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And Quiet Flows The Virtual Water : *Dr. Gurudas Nulkar*

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A grueling Indian summer can flare up tempers of those placing competing demands on water resources. This year was particularly intense. After enduring two successive monsoon failures, the summer of 2016 was a torturous period for most parts of India. Media was vociferous when blaming biased management practices and the inefficient bureaucracy. Political rhetoric was at its best and swords were out in the Cauvery water situation.

While this was keeping Indians busy, environmentalists were busy dishing out advice on water conservation. Everything from fixing tap leaks to avoiding car washes was suggested. Corporate India put up posters eulogizing water. Municipal transport had

a good reason for their dirty buses and builders for their project delays. But as adversity often drives people to pursue common goals, all sections of society were visibly shaken and many were involved in conservation efforts.

Did all get us the desired outcome? Not at all. Not because the efforts were weak or saving was not enough, but simply because they were aimed at reducing 'direct' water consumption. An average urban citizen's water requirement comprises just about 5% of such direct use. Nearly 95% of his water is consumed indirectly and is not easy to control in the short run of which agriculture forms the single largest component. Much has been written about 'embodied water' in goods and services and is not the focus of this article.

However, what is not easily visible, and ignored by policy-makers, is the virtual water which flows from India to other countries. When we export one kilogram of sugar, 1500 liters of Indian water have been diverted to that country. Until March 2016, India had booked export orders for 1.3 million tons of sugar. The virtual water flowing out of the country through this consignment is staggering! While the export is palliative for our trade deficit, it benefits no one else. The farmers do not get a higher price for their cane, their villages draw more water depriving others of their share and our *netas* spend precious time in public spats.

The concept of virtual water flow was first proposed by Professor John Anthony Alan of Kings College London, in 1993. During his research in Jordan, a water-scarce nation, he realized that they saved precious water by importing water intensive farm produce. Like Jordan, many water-scarce nations have leveraged argo-imports. Arid nations in the middle east and Africa, island countries like Singapore and cold Nordic regions have thus imported water virtually through farm trade. In today's global economy the volume of virtual water flows in commodities is estimated to be 1,625 billion cubic meters a year and accounts for about 40% of total water consumption. Of this, nearly 80% is from agricultural produce and the rest from industrial produce.

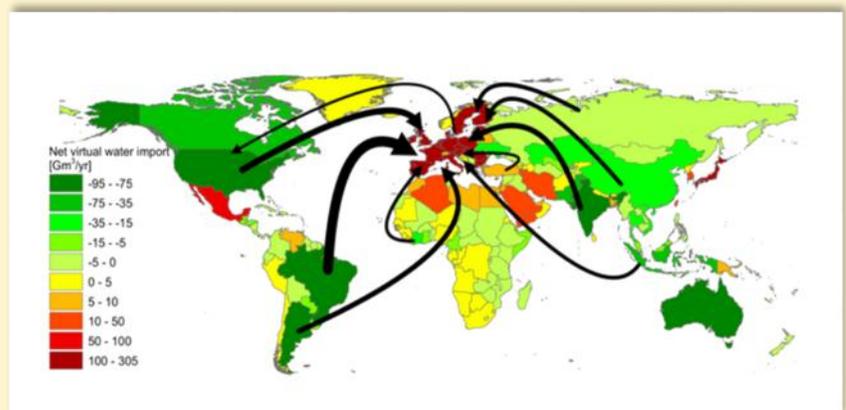


Figure 1: Virtual water flows in the world. Source : Value of Water Research Report, Mekonnen, M.M. and Hoekstra, A.Y. (2011). UNESCO-IHE.

And Quiet Flows The Virtual River..... Contd....

Farm trade allows countries to import and export virtual water. India is a major net exporter of virtual water while the large net importers of virtual water are North Africa, Middle East, Mexico, Europe, Japan and South Korea. Mexico, for example, imports maize and saves 12 billion cubic meters per year of its water resources.

Closer home, the virtual water flowing out of Maharashtra through horticultural export is equally staggering. Table 1 shows how much water Maharashtra has lost during 2014-15 by exporting just three fruits. This was the year the monsoon failed in the areas where the fruits are cultivated.

Fruit	Exported quantity (Metric tons)	Water required to produce 1 ton of fruit (Liters)	Virtual water flow happened by the export (Lacs liters)
Grapes	140,000	300,000	394800
Pomegranates	23,500	400,000	87655
Bananas	5000	300,000	16000
		Total virtual water export in 2014-15	498455

Table 1 :Virtual water flow out of Maharashtra arising out of horticultural export.
 Source: Data computed by Ashwin Paranjape from Government of Maharashtra sources.

In the globalized economy, it should be no surprise that agricultural imports are driven by market forces and not water scarcity, as they would have been, some years back. David Ricardo’s theory of comparative advantage of nations is the compelling driver here. In such a situation, plugging virtual water leaks seems to be an insignificant consideration for agro-economists. Earlier in June this year, when the government slapped a 20% export duty on sugar, none of the papers even made a passing mention of the potential water saving! They were only worried about loss of revenue.

Even as demand for water outstrips the supply in many regions of the country, Indian policy makers have long ignored this huge burden on our water resources. Although the virtual water concept is not without limitations and deficiencies, it is of significance while formulating our water policies. It is time the government realizes that converting water into export income is an irreversible process and that the generated money is useless in drought situations.

As global warming disrupts the Indian monsoon patterns, time is running out for us. We must incorporate indirect water use and virtual water flows in our water policies and management. If not, the nation stands to face increasingly grave droughts and social unrests which could be far worse than the Cauvery crisis.

Snippets: Electric cars and water consumption!

A new study concludes that producing electricity for hybrid and fully electric vehicles could sharply increase water consumption in the United States. Each mile driven with electricity consumes about three times more water than with gasoline, the study found.

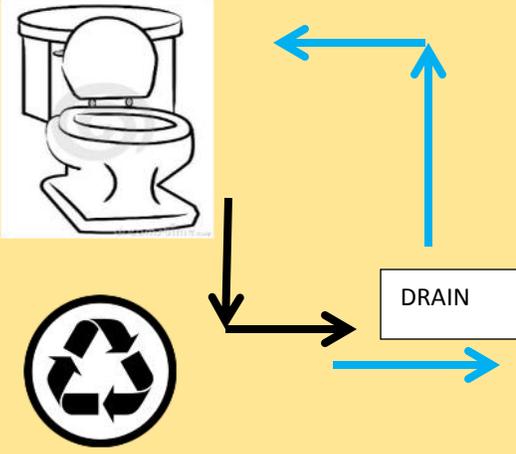
Each mile driven with electricity consumes about three times more water (0.32 versus 0.07-0.14 gallons per mile) than with gasoline, the study found.

Story Source: Materials provided by American Chemical Society.



सांडपाणीपुनर्वापरआणि नदी प्रदूषण : मनीष घोरपडे

नुकताचएका गृहप्रकल्पाला भेट देण्याचा योग आला. साधारणपणे २५०-३०० सदनिकांचे हे एक मोठे गृहसंकुल आहे. तिथे एक अत्यंत प्रभावी अशी सांडपाणी व्यवस्था आहे. सर्व मैलापाणी हे त्या प्रकल्पाच्या आत बसवलेल्या प्रक्रिया यंत्रणेकडे पाठवले जाते. प्रक्रिया करून शुद्ध झालेले पाणी हे सर्व सदनिकांमधील संडासांच्या टाकीला (फलशला) पुरवले जाते.त्यासाठी आधीपासूनच वेगळी पाईप लाईनची व्यवस्था करण्यात आली आहे.



वरील आकृतीत दाखवल्याप्रमाणे सर्वसाधारण हि व्यवस्था असते.

अर्थात, अशी व्यवस्था राबवण्यासाठी अनेक अडचणीही आहेत. जुन्या आस्थापनांमध्ये जागेचा अभाव, प्लंबिंग मधील मोठे बदल अशा तांत्रिक अडचणींच्या बरोबर त्यासाठी येणारा खर्च, आणि अशी व्यवस्था चालवण्याचा खर्च अशा आर्थिक अडचणीही आहेत.

परंतु या व्यवस्थेचे फायदे पहिले तर यावर गंभीरपणे स्थानिक प्रशासनाच्या पातळीवर विचार झाला आहे असे वाटते.अधिक माहिती काढल्यावर असे समजले कि आता सर्व नवीन बांधकामांना अशी व्यवस्था राबवणे अपरिहार्य

केले गेले आहे (अर्थात हा नियम ४-५ इमारतीपेक्षा मोठ्या प्रकल्पांनाच लागू आहे.) छोट्या प्रकल्पांना आर्थिक सवलतींच्या रूपाने अशा व्यवस्था राबवण्यासाठी प्रोत्साहन देऊन त्याचा वापर वाढू शकेल का, या पर्यायाचा विचार होऊ शकतो. जुन्या आस्थापनांमध्ये कोणत्या परिस्थितीत अशी व्यवस्था राबवणे व्यवहार्य ठरेल याचे काही निकष तज्ज्ञांकडून तयार करता येतील.

कोणत्या परिस्थितीत आणि किती ठिकाणी अशा व्यवस्था राबवता येतील याचा अंदाज लगेच बांधता येणे अवघड आहे. मात्र, नदीप्रदूषण संपवण्याच्या आपल्या लढाईत अशा व्यवस्थांना नक्कीच महत्वाचे स्थान आहे.

याव्यवस्थेचा दुहेरी फायदा आहे. एक म्हणजे या संकुलातून बाहेर पडणारे पाणी कोणत्याही ओढा, नदी किंवा तळ्याला प्रदूषित करत नाही. आणि दुसरा म्हणजे यामुळे पाण्याचा पुनर्वापर होऊन एकूण त्या संकुलाची पाण्याची मागणी घटते. या दोन्ही गोष्टीपुण्यासारख्यामोठ्या आणि वाढणाऱ्या शहरासाठीआणि मुठा नदीसाठी अत्यंत महत्वाच्या आहेत.

जर का अशी व्यवस्था मोठ्या प्रमाणावर नवीन आणि जुन्याही बांधकामांमध्ये राबवली गेली तर नदीप्रदूषण लक्षणीयरीत्या कमी होऊ शकते. एवढेच नाही तर १५-२०% पाण्याची पुनर्वापरामुळे बचत होऊ शकते. वाढणाऱ्या शहरासाठी,आहे त्या साठ्यामाधूनचपाण्याची उपलब्धता वाढणे, हि फार महत्वाची गोष्ट आहे.तसेच, सांडपाणी व्यवस्थापन विकेंद्रित झाल्यास त्याचाही भविष्यात मोठा लाभ होईल.



Snippets: Largest Die-off of Corals in Australian Great Barrier Reef

Scientists have confirmed the largest die-off of corals ever recorded on Australia's Great Barrier Reef. The worst affected area, a 700 km swath of reefs in the northern region of the Great Barrier Reef has lost an average of 67% of its shallow-water corals in the past 8-9 months.

Most of the losses in 2016 have occurred in the northern, most-pristine part of the Great Barrier Reef. This region escaped with minor damage in two earlier bleaching events in 1998 and 2002, but this time around it has been badly affected.

Scientists expect that the northern region will take at least 10-15 years to regain the lost corals. Drew Harvell, a professor of ecology and evolutionary biology, is widely recognized for her work on marine diseases. Harvell says the ARC Centre of Excellence for

Coral Reef Studies report showing that higher water temperatures in 2016 caused the worst destruction of corals ever recorded on Australia's Great Barrier Reef may be followed by devastating outbreaks of infectious disease.

This is the worst bleaching event of the northern great barrier reef. Typically outbreak of disease following the bleaching events occurs, because of the double whammy of the corals being stressed and warm temperatures favor infectious microorganisms.



Story Source: Materials provided by James Cook University

If it smells like food, and looks like food, it must be food right?

It turns out that marine plastic debris emits the scent of a sulfurous compound that some seabirds have relied upon for thousands of years to tell them where to find food, according to a study from the University of California, Davis. This olfactory cue essentially tricks the birds into confusing marine plastic with food. Tubenosed seabirds, such as petrels and albatross, have a keen sense of smell, which they use to hunt. They are also among the birds most severely affected by plastic consumption. The plastic reeked of the sulfur compound dimethyl sulfide, or DMS, a chemical cue released by algae, which coats floating plastic.



DMS is released when algae is eaten by animals like krill, one of the birds' favorite meals. So while the algae does not smell like food itself, it does smell like food being eaten, which is the birds' version of a dinner bell. The study noted that seabirds that track the scent of DMS to find prey are nearly six times more likely to eat plastic than those that do not.

Journal Reference: M. S. Savoca, M. E. Wohlfeil, S. E. Ebeler, G. A. Nevitt.



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