Use of the WBCSD Global Water Tool to Assess Global Water Supply Risk and Gain Valuable Strategic Perspective

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ABSTRACT

As water scarcity becomes more prevalent across the world, the risk to industry rises. There is a growing need for a practical tool that can map water use and effectively assess water risks for industries, especially global companies and organizations with operations and suppliers in numerous countries.

The Dow Chemical Company (Dow) participated in the development of the World Business Council for Sustainable Development (WBCSD) Global Water Tool. Dow used the metrics and mapping results generated by the tool to review and communicate corporate risks with internal stakeholders.

The WBCSD Global Water Tool has given Dow a unique and valuable perspective on the water use and relative corporate risks in their global operations. The Global Reporting Initiative metrics were especially useful for business stakeholders to frame the relative risks that exposure presents at the various production facilities.

KEYWORDS: Global Water Tool, Water Risks, Water Scarcity, Water Sustainability, Business Sustainability, Global Reporting Initiative

INTRODUCTION

Water scarcity affects business throughout the value chain such as production, operations, logistics and services. In 2001, driven by waste reduction goals, increasing infrastructure costs and droughts that had impacted the company's largest production site, The Dow Chemical Company (Dow) set off on a journey to more effectively manage all aspects of water handling, "The Water Envelope".

The effort began by consolidating the management of water assets at Dow's 14 largest sites. The primary objectives for the effort were to protect production capabilities, conserve fresh water, minimize waste water generation and improve or at least control the impact of water

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management cost on the cost effectiveness of Dow's production assets. This consolidation involves reorganizing assets from numerous business units into a single structure to manage water and waste water for the company's largest facilities.

As time progresses, the need to manage water as a critical business consideration becomes ever more apparent to broadening groups of stakeholders. The need to reach out and consider impacts for all of the company's assets and the need to be able to compare the risk at one location to the risk at others has also become increasingly apparent.

In 2006, The Dow Chemical Company's Environmental Technology and Sustainability groups were faced with the challenges of framing the future risk for water supply at all of Dow's existing and future sites. This was no small task given that there are roughly 160 sites globally to be assessed.

Dow's involvement in the World Business Council for Sustainable Development provides the opportunity to collaborate with other industry stakeholders and consultants to develop a simple tool capable of efficiently completing the required assessment.

METHODOLOGY

The "Global Water Tool" is a public-domain and easy-to-use tool that allows companies or organizations to map their water uses and risks relative to water availability in their global operations and supply chains. It was created through collaboration between non-governmental organizations and business water experts including global companies.

The tool is a product of the World Business Council for Sustainable Development (WBCSD), which is a global association of some 200 companies dealing exclusively with business and sustainable development. It is comprised of 20 major industrial sectors. The WBCSD's Water Working Group stewarded the development of the Global Water Tool. WBCSD Member and the global engineering company CH2M HILL led the tool's development. An Advisory Board, comprised of 22 WBCSD member companies in a wide range of industries, provided oversight and pilot testing.

Global Water Tool is designed for companies and any other stakeholders who need to better understand the water issues in their operations and extended supply chain. The tool allows companies and organizations to quickly and accurately answer such key questions as:

1) How many of our sites are in extremely water-scarce areas? Which sites are at greatest risk? How will that look in the future?
2) How many of our employees live in countries that lack access to improved water and sanitation?
3) What percentage of our suppliers is in water-scarce areas now? How many will there be in 2025?

The Global Water Tool does not provide specific guidance on local situations, which require more in-depth systematic analysis.

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By integrating external datasets and the company's water use figures, the tool provides the following benefits to users:

1) Compares the company's water use (including staff presence, industrial use, and supply chain) with validated water and sanitation availability information – on a country and watershed basis.
2) Allows calculation of water consumption and efficiency.
3) Establishes relative water risks in a company's portfolio to prioritize action – including more detailed assessment.
4) Creates key Global Reporting Initiative (GRI) water indicators, inventories, risk and performance metrics and geographic mapping.
5) Enables effective communication with internal and external stakeholders on company's water issues.

The tool has two parts: the input data form and the online map. The input sheet allows the user to provide their company's site location and water use information. After entering the company's water use figures, the sheet automatically provides outputs, including GRI water indicators and downloadable metrics charts that demonstrate the company's data combined with both the country and watershed figures.

RESULTS AND DISCUSSION

Tool Implementation and Data Collection: Dow's Application

Implementation of the tool for the preliminary Dow Chemical Company assessment was completed with the support of experts in Dow's Sustainability and Environmental Technolgy Center Area.

The objectives for the effort were established as follows:

- Identify existing sites that will develop water supply issues in the future
- Provide water supply/demand analysis for key growth areas for Dow
- Identify key drivers in supply/demand for each priority location, and developing issues milestones be tracked

The first element of the effort was inputting the location and location associated information data for the various Dow Manufacturing, Distribution and Support Facilities into the downloaded WBCSD Global Water Tool. It was easy to enter the site information and coordinates into the tool with the built-in Google powered global address look-up capability. The output of this first, relatively simple, activity can be viewed in Figure 1. For the limited effort required, this mapping capability provides very useful insights into potential areas for concern.

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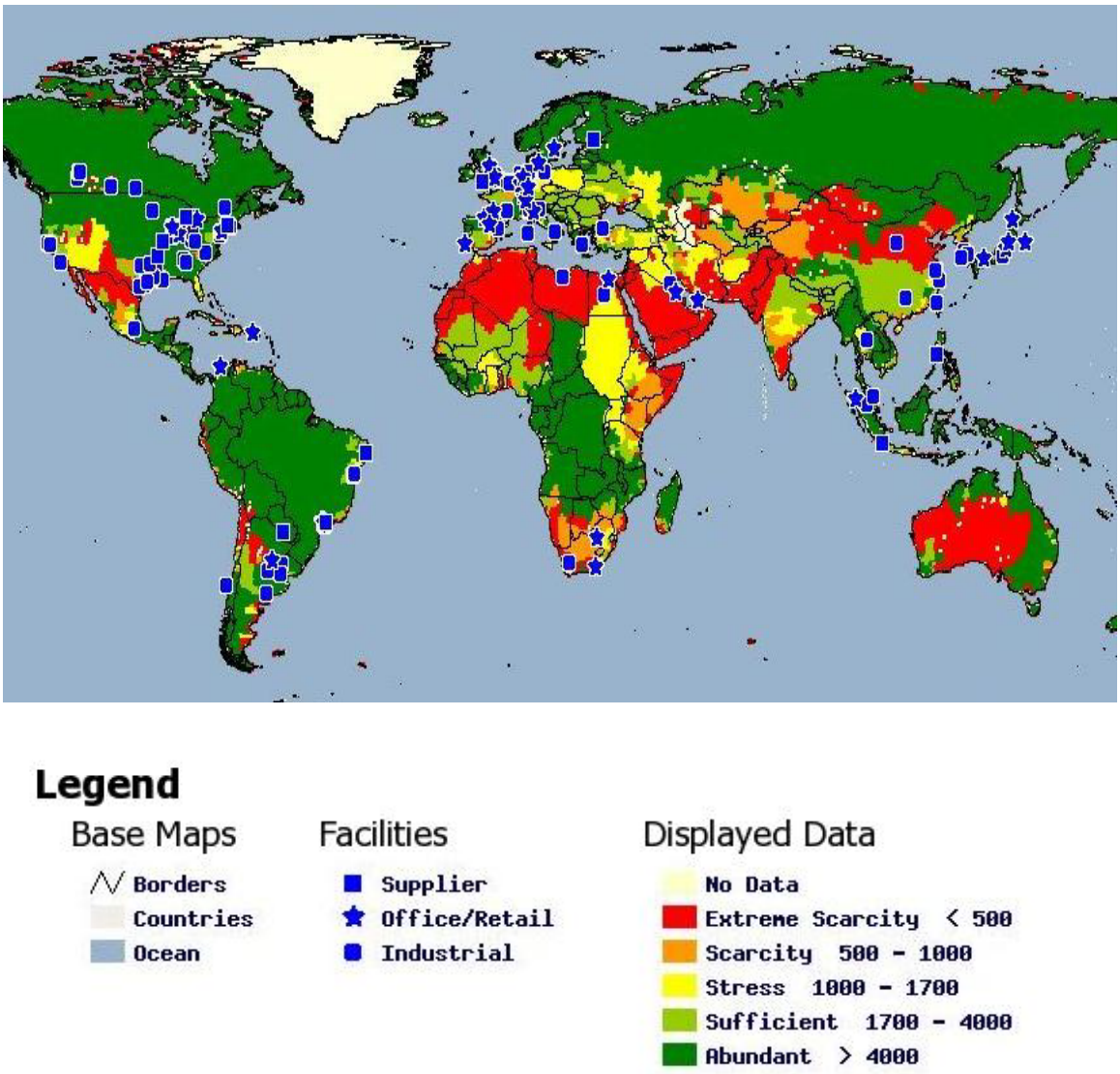

FIGURE 1.
Locations of Dow's Facilities versus Annual Renewable Water Supply per Person (m3/ person/ year): Projections for 2025

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The data analysis and mapping reports that are generated by the tool are very straightforward to analyze. They provide a visual and simple comparative means to educate stakeholders regarding both present and anticipated future conditions for operational sites as shown in Figure 1.

The query databases within the tool provide background information on site locations that are inputted into the tool. The information supplied by these databases is nothing short of outstanding. Without the aide of the WBCSD Global Water Tool assembling the site data, completing regional supply risk assessments for an organization with as broad a global asset base as The Dow Chemical Company's 157 manufacturing sites would be a very challenging task. It would require specialty consultant support, but with the tool, this assessment was completed in a manner of weeks.

The next step in the process was to gather and input water use data for the identified priority sites. Previously, water use data gathered as part of Dow's annual water use inventory was found to be suitable as input to complete this task.

In addition to inputting location and water usage data, site visits to the two most water constrained U.S. sites, located in Texas, were conducted. In addition, phone surveys and data gathering were completed for other global sites identified to be in water constrained regions. This survey work was done in the context of the Water Sustainability Planner Tool by Global Environmental Management Initiative (GEMI) and gathered a local perspective on various risk factors influencing water supply.

It is worthy of noting that the Global Water Tool is a useful tool for making high-level decisions about water risk with a focus more on a national to global perspective. However, it does have limitations at the regional and local level in its ability to provide specific water resource information.

A good example is this regional/local limitation result for two of Dow's Texas Sites. Dow's Freeport Site reported out as a higher risk than the Texas City Site when in fact water to both is supplied water from the same source. The WBCSD Tool assumes that a facility is sourcing water from within the basin in which it is located. This is certainly not always true and even if it were always true, there are legal, political, social, environmental and contractual factors that are potentially at play in the allocation of water in any particular location. These factors must eventually be taken into consideration when determining risk and strategy. All of these factors tend to be amplified in extremely water-stressed areas.

Priority Risk Management Issues

A simple six-tiered approach to classifying the supply conditions at a site is utilized. Dow focused attention on sites that are or will be in the following three regions:

- Stressed (less than 1,700 m^3/person/year but greater than 1,000 m^3/person/year)
- Scarcity (less than 1,000 m^3/person.year but greater than 500 m^3/person/year) or
- Extreme Scarcity (less than 500 m^3/person/year)

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In addition to the risk assessment based on regional supply per capita, other factors are taken into consideration to develop risk factor scores. Risk factor scores are generated for the following areas by the water management risk assessment program from the GEMI water sustainability planner:

- Watershed
- Supply Reliability
- Social Context
- Compliance
- Efficiency
- Supply Economics

GEMI water sustainability planner is segregated into three modules that guide a facility user through: (1) the process of assessing the facility's specific water uses/needs in comparison to the availability of water in the region; (2) the impacts these operations pose on the available water resources; and (3) the identification of factors that may pose a risk to the operation's ability to produce.

Once the data collection, analysis and surveying efforts were complete, risk profiles and priority risk management issues were established for each of the targeted sites. The priority risk management issues for each of the sites were then consolidated to a list to provide a focused basis for developing strategy to minimize the impact of water supply risks. Preliminary recommendations to address many but not all of the risk areas were developed. The more challenging issues will require more in-depth study, but it is clear that the tool helps drive focus to these more challenging higher risk issues.

Many of the findings were well known and understood at a local level before the analysis was completed. For example, it was well known within the company that Dow's Key Texas Sites in Freeport, Seadrift and Texas City were in areas that required special consideration with regard to water rights. It was also well known that Dow's Ternuzen, Tarragona and Central Germany sites required special focus on water supply. What was not known is the relative stress in these regions of operations in comparison to other existing and proposed facilities.

The elements of the analysis effort were assembled into a concise presentation format to be shared with stakeholders. The output from the WBCSD Global Water Tool enabled stakeholders to quickly gain understanding from the visually comparative analysis and mapping. The risk profiles and priority risk management issues assembled for each of the water stressed sites allow stakeholder to quickly understanding what can be a relatively complex set of issues.

A Valuable Strategic Perspective

The analysis enabled by the WBCSD Global Water Tool provides a unique and valuable perspective. It aided Dow in drawing attention to water supply risks for seven existing sites and the challenges of providing water at six developing sites.

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The supporting survey work helped to create understanding that while at a high level "water availability per capita" is a useful indicator and can aide in prioritization, there are many additional factors that locally influence the risks associate with water supply. This survey work made it clear that global assessment and strategy can drive priority, but local analysis and understanding are required to define the potential solutions for issues in a given location.

The overall effort allowed stakeholders to understand where to place priority and that water management is a local issue. It also helped stakeholders understand that goals like water use reduction at a fixed percentage at each location globally are not as beneficial or important as setting targeted goals to reduce and conserve water in extremely strained regions.

It created the understanding that, due to water stresses, in some locations minimal water use is the desired target while in other areas once-through cooling may be appropriate and desirable given its ability to reduce energy demand and green house gas emissions.

Over the past seven years substantial progress has been made on The Dow Chemical Company's 2001 objective to more effectively manage all aspects of water handling, "The Water Envelope". In this time, Dow has completed more than 100 water related projects on more than 20 different internal production sites. These projects have ranged from leveraged best practice activities, to six sigma projects used to optimize all manner of operational systems, to very large capital projects necessary to meet the strategic business needs and provide water for new or upgraded production capabilities.

Executed projects have included efforts such as the following:

- reducing water losses in conveyances from reservoirs,
- implementation of near zero liquid discharge concepts,
- reducing waste water hydraulic and organic loads,
- installation of Volatile Organic Compounds (VOC) reducing pure oxygen wastewater treatment,
- improvement in operation of water based process cooling assets, and
- recycling both industrial and municipal waste water for varied purposes ranging from de-mineralized water production to evaporative cooling

In some locations, Dow has shifted to the use of once-through sea water for cooling to conserve both fresh water and energy. In another location, Dow has constructed large seawater towers to manage waste heat without fresh water consumption. These are but a sampling of many water related efforts.

New facilities currently in planning stages will continue to drive the optimization of industrial water envelope service for large integrated petrochemical complexes operated by Dow. The WBCSD Global Water Tool is a welcomed addition to Dow's arsenal of tools to help drive more efficient water use and the highest priority locations in what is becoming a very water constrained world.

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The Path Forward

The analysis provided by the WBCSD Global Water Tool is only one piece of the puzzle to driving an effective corporate water management strategy. It can, however, be a very important piece of this effort given its capability to assess regional stresses and enable global prioritization to drive focus to the highest risk areas.

In Dow, the recommendation from the initial WBCSD Global Water Tool effort, once understood and validated by stakeholders, have formed the basis for allocating resources and driving studies to defined alternatives and solutions for mitigating risk in the more water constrained regions. Answer to water supply issues do not necessarily come easily, but accurately understanding risk and the potential business implication for a particular site is essential to placing appropriate priority on risk mitigation efforts. It is a matter of spending the right time, effort and money in the right place at the right time.

The ability of the WBCSD Global Water Tool to compare situations for sites in different regions around the globe helps stakeholders better understand and prioritize resources to mitigate water supply risks.

CONCLUSIONS

In conclusion, organizations operating, or wishing to operate, in multiple jurisdictions will find the WBCSD Global Water Tool invaluable in informing strategic decision makers at the corporate and business unit level. The Global Water Tool has been used to assess risk at nearly all of The Dow Chemical company's 157 manufacturing sites. The tool was easy to use and provided very useful insight into which sites were at the highest risk. The tool in combination with site data collection and surveys allow for the efficient development of risk assessment presentation to educate key stakeholders regarding the business risks for sites in water constrained areas. The perspective, which resulted from the analysis and discussions with stakeholders, allows for more effective resource allocation to mitigate risks. It allows time and financial resources to be spent more effectively in the effort to manage water in a more sustainable manner.

ACKNOWLEDGEMENTS

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REFERENCES

Global Environmental Management Initiative (GEMI) (2007). Collecting the Drops: A Water Sustainability Planner Tool, http://www.gemi.org/waterplanner/

World Business Council Sustainable Development (WBCSD) (2007). Global Water Tool, http://www.wbcsd.org/web/watertool.htm

Zhang, H. X. and Dell, J. (2008). Managing Water Risks in a Water Scarce World: Use of WBCSD Global Water Tool for Sustainable Water Management, Proceeding of Sustainability'08, 689-703, Water Environment Federation, National Harbor, MD, June 23 – 25, 2008

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