Science.

TSUNAMI SHIELD

Mangroves do a coast good

FIELD studies of an Indonesian coastline ravaged by a tsunami in December 2004 suggest that leaving mangrove forests intact along a shoreline could substantially reduce damage from moderate-sized tsunamis.

When a magnitude 9.1 earthquake struck west of Sumatra on December 26, 2004, it spawned a tsunami that hammered nations fringing the Indian Ocean. Near Banda Aceh, Indonesia, on the northwestern tip of Sumatra, the tsunami swept inland more than 4 kilometers and killed tens of thousands of people. Now, by studying wave-induced damage to the mangrove forests surrounding that city, civil engineer Shunichi Koshimura of Tohoku University in Sendai, Japan, and his colleagues have developed a model to estimate the tsunami-buffering capacity of intact mangrove forests. They report their findings online June 30 in the Journal of Geophysical ResearchOceans.

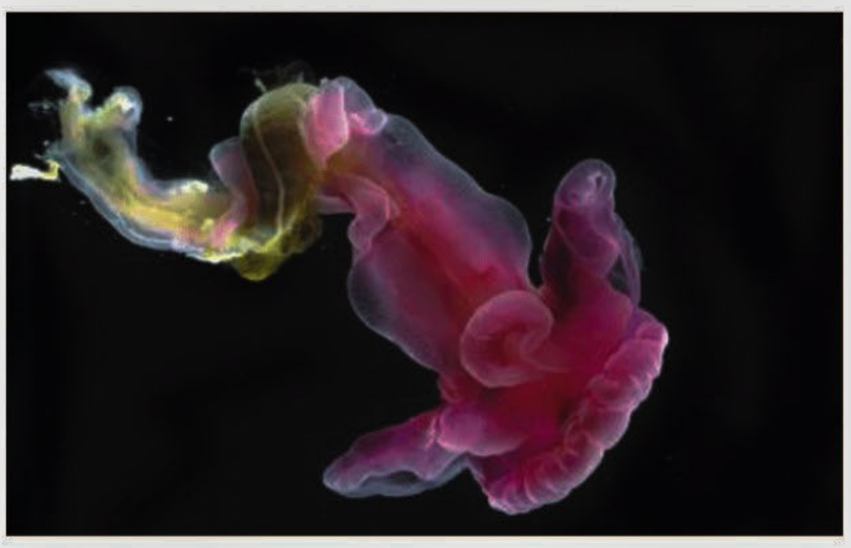
About two years after the damage occurred, the researchers took measurements of almost 700 mangrove trees in five broad swaths of intertidal terrain where dense stands of those trees from the genus Rhizophora had stood before the tsunami struck. Many of those trees were damaged, snapped off near their bases by the surging water, but some had survived the inundation unscathed. The team's analyses showed that as the estimated wave-induced stresses on tree trunks increased, the proportion of damaged trees also increased.

Source: : Science News

A wide, dense swath of mangroves can absorb much of the coast-battering energy of a moderate-sized tsunami, a new study suggests.

DENIZENS OF ABYSS

Deep seafloor teeming with life



A newly-discovered purple winged enteropneust

SCIENTISTS from the United Kingdom and 16 other nations have just returned from an expedition to explore a never-before-seen area of the ocean floor. Instead of the barren, sparsely inhabited environment some expected to see, scientists brought back pictures of a mysterious world that is teeming with life.

The research focused on the Mid-Atlantic Ridge, a massive, undersea mountain range which essentially splits the ocean in half, dividing east from west. The seascape, featuring rocky outcroppings, sheer cliffs, and flat, open plains, might look familiar to anyone who has spent time in the American west. The residents of this ridge, however, are decidedly exotic.

At least 10 creatures that possibly represent new species were discovered during the six-week journey aboard the U.K. research vessel the James Cook.

Exploring the seabed

Scientists sent a remotely operated vehicle, the Isis, on dives lasting up to 30 hours, down to depths of up to 12,000 feet (3,600 meters). Outfitted with 10 high-definition, studio-quality cameras and powerful lamps to illuminate the darkness of the sea floor, the van-sized ROV took hours of footage of myriad species, all interacting in their natural habitat.

Of particular interest are three new species of brightly colored enteropneust, a kind of deep-sea worm. The small invertebrates, about four inches (10 centimeters) long, had previously been found only in the Pacific Ocean.

Professor Monty Priede, director of the University of Aberdeen's Oceanlab, said it was a pink enteropneust they saw first.

"It was a very exciting moment. We said, 'Ah, we're the first people to see this!'" Priede said. "Other samples have been fragmented and broken up we were the first to get specimens of these animals."

For Priede, the real eureka moment came when the team saw one of the worms actually swimming.

"It was just floating in the water, curled up and drifting along in the current," said Priede. "But when it perceived our presence, it held its tail straight, almost like a human diver, and went shooting down to the bottom."

Priede said that the eyeless creatures can't actually see, but the worm must have somehow sensed the Isis lurking nearby.

An evolutionary discovery

The discovery of the new worm species was important, Priede said, because these creatures represent "the base of the chain of evolution. They're not the missing link, but they're very close to it."

Dr. Daniel Jones, of the UK's National Oceanography Centre, said it was the rocky regions of the Mid-Atlantic Ridge that were most surprising. "We really didn't know what to expect," he said.

Researchers found new varieties of cliff-dwelling, uncharacteristically active sea cucumbers, corals several meters tall that might be a thousand years old, and sea lilies, which are marine animals that look like flowers.

Priede said the Cook's expedition, part of the international Census of Marine life, opens a new chapter in our understanding of ocean populations.

"There's plenty of real estate out in the middle of the ocean where these animals are living," he said. "We're realizing there's much more habitat out there than we realized. So that will turn around our whole idea about how life is organized in the ocean as a whole."

Source: Live Science

EMBATTLED PILL

Heart risk of diabetes pill

FEDERAL health scientists have panned a GlaxoSmithKline study that the company used to defend the safety of its embattled diabetes drug Avandia, a once blockbuster-seller that has fallen out of favor because of potential ties to heart attacks.

The Food and Drug Administration posted an exhaustive 700-page review of Avandia on Friday ahead of a meeting next week to decide whether the drug should stay on the market.

The FDA finds itself in a difficult position that's all too familiar: reviewing a drug approved a decade ago that now appears tied to deadly side effects. Experts say the FDA's predicament is a result of shifting standards for the agency: increased scrutiny on safety and stepped-up pressure from Capitol Hill.

The FDA reviewed dozens of studies of Avandia, including one Glaxo has pointed to as proof of the drug's safety. But an FDA reviewer said the study was plagued by "serious flaws" and actually supports the case against Avandia.

The drug works by increasing the body's sensitivity to insulin, a key protein needed for digestion that diabetics don't adequately produce.

People with diabetes are unable to properly break down carbohydrates, either because their bodies do not produce enough insulin or because of resistance to insulin. They are at higher risk for heart attacks, kidney problems, blindness and other serious complications.

Avandia was Glaxo's third best-selling drug in 2006 with U.S. revenue of $2.2 billion, according to health care statistics firm IMS Health. But safety concerns swirling around the drug have pummeled sales over the last three years, with sales falling 75 percent to $520 million last year.

In 2007 an analysis of dozens of studies first linked the drug to heart attacks. The FDA responded by adding a warning label to the drug later that year.

Glaxo, based in London, has argued for years that Avandia's safety should be assessed only based on clinical trials, considered the gold standard of medical research.

But the FDA reviewer said Glaxo's chief trial "was inadequately designed and conducted to provide any reassurance" about the heart safety of Avandia.

Source: AP

A pharmacist holds a bottle of Avandia pills at Maximart Pharmacy in Palo Alto, Calif

NECROPOLIS OF KINGS

Tombs emerge from Egypt sands

Workers and archaeologists stand at the 4,200-year-old site of two rock-hewn Egyptian tombs recently excavated near Cairo and unveiled Thursday.

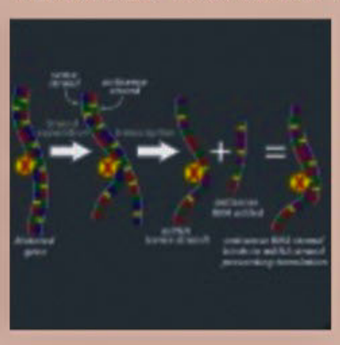
Featuring boldly painted false doors, the tombs are the last resting places of Shendwa, head of the royal scribes under Pharaoh Pepi II, and his son Khonsu, also a scribe. Both were members of the literate ruling class during ancient Egypt's Old Kingdom (2686 to 2160 B.C.), during which most of Egypt's pyramids were built (ancient Egypt time line).

Occupying a thousand-square-foot (300-square-meter) site, the tombs were found in the royal burial ground at Saqqara (map) strangely far from the tomb of Pepi II. "We never expected to find a tomb that belongs to [the period of] that king" at the dig site, said Abdul Hakeem Karar, director of the Saqqara necropolis for Egypt's Supreme Council of Antiquities.

Source: National Geographice

DO YOU KNOW?

What is the anti-sense gene?



The term anti-sense comes from the fact that messenger RNA is synthesized from one of the two strands of the DNA double helix - that strand is called the template, or sense strand. The complementary strand of DNA is called the anti-sense strand. The two DNA strands - sense and anti sense - are complementary to each other and form a double helix. The two RNA strands produced from these DNA strands are also complementary. When bound into a double helix, the RNA strands cannot function to produce proteins.