

(Regular Monthly CSR and Sustainability E-Newsletter in Bangladesh)

Vol. 1, No. 2, March 2009, English Version  
[For Private Circulations only]

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**Message from the Chairman**



It is my pleasure to present you a 2<sup>nd</sup> issue of E-Newsletter. The CSR Bangladesh started with a vision to serve the society and the nation by providing SR related services through education, research, consultancy and training services. I believe the professional and organizational excellence can be achieved through being socially responsible, profitable and sustainable. We welcome any suggestions and advise to our initiatives and activities.

**Message from the Executive Director**



I am happy to share with you the second issue of CSR E- Newsletter.

Corporate Social Responsibility Bangladesh is a social enterprise started with a vision to provide SR related services to public and private sector in Bangladesh. The objective of the newsletter is to provide corporate information and news specially focused on sustainability and development related issues. It aims to provide information to the

stakeholders regarding social accountability and responsibility.

The sustainable development cannot be achieved without being socially responsible and having adequate understanding and knowledge about social aspect of business.

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**Return on  
Investment**

**Return to the  
society**

**Profit  
Maximization**

**Economic  
and Social  
Change**

The "interdependent and mutually reinforcing pillars" of sustainable development as economic development, social development, and environmental protection.

## Social Responsibility in collective bargaining

(Is union membership an entitlement or a conspiracy against the employer?)

- Rodney Reed\*



Is the problem in Bangladesh union activity itself or is the problem one of corrupt unions, corrupt Collective Bargaining Agents (CBAs) and manipulative employers?

The Social Responsibility ISO which is intended for implementation worldwide in 2010 will be termed ISO 26000. It has seven key themes one of which is the entitlement to freedom of association and independent representation. In this article Rodney Reed considers the role of Trades Unions in Bangladesh and the place of collective bargaining in Social Responsibility.

The 'ideal situation' is of democratically elected union representatives of socially responsible trade unions negotiating on behalf of their individual members with socially responsible employers. The reality in Bangladesh in the public and the private sectors seems to be of management 'commanding' in place of 'negotiating', or of management failing to communicate with their workers in any meaningful way and of unrepresentative union officials and CBA's negotiating in their own best interests rather than in the interests of the workers. The corrupt practice of some individuals as CBAs has given trades unions and union activity a bad reputation in Bangladesh.

Several of the UN Compacts and Protocols and much of the work of ILO has been to highlight the needs of workers and to emphasise their right to representation. China permits only membership of the State Union and so effectively bans freedom of association. During the state of emergency and the period of the Caretaker Government, union activity was banned in Bangladesh. According to media reports trade union activity still appears to be restricted inside the EPZ's even after the lifting of the State of Emergency in Bangladesh.

Trade Associations and employers of large numbers of workers in Bangladesh argue there is a conspiracy led by US based labour organisations to force up the cost of doing business in Bangladesh as part of a US protectionist policy. The same conspiracy theorists also argue that the local and national and international NGO's that seek to represent and protect the rights of workers in Bangladesh are part of this same 'protectionist conspiracy' or have an agenda to undermine the country and so are subversive and possibly communist. However 'freedom of association' and 'collective bargaining' is an expectation of western customers and of their local buyers.

Too often the Bangladesh experience is of factory management running compliant unions and of the worker 'representatives' actually being management 'agents'. Several questions present themselves for example:-

- If Management has a free and open route to talk regularly with worker representatives, would there be less trouble in the Bangladesh garment factories?
- Is it that weak and incompetent managers are afraid of unionisation and prefer to command rather than consult with their workers?
- Is the concept of a trade union a socialist or communist idea that is in direct opposition to a materialist wealth creating free market economy?

In many other countries union representatives (even in Government Ministries and Departments and State run industries) the 'shop stewards' work on the 'shop floor' alongside of the people they represent. They are full time workers, receiving no pay for their union duties who experience all of the difficulties and the opportunities of life in the daily work. These worker representatives actually take the real working experience and the views and demands of the workers to their management because they are part of the work force and experience the same workplace realities.

Dr. Zulfikar Ahmed writing in 'A Text Book of The Bangladesh Labour Act, 2006' produced the following definition of Trade Union "Generally, Trade Union means an association of workers.

A trade union is an essential institution in an industrial organisation. Trade union means any coming together of people primarily for the purpose of regulating the relations between workers and employers or between workers or between employers". The Bangladesh Labour Act, 2006 gives the following definitions:-

- A trade union may be constituted with an object of imposing restrictive condition on the conduct of any trade or business
- A trade union is formed for the purpose of regulating the relations between workers; or workers and employers or employers
- A trade union is an association of workers usually but not necessarily employed in the same trade for the purpose of combined action in securing the most favourable wages and conditions of labour
- A trade union is limited in membership to people in the same trade or business.

## Social Responsibility in collective bargaining

Continue....

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- A trade union is an association of workers united as a single representative entity for the purpose of improving the workers' economic status and working conditions through collective bargaining with employers
- A trade union is an organisation formed to negotiate with employers on behalf of workers collectively about job-related issues such as salary, benefits, hours and working conditions

There are two types according to Dr Ahmed - the 'horizontal union' in which all members share a common skill and the 'vertical union' composed of workers from across the same industry.

The Bangladesh Labour Act definition of trade union includes a federation or confederation of unions.

### The purpose of a Trade Union

According to Dr Ahmed The Bangladesh Labour Act 2006 provides for registration of trade unions with a view to render lawful organisation of labour to enable collective bargaining. It also confers on a registered trade union certain protection and privileges. The Act extends to the whole of Bangladesh and applies to all kinds of unions of workers and associations of employers, which aim at regularising labour management relations.

A Trade Union is a combination whether temporary or permanent, formed for regulating the relations not only between workers and employers but also between workers and workers or between employers and employers. Although the object with which a trade union is formed may be collective bargaining, the right of collective bargaining is not included in the fundamental rights to form an association of union. A trade union may be formed for the purpose of regulating the relations between workers and workers or workers and employers or employers and employers. It may also be formed for the purpose of imposing restrictive conditions on the conduct of any trade or business and includes any federation of two or more trade unions.

### Some of the important objectives of a trade union are as follows:-

The fundamental purpose of the trade union is to promote generally the social, civic and political interest of the working class in order to:-

- Secure speedy improvement of conditions of work and life and of status of the workers in industry and society
- Secure increasing association of the workers in the administration of industry and their full participation in its control

- Obtain for the workers various measures of social security including adequate provision in respect of accidents, maternity, sickness, young persons and unemployment
- Secure a living wage for every worker in normal employment and to bring about a progressive improvement in the workers standard of living
- Establish just industrial relations
- Secure redress of grievances without stoppage of work by means of negotiation and conciliation and failing these by arbitration or adjudication
- Make necessary arrangements for efficient conduct and satisfactory and speedy conclusion of authorised strikes
- Develop in the workers a sense of responsibility towards industry and the community
- Raise the workers standard of efficiency and discipline

The Bangladesh Labour Act comments on **unfair labour practices** by both the employers and the employees.

The **unfair practices on the part of employers** include:-

- imposing any condition in the contract of employment
- seeking to restrain the right of a person to join a union,
- refusing to employ or to continue to employ a person because he or she is or is not a member or officer of a trade union
- dismissing an employee because he or she becomes a union member or recruits others to do so
- recruiting workers during a strike period
- intentionally failing to take up recommendations of a participating committee
- commencing or continuing an illegal lockout or persuading other people to do so.

The **unfair labour practices on the part of the employees** include:-

- joining in trade union activities during working hours without permission of the employer
- intimidating any worker to join or continue to be a union member or officer
- inducing a member officer to leave a union by offering some advantage
- compelling or coercing a worker to pay or refrain from paying union dues
- compelling an employer to sign a memorandum of settlement using intimidation or coercion
- commencing or continuing an illegal strike or go-slow work or persuading another person to take part, to create a blockade,

## Social Responsibility in collective bargaining

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an obstacle in the transport or communication system or cause damage to property for the purpose of satisfying any demand or object of a trade union.

### So what is a Collective Bargaining Agent?

Collective bargaining involves a process of negotiations between individual employers or representative of employers' organisations and trade union. The Bangladesh Labour Act 2006 defines CBA as "Collective Bargaining Agent" in relation to an establishment or group of establishments. To emphasise the representative character of the trade union in industrial disputes and to obtain representation on committees, boards and commission the Labour Act makes provision for the appointment of a Collective Bargaining Agent (CBA). The CBA is a registered trade union elected by secret ballot. The CBA is entitled to undertake collective bargaining with the employer or employers on a wide range of matters connected with employment. These agreements may contain matters such as the facilities in the establishment for trade union activities and procedures for settling collective disputes including grievances and disciplinary procedures, terms and conditions of employment, wages and salaries, hours of work, holiday entitlement and pay, level of performance, job grading, lay-offs, retrenchment, sick pay, pension and retirement schemes. Such agreements once duly executed by both parties are binding. The agreements should be in writing and should be drafted with care because they are meant to settle disputes rather than raise them.

### So what is a Participation Committee?

The Bangladesh Labour Act is the main Instrument providing for the functioning of a Participation Committee which is a bipartite mechanism comprising of an equal representation of workers and the employer meeting bimonthly. The employer of every establishment in which fifty or more workers are employed is required by the Act to constitute a Participation Committee. The representatives of the workers must be appointed based on the nomination by the trade unions of the establishment from amongst the workers employed in the establishment.

### Bipartite and Tripartite Mechanisms and Collective Bargaining

The industrial Relations Ordinance is the main Instrument providing for the above mechanisms. There is clear provision to form a Participation Committee, a bipartite mechanism comprising of equal number of representation of workers and the employer. According to Dr Ahmed this mandatory provision is not complied in 98% of the establishments due to very poor inspection and weak enforcement of law.

The Essential Services Act can restrict a Union from strike action. The Government may at any time declare the Industry or Service 'essential' and so place a ban on strike action.

**Trade union structure** - the trade union structure in Bangladesh can be understood to comprise three tiers:-

**Tier 1 - National Federation:** e.g. the Bangladesh Jatiyatabadi Sramik Dal (BJSD) is one of the largest Trade Union National Centres. BJSD reports that it is an active member of Sramik Karmochari Oikya Parishad (SKOP) and the Bangladesh Institute of Labour Studies (BILS) and the Bangladesh Confederation of Trade Unions (BCTU).

**Tier 2 - Industrial Federation:** It is the body of unions from the same industrial sector. It deals with common problems and demands of the sector. Basic unions within the sector are its members.

**Tier 3 - Basic Union:** This is the main union formed by the direct participation of the workers. Grass root level activists are the members of these workplace based unions. An elected body of industry or factory level unions works as a Collective Bargaining Agent (CBA).

In a mature democracy with well organised and settled public and private sectors Social Responsibility will be demonstrated by all parties in collective bargaining and other wage negotiations – including the Government, Employers, Employees and the Associations and Unions representing the Employers and the Employees. Social Responsibility will be seen in these negotiations in a variety of ways including:-

- Employee representatives have been democratically elected and have consulted with their colleagues and so bring the generally held views of their workers to their negotiating table
- Employers negotiate in good faith and agree to deliver on promises and commitments made – including the payment of wages and bonuses on time every time
- Employee representatives make realistic demands for wages and improved working conditions having due regard to the actual economic situation of the factory or mill or other working situation
- Employers are genuinely concerned to improve the economic situation and working conditions of their employees and do not seek to keep wages deliberately low in order to improve the profitability of the company
- All parties agree to resolve disputes by negotiation and not to resort to walk outs, lock outs, strikes or 'strong arm tactics'

## Social Responsibility in collective bargaining

Continue....

(Is union membership an entitlement or a conspiracy against the employer?)

### The role of the International Labour Organisation (ILO) in Bangladesh

The ILO (according to its Bangladesh website) set up its country office in Bangladesh in 1973. Since then the ILO has contributed to national endeavours promoting and strengthening social justice and economic development of the country through a variety of actions including:-

- Providing advisory services and support to capacity building of social partners (Government and employers and workers organizations);
- Technical cooperation activities in support of ratification and implementation of international labour standards and promotion of the ILO's fundamental principles and rights at work;
- Technical cooperation programmes and projects in the areas of vocational training, employment, child labour, employment promotion of women and disadvantaged group and occupational safety and health.

The ILO Decent Work Country Program (DWCP) for Bangladesh has three country priorities:-

- (i) The country remains competitive post-MFA and promotes decent and productive employment for its workforce
- (ii) Fundamental principles and rights at work are promoted including progressive elimination of WFCL
- (iii) Other areas of work including 'capacity building' of the constituents, vocational training system reforms, migration.

Besides the Ministry of Labour and Employment, the ILO also works with other government ministries and departments as part of its ongoing work. As regards employers, the Bangladesh Employers Federation, which represents more than 90% of the major employers in the country, remains ILO's main contact. The ILO reports there are 32 national Trade Union (TU) federations in the country. The ILO has encouraged the unions to work together and speak in once voice. According to ILO Bangladesh 14 TU federations have formed a loose grouping named the National Coordination Committee on Workers Education (NCCWE). The NCCWE is reported to be the ILO's main partner in Bangladesh for activities at the country level.

### Employers' Organizations in Bangladesh recognised by the ILO

Bangladesh Employers' Federation (BEF)

### Workers' Organizations in Bangladesh recognised by the ILO

National Coordination Committee on Workers Education (NCCWE)

Bangladesh Mukta Sramik Federation (BMSF)

Bangladesh Jatiya Sramik Federation (BJSF)

**In conclusion** – collective bargaining, free from coercion, corruption and illegal influence is a 'good thing' and can promote industrial harmony when carried out with 'good will' by all parties concerned. A company, according to the ISO 26000 SR guidance, cannot claim to be socially responsible to an international standard if the entitlement to freedom of association and independent representation is denied to its workers by Government or a Trade Association or by that individual employer. The Government of Bangladesh and the staff and the CBAs in its Ministries and Departments have some way to go before they are an example of 'best practice'. It remains to be seen whether the efficiency improvements made to the Chittagong Port and the reforms made there by the Caretaker Government concerning the role of the CBAs and the activities of the other labour representatives can be sustained during the period of an elected Government. The largest of our export sectors, for example the manufacturers of knitwear and readymade garments, have often demonstrated the problems that can be brought into the street by workers who do not have real representative channels in place and elected honest representatives in post. Socially responsible employers in the public and private sectors in Bangladesh and their employees need to recognise that CSR (Corporate Social Responsibility) or SR (Social Responsibility) is not simply a matter of making cash payments to good causes rather it includes a wide range of themes and practices and in this case it involves freedom of association, independent representation and meaningful collective bargaining.

Rodney Reed is Company Chairman of Reed Consulting Bangladesh Ltd [www.reedconsultingbd.com](http://www.reedconsultingbd.com)

Reed Consulting has been based in Dhaka for three years and works to 'enable business in Bangladesh to be socially responsible, sustainable, and profitable'.

# Practicing CSR

- A K M Ahsanul Hoque\*



By practicing CSR an organization can achieve a competitive advantage in the industry. If the organization have the vision of growth and expand their business globally, then the organization must practice CSR. Without practicing CSR an organization can not establish his existence in the global competitive market. CSR is one of the major requirements for the conscious buyers in the global and local market.

To practice CSR a strong CSR strategy and planning is required. Good & sustainable CSR practice must contribute in the growth of the organization. When an organization is not only focuses on the financial performance of the organization but also thinks about their employees, surrounding community and environment, the growth of the company and the sustainability of the company is very much certain. If an organization is conscious and careful about its employees then the employees will also happy on the organization and will conscious about the development of the organization. If the employees of the organization are happy then any types of employee or labor union related problems will not arise, the production of the organization will not shutdown for a single day. The relationship between employee and the employer will be good and the bonding will strong. Some stakeholders thought only to keep the employees happy will solve the problem, to keep the employee happy they apply different programs like on time payment, timely bonus, monthly special lunch/dinner and so on. But the question is, Are these tangible programs? Are these long time beneficiary program for the employees? What is the acceptance level of this type of program in the industry and globally? Are global buyers accepts these programs?

So to avoid all these types of questions a good CSR strategy need to develop and strongly follow the CSR strategy, only then the organization will get the return of that investment, otherwise all the investments goes to nowhere. If practicing CSR does not give any return to the organization, then it is very clear that there are some problems in the CSR strategy part.

A good CSR model can be defined only by CSR experts in the industry. There are lots of organizations who are successfully practicing CSR in their organization, and getting good return on that investment. As a first or second generation stakeholders, we do not have clear ideas about the CSR practices in the organization, but to compete in the global market, to create an acceptance globally and to achieve different certifications like ISO, IEEE, CMMi, VeriTest and so on, our

stakeholders need to practice CSR. There are many sad stories of shutting down of good industries only because of not practicing CSR in the organization. However as CSR is a new concept for the stakeholders in Bangladesh, still we have time to adapt the CSR practices in the organization for sustainable growth and development. Government is also providing 10% tax exemption for practicing CSR in Bangladesh. We hope our stakeholders realize the future needs of the organization to compete globally and achieve competitive advantage in the industry. Practicing CSR will give highest return to the organization, and increase the financial performance of the organization ever before.

## Training: Leadership for Sustainable Development 2009- Deadline Approaching!!

LEAD Europe is recruiting for its inspiring leadership and sustainable development programme starting in London in June 2009.

Using leadership and climate change as a lens to explore sustainable development issues, the 17 day residential LEAD Europe training programme is one of the most dynamic, innovative and engaging leadership development programmes in Europe. Over the course of three modules, our programme will inspire you with the latest sustainability thinking, enhance your leadership skills and develop your personal awareness. You will become a member of a network of high-level peers across Europe and the world who are passionate about creating more a sustainable world. While gaining practical experience working with colleagues from diverse professional and cultural backgrounds you will analyse contemporary sustainability challenges and opportunities, and explore and identify collaborative solutions to real world issues.

"Being part of the LEAD Network is to be in the right place, at the right moment, with the right people"- Klaus Niederlander, 2008 LEAD Europe Fellow

Key dates

Module 1) 29 June-3 July 2009 London: Towards a Low Carbon Society\*

Module 2) 7-11 September 2009 Brussels: The EU and Leadership Towards a Sustainable Future

Module 3) 8-14 November 2009 Beijing International Session: Impacts, Innovation, and Interdependence

To find out more visit <http://www.lead.org/page/174> or email [europe2009@lead.org](mailto:europe2009@lead.org). You can download our application here [http://docs.lead.org/allcohorts/2009\\_application\\_pack.doc](http://docs.lead.org/allcohorts/2009_application_pack.doc)

\*Subject to training team approval, participants from business may apply to attend the London module only.

Deadline to apply: **30th April 2009**

# CSR Strategy – A Business Tool for Success

- Edward Probir Mondol\*



Corporate Social Responsibility (CSR) is defined as the way companies integrate social, environmental, and economic concerns into their values and operations in a transparent and accountable manner. It is integral to long-term business growth and success, and it also plays an important role in promoting values internationally and contributing to the sustainable development of communities.

Corporate Social Responsibility Strategy is a effective tool for business success. There is a need for incorporating CSR initiatives in every business strategy in order to achieve sustainable long term growth in the private sector in Bangladesh. As small businesses grow into larger ones there is a need for reaching out into the wider global markets. In today's world CSR has become a global necessity for taking a leap forward and attaining a larger share of the market CSR should be at the heart of the business and be integrated into the all aspects of the company starting from its HR policies to business practices to marketing strategy.

Developing a well thought-out, credible and effective Corporate Social Responsibility (CSR) strategy can be a daunting and time-consuming task. Organizations need to understand and prioritize both the strategic and reputational risks that arise as a consequence of their business practices and operations. Too often, companies turn to a CSR strategy in response to an adverse event. In this "reactive" mode, companies often make hasty decisions, which lead to an ineffective allocation of resources.

- How do I build a stronger business case to get senior management's attention?
- What are our biggest risks and how should we manage them?
- What should be our priorities?
- Are there gaps in our CSR strategy?
- What is the best way to implement the strategy?

CSR policy and setting up a strategic plan and budget are essentials for development of CSR strategy. The policy can be developed under four headings: Economic, Education, Community and Environment

Key to the strategy has been commitment through employee involvement in four areas/groups.

## Economic

Economic involvement centred on building relationships with the public and private sector leaders in through a senior manager's involvement in a project to create and manage the economic development strategy for the area/region.

## Education

Education, seen as core due to the desire to promote the company to future potential employees, has focused on creating links to educational projects with "Right to Read" and "Partners in Leadership".

## Community

Community has developed a Philanthropy program with a mixture of support to individual employee's own community initiatives (e.g. fund raising matching) and by identifying and focusing company effort on a Company Fundraising Partner

## Environment

Environmental has incorporated in company's extensive environmental program into the broader CSR program with emphasis on areas where it touches the community (environmental competition for schools, school visits, involvement in local and national Environmental Groups).

## **Constraints**

The biggest constraint has been cost. Operating within tight budget constraints.

## **Benefits**

CSR profile was raised within the company

Money was raised for CSR initiatives.

Award – like environmental clearance

A very high level of participation of employees in fund raising initiatives raising social consciousness and building team spirit amongst employees.

Edward Probir Mondol is the Founder Executive Director of CSR Bangladesh. He can be reached at

## **Developing an Integrated CSR Strategy**

CSR Strategy Development, Taking into Account the Economic, Environmental and Social Pillars

## CSR Bangladesh Updates

### Completion of First CSR Essentials Training



CSR Bangladesh has successfully organized a day long training program on "**CSR Essentials**" on Friday March 20, 2009 at Hotel Asia Pacific, Road 2, House 2, Baridhara, Dhaka. A good number of participants from different industry/sectors attended the training program. The program started at 9:30 am and ends at around 5:00 pm. It was a very interactive training program at where all the participants joined in the discussion in different sessions.

The following sessions were conducted by senior trainer and resource person from the industry.

1. Getting Started: Embedding Corporate Responsibility in the Organization.
2. Upscaling Corporate Responsibility through Human Resources Development
3. Community involvement
4. Promoting Diversity
5. Engaging NGOs/Partnership
6. CSR and Sustainability

### Signing of MoU with IITM



A Memorandum of Understanding was signed with IITM. On behalf of CSR Bangladesh, the Founder Executive Director Mr. Edward Probir Mondol and the Chief Executive Officer of

IITM Mr. Ziaur Rahman signed the MoU for collaboration on CSR activities in Bangladesh. Late Mr. Nasir Uddin Ahmed, Director CSR Bangladesh and Mr. A K M Ahsanul Hoque was present during the signing ceremony.

### Call for Contributors

#### CSR Case Book

We seek business case studies from different sectors in Bangladesh for upcoming CSR Case book publications. We welcome industry cooperation in this regard. Any individual or organizations interested to contribute are highly requested to contact the editor.

Please send your case studies to the following e-mail address by April 15:

[editor@csrbangladesh.org](mailto:editor@csrbangladesh.org)



## Business News Analysis

### Community Development Outreach by CSR Bangladesh



In Association with Subani Manob Kallan Sangtha and Free launch Journalist Society of Bangladesh, CSR Bangladesh visited several places of Kaliakoir, Gazipur. The CSR Bangladesh expressed their willingness to support Riverview Pre Kadet Kindergarten at Kaliakoir. The discussion was held with Mr. Ayub Rana, the proprietor of Subani Press Ltd. And Director of Riverview Pre Kadet Kindergarten for further development of the education to the underprivileged community at Kaliakoir. Later the team also visited Bangladesh Adventist Seminary and College at Gowalbathan, Kaliakoir, Gazipur. They appreciated the education system and campus infrastructure of BASC.

### Joining of Research Director at CSR Bangladesh



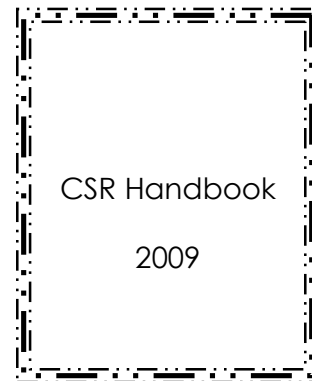
Prof. Dr. Monirul Islam joined CSR Bangladesh as Director Research. He was replaced in the position of late Nasir Uddin Ahmed. He has Dr of Engg., FIEB, MIAHS. In Profession he is the Chair, Dept of Civil Engineering and Director, South Asian Disaster Management Centre (SADMC).

### Joining of Administrative Officer



Afsana Amin joined CSR Bangladesh as Administrative Officer. She is also work as a editorial assistant of CSR Newsletter. Prior to her assignment she worked at Dhaka Bank Limited.

### Upcoming CSR Bangladesh Publications



**Expected date of Publication  
November, 2009**

### Socially Responsible Booklet

1. Children's Edition
2. Teenager's Edition
3. Professional's Edition
4. Businessmen's Edition

**Expected date of Publication July, 2009**

## Business News Analysis

### Scientists find new solutions for the arsenic-poisoning crisis in Asia

March 24th, 2009 by Chelsea Anne Young

More than 15 years ago, scientists pinpointed the source of the contamination in the [Himalaya Mountains](#), where sediments containing naturally occurring [arsenic](#) were carried downstream to heavily populated river basins below.

But one mystery remained: Instead of remaining chemically trapped in the [river sediments](#), arsenic was somehow working its way into the groundwater more than 100 feet below the surface. Solving that mystery could have significant implications for policymakers trying to reverse the mass poisoning, said Stanford University soil scientist Scott Fendorf.

"How does the arsenic go from being in the sediment loads, in solids, into the drinking [water](#)?" said Fendorf, a professor of environmental Earth system science and a senior fellow at Stanford's Woods Institute for the Environment.

To find out, he launched a field study in [Asia](#) in 2004 with two Stanford colleagues: Chris Francis, an assistant professor of geological and environmental sciences, and Karen Seto, now at Yale University. The initial study was funded with a two-year Woods Institute Environmental Venture Projects grant. Five years later, the research team appears to have solved the arsenic mystery and is working with policymakers and government officials to prevent the health crisis from escalating.

"The real thing is, how do we help the people who are there?" Fendorf said. "But first, we have to understand the coupling of hydrology—the way the water is flowing—with the chemistry and biology."

#### Finding a study site

Arsenic-laden rocks in the Himalayas feed into four major river systems: the Mekong, Ganges-Brahmaputra, Irrawaddy and Red. Epidemiologists first identified arsenic poisoning in the 1980s in the Ganges-Brahmaputra Delta in Bangladesh. The sudden occurrence of the disease was linked to the increased use of wells for drinking water. Scientists had long assumed that the contamination process occurred deep underground, in buried sediments that release arsenic into aquifers 100 to 130 feet below the surface. But Fendorf and his colleagues had data suggesting otherwise. They suspected that the arsenic actually dissolved at a much higher depth, very close to the surface. "As the water starts to move down into the soil, it picks up arsenic. That was our hypothesis," he said. "We needed to follow the chemistry of the surface water as it moved down into the groundwater."

Fendorf and his colleagues began their fieldwork in the [Brahmaputra](#) River basin of Bangladesh. However, creating a hydrology model was a challenge, because the landscape was dotted with irrigation wells that alter the natural path of water. "When you draw out how the water might flow, it looks like spaghetti," Fendorf explained. "Before we even started we said there is no way this is going to be possible."

in Cambodia offered a perfect alternative. Its headwaters are only 100 miles away from those of the Brahmaputra River. "All the chemistry up in the Himalayas is similar," Fendorf added. "The transport down the big river system is very similar as well."

More importantly, the Cambodia site was mostly undeveloped. "Cambodia had been under a 35-year civil war that had really repressed its development, so it was in essence Bangladesh 40 or 50 years ago," he said. "In some ways it would actually be setting the clock back and getting a snapshot back in time. By virtue of having this more simplistic system, we could really track the entire water flow."

#### Field results

The new field site was located just south of Cambodia's capital, Phnom Penh. Fendorf hired local workers to drill wells at three different depths throughout the 20-square-mile site. Testing the water for dissolved arsenic at various depths allowed the researchers to pinpoint where the toxin was migrating into the aquifer. To observe solids, they also installed water-sampling devices a foot or two below the surface

The data they collected allowed them to put together a model of arsenic cycling in the river delta.

"We found out that, sure enough, within the first 2 to 3 feet from the surface, arsenic was coming out of the solids—that is, the sediments transported down from the Himalayas—and into the water, and then it migrated down into the aquifer," Fendorf said. Aquifers are the source of drinking water for people who use wells throughout Cambodia, Bangladesh, Myanmar, India and Vietnam.

The culprits responsible for dissolving the arsenic turned out to be bacteria that live in the soil and sediment of the river basin. The researchers discovered that arsenic flowing down the river from the Himalayas sticks to rust particles called iron oxides. Upon reaching the river delta, these arsenic-laden particles are buried by several layers of soil, creating an oxygen-free, or anaerobic, environment. Normally, bacteria use oxygen to breathe. But in an anaerobic environment, they can use other chemicals, including rust and arsenic. As the bacteria metabolize the iron and arsenic, they convert it to a form that readily dissolves in water.

"As these sediments get buried very rapidly, the bacteria go through an anaerobic metabolism that dissolves the iron minerals and the arsenic with it," Fendorf said. "The arsenic goes into the water and the problem starts."

The results, published in the journal *Nature*, confirmed Fendorf's hypothesis: Arsenic contamination was occurring near the surface and, in fact, would take at least 100 years to reach the aquifer below. The Stanford team also showed that the 100-year-scale cycling of arsenic into the aquifer was a natural process that had been occurring for thousands of years, preceding any human influence. "We showed that there is a perpetual source of arsenic that replenishes from the surface," Fendorf said.

#### Solutions to the crisis

Understanding the area's hydrology will allow developers to strategically install wells that draw from areas free of dissolved arsenic,

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providing clean, drinkable water. Such targeted excavation can be extremely accurate, Fendorf said.

But what if a village needs a well but is unable to find an arsenic-free location to install it? Fendorf has proposed several solutions, including installing arsenic filters, collecting rainwater and purifying surface water. Each option has pros and cons, he said.

Filtering arsenic from well water raises the problem of how to dispose of leftover waste. "There aren't hazardous waste landfill sites," he noted. Additionally, the filter approach requires a dependable monitoring system. "If you do have a failure of the filter, how do you know when it occurs, and how are you going to be testing for that?" he asked.

Harvesting rainwater with collection tanks or rooftop gutters can be effective in certain locations and for certain people, he said. But areas with longer dry seasons require big tanks that are often too expensive. "These are areas where people are making less than \$2 a day," Fendorf noted.

Another option is to use a disinfectant to purify surface water collected from ponds or rivers. The problem, he said, is that the filters have to be very cheap and easy to use. To solve the problem, Fendorf has been collaborating with Resource Development International (RDI), a non-governmental organization in Cambodia that makes affordable filters from locally discarded clay and rice hulls.

With these challenges in mind, Fendorf and Stanford post-doctoral scholar Matt Polizzotto have proposed finding the best option on a village-by-village basis. Beginning March 24, Fendorf will co-host a four-day meeting on arsenic poisoning in Siam Reap, Cambodia, with about 60 experts, including government officials, scholars, NGOs and funding agencies, such as the World Bank. The meeting was convened by the American Geophysical Union and the Woods Institute.

"The first three days will be devoted to the arsenic groundwater problem," Fendorf said. "We hope to converge on a resolution, as a scientific body, on what we agree about the problem, what remains unresolved and what needs to be done to fill the gap. The final day of the meeting will look more holistically at the water problem, examining best options for bringing safe drinking water to the populace."

### Land-use changes

According to Fendorf, the new understanding of arsenic cycling comes at a critical time for Cambodia, which is finally recovering from years of political unrest and is looking to bolster its economy by installing wells for drinking water and irrigation, and excavating soil to make roads and bricks. Such land-use changes could affect arsenic flow patterns throughout the delta, he warned, although in some cases, this may not be a bad thing. "The land-use changes will definitely modify the arsenic levels," he said. "Sometimes they might increase the level, and sometimes they might decrease it, depending on where they are situated and what the surrounding environment is like."

Although Fendorf and his colleagues came to Cambodia focused on understanding the science of arsenic contamination, they soon realized that what mattered most was the potential to make a difference in the lives of individuals. For example, the researchers tested each well they

drilled for arsenic contamination. If it tested clean, they installed an additional well for domestic use and offered it to the landowner. If a well

proved contaminated, the researchers would buy the landowner a rainwater-harvesting unit locally made by RDI.

"If we can give people a clean well or a rainwater harvesting unit, that's going to go a lot further, in the short term at least, than any of our study results," Fendorf said.

Provided by Stanford University

Excerpts from the internet source:

[www.csr-asia.com](http://www.csr-asia.com)

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