



THIS REPORT HAS
BEEN PRODUCED
IN COLLABORATION
WITH



REPORT

D

2011

A weathered, white sign with blue Arabic calligraphy and the letters 'EAU' is mounted on two poles in a desert landscape. The sign is rusted and has a triangular shape on the right side. The background shows a vast, arid desert under a blue sky with scattered white clouds.

EAU

Human Water Security

Sustainability

Biodiversity

ASSESSING WATER RISK

A Practical Approach for Financial Institutions

Table of contents

4	Message from the Chairman of DEG
5	Message from the CEO of WWF Germany
6	Executive Summary
9	1. Setting the Scene – Water as a Risk Factor
9	1.1 Background – Why Water Matters
9	1.2 Global Water Trends
	Regional differences
	Population Growth
	Climate Change and Water Stress
	Industry and Water
12	1.3 Water Risks, Business and Financial Institutions - Why Water is Different from Carbon
13	1.4 Water Stewardship – Turning Red to Green
14	1.5 Other Water Risk and Assessment Tools
17	2. The DEG – WWF Water Risk Assessment Project
17	2.1 Outline of the Project Purpose and Methodology
19	2.2 Initial Screening of DEG’s Current Portfolio
20	2.3 Water Risk Survey
26	2.4 Application of WBCSD Global Water Tool
27	2.5 GIS Mapping – Visualising Water Risks
32	2.6 Water Risk Country Data Sets
35	3. The DEG – WWF Water Risk Filter
35	3.1 Basic Principles of the Water Risk Filter
	‘Practical, not Academic’
	‘Water Risks are Local’
37	3.2 Risk Indicators, Weightings and Risk Mathematics
39	3.3 Sources for Answering Risk Questions
40	3.4 Water Risk Filter
	The Pre-Assessment Tool
44	3.5 Results from the Water Risk Filter Application
46	3.6 Challenges in the Project
46	3.7 Main Data Gaps
47	3.8 Applicability for Financial Institutions (and Other Industries)
50	4. Outlook to the Next Phase
52	APPENDIX
	Existing Tools Related Directly or Indirectly to Water Risk Assessment
54	DEG – Our Business is Developing
55	WWF Water Stewardship – Shared risk and opportunity at the water’s edge
56	References

Maps and boxes

10	Map 1	Water Stress Index
28	Map 2	Threats to Biodiversity and Human Water Security
30	Map 3	WWF's Global 200 Freshwater Places and WWF International Priority River Basins
12	Box 1	Water Risks
17	Box 2	DEG's Environmental and Social Risk Indicator
18	Box 3	How is the Water Risk Filter envisioned to be used at DEG?
25	Box 4	Company example 1: Sekem
25	Box 5	Company example 2: ISA Tan Tec
26	Box 6	WBCSD Global Water Tool
32	Box 7	Challenges in Determining Water Stress and Impact
36	Box 8	Basin Governance
38	Box 9	Examples of Water Risk Indicators Questions
38	Box 10	Examples of Water Risk Indicator Answers
39	Box 11	The Need for and Challenges of Information from Client Companies
42	Box 12	Risk Mitigation
47	Box 13	Maintaining the Databases
20	Figure 1	Results of the Initial Screening
21	Figure 2	Company's reliance on water and an indication of recent water challenges
21	Figure 3	Quantity and quality measurements
22	Figure 4	Water regulation and enforcement
22	Figure 5	Expected regulatory changes
23	Figure 6	Responsibility of water related issues within companies
23	Figure 7	Content of water strategies and plans
24	Figure 8	Engagement with other river basin stakeholders
26	Figure 9	Water Scarcity: Difference between Company Self Assessment and WRI Basin Indicators
27	Figure 10	DEG Client Locations on Vörösmarty et al Map (no data for 21 companies)
35	Figure 11	Conceptual framework of the Water Risk Filter
37	Figure 12	Water stress in Africa as percentage of the population
40	Figure 13	Results of the Water Risk Assessment of DEG's Portfolio
41	Figure 14	Heat Map of an Individual Company Water Risk Assessment
43	Figure 15	Pre-Assessment Tool in the Water Risk Filter
44	Figure 16	DEG's portfolio assessed in the Water Risk Filter
45	Figure 17	Distribution of Risk Levels of the Assessed Part of DEG's Portfolio (%)
45	Figure 18	DEG's Portfolio Assessed in the Pre-Assessment Tool (319 companies of non financial sector)

Message from the Chairman of DEG



In many developing countries and emerging markets, providing a sufficient supply of drinking water or ensuring working waste water systems is a daunting challenge. Not only are financial means often missing, but also trained staff and effective organizations. In

some cases private enterprise can close this gap. But private enterprises are also forced to react to the water scarcity in many of these countries, employing innovative water saving technology or reusing wastewater. Some are even engaging to work with their peers and authorities to improve the situation in their watersheds. These companies must be assisted.

We at DEG, member of KfW Bankengruppe, value water as one of the most important natural resources. We are actively engaged in financing entrepreneurial initiatives in the water sector aimed at creating a sustainable use of water. But we realize that population growth and climate change exacerbate the water risks for many of our clients. Climate change will affect people and their lives in established and in emerging markets. Our partners in the developing world will be hit especially hard by its consequences. Water scarcity and/or floods will be the most common consequence of climate change. Therefore DEG sees the need to support our clients in first identifying, but more relevantly in mitigating water related risks in their business operations. To this end we have initiated a Water Stewardship Program with WWF. As a first step we have screened our portfolio for points of action and developed a water risk filter, which can be applied to DEG's current and future financing projects.

This project is a direct extension of our commitment to integrate both climate as well as water related risk into our business operations. It will allow DEG to better understand how water-related guidance and services can be developed for our partner institutions.

We would like to invite other financial institutions to work with us and WWF to further refine the water risk filter tool, to make it accessible to other institutions and to engage with clients on the ground to adapt to the fundamental challenges of climate and water related risks that we are facing today.

A handwritten signature in black ink, appearing to read 'Bruno Wenn', written over a light blue horizontal line.

Bruno Wenn
Chairman of the Board of Management
DEG - Deutsche Investitions- und Entwicklungsgesellschaft mbH

Message from the CEO of WWF Germany



Consider any of the major global challenges of the 21st century: climate change, population pressures, political upheaval, food security ... a common undercurrent is water. For too long, water has been an issue most of us have been able to ignore, but those days are gone. No

longer a concern limited to the poor and powerless – water has emerged as an issue that has resonance in boardrooms, corner offices and the halls of power around the globe.

Water is vital for ecosystems, for our shared priorities around energy, food and water security, as well as for the health and sanitation needs of the world's citizens. For business, almost every product and most services require water somewhere in the process or supply chain and this dependence often poses serious financial risks to companies. As such, companies are beginning to deal with the manifold issues surrounding water, its sustainable use and its associated risks.

WWF values the cooperation with DEG to address the topic of water risk. We believe it sends a strong message: An internationally active investor can demonstrate responsibility by working with the financial institution's own investments to better account for water issues and drive a water stewardship agenda. The financial sector has leverage to shape positive change on today's most pressing issues, water being a crucial one.

The aim of this project is to explore the potential risks that individual clients might face stemming from their exposure to water issues. It is extremely important to stress that the intention of this work is not simply to highlight or eliminate 'high risk' companies from the portfolio, or even to direct future investments. Rather the intention of this work is to leverage opportunities for improving company performance – both inside and outside the fence line – so that we can look beyond the perceived risks to create new opportunities: 'turn red into green'.

DEG and WWF will show how pressure on stressed water resources means both shared risk and shared responsibility. We will assist affected companies to optimise their own water use and discharge. Where water issues relate more to the world outside the company walls, we will provide tools to engage in the broader water management dialogue. Communication and engagement with other stakeholders is an indispensable component of a company's water stewardship journey; a journey that will develop all the more successfully with investors' awareness, support and facilitation.

We hope that other financial institutions will be inspired to follow DEG's lead in approaching water in such a proactive and practical manner, and integrate water risks and opportunities into their daily business operations.

Eberhard Brandes
CEO
WWF Germany

Executive Summary

It is understood that water is essential to life on Earth. It is also an essential ingredient in any production process, be it agricultural or industrial. Today, there is an increased awareness of the diverse ways in which water use can pose substantial threats to businesses in certain regions and sectors.

Business risk stemming from a company's relationship to water can be broken into three broad, inter-related categories: physical – as a result of too little, too much or polluted water; regulatory – with dwindling availability and increased pollution, the regulation of water is bound to become stricter; and reputational – public and media awareness of water and how companies are handling this resource is on the rise.

All of these risks can cause disruption of supply and, in worst cases, termination of business operations. As a result, financial institutions are advised to assess the exposure of their investments and credit portfolios, and learn how these risks affect their own clients and profitability. The awareness with regard to water risk is growing in the investor community, but concrete actions and practical approaches for clients are still lacking.

To help bridge this gap the DEG – Deutsche Investitions- und Entwicklungsgesellschaft mbH and WWF have undertaken this important project to create a practical tool that will help investors understand and analyse their exposure to water-related business risks. Our intention is to provide the conscientious investor with the knowledge to work with clients toward more sustainable water management, with the aim of mitigating both business and environmental risks.

The potential severity and extent to which DEG's client companies may face water risk was completed with an initial screening of all 319 non-financial client companies.

Out of the portfolio 124 potentially high risk companies were selected and sent an online Water Risk Questionnaire. The survey contained questions on water use, monitoring processes, governance and regulation. Forty-eight companies representing 65 operating locations completed the survey. Interestingly, more than half of the respondents indicated a need for water-specific assistance from DEG.

The World Business Council for Sustainable Development Global Water Tool was applied to all responding companies. This created a bank of high-level water scarcity information on a river basin level, which became input parameters of the eventual Risk Filter.

Because a substantial part of a company's water risks will always be tied to its geographical location, all of DEG's client companies were mapped as overlays on two different GIS maps. The first represented the threat to human water security and biodiversity, and the second showed proximity to WWF's priority river basins. The majority of DEG's portfolio is located in areas with a high threat to biodiversity, and a third of its portfolio is located in one of WWF's global freshwater eco-regions.

The Risk Filter also relies on water risk country data sets for the 85 countries where DEG's clients are currently active. Every data set consists of a detailed description and 33 relevant water indicators. These data sets serve as reference points to portfolio managers.

The Water Risk Filter uses all these resources to highlight areas that may require special consideration regarding a company's water risk exposure. The risk evaluation is divided into basin-specific and company-specific risks, as both have a particular bearing on mitigation options and opportunities. If, for example, risks are mostly tied to a production facility's geographical location, then mitigation responses that only focus on improving water efficiency and effluent quality may not prove sufficient in the long run. Rather, a more holistic water stewardship approach will be a more effective mitigation option. Water stewardship refers to communication and engagement with community, private sector and government stakeholders to plan, support or implement better basin-wide water management.

To arrive at a risk evaluation for a specific company, the Water Risk Filter uses a large set of risk indicators. These indicators are all based on publicly available datasets with global coverage selected and compiled as part of this project. The second strain of water risk assessment draws on specific information from the water risk questionnaire and is more specific to the company.

In total, 22 river basin- and 26 company-related risk indicators were used in the Water Risk Filter, covering all areas that influence water risk levels. The indicators are weighted according to relevance in the assessment of water risk. By assembling the different input databases and relating them to individual company reference numbers, answers for >90 % of the indicators are automatically provided, a particularly helpful feature for users with little background in water management.

The Risk Filter was applied to 65 operating locations which returned the water risk questionnaire. 46 % of these locations were identified as potentially having (very) high basin related risk, and 57 % as having a (very) high company related risk.

The Risk Filter also includes a far simpler 'pre-assessment,' which only requires very basic input of the country or basin the company is located in, as well as the relevant industry sector. Given the minimal amount of information required, it is possible to conduct a high-level risk screening at the very first point of contact with a company. DEG's entire non-financial sector portfolio was scrutinised with the pre-assessment; of the 319 companies, 191 were classified as having either potentially high basin-related or potentially high industry-related water risk, or both.

With the results from the water risk assessment, DEG will focus efforts and funds on helping individual clients or groups of clients facing the greatest water risk.

The current version is fully functional in assessing a company's water risk, but the Water Risk Filter was always envisioned as an evolving tool that would be shared with other companies. Now that the first version is completed, further testing and on the ground application will highlight areas that require improvement and further thought. The set up of the tool allows for easy adjustments.

It has been generally recognised that the supply chain can and often does hold substantial amounts of water related risks. This aspect of risk is currently under-represented in the Filter's methodology and weightings, mainly due to companies' reticence to share the information necessary to consider these risks realistically. This will be one of the core issues tackled in the next phase of this project.



Water pollution in Karachi, Pakistan

1. Setting the Scene - Water as a Risk Factor

1.1 Background – Why Water Matters

It is becoming clear to many people, both inside and outside of business, that water issues are worth paying attention to. It is genuinely difficult to reconcile the dietary and other requirements of humanity's growing population with the water needed to maintain key functions – one that literally keep us alive. Already 41 % of the world's population live in areas of severe water stress, 1.1 billion people lack access to safe drinking water and 2.6 billion lack adequate sanitation services. In the developing world up to 70 % of industrial wastewater is disposed of without treatment¹ and global freshwater biodiversity has declined 35 % between 1970 and 2007.² The implications for us are clear: meeting the water needs of society, business and the environment in the future will be heavily constrained by the scarcity and quality of freshwater.

The consistent availability of clean water underpins shared action on health, food security, energy security, poverty reduction, economic growth, conflict reduction, climate change adaptation and biodiversity loss. But increased exploitation of water resources across the world has led to significant degradation of ecosystems and the goods and services they provide. In many places, the result has been rivers that no longer reach the sea, lakes that are a fraction of their natural size and aquifers whose levels have fallen drastically. As well as being an issue of concern to environmentalists and communities, over-exploitation of water has economic risk implications for businesses and can adversely affect the ability of governments to meet a broad set of policy goals related to water in the economy.

Importantly for business, their needs for water and the ways in which they use, dispose and operate their facilities, will be increasingly under the spotlight and open to the scrutiny of society, communities, governments, media and increasingly, investors. The concept of risk can be used to describe these impacts and highlight potential responses to be undertaken.

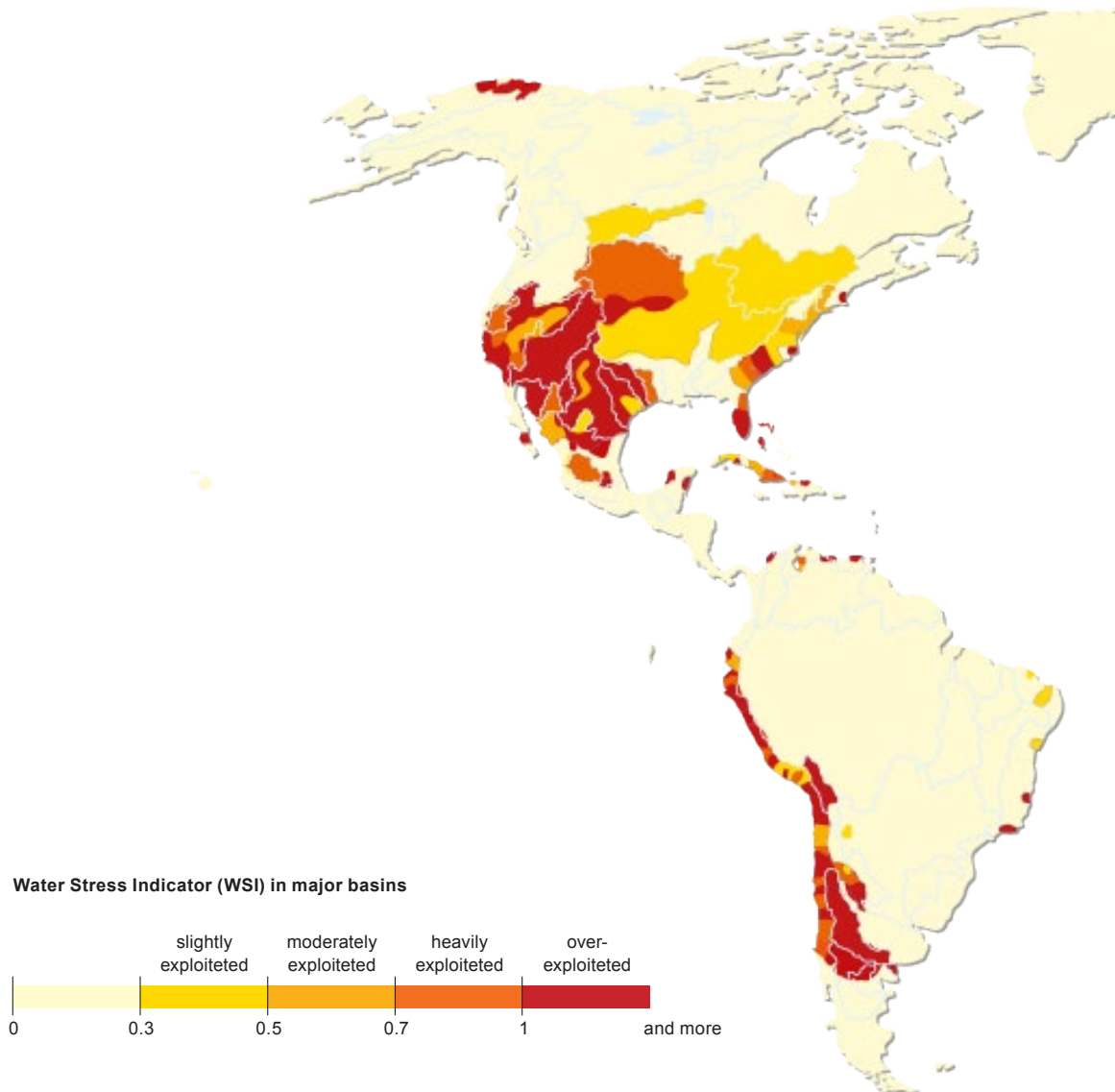
1.2 Global Water Trends

Regional differences

Today, there is a significant physical risk for adequate human water supply in Central-South America, the Middle East region, Eastern Europe, Sub-Saharan Africa and areas of Central-South Asia including China. In most of these areas, declining water availability is also posing a threat to river biodiversity and ecological processes.³ In other parts of the world (mainly North America, Western Europe and some areas in Australia), water security for humans has (temporarily) been ensured, but often with the burden of significant economic (infrastructure) investments and a deterioration of river ecosystems and other freshwater bodies.

In addition, economic risk derives from the consequences associated with extreme phenomena (e.g. flood episodes, tropical storms or drought episodes) or lack of reliable supply networks, scenarios which apply to many regions of today's world (Central-South America, Sub-Saharan Africa and South Asia).⁴ According to projections on future water stress, for instance of the Water Stress Indicator (WSI)⁵ (Map 1), it is anticipated that the pressure on this already stressed resource will be exacerbated in the next few decades.

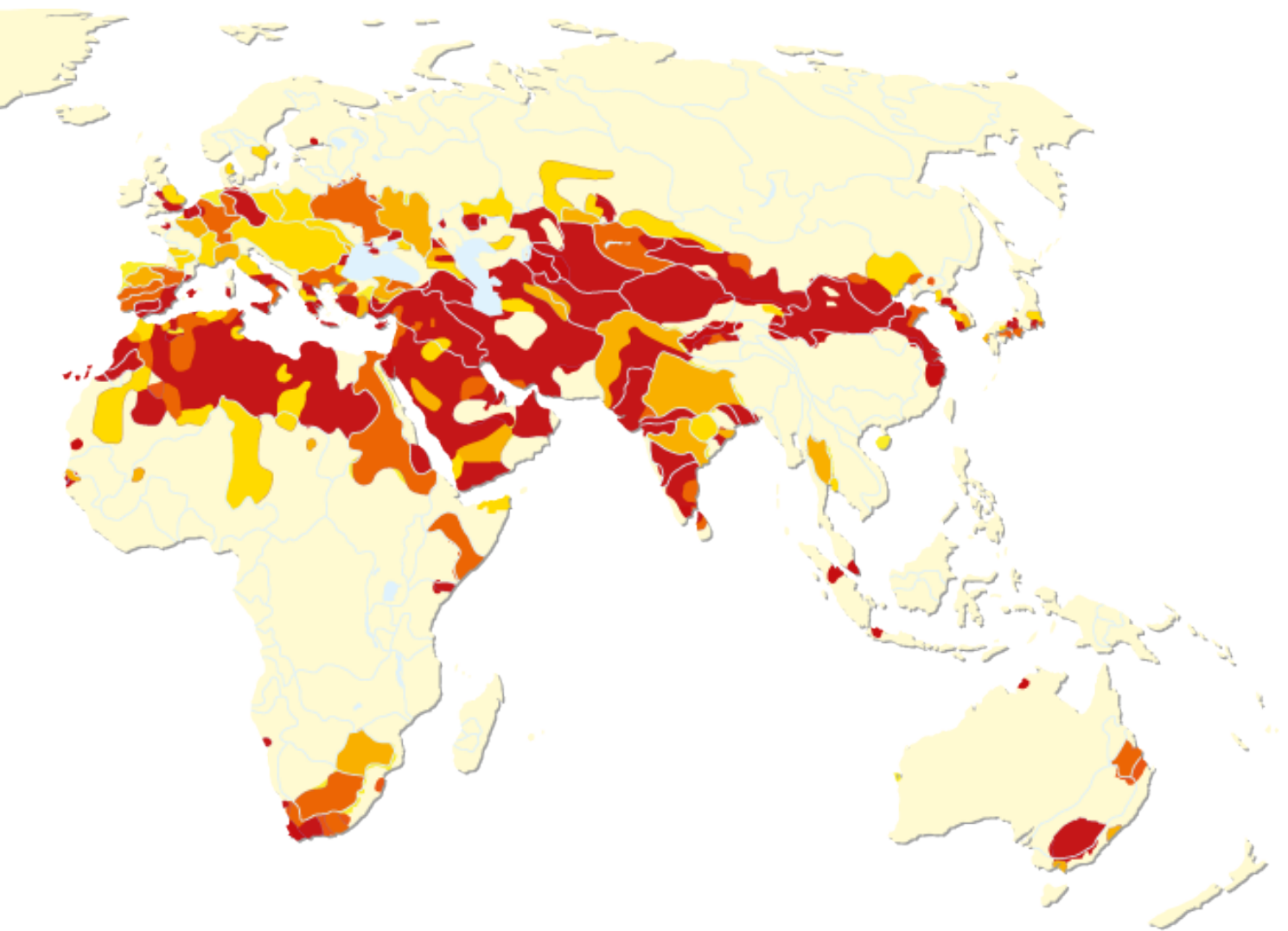
Map 1 Water Stress Index.⁶ Philippe Rekacewicz (*Le Monde diplomatique*), February 2006



Population Growth

In this century, Africa and Central and Southern Asia will experience a high increase in population, reaching a stabilisation in the last decades of the century. The population in the Middle East region and Central and South America will also continue to grow, but at a lower rate than in Africa and Asia. China shows a pattern of moderate growth followed by a clear decline in the number of people. In developed countries,⁷ a stabilized or shrinking population pattern – currently the case in Northern America and Europe – will also lead to a much older population.⁸ This will lead to increases on water demands, not only for human consumption (e.g. drinking water, irrigation withdrawals for food production), but also for other uses related to changes in human behaviour due to healthier and longer lives.⁹

Urbanization and rising incomes, especially in the BRIC countries, will lead to higher consumption patterns. Shifts and increase in demand for different food crops and specifically meat will result in higher per capita water requirements. To feed the larger and richer population a near doubling of water for irrigation has been projected for some areas.



Climate Change and Water Stress

Another major driver for increasing pressure on water resources is climate change, which will possibly aggravate the effects of other water stressors and alter the reliability of current water management systems and infrastructure. As a result, many areas which today suffer from aridity will likely experience increasing water scarcity,¹¹ like the Mediterranean, Central and Southern Africa, Europe and Central and Southern America. Some areas of Southern and Central Asia will likely experience an increase in the overall runoff, although this will generally occur during the wet season and thus may provoke flood episodes¹² without providing water during dry seasons.

Industry and Water

When looking at where new improved approaches to water management are required, it is important to note that agriculture accounts for by far the most human water consumption. On a global level 70 % of human water use goes into cultivating crops and rearing livestock.¹⁴ In developing countries the proportion often reaches 90 %. The industry and energy sectors together account for 20 % of global water consumption. The remaining 10 % are consumed in households.¹⁵

1.3 Water Risks, Business and Financial Institutions – Why Water is Different from Carbon

As well as being an issue of concern to environmentalists and communities, over-exploitation of water has economic risk implications for businesses and can adversely affect the ability of governments to meet a broad set of policy goals related to water in the economy.

Most producing industries' direct operations rely, more or less heavily, directly on water. These industries will no doubt understand the concept of water risk and find it applicable to their businesses. But even where such risks may not be so obvious in direct operations, the supply chain may well hold substantial concern, especially for businesses relying on resources from agriculture or the extractives industry. Any of the risks outlined in Box 1 can in worst case scenarios lead to business disruptions or even operational closure. Physical, regulatory and reputational risks are interlinked; where water is becoming increasingly scarce, regulation is more likely to become stricter and the public will be more apprehensive about a business's relationship to water where communities do not have access to sufficient amounts of water that fulfil their basic needs and expectations.

Box 1 | Water Risks

Different aspects of a business' relationship to water and the local water context can pose a number of potential water related risks. Different frameworks and definitions exist for these different types of water risks to business operations. In this report and throughout this project, the most common categories are used: physical, regulatory and reputational risks

Physical risk

Relates to water quantity (scarcity and flooding) and water quality that is unfit for use (pollution). Physical risk may mean that a company might not have sufficient amounts of good quality water for their business operations and supply chains.

Regulatory risk

Relates to the imposition of restrictions on water use by government. This may include the pricing of water supply and waste discharge, licenses to operate, water rights, quality standards etc.

Reputational risk

Relates to the impact on a company's brand + image and can influence customer purchasing decisions. Reputational risk manifests itself through tensions and conflict around access to water or the degradation of local water resources. In a highly globalised information economy, public perceptions can emerge rapidly around business decisions that are seen to impact on aquatic ecosystems or local communities' access to clean water.

In a short space of time, as water awareness has increased within the private sector, an spree of activity has taken place to deal with these concerns. Reports, tools, studies and initiatives have sprung up to accommodate a range of sector specific concerns related to water. At their most general these responses have spanned water accounting to public policy concerns. Investors have also joined the fray, mostly from an investment analyst perspective, demanding information from listed companies and providing this to the financial institution's clients, whilst largely neglecting the potential risks to their own investment portfolios. Corporate and investor risk related to water is an emerging issue and is likely to become more significant due to continued poor management and poor-valuation for this resource, as well as water stress internationally and growing public awareness.

Many companies and investors, have tended to treat water in a similar way to carbon. It is crucial, however, to recognise that water is fundamentally different for a number of reasons.

The availability, management and impact of water are local at a watershed or river basin level. This means that business and investor risk around water is fundamentally related to location and exposure to local water conditions. Conversely, the most effective response will be improved management and taking account of the local context. This is the complete opposite of the global management and markets around carbon. With carbon the resulting climate impacts are not necessarily felt where the carbon is emitted. This had led to carbon offsetting, where carbon emissions are reduced elsewhere to account for potential damage caused elsewhere. With water this is not feasible, as shortcomings in water management are always felt locally, rather than globally, which is the case in the carbon and climate context.

Finally, water is fundamental to life and human dignity. This social and cultural dimension is juxtaposed with the need for water in various production processes, which imposes an economic value on water. It is this duality, together with the need for water to support all ecological processes, which has resulted in water resources and their typically monopolistic management being the domain of government in the 'public interest'. It is within this reality that water management, investment and solutions must be crafted – and crafted in such a way as to not ignore the human, social and environmental elements of water in our lives.

1.4 Water Stewardship – Turning Red to Green

Water Stewardship is a term used here to refer to company behaviour and performance around water. From WWF's experience in working closely with business on water issues, the strongest 'Water Stewardship' response from the private sector will encompass a full set of measurement and internal management decision making on water, and is ultimately much more about how companies perform and behave in the water contexts in which they find their operational facilities and their supply chains. At its core, Water Stewardship is a response to risk and manifests itself in all efforts to conserve, restore and manage water resources and freshwater ecosystems in a sustainable manner, by engaging all stakeholders, including the private sector, in voluntary action at the local, basin, national, and global levels.

Defining and guiding the right set of responses to water challenges is essential to bring about the right set of societal, environmental and business outcomes. Just driving efficiency will not amount to much if the cumulative draw on the resource is too high. Communication with the other private and public stakeholders relying on the same resource is central, as is engagement in forums or organisations on a river basin or watershed level where dialogue and discussion on water issues is held. Where no such platforms exist, forerunners on water topics may want to consider founding new ones. Being a water steward means to proactively invest in conservation, restoration and management of rivers, lakes and aquifers as action at the watershed level will be paramount. In many cases this approach will have pioneering qualities, therefore being a water steward also means leading by example. Striking the balance between internal and external action is at the very heart of company action on water. This approach presents challenges for companies, but also helps to turn risk into opportunity.

1.5 Other Water Risk and Assessment Tools

Since many of the issues that surround water are widely acknowledged, there already exist a number of tools for water accounting and water risk assessment. Of the currently available tools, none yet represent a comprehensive water risk matrix specifically designed for financial institutions.

One of the great difficulties is to quantify and meaningfully analyse water risks and impacts due to a lack of systematic measurement and data. The obvious approach, which most tools take, is to look at water consumption in comparison to water availability. It is true that most issues will stem from not having enough water for one's needs. Abstraction regulations will become tighter when it becomes clear that competing needs for the same meagre resources are resulting in conflict. The same goes for regulations on water quality and discharge. The public will look more suspiciously on companies using vast quantities of water or the pollution resulting from factories processes in regions where the water needs of the community and/or the ecosystem can no longer be met.

It is by far more difficult to quantify regulatory, reputational and (due to a lack of data) water quality aspects of water risks. Another difficult subject of major importance when trying to meaningfully assess water risks is the inclusion of the supply chain. A lack of information and possibly awareness has meant that issues associated with a company's supply chain are not sufficiently included in any of the currently available water risk tools.

A table with a short outline of the current water risk and assessment tools can be found in the Appendix.





Asparagus cultivation in the Peruvian desert

2. The DEG - WWF Water Risk Assessment Project

2.1 Outline of the Project Purpose and Methodology

As a financial institution with a strong development agenda, DEG has been considering climate change related risks and responses for some time. In 2009, DEG published a best practice report together with CERES and RiskMetrics on financial institutions in emerging markets and their approaches to addressing climate change related risks based on the results of questionnaires sent to DEG's financial sector clients.

During this work and as a result of a detailed engagement with the topic of climate change, DEG established water as a critical field in which impacts of climate change would manifest themselves. The obvious next step for DEG was to investigate deeper what this would mean for DEG's client companies and effectively DEG to then potentially integrate water more prominently into their existing environmental and social risk assessments.

Box 2 | DEG's Environmental and Social Risk Indicator

The 'Environmental and Social Risk Indicator' (EaSI) is an integral part of the environmental and social examination of DEG projects. In all project phases, it provides a quick and clear first insight into the environmental and social category, performance and risk of the project and the underlying initial information. The comparison of the planned and actual status related to some basic contractual obligations regularly reveals the need for action and/or the success of the DEG commitment. EaSI is a simple model, which can reflect complex situations with sufficiently high accuracy. As such, it objectifies and standardises the risk assessment of the environmental and social processes within DEG. EaSI is a knowledge management and know-how analysing tool at the same time.

Environmtl. Category	Social Category	Environ. perf. (actual)	Social performance (actual)
A	A	86	40
Role DEG (Environmental)	Role DEG (Social)	Environ. perf. (contractual)	Social performance (actual)
Significant	Significant	137	137
Image risk DEG	Image chances DEG	Environ. risk index	Social risk index
Medium-High	Medium-High	M-U 13	M-S 16

WWF engages with private sector companies and investors to establish and work towards more sustainable water and watershed management. The topic of water risks to business has been a prominent consideration in WWF's freshwater agenda.

This shared interest in water related business risks and the vision to establish practical approaches to meaningfully influence the world's perception and treatment of a resource as vital as water, was the corner-stone of this cooperation.

The aim of this project was to develop a methodology for financial institutions in general and DEG in particular, to enable us to, assess and quantify any clients' related water risk. This tool was developed to allow a financial institution employee with potentially little environmental expertise to reasonably and quickly arrive at a detailed and yet comprehensive assessment of a client's relationship to water and the potential issues and risks arising from this relationship.

Box 3 | What is the envisaged use of the Water Risk Filter at DEG?

- All companies of the existing and future DEG portfolio will undergo a high level risk assessment ('pre-assessment') to identify high potential water risks. This simple assessment can be done in little time and only needs a bi-annual update
- All companies where high potential water risks were identified in the pre-assessment should perform the full risk assessment. This needs to be updated annually or bi-annually. For potential investments, the goal is to understand where risks are located and how they can be mitigated. This tool is not designed to be a road-block to investment opportunities
- Based on the outcomes of the full risk filter, DEG can decide where to act on risk hotspots by engaging with the client company on how to mitigate the highlighted risks

The box above outlines the need to develop two tools.

- A simple 'pre-assessment' tool to be used for all existing and potential new clients, which should give a high level risk indication in a matter of minutes.
- A detailed and comprehensive water risk tool, to be used for the most risk exposed client companies.

To date, no similar tool for quantifying water risks exists that is tailored towards a financial institution's needs to assess a client's risk. The real goal for the tool is to empower investors to make informed decisions on their credit and investment portfolio and to enable them to proactively support the development of mitigation measures and more sustainable water practices. This will ultimately improve water management on a company level and water stewardship on a basin level.

The tool helps the company to visualize areas which need particular attention in order to avoid any negative impact to the company, surrounding communities and others. Furthermore, this tool is a first step to ensure that sustainable water use becomes an integral part of any sustainability and/or climate change policy from the financial institution.

Both DEG and WWF share the vision that once the tool is fully developed and has been practically applied, it should be easily accessible by financial institutions or other organisations wishing to use the tool. In order to promote sustainable economic growth and improved living conditions through private investment, it is the responsibility of development finance institutions like DEG to ensure that companies not only apply international environmental and social standards, but also promote additional strategies for sustainable businesses, of which the Water Risk Filter developed in this project is a good example.

Two additional outputs of the project were identified; the mapping of DEG's non-financial sector clients in two different maps as an additional risk assessment (section 2.5) as well as the creation of water risk country data sets for all countries in which DEG is active through the clients or the clients' suppliers. The data sets are to be used as first points of reference regarding water risks (section 2.6).

This first phase of the project began in May 2010 and is finalised with this report. The key steps of the first phase are briefly outlined below:

1. **Initial screening of DEG's current portfolio** – In a high level assessment all of DEG's 319 non-financial institution clients were assigned risk levels based on the country they operate in, as well as their industrial sector's direct operations and typical supply chain.
2. **Online water-risk survey** – A selection of 124 high-risk clients from the initial screening were sent specifically designed water risk questionnaires collecting information needed for the WBCSD Global Water Tool as well as the final Water Risk Filter Tool. Forty-eight companies replied to the request, representing 65 operational locations (One company might own more than one operation site).
3. **WBCSD Global Water Tool** – As a further screening and source of complimentary information on a basin level, the relevant companies' answers from the survey were fed into the WBCSD Global Water Tool.
4. **GIS mapping** – All known 477 operational sites of DEG clients were mapped against WWF priority river basins as well as indicators of human water security threat and biodiversity threat.
5. **Country data sets** – Water risk data sets were developed for the 85 countries where DEG's clients are active, either directly or indirectly through their suppliers.
6. **Water Risk Filter** – Developed the Water Risk Filter methodology and tool using input from the previous steps and other databases. The tool was applied to the Forty-eight clients that responded to the water risk survey, some of which had multiple production sites.

2.2 Initial Screening of DEG's Current Portfolio

To gain a first understanding of the potential severity and extent to which DEG's client companies may face water risks, and to test the eventual risk filter with a selection of likely 'high risk' client companies, all of DEG's 319 non-financial client companies, spread across 68 countries, were screened in a high level assessment. As the basis for this assessment two indicators were established. First was the water situation tied to the geographic location of the company operations, and secondly, a 'typical water risk' screen for the respective industry.

- Indicators for geographically bound water risk level: the amount of available freshwater resources per capita per year and percentage of total actual renewable freshwater resources withdrawn, both taken on a country level from FAO's AQUASTAT.¹⁷
- Indicators for industry related water risk: Qualitative assessment of the relationship to water for the 57 industries as defined by DEG, focussing both on the industry's direct operations as well as on their supply chains.

All indicators were split into high, medium and low water risks. For both the country water risk indicator as well as the industry indicator, the higher of the two indicators was used as an overall indication of risk. This initial screening resulted in 191 companies being classified as having potentially high water risk on either the company or the country side of the risk assessment, or both.

Figure 1 Results of the Initial Screening

Country related risk	High	3	12	20
	Medium	30	52	79
	Low	17	29	77
		Low	Medium	High
		Industry related risk		

This initial screening evolved during the project into a tool that can be used in minutes, with improved underlying data for the industry related risk, and with the geographically bound risk based on a river basin level instead of country level data (See ‘Pre-Assessment Tool’ in Section 3.4).

It is important to note that the DEG portfolio is mostly situated in developing countries with often higher water risk profiles. The initial screening was performed on a client company level, whereas the detailed Risk Filter assesses each single operational site.

2.3 Water Risk Survey

Of the 191 companies identified as ‘potentially high risk’, 124 companies were selected to undergo further analysis and sent a specifically prepared online water risk survey. The survey was designed to collect information on the water withdrawal, reuse, recycling and discharge information required for the WBCSD Global Water Tool (see Box 6). Furthermore, it collected important (mostly qualitative) information to be used in the eventual Risk Filter. The receiving companies were asked to fill in the questionnaire for every operational site, as water related risks are highly local.

WWF and DEG recognise that it can be challenging for certain investors to demand this type of information from multi-national companies when they may have over 100 operating sites. For a development financial institution such as DEG, it is less problematic as they are most often the major investor, and most of their client companies have less than 10 operating sites.

Most questions in the surveys originated from:

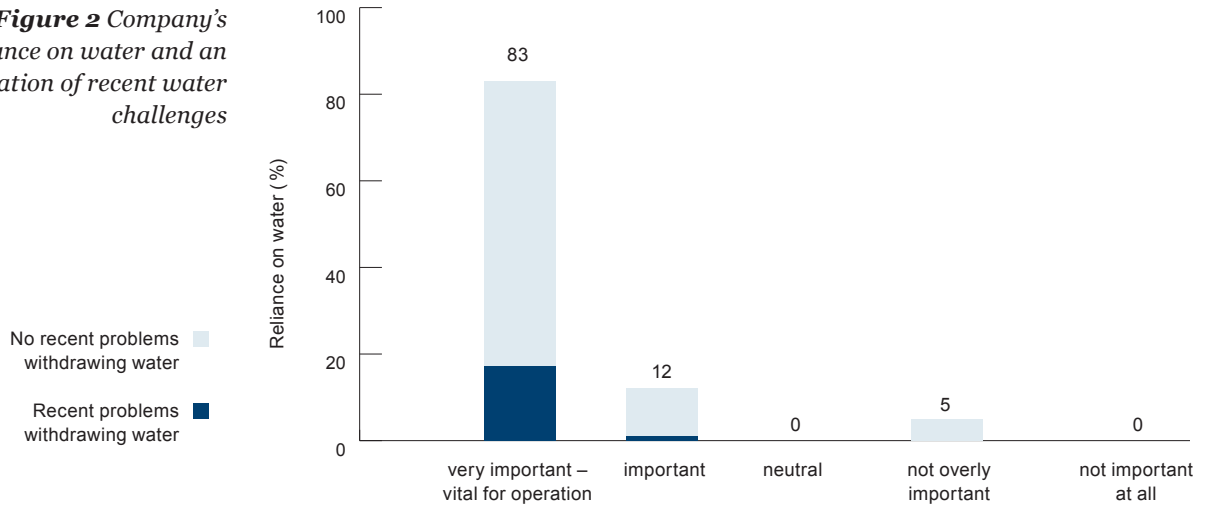
- Previous WWF Water Stewardship work
- WBCSD Global Water Tool
- Carbon Disclosure Project (CDP) Water Initiative¹⁸
- CERES and Pacific Institute: ‘Water Scarcity and Climate Change’ report¹⁹

The survey was sent out in multiple languages and in three different versions, one for hydropower stations, one for water suppliers and one for all other industries. 48 Companies replied for 65 locations in 30 different countries. This response rate of ~40 % is highly acceptable considering the extra effort companies had to put into completing the questionnaires. Food and Beverages (11 replies), Agriculture and Hydropower (both 7) were the sectors with the most replies, reflecting DEG’s diverse portfolio. For developing countries, China dominated with 8 replies followed by India and Peru (both 3).

An updated version of the survey has been prepared, which is in line with the final version of the Water Risk Filter, and which can be integrated into DEG's annual environmental questionnaire to client companies.

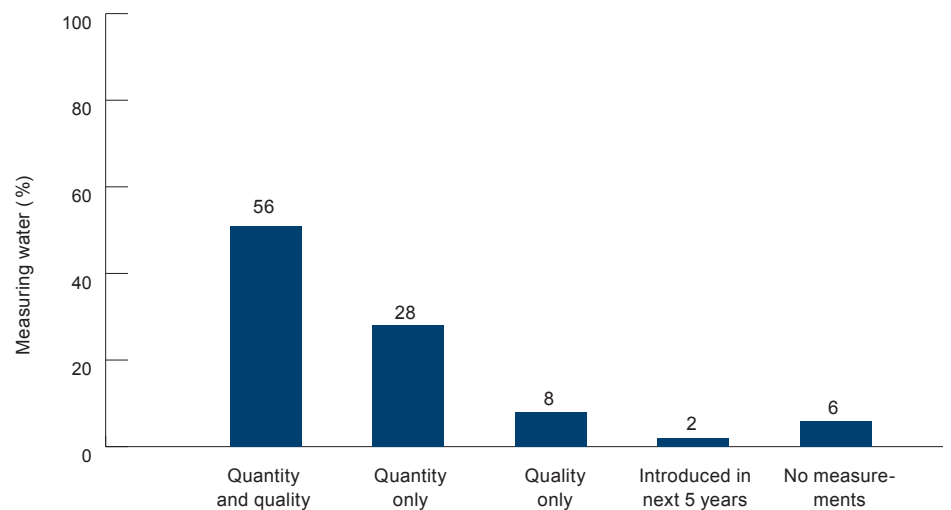
A selection of the survey results are presented in the following graphs.

Figure 2 Company's reliance on water and an indication of recent water challenges



A vast majority, 84 % of the production sites, stated a heavy reliance on water for their operations. One quarter of these sites have experienced difficulties in accessing the required amounts of water for their operations and therefore may see the urgency for action regarding water management and stewardship.

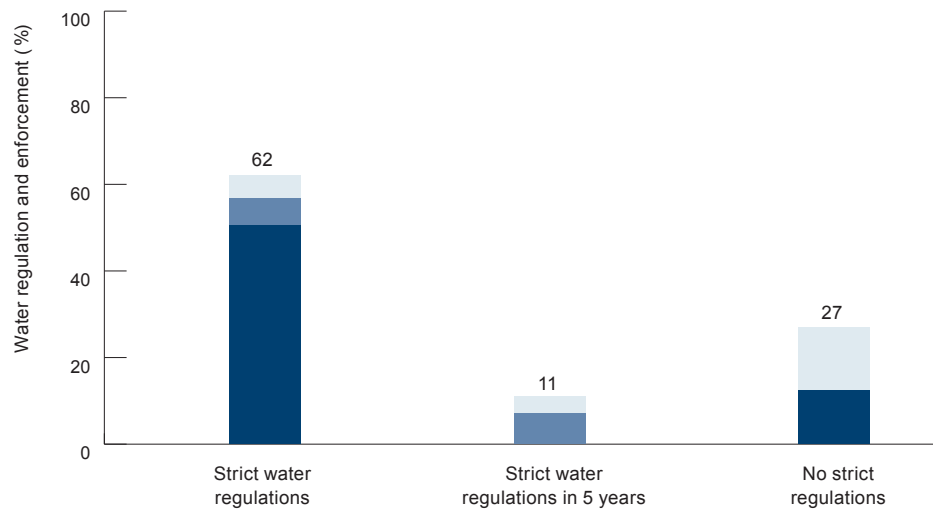
Figure 3 Quantity and quality measurements



Measuring water quantity and quality is a pre-requisite for water awareness in companies, and the starting point of water management. Only half of the assessed companies currently measure quality and quantity of water abstracted and discharged, leaving room for improvement.

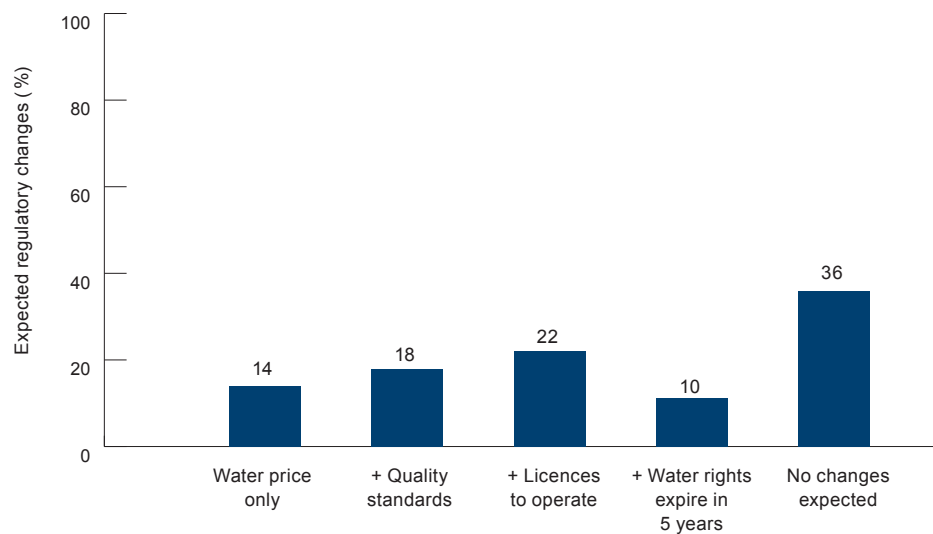
Figure 4 Water regulation and enforcement

No strong enforcement
 Strong enforcement
 expected in next 5 years
 Strong regulatory enforcement



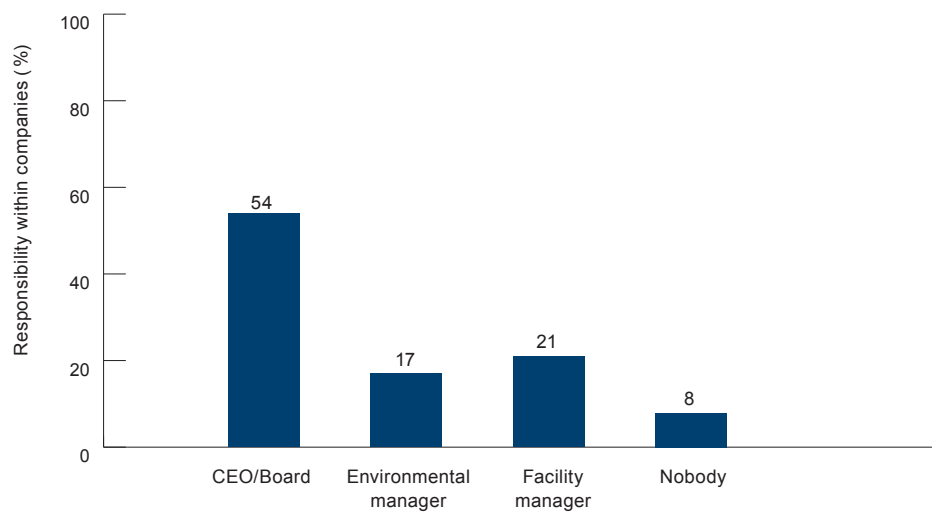
For a majority of production sites, companies stated that regulation is strict and enforcement is strong. At ~10 % of locations, regulations are expected to become stricter within the next five years and at ~10 % locations, enforcement is expected to increase.

Figure 5 Expected regulatory changes



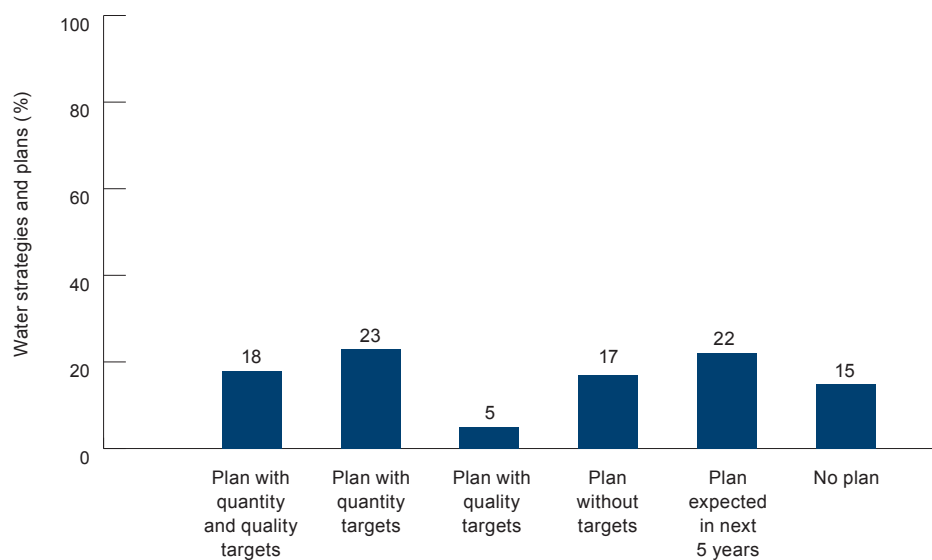
With a substantial amount of the assessed companies expecting some sort of regulatory change, including the expiration of water rights and licenses to operate, this is a critical, if complicated area for further focus. Usually companies will not have much influence on these changes themselves. Good communication with other stakeholders, both public and private, as well as preventatively assuring that new regulations are met prior to their introduction will (partly) mitigate resulting regulatory risks.

Figure 6 Responsibility of water related issues within companies



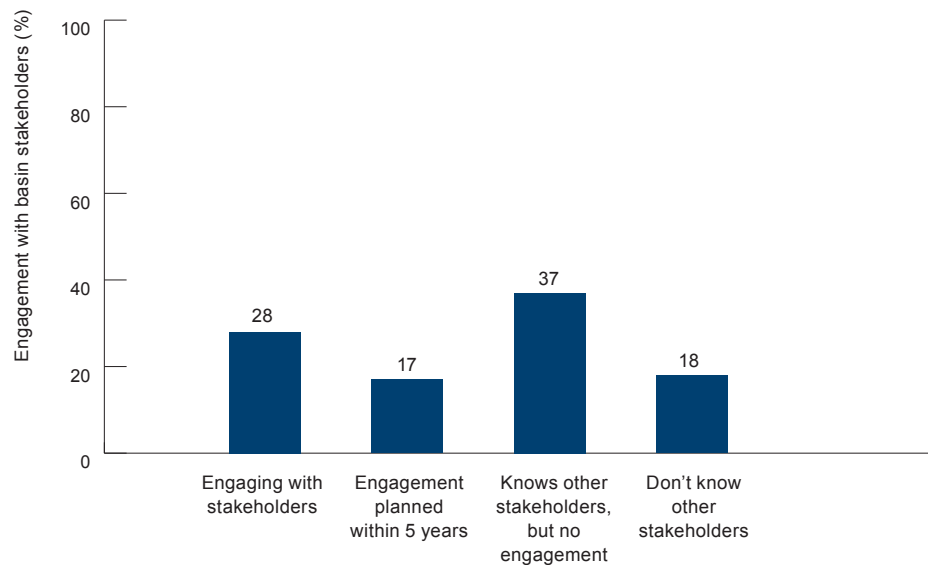
A clear definition of roles and responsibilities are important for internal water management. The 8% of assessed companies with no clear responsibility for water issues is highly worrying and points towards a lacking sensitivity towards the seriousness of water risks.

Figure 7 Content of water strategies and plans



A majority of companies claim to have a water policy in place. Of those, 12 also have a contingency plan. Four companies without a water policy do however have a contingency plan in place and another 18 plan to introduce such a plan in the near future.

Figure 8 Engagement with other river basin stakeholders



18% of respondents did not know other stakeholders in the production site’s river basin. Of the remaining, just 28% engage with these local stakeholders and another 11 want to do so in the future. Of the respondent’s locations, 17 water basins have official forums to discuss basin wide issues and the creation of such a platform is planned in another 10.

One of the questions in the survey relates to the client’s readiness and need for water specific technical assistance (TA). This call was met with 39 respondents in favour of such measures. More specific suggestions were in regards to water efficiency (13 responses), assistance with contingency planning, EU regulations and water basin governance with the wider stakeholder community (11 respondents), and 10 clients were interested in water treatment (wastewater treatment 8, and 2 for water reuse).

Very few companies in DEG’s portfolio deal with water risks outside their own facilities – a trend that is mirrored across the world. Two examples of companies which are optimizing water use and the company’s relationship to water and which have realized the importance of looking beyond the metaphorical factory gate are briefly introduced in the following boxes.

Box 4 | Company
example 1: Sekem

Sekem, an agricultural producer, is located in Egypt, a country well known for water scarcity and heavy reliance on irrigation water from the river Nile. Libra Organic Cultivation, one of Sekem's subsidiaries, also heavily relies on irrigation and withdraws around 50% of its water from surface water and the other half from groundwater supplies. However, less than one sixth of legally allowed withdrawal rates are actually abstracted and around one fifth of this water is recycled. Sekem engages actively with other farmers through the Egyptian Biodynamic Association to further the concepts of sustainable water and soil management and are also involved in the 'Technology management and integrated modelling for natural resources – win-win university enterprise partnership (TEMPUS-Project)' a joint Masters degree between European and Egyptian universities with a very large focus on water management.

Box 5 | Company
example 2: ISA Tan Tec

ISA Tan Tec is a German – Chinese leather manufacturer that received a loan from DEG for the development of a new production site in Vietnam.

ISA Tan Tec produces 'LITE Leather' which requires 30% less water and 50% less energy, than conventionally produced leather. ISA Tan Tec also has a detailed water policy and water saving plan. Cooling water is reused and recycled, water efficiency measures are in place and waste water is treated on site. As part of the wider water policy, ISA Tan Tec publishes the water used per m² for every product, with the aim of setting new standards for the industry. Further the new production site in Vietnam saves 35% of CO₂ emissions compared to an average tannery.

2.4 Application of WBCSD Global Water Tool

The WBCSD Global Water Tool was applied to DEG’s clients in this project as a further risk screening. The World Resources Institute (WRI) Watershed scarcity data, as generated by the Global Water Tool is also included as an indicator in the Water Risk Filter.

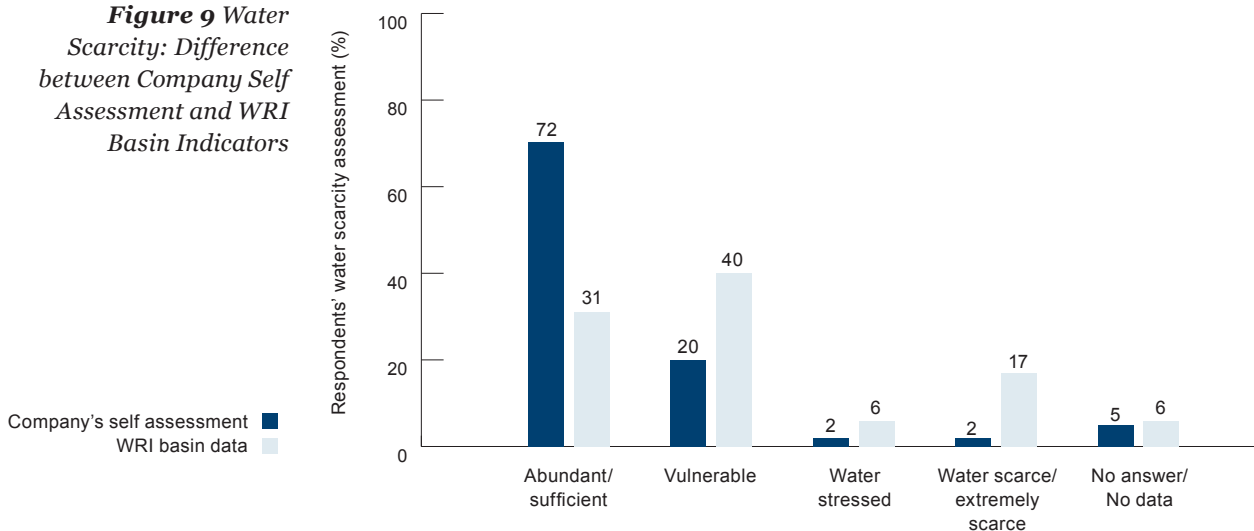
For companies that replied to the survey, the WBCSD Global Water Tool excel files were filled in for all operational sites. The numerical outputs of the WBCSD Global Water Tool need to be read with caution, as some provided inputs may not be realistic, as some of the original questions - especially on reused and recycled water may not have been clear to respondents.

Box 6 | WBCSD Global Water Tool

The World Business Council for Sustainable Development Global Water Tool is freely available on the internet (www.wbcsd.org/web/watertool.htm) and comes in the form of an excel sheet, which makes it very easy to use and requires very little input. The application and the results of the tool are easily understandable. The Global Water Tool looks at water quantity and where water is sourced from and returned to. For a deep risk assessment the tool does not capture enough detail, but as a first snapshot and high level risk screening tool the Global Water Tool is highly practical with a mapping function that illustrates scarcity aspects clearly.

The automatic locating of DEG clients and linking to water relevant data sets on a basin level were of great value. One interesting result was the discord between many companies’ assessment of freshwater availability and the actual WRI data computed by the Global Water Tool. Only for 1/5th of the 65 locations were companies’ assessments in line with the WRI data. This might point towards a worrying trend of poor awareness of scarcity issues amongst DEG’s clients.

Figure 9 Water Scarcity: Difference between Company Self Assessment and WRI Basin Indicators



2.5 GIS Mapping – Visualising Water Risks

As a substantial part of a company’s water risks will always be tied to the geographical location of the operational facility, DEG’s entire current portfolio, excluding financial institutions, was mapped on two different Global Information System (GIS) maps. With information obtained through the water risk surveys or already held by DEG, it was possible to map 477 of 483 clients.

The first map is based on the findings of a recent report by Vörösmarty et al., 2010²⁰. This map indicates areas with low or high threats to human water security and/or low or high threats to biodiversity. It is clear that the majority of DEG clients are located in areas with a high threat to biodiversity and in a substantial portion of areas with a high threat to both biodiversity and human water security. It should be noted that all of these high risk areas are located in developing countries and emerging markets. As a development financial institution, DEG is bound to invest in these regions. As stated earlier, it is vitally important to not regard areas identified in ‘red’ as no-go areas, but rather to explore the opportunities these areas hold for improvement in on sight water management and basin water stewardship. The table below outlines the locations of DEG clients as found on Map 2.

Figure 10 DEG Client Locations on Vörösmarty et al Map (no data for 21 companies)

Threat to Human Water Security	High	0	244
	Low	16	195
		Low	High
		Threat to Biodiversity	

The second map outlines WWF’s priority places. More precisely, these are the 53 freshwater places from the WWF Global 200; a list of eco-regions with particular conservation value. The list was compiled as a list of areas that if conserved, would maximise the diversity of Earth’s eco-regions and biodiversity saved. The 12 WWF priority river basins are the second indicator outlined on the map (Map 3). This map was drawn up to a) help WWF map corporate activities in these highly valued places, and b) to show areas where economic activity should be highly sensitive to freshwater and freshwater biodiversity.

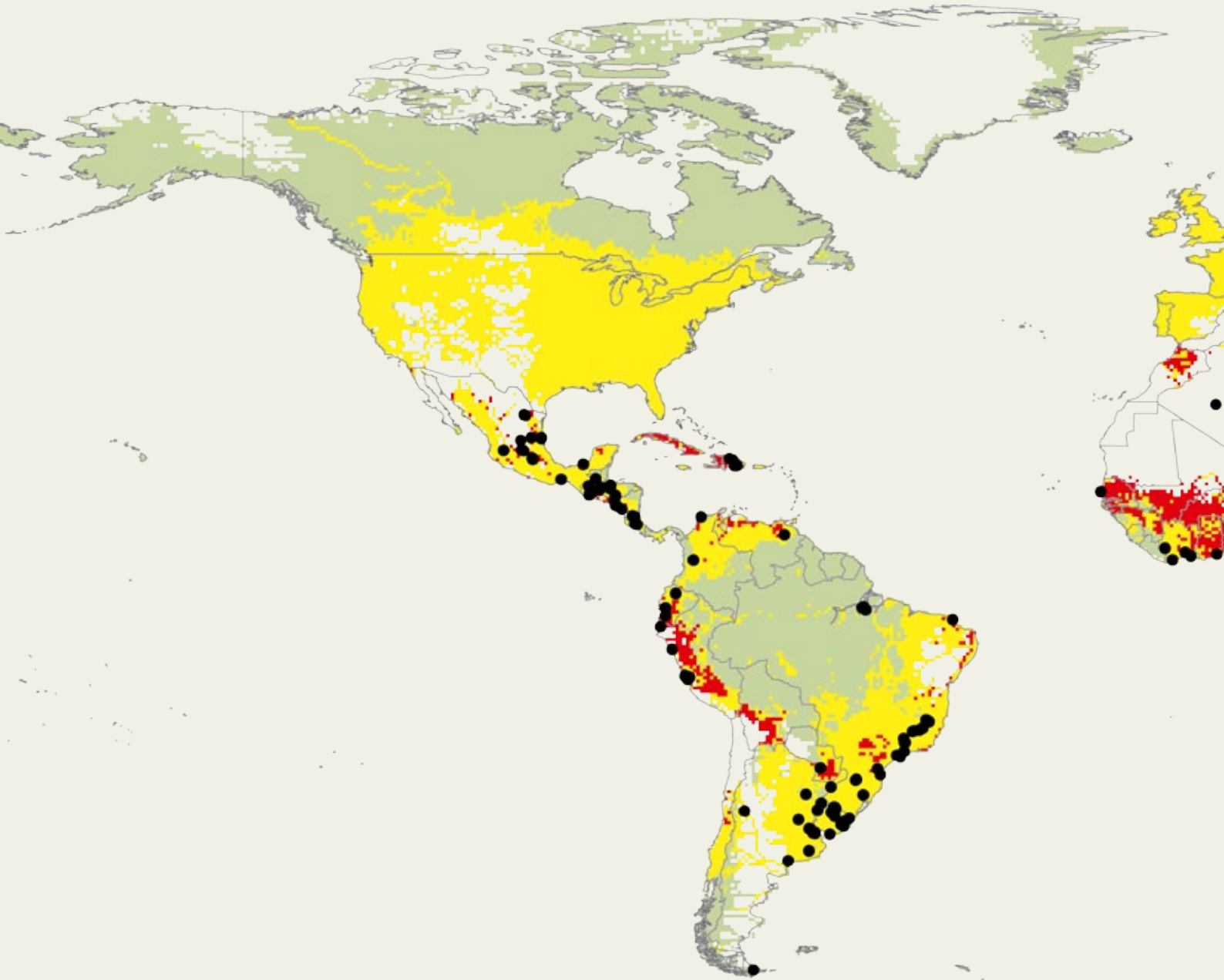
Of DEG’s current clients, 128 are located in the 53 WWF Global 200 Freshwater Eco-regions. There are 21 operational sites located in the Ganges basin, 16 in the African Rift Valley Lakes, and 13 in the Mexican Highlands and 9 in the Gulf of Guiana Rivers and Streams. In the 13 WWF priority river basins, 64 of DEG’s clients can be found. The 4 basins with the most client activity are the Ganges, the African Rift Valley, the Yangtze Basin and the Balkans.

Threats to Biodiversity and Human Water Security.

Map 2

DEG's current clients mapped against areas with high threats to biodiversity and/or human water security. Based on: C. Vörösmarty, P. B. McIntyre, M. O. Gessner, D. Dudgeon, A. Prusevich, P. Green, S. Glidden, S. E. Bunn, C. A. Sullivan, C. ReidyLiermann & P. M. Davies, 'Global threats to human water security and river biodiversity', Nature, 461 (2010), 555-561





Map prepared by TYP SA Consultancy, Jorge Garcia - Cobo

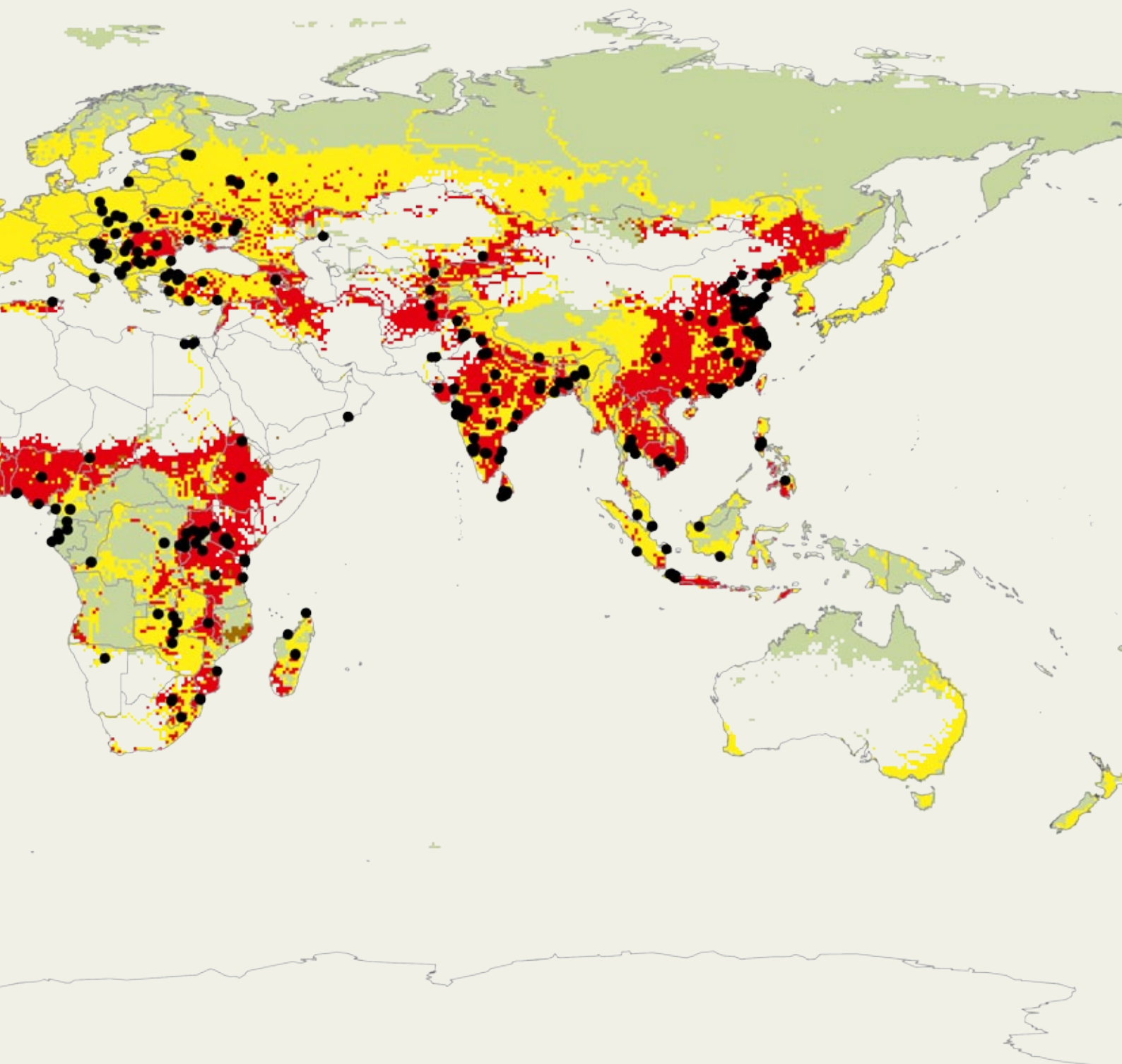


Legend

Project Location
Industry Risk

● Location

Human Water Security Threat	Biodiversity Threat	
	Low	High
Low		
High		

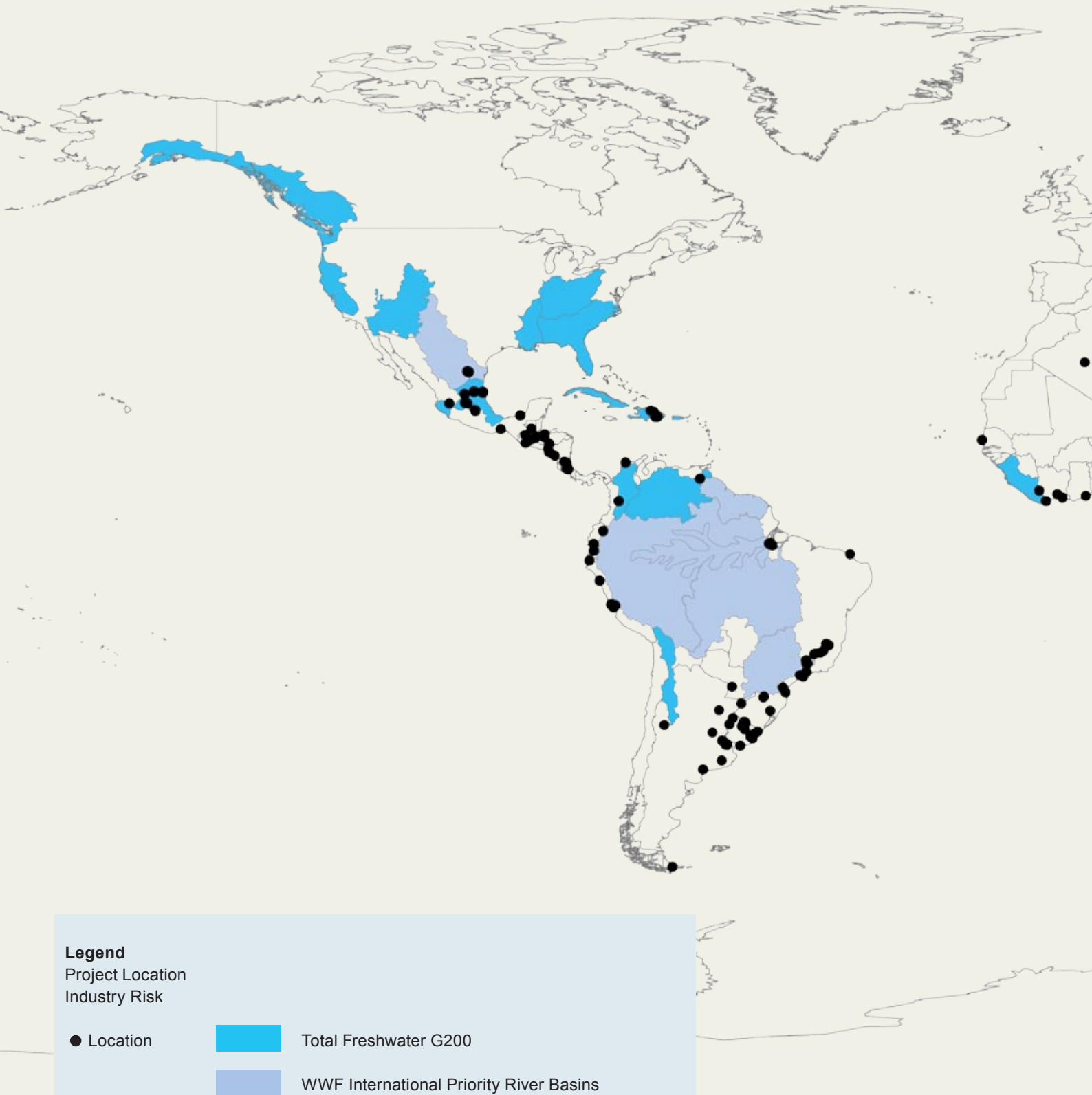


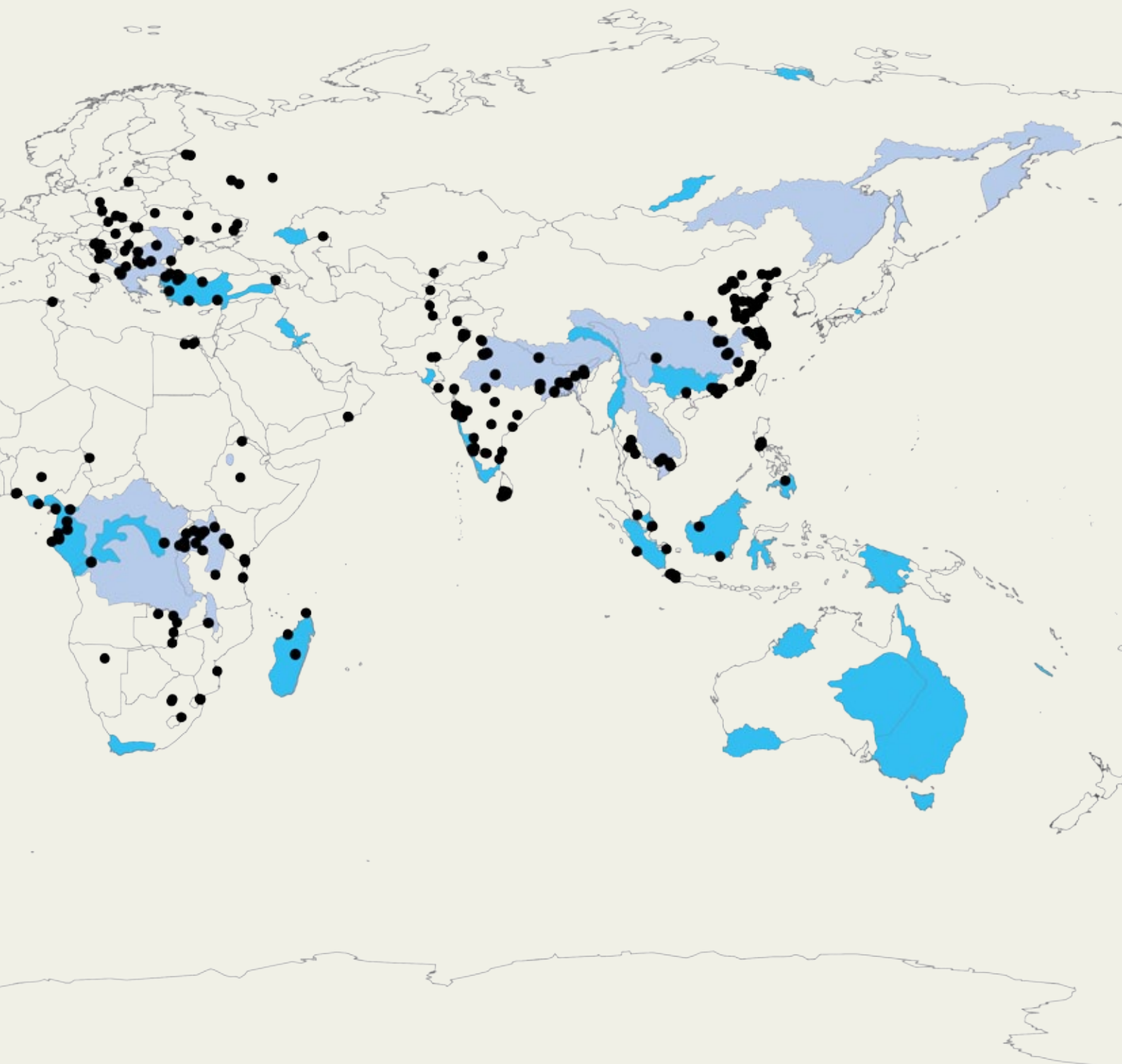
WWF's Global 200 Freshwater Places and WWF International Priority River Basins.

Map 3

DEG's current clients mapped against freshwater areas with particular conservation value to WWF.

Map prepared by TYPESA Consultancy, Jorge Garcia - Cobo





2.6 Water Risk Country Data Sets

As part of this project, a set of 85 water risk country data sets were developed, representing the countries in which DEG's clients are currently active either directly or through their known suppliers.

These data sets can act as a reference point for a financial institution's portfolio managers. Especially when first engaging with a new potential client, a financial institution employee can quickly look up the country in question to inform him or herself about the national water situation and potential water related risks this investment may need to consider.

Every data set consists of two parts, a descriptive text and a sheet with collated water risk indicators. A number of these indicators are a direct input into the Water Risk Filter. The descriptive text is divided into sections on various aspects - physical, governance, religious and cultural and geopolitical. The indicator sheet holds 33 relevant water indicators and is grouped into the categories 'physical aspects', 'governance aspects', 'geopolitical' and 'other aspects'. These data sets should be kept up-to-date, however most of these figures will not change very frequently.

In the future, country data sets will be prepared for all remaining countries in the world, in order to increase the applicability of the Risk Filter for other financial institutions.

Box 7 | Challenges in Determining Water Stress and Impact

Quantifying water risks at appropriate spatial scales can be challenging. It is of particular concern that many commonly applied global metrics, which attempt to characterize water situations at the scale of nations or very large river basins, obscure critically important and unique local contexts that influence water risk. Additionally, metrics depicting water scarcity or stress, which are measures of human pressure on available water supplies, may not provide reliable proxies because they do not address environmental or social impacts explicitly, or do so in generalized ways that may be irrelevant or not useful in many local contexts. These two shortcomings – overly coarse spatial granularity and a lack of direct local linkages between water use and impacts – can generate misleading risk indices and lead to inefficient targeting of water hotspots. WWF works closely with numerous academics and groups such as the Water Footprint Network (WFN), The Nature Conservancy (TNC), and the World Resources Institute (WRI) to better improve representation of water stress and scarcity. By closely working with these organisations, WWF is helping to ensure that the tools and guidance that emerges from WWF's work with companies and the financial sector remain consistent and relevant to the water challenges that we all face.





The Yangtze in China is choked with sewage and poison from chemical plants and other heavy industry

3. The DEG - WWF Water Risk Filter

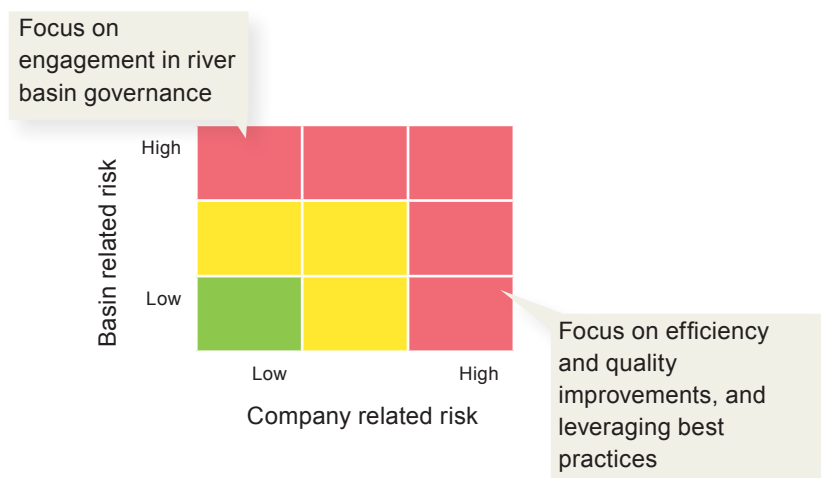
3.1 Basic Principles of the Water Risk Filter

The goal of the Water Risk Filter is to quantify the water related risks for a certain investment. The risk methodology seeks answers to a set of carefully drafted questions which result in scores, and which have certain weightings to eventually determine the risk level of an investment. This is in line with standard risk assessment methodologies. The difficulty is to determine the right set of questions (also called risk indicators), a predetermined set of potential answers, scores and weightings that reflect the importance of the answer or indicator, respectively.

Furthermore, the risk indicators should reflect the influence of a company’s geographical location (river basin), and of both the direct (own) and indirect (supply chain) operations of the company.

By splitting these basin and company related risks, the risk framework developed for this project results not in a single risk level per investment, but provides a high level strategic direction for the investor. The investor might then offer to provide an investment with focused support to mitigate the water related risks. Depending on the position as minor, major or sole investor, the financial institution might even request its client to take actions that help reduce risk and appear more attractive to the investor.

Figure 11 Conceptual framework of the Water Risk Filter



The focus of many companies is to assess and mitigate the risks directly influenced by the company itself, which is reflected in the horizontal axis of the framework. This approach however also reflects the high importance given in the Water Risk Filter to risk causes driven by external factors in the river basin. This is in line with the concepts of water stewardship, that in order to reach sustainable water resource management, a company (or any stakeholder for that matter) should not only have its own house in order, but should also be willing to engage outside the fence line.

When the company related risk is high, the client company might want to focus on water efficiency and quality improvements, and perhaps also explore opportunities around better performance in water management.

In the case of a high basin related risk, the client company might be asked to focus more on engaging in improving and supporting better basin governance to improve the general state of the river basin.

Box 8 | Basin Governance

Water governance across various levels is becoming increasingly relevant to companies. Many companies perform well within their factory gates, with often high efficiency, reuse and recycling. Yet efficient companies on water bodies that are poorly managed remain at high risk, as the social and environmental dimensions of water are difficult to separate within such a shared resource. WWF defines its work on Water Stewardship as encompassing all efforts by companies from water accounting to policy engagement. WWF has been active in helping to define and explain external engagement in water policy through its own publications and partnerships and in collaboration with the UN Global Compact. Basin risk in the filter refers to this point – that internal company actions might not be enough, and that the basin situation might present other high risk potential. As such, much of Phase 2 of this project will be defining a toolkit of actions beyond the factory gate, for DEG to share with its clients and for other companies and institutions to implement and test.

Further information under:

http://www.unglobalcompact.org/docs/issues_doc/Environment/ceo_water_mandate/Guide_Responsible_Business_Engagement_Water_Policy.pdf

http://assets.wwf.org.uk/downloads/investigating_shared_risk.pdf

Although no methodology exists to assess water related risks for financial institutions, significant scientific knowledge on general water risk assessments for other sectors is readily available. To avoid duplication, combining the right aspects of existing knowledge was key in this project. In essence, assessing the exposure of a financial institution to water related risks is similar to the sum of the exposure of the different underlying investment companies.

From the project outset, the team sought to harmonize with other leading institutions such as the Water Footprint Network (WFN) and the World Resources Institute (WRI), to share thoughts, input data and reviews. The Risk Filter was built with the idea that it would continuously improve over time and by testing.

‘Practical, not Academic’

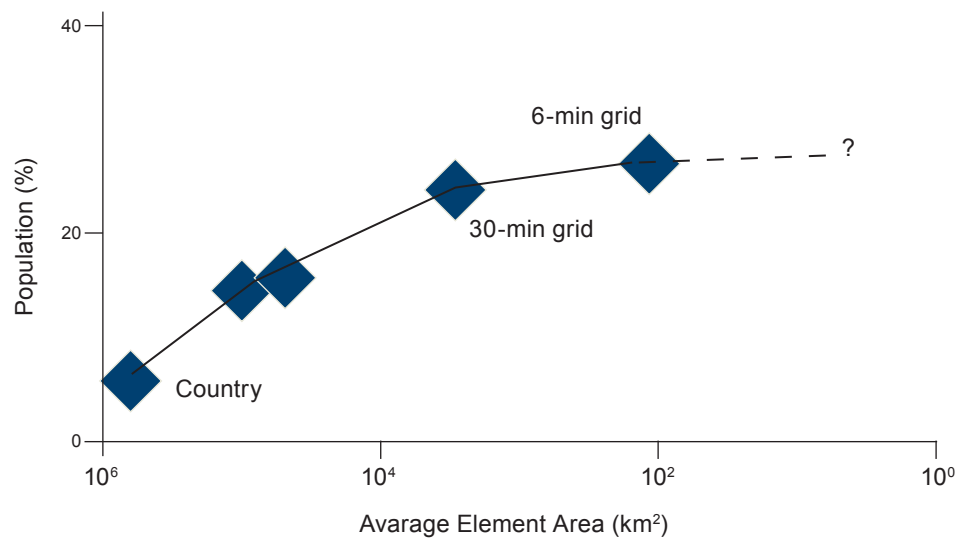
The Risk Filter has been designed with the end-user (a financial company employee with limited knowledge of water risks) in mind. The idea was that such a Risk Filter can be used on a daily basis by investors during the scanning and more deliberate due diligence phases, and not so much for a one-off risk assessment performed by a water expert. The tool could also be integrated in portfolio monitoring. From that perspective, efforts were made to balance the practicality of the Risk Filter with the fact that it should be scientifically solid.

‘Water Risks are Local’

Water risks are closely related to the location of the investment, so unlike climate change, water risks are different for each river basin. Solving practical water resources management problems requires higher time and space resolution data than national-average statistics can offer. Information gained from a geospatial analysis of water stress can be dramatic. For instance, a study²² quantified global water stress in 1995 at a 30-minute (0.5 degree) resolution and found that nearly 4 times more

people were exposed to water stress than were identified by the UN using a country level analysis.²³ Applying the geospatial approach to Africa at a 6-minute resolution, Vörösmarty et al. found this to be true to an even greater degree.²⁴ The following figure shows the relationship between populations exposed to water stress in Africa and the scale of the analysis. At the country level, about 4 % of the population was identified as suffering under severe water stress. Using the geospatial approach, this increased to around 26 %. Therefore, the project preferred assessing location-bound water risks on a basin level, not on a country level, wherever possible.

Figure 12 Water stress in Africa as percentage of the population computed with increasing resolution. The relative water stress index (RWSI) was computed as the percent of annual average renewable water resources used by humans.



3.2 Risk Indicators, Weightings and Risk Mathematics

- The Filter risk levels are determined based on scores related to the answers on a set of questions/indicators multiplied by a corresponding weighting. The basic mathematical principle of the Risk Filter is:
Sum of (scores of all questions x respective weightings) = risk level
- For each indicator, five different answer options are defined. The different answer options reflect the resulting risk scores from 1 ('no or very limited risk') up to 5 ('very high risk'). The questions and answer options can easily be adjusted or tailored in the Filter model.

The questions were replicated from, or based on existing knowledge from within the global WWF Network and the work on water risk by other organisations.²⁵ A long list of questions from different sources was prepared. For practical reasons, the intent was to minimize the number of questions, while making sure that all relevant topics that influence the risk level were covered. Furthermore, the global availability of data for each indicator, not just for a single river basin, was important for this version of the water risk tool. In total, the current version of the Water Risk Filter uses 22 basin related indicators and 26 company related indicators. These 48 indicators as well as the answer options will be made available once the final version of the tool will be released, most likely after the completion of the next phase of this project.

Where possible quantitative answer options were provided to increase the usability of the tool. Where qualitative answer options were unavoidable, the goal was to use the 'tick mark' or 'criteria' approach as much as possible (e.g. if a certain criteria is met, you will get a certain score, if you meet another criteria as well, you will get a better score.)

For both the country/basin and company specific risks, the Filter assesses indicators for physical (quantity and quality), regulatory and reputational risks, as shown in the following box.

Box 9 | Examples of Water Risk Indicators Questions

Examples of Basin related risk indicators:

- Physical risk: ‘What are the total annual renewable freshwater resources per capita in the basin?’
- Regulatory risk: ‘Is there a strong enforcement of water related regulations in the river basin the company is operating in?’
- Reputational risk: ‘How important are cultural and/or religious aspects of local water resources?’

Examples of Company related risk indicators:

- Physical risk: ‘How much of the withdrawn freshwater is discharged as non-freshwater (with some sort of pollution)?’
- Regulatory risk: ‘Is the company (likely to be) exposed to significant regulatory changes in the next five years?’
- Reputational risk: ‘Does the company conduct contingency planning to be prepared to respond to water risks, such as supply disruptions, price increases and more stringent regulations?’

The final goal, for both DEG and WWF, is to make the water risk methodology, tools and dataset widely available for the private sector to encourage the integration of water risk assessments into existing processes and decision-making. The tools and datasets and the complete list of questions will be tested thoroughly in the coming months, after which they will be shared.

Box 10 | Examples of Water Risk Indicator Answers

Example of the answer options for one of the indicators (“What is the total annual actual renewable freshwater resources per capita in the basin?”):

1. >4000 m³/capita/year: Water abundant
2. 1700-4000 m³/capita/year: Water vulnerable
3. 1000-1700 m³/capita/year: Water stress
4. 500-1000 m³/capita/year: Water scarce
5. <500 m³/capita/year: Extreme water scarce

To ease usability, the Filter automatically provides suggested answers for more than 90% of the questions, which are all gathered from the different underlying databases. The user can choose to accept these suggestions, but can always digress from the suggested answer if they feel sufficient evidence is available. The dataset that the suggested answer is based on is always indicated next to the answer.

- For example, a suggested answer for a specific company and location to the question “What is the total annual actual renewable freshwater resources per capita in the basin?” might be “1700-4000”. The user can now select option 2 from the drop-down menu “1700-4000 m³/capita/year: Water vulnerable”, but has the option to deviate from this if evidence is present. The suggested answer results from the coupling of company ID and location numbers with the location specific information in the Water Risk Filter database.

In principle, answers for all questions should be provided, as the set of risk indicators and their weightings are optimized for this. However, if a good reason prevents the user from filling in a single or multiple questions, the weightings are recalculated automatically to make up for the missing answer(s). This works well. However, if a company does not provide information on a certain topic, it may indicate a high risk as the company is not able/willing to disclose information.

It is important to note that the Risk Filter is intended to be applied for every production site of a client that relies on the investors funding.

3.3 Sources for Answering Risk Questions

The holistic approach of looking at all subjects that influence risk has the implication that many different sources are needed to answer the wide range of questions of the Water Risk Filter. The sources themselves are often compilations of different data sets. The different sources have all been integrated in a single model, making the different data sets easily accessible for the user. The different data sets are:

- The DEG client company database, as reference point and source for company name, reference number, country of operation and industry sector
- The online Water Risk Survey, sent to DEG clients, as outlined above
- The 85 country data sets
- The WRI basin information database, as extracted from the WBCSD Global Water Tool
- The industry risk database, as developed for the preliminary water risk screening of DEG's portfolio

Box 11 | The Need for and Challenges of Information from Client Companies

If indications are that a company is located in a water scarce river basin, the actual risk level for that company is still highly dependent on how much freshwater the company uses. Other issues to consider are how sustainable and reliable withdrawal is, if the company is a key user of scarce water resources, whether local people have access to clean freshwater etc.

This information is most efficiently obtained by using an online survey. In the future the project team will investigate the best risk assessment methods available if such a company survey is not obtainable.

Initial feedback from some investors indicated that they would prefer not to rely too much on the input of their clients. While this differs from financial institution to financial institution, the suggested approach is to make client companies more comfortable sharing water data if they are frequently reminded of the overall goal of helping them reduce often substantial financial risks instead of using the risk assessment as a go/no-go decision tool.

As large companies have more resources to investigate and measure and then fill in such a questionnaire, the increasing complexity of a large company's organisational structure can be daunting.

Finally, specific regulation for the disclosure of any sensitive information of stock listed companies should be taken into account. In most countries, if a listed company discloses water information to an investor, it should disclose this information to other investors as well.

3.4 Water Risk Filter

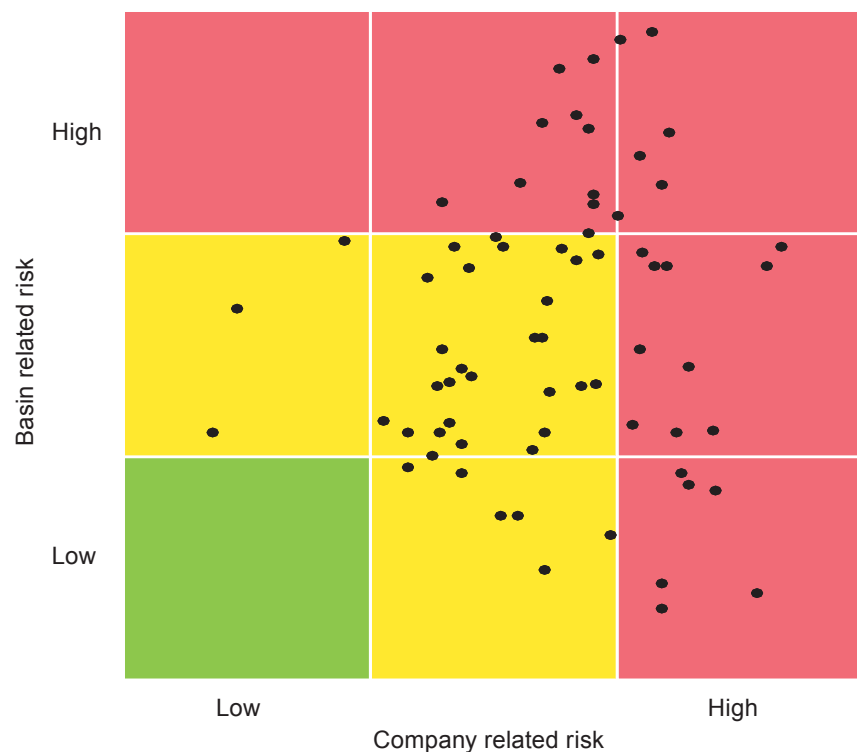
The Water Risk Filter consists of two different parts:

- A pre-assessment tool to be used for all client companies, to attain a high-level water risk indication. The full Water Risk Filter shall only be used when the pre-assessment tool returns a high risk.
- A comprehensive Water Risk Filter, which contains a thorough and holistic risk assessment.

The calculated risk levels in the Water Risk Filter are reflected on two levels, a matrix in which all assessed companies are plotted and as detailed risk levels for the specific company.

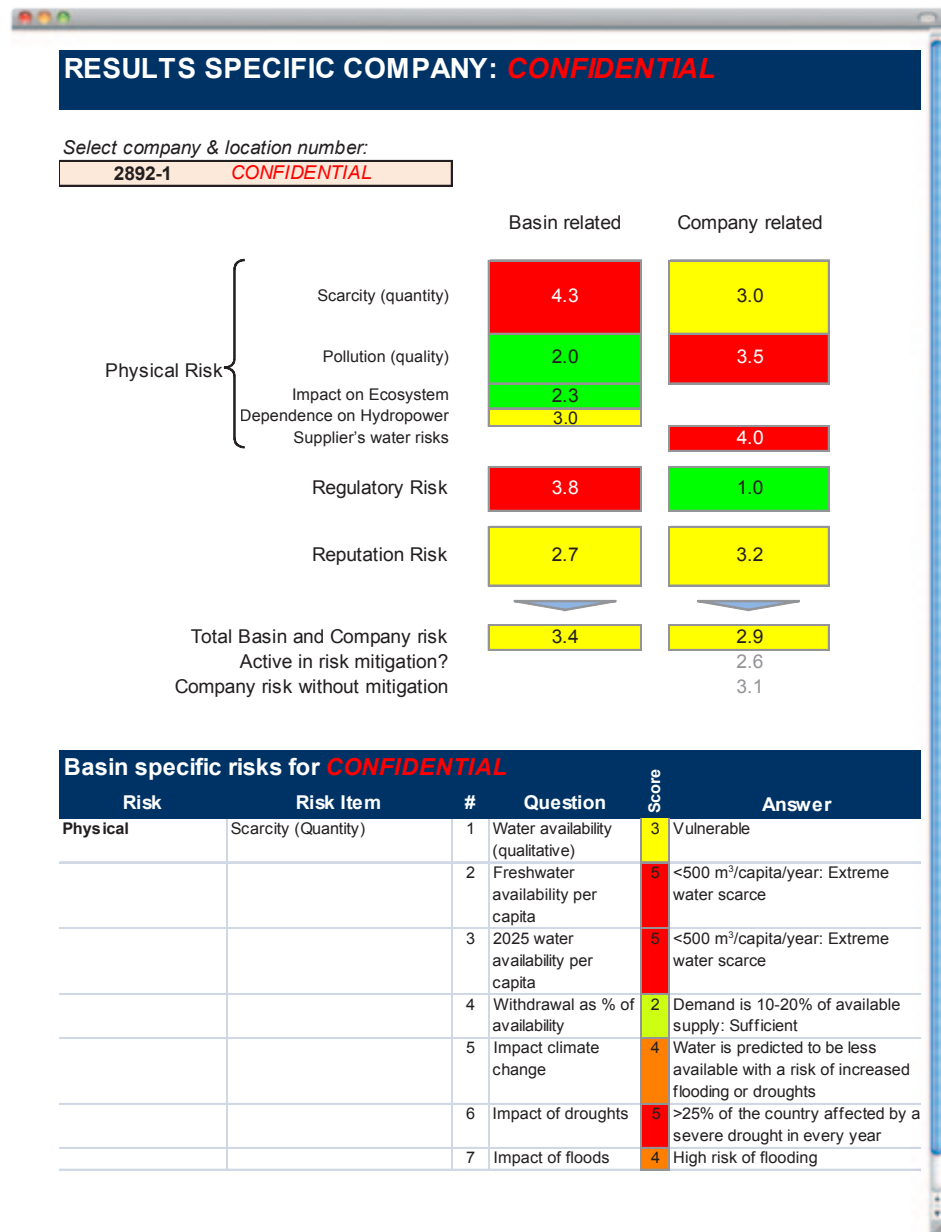
The matrix provides an overview of the risk levels of DEG's portfolio. It shows which companies should focus more on internal solutions or external solutions. If the risk assessment can be performed on an annual basis, progress in risk mitigation across the portfolio can be monitored. The impact of mitigating measures as performed by client companies over the years should be reflected in the reduction of the risk levels.

Figure 13 Results of the Water Risk Assessment of DEG's Portfolio



More detailed risk levels for all companies can also be displayed. This provides useful information to engage with a specific company to actually begin to explore efforts to mitigate aspects of certain water risks. The company and location specific results are shown in two ways. First, in the 'heat map' the basin and company related risks are split into more insightful risk indicators, showing Physical (with quantity, quality, impact on eco-system, dependence on hydropower and supplier's aspects), Regulatory and Reputational risk levels. The colour coding visualises the resulting risk levels (green represents low, yellow medium, and red high risks).

Figure 14 Heat Map of an Individual Company Water Risk Assessment



Finally, short versions of all the questions are shown again in the results section of the tool. The answers that were given for this particular company and location are colour coded in a similar way to the overall risk indicators, according to the score the answer provoked. If a certain risk appears to be high in the heat map; one can look at the given answers that resulted in this high risk to gain more detailed information.

The resulting risk scores on different levels not only provide insights on the risk level itself, but also on the background of that risk level, which helps investors in their discussions with their client companies to start mitigating part of those risks.

Box 12 | Risk Mitigation

The heat map contains two lines related to risk mitigation. A proper risk model would incorporate: $\text{risk level} - \text{mitigation/contingency} = \text{risk exposure}$. However, water risk levels and the impact of a certain mitigation/contingency measure cannot be easily estimated. The only thing that can be estimated is the current risk level (or exposure) after all the mitigation that has already taken place.

To gain insight on how active a client company has been to mitigate water risks, and to see which risk mitigation measures have not been exploited by the company, a number between 1 (very active) and 5 (no risk mitigation activities so far) has been added. This number is based on the outcomes of a subset of questions related to mitigation activities. This number does not imply a measurable effect, only that measures have been used.

The Pre-Assessment Tool

The pre-assessment tool is designed to be simple and able to be filled in within minutes to attain a high-level risk indication. Only in the case of an emerging 'potential high risk' is the user urged to fill in the full Risk Filter. In such a case, a warning will be given to the user.

- Information used to calculate risk levels in the pre-assessment tool are basin water availability, country water availability, country water quality, industry quantity issues (including their suppliers), and industry quality issues (including their suppliers).
- Underlying calculations, weightings and assumptions are similar to the full Risk Filter.

Based on the underlying parameters related to the location and industry of the company, the pre-assessment tool automatically provides a high-level risk indication. Both water quantity and quality aspects are taken into account.

- The risk indication is shown in a 3x3 matrix similar to the framework used to visualize the risk levels in the full risk tool, indicating both the country/basin and industry related risk as Low (green), Medium (yellow) or High (red) to avoid pseudo-precision.
- If either of the two categories is High (red), a warning text in red will appear urging the user to apply the full Risk Filter to that company.
- For more depth, the high level results on country/basin and industry levels are split in quantity and quality related risks.

The pre-assessment tool is to be used one company at a time, and the results cannot be stored automatically in the current version.

Figure 15 Pre-Assessment Tool in the Water Risk Filter

PRE-ASSESSMENT

INPUT

1 Select country:

2 Do you know the (most important) location of the company?

In that case, please fill in the WBCSD Global Water Tool and select the resulting answers in the following boxes to assess the risks based on the basin level instead of on the country level.

2.1 Annual renewable water supply per person (1995)
 2.2 Forecasted annual renewable water supply per person (2025)
 2.3 Mean Annual Relative Water Stress Index

3 Select industry:

RESULTS

Basin related risk Medium

Industry related risk High

High risk! Please perform full water risk assessment

	High	Medium	Low	
High		Medium	Low	Basin related risk
Medium		Medium	Low	
Low		Medium	Low	
	Low	Medium	High	

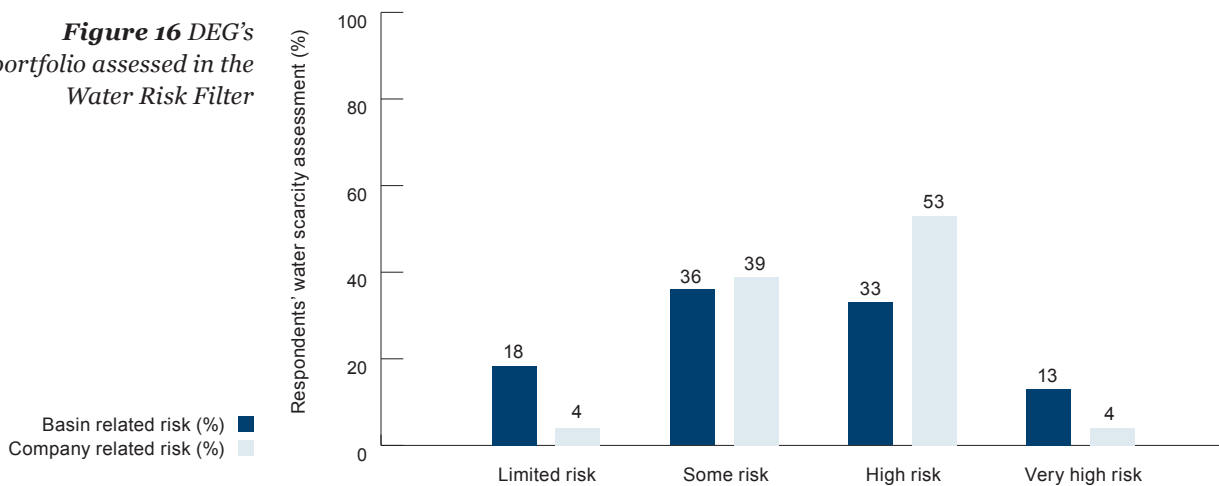
	Medium	Low	
High	Medium	Low	Basin related risk
Medium	Medium	Low	
Low	High	High	
	Quantity related	Quality related	

3.5 Results from the Water Risk Filter Application

As part of the project, ~15 % of the DEG portfolio (excluding financial companies) was assessed with the Water Risk Filter. On the highest level, the results are shown in the risk matrix of Figure 6. It may be expected that the results are somewhat skewed towards high risk companies which are already active in risk mitigation, due to the pre selection and the bias of companies that returned the survey.

Of the assessed portfolio, ~45 % are located in a potentially (very) high risk river basin, while ~55 % of the companies have been indicated as having a potentially (very) high risk based on how they operate and manage water (see Figure 15).

Figure 16 DEG's portfolio assessed in the Water Risk Filter



Looking a level deeper, Figure 16 shows the results for the specific risk items. Interestingly, while ~20 % of the companies are actually located in river basins with a (very) high scarcity risk, ~75 % have indicated that freshwater is crucial for their operations and that they had recent issues of attaining sufficient amounts.

The high level assessment of supplier risks resulted in ~85 % high risk scores for those client companies with suppliers, affirming the hypothesis that agricultural and extractives supplying industries play a key role in the different value chains with regard to water risk.

On a basin level, regulatory risk scored more than 85 % (very) high, as legal frameworks, strategies, enforcement and/or investments are not sufficient in a number of developing countries. On a company level, only ~15 % of the client companies have a (very) high regulatory risk, as most companies meet legal requirements. More than 50 % of the companies expect potentially significant regulatory changes.

Local and global stakeholders are often more aware of the existence of water issues in river basins than individual DEG client companies. Therefore, reputational risk on a basin level has been indicated to be higher than on a company level.

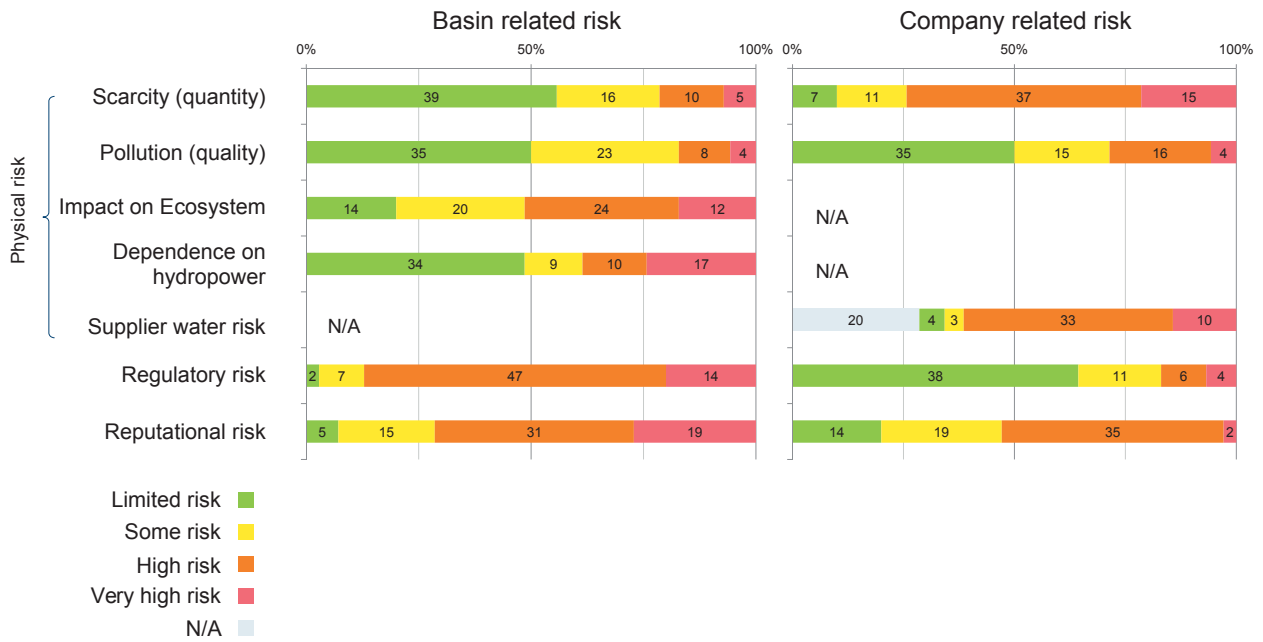
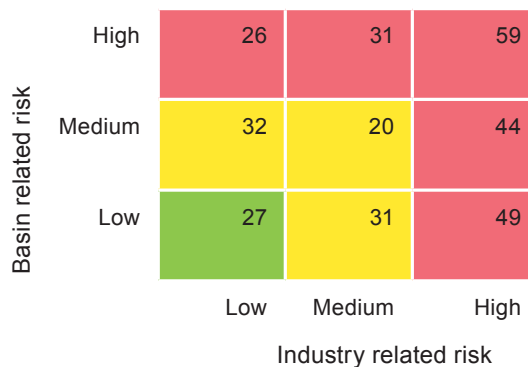


Figure 17 Distribution of Risk Levels of the Assessed Part of DEG's Portfolio (%) (top)

The full DEG portfolio was completed using the simple pre-assessment tool. During the project, basin related input and a more sophisticated industry risk assessments have been added, making the tool more accurate than before. Although there were significant changes on the company level, on a higher level the results shown in Figure 17 are similar to the results of the pre-selection discussed in Chapter 2.2. Due to the better industry risk assessment, the results are less skewed towards high risk industries. In total, ~65% of the companies were indicated as having a potentially high water risk, while this was ~60% in the pre-selection. ~35% of the portfolio was indicated as having a potential high basin related risk, while almost 50% of the portfolio was indicated as having a potential high company related risk.

Figure 18 DEG's Portfolio Assessed in the Pre-Assessment Tool (319 companies of non financial sector)



3.6 Challenges in the Project

One of the challenges in the project was to automatically link GPS coordinates to a specific basin and the water indicators which go with this basin. At the moment the WBCSD Global Water Tool is required to obtain this data. The WBCSD Global Water Tool excel model is linked to Google maps and can automatically locate companies if the GPS coordinates are supplied. To get this information into the DEG-WWF Water Risk Filter Tool, the Global Water Tool needs to be used to then manually copy the indicators on a basin level into the Water Risk Filter Tool. In future versions of the Water Risk Filter Tool it would be ideal to make this detour redundant by programming the tool to have a locating capacity similar to the WBCSD tool.

It became clear rather quickly that it is preferable to assess different industries with industry specific questions and weightings. Two sectors that were singled out in this phase were the hydropower and the water supply/utilities sectors. These two sectors received slightly altered questionnaires and are therefore assessed with different weightings in the Water Risk Filter Tool, but this added much complexity to the modelling.

3.7 Main Data Gaps

Relevant and desired risk indicators were formulated at the outset of this project. This list of indicators did not however consider whether appropriate data sets with global coverage were actually available. Therefore the indicators had to be adapted according to publicly available information.

The most important data gap is information regarding company supply chains. This was anticipated, but the lack of data on suppliers was even more profound than had been foreseen. The answers to the survey issued to gather the information required for this tool highlighted this; very few companies were able or willing to give much detail on their supply chain. As a result the influence of supply chain related water risks in the Water Risk Filter has been more limited than originally planned considering the importance of the supply chains for a complete risk assessment. In many cases, the water risk to the supply chain may strongly outweigh that of other parts of a company's value chain. This is of course particularly true if this company processes or trades in agricultural or mining products.

The lack of supply chain information makes a complete assessment of water risk impossible and remains a key feature to be tackled in the next phase of the development of the Risk Filter.

Pollution information on a basin level also proved to be hard to gather. As far as the project team was able to establish there is no harmonized data set in existence with water quality information on a basin level which covers the entire globe.

In addition, the information on water related governance, legislation, enforcement and illegal withdrawal on a basin or even country level was very scarce. In some cases, proxies had to be used to estimate the situation in a specific country.

3.8 Applicability for Financial Institutions (and Other Industries)

Initial response from financial institutions about the applicability, usability, risk framework and mathematics of the Water Risk Filter has been positive. In principle, this Filter can be used by any investor/ financial institution, and due to the potentially highly negative impact of a deteriorating water situation, such a Risk Filter should be part of their risk management processes. Furthermore, due to the wide exposure of financial institutions to companies of all sizes, the positive impact on ecosystems can be very large. Finally, risk assessments on a regular (e.g. annual) basis can be useful for monitoring the risk levels on a portfolio level and the progress of mitigating earlier assessed risks. Naturally, by assessing risks, no actual impact can be made. To understand what measures can and should be taken by a company to mitigate a specific water risks, the project will strive to develop a so-called mitigation toolkit (see the next chapter).

The high usability of the Water Risk Filter will hopefully lead to a high adoption rate by financial institutions. However, the applicability of the Water Risk Filter is different for minority and majority investors, lenders or insurers.

The need for information from the client company itself can be complicating. Since most investors are minority owners or creditors, it is harder for them to ask client companies to fill in these kinds of surveys. Still, even as a minority investor, the financial institution can push their clients to provide information as a demand for transparency and improvements in corporate reporting.

Future versions of the Filter should aim at providing as much insight as possible without the additional input of a survey, as some (mostly commercial) banks indicated that they were not able or willing to ask their minority investors to fill in such a survey.

For majority investors the Filter is highly suitable; typical examples are development banks, private equity companies, large banks, pension funds and even insurers.

This Filter can also be tailored to suit other industries outside the financial sector by the changing of questions and weightings, as the basic risk framework and mathematics are valid for any industry. A few multinationals have developed their own risk assessment tools; however none to our knowledge with an approach this holistic and the backing of detailed input data. For companies that directly own plants it is easier to tailor questions to their industry and to oblige of their plant managers to provide as detailed information as required.

The risk model has been set up specifically in a way that makes it easy to change questions and weightings, with all changes automatically reflected in all other relevant places in the model.

Box 13 | Maintaining the Databases

Keeping the databases of the filter up-to-date could be a serious burden for financial institutions and may hinder the ability to adopt the Water risk filter in their processes. A potential cost-effective solution could be that a neutral organisation keeps the databases up-to-date and provides the same information to all interested parties.



Computerised drip irrigation system for roses in a green house, Lake Naivasha region, Kenya



4. Outlook to the Next Phase: The Road Ahead

Phase 1 was geared specifically towards the needs of DEG. It is paramount to both DEG and WWF to ensure the tool is used as widely as possible. To date, the feedback from fellow development FIs and commercial banks to the tool was generally positive. The current tool should easily fit into the day to day business,

assessment and reporting realities of other development FIs; however, to be usable by commercial institutions and the wider financial sector the tool will require some adjustments and testing by interested parties. Further engagement and cooperation with other FIs will be explored. A second phase is therefore planned to improve and advance the tool and create a Risk Filter to be shared with and hopefully used by other financial institutions.

Some technical details of the current version of the tool will require revisiting in the second phase, such as the improvement in the localisation of companies using GPS coordinates and linking the location to certain indicators to enable easier operation. Likewise, some of the data sources used in the tool need to be broadened in order to make it usable outside of DEG's context and to lower the burden for adoption by other financial institutions. For instance, the list of industries needs to be revisited and brought in line with common industry definitions, and the country data sets need to be developed for all remaining countries. Also, more detailed data for certain river basins is needed. This will increase the accuracy of the Filter, but also the complexity. Such new data sources are being developed by both the Water Footprint Network (WFN) for a global list of basins, as well as by the World Resource Institute (WRI) for 10 river basins. A close alignment with these initiatives will strengthen the individual projects and make them work as complimentary tools, as well as avoiding a doubling of resources and output.

Phase 2 will include the following elements;

- Mitigation toolkit - To aid the process of direct, on the ground action a comprehensive toolkit of mitigation measures will be developed which can be leveraged by an investor or client to start mitigating a specific risk. The toolkit should contain measures and best practices ranging from technical efficiency improvement projects up to public policy engagement.
- Improve the filter for use by other FIs – More country data sets will be required for global coverage. These data sets will also be designed for easier upkeep and amendment. Phase 2 will add more sectors relevant to the banking industry as well as begin to harmonise terminology on sectors.
- Inclusion of the supply chain – as expected in many sectors, the water use and risk elements of the supply chain can be very high. We recognise this element of the portfolio is essential to capture.
- TA assistance - The application of the tool itself has not yet resulted in marked change. An important component of Phase 2 will be engagement with companies in the form of technical assistance (TA) projects undertaken by DEG with their clients.
- Alignment with partners on impact and risk – as stated in Box 7, the further improvement of establishing elements of impact are evolving and WWF is central to ensuring not only the best methods are created but alignment is made with other initiatives mentioned in this report.

WWF and DEG welcome any financial institution or company to contact us in regard to this work. We urge their support to help us to build through Phase 2, a tool that broadens knowledge of water issues, support action and drives better water stewardship in watersheds.

APPENDIX

Tool	Target Users	Description	
CDP Water Disclosure	Investors	Questionnaire sent to companies, with request for disclosure	
GEMI Collecting the Drops: A Water Sustainability Planner	Production facilities	Online set of questions and best practice examples; Good for companies beginning to explore water risks	
GEMI Connecting the Drops: A Water Sustainability Tool	Companies	Online tool with guidance and questions to help a company design a water strategy	
RepRisk	Investors	Not focused on water specifically, Online data base compiling information on companies regarding environmental and social issues in newspapers, NGO newsletters and blogs	
Water Footprint	Nations, basins, companies, products, groups of consumers, individuals (any well defined entity)	Virtual water, all water embodied in a product, service etc., also highlights where water comes from	
WaterGAP	Academics	Scientific runoff model, capable of simulating future hydrological flows under different scenarios	
World Business Council for Sustainable Development Global Water Tool	Companies or organisations with operations in various locations across the globe	Excel file; water use and discharge input is put into relationship with water data	
WRI Water Index/ Aqueduct	Investors	Under development Online based risk analysis of the river basin a company is located in	

	Risk analysis	Applicability to FIs	Link
	Output in the form of reports on sectors or regions, ideal for benchmarking of companies	Designed for use by investors, however does not quantify water risks	www.cdproject.net/en-US/Programmes/Pages/cdp-water-disclosure.aspx
	Helps establish risk hot spots for a facility and best practice examples can point at possible mitigation options	Requires a lot of input from a facility; intended to help companies, therefore assessment not easily usable by an FI; water risks are not quantified	www.gemi.org/waterplanner/
	Similar to GEMI Collecting the Drops, but more high-level	Intended to help companies, therefore assessment not easily usable by an FI; water risks are not quantified	www.gemi.org/water/
	Negative reports on company activities collected to determine a Reputation Risk Score; not focused on water, yet water one of the issues looked at	Good tool for tracking reputational risks that may arise from engagement with a certain company for FIs, yet not sufficient to assess a client's water risks	www.reprisk.com
	Focus on physical side of risk, useful for impact assessment of water use	Currently fairly complex to establish, yet online tool being developed which will make application easier	www.waterfootprint.org
	Very detailed water availability assessment and projection. Does not quantify risks	Highly scientific and therefore not practical for FIs	http://www.usf.uni-kassel.de/usf/archiv/dokumente/kwws/5/ew_2_watergap.pdf http://www.geo.uni-frankfurt.de/ipg/ag/dl/forschung/WaterGAP/index.html
	Very good tool for water risk hot spotting; links coordinates of production site to available water data, locates production sites on map	FIs portfolio easily inserted in tool, even if only location of production site is known, a very good first hot spotting tool; however does not quantify water risks	www.wbcds.org/web/watertool.htm
	Various risk indicators weighted differently for different industry sectors or adjustable individually	Intended for investors, good tool for location hot spotting	http://projects.wri.org/aqueduct

DEG - Our business is developing.

DEG, member of KfW Bankengruppe, is one of the largest European development finance institutions. For nearly 50 years, DEG has been financing and structuring the investments of private companies in developing and emerging market countries.

DEG invests in profitable projects that contribute to sustainable development in all sectors of the economy, from agribusiness to infrastructure and manufacturing to services. The financial sector is a further focus in order to facilitate reliable access to investment capital locally. DEG provides long-term investment capital for private enterprises through loans or equity participations.

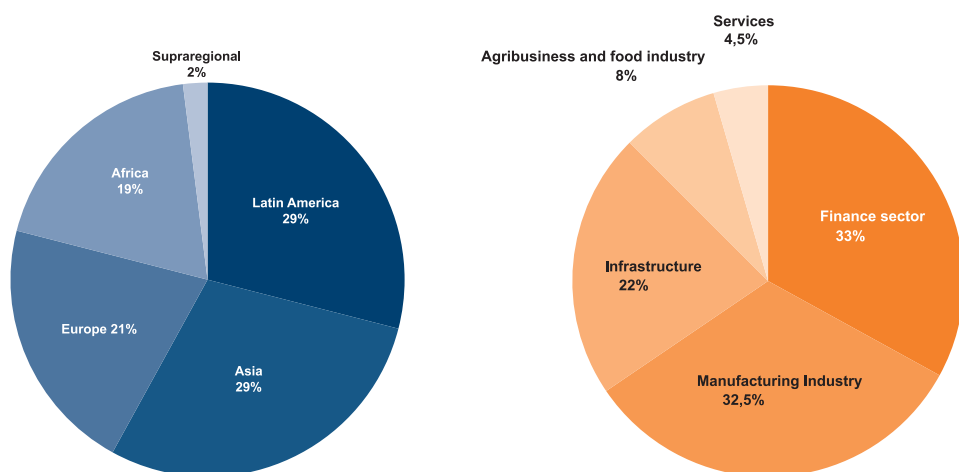
DEG's aim is to establish and expand private enterprise structures in developing and emerging countries, and thus create the basis for sustainable economic growth and a lasting improvement in the living conditions of the local population.

DEG is committed to maintaining high environmental and social standards for both itself and its clients. For this reason, DEG contractually requires all projects to meet the local and European Union or World Bank/IFC environmental and social performance standards. Projects must also comply with International Labor Organization standards. Clients must regularly provide evidence that their plants, processes, products and services currently meet these standards or that they are implementing measures to achieve them.

DEG also provides assistance to build capacity in environmental and social standards where needed.

Climate change is a strategic focus area for DEG. KfW Bankengruppe is one of the largest investors in renewable energy worldwide. DEG has committed EUR 229 million for climate-related private sector investments in 2010 alone.

Targets and basic conditions for investments are defined in DEG's Climate Strategy, which identifies renewable energy, renewable resources, energy efficiency and CDM/JI projects as core areas of focus. In this context water will be also included as a core area of focus.



WWF Water Stewardship – Shared risk and opportunity at the water’s edge

From the United Nations to community water management committees and corporate boardrooms to factory floors, water issues are on the agenda. The stakes are high, and solutions aren’t simple. They require a deep understanding of the causes of water risks and a willingness to think beyond a given factory, river basin, industry or border.

Issues of global water quantity and quality have significant and growing social, environmental and economic consequences. WWF has long been a leader in freshwater conservation because the issue is integral to our mission of building a future in which people live in harmony with nature. Now, the realities of climate change – coupled with investor expectations, community perceptions and increased consumption – has focused the private sector’s attention on water as a key resource under threat. How can economies and businesses flourish in a changing and uncertain water future, the effects of which reach far beyond traditional water-intensive industries? This is the question savvy companies and policymakers are striving to answer.

Yet most companies have difficulties understanding water issues and few have assessed their exposure to water risk. It’s not surprising – water is a resource we have been able to take for granted. But that’s no longer the case. Even a small shock to the system could have serious consequences for a company’s direct operations, as well as supply chains, brand reputation, and therefore on growth opportunities and profit.

WWF expects companies to become much more than just efficient water users. The root cause of water risk is often not the availability or use of water, but governance; unless an entire river basin is managed in a sustainable way, one company’s improved efficiency will likely be overshadowed by increased usage by a competitor or a neighbouring community. This makes water the ultimate shared resource – and everyone’s responsibility.

Get active on water

- Define your unique water-related risks.
- Integrate water strategy into your operational plans and manage your supply chain.
- Explore in detail your business’s dependence on water and the potential implications.
- Identify the policy and governance gaps that fuel your risk, and seek solutions with policymakers and local partners.
- Engage stakeholders on the ground where you work and contribute to the global water debate.
- Achieve compliance with all relevant policies, and become active in efforts to set standards for water use, adaptable to change and, with WWF, a strong advocate for government accountability.

References

- ¹ UN Water (2010), Statistics: Graphs & Maps – Water Pollution, Environmental degradation and disaster, [online], [Available: www.unwater.org/statistics_pollu.html], [Accessed 6 January 2011]
- ² Pollard, D. (ed) (2010), Living Planet Report 2010: Biodiversity, biocapacity and development, WWF International, Gland
- ³ Vörösmarty, C.J., McIntyre, P.B., Gessner, M.O., Dudgeon, D., Prusevich, A., Green, P., Glidden, S., Bunn, S.E., Sullivan, C.A., Reidy Liermann, C. & P.M. Davies (2010), 'Global threats to human water security and river biodiversity', *Nature*, Vol. 461: 555-561
- ⁴ Pegram, G. (2009), Global water scarcity Risks and challenges for business, WWF–UK and LLOYD'S 360° Risk Insight. United Kingdom (UK)
- ⁵ Smatkhtin, V., Tharme, R., Nackoney, J. & Y. Kura (2004), 'Taking into Account Environmental Water Requirements in global-scale Water Resources Assessments', In Comprehensive Assessment Research Report n° 2, Comprehensive Assessment Secretariat, Colombo, Sri Lanka
- ⁶ UNEP/GRID-Arendal (2009), 'Water Scarcity Index', UNEP/GRID-Arendal Maps and Graphics Library, [online], [Available: <http://maps.grida.no/go/graphic/water-scarcity-index>], [Accessed 6 January 2011]
- ⁷ Rosegrant, M.W., Cai, X. & S.A. Cline (2002), 'Global Water Outlook to 2025. Averting an Impending Crisis', In Food Policy Report, International Water Management Institute (IWMI) & International Food Policy Research Institute, Colombo, Sri Lanka
- ⁸ Lutz, W., Sanderson, W. & S. Scherbo (2001), 'The end of the world population growth', *Nature* 412: 543-545
- ⁹ Lutz, W., Sanderson, W. & S. Scherbo (2008), 'The coming acceleration of global population ageing', *Nature* 451: 716-719
- ¹⁰ UNEP/GRID-Arendal (2009), 'The contribution of climate change to declining water availability', UNEP/GRID-Arendal Maps and Graphics Library, [online], [Available: <http://maps.grida.no/go/graphic/the-contribution-of-climate-change-to-declining-water-availability>], [Accessed January 24, 2011]
- ¹¹ Bates, B.C., Kundzewicz, Z.W., Wu, S. & J.P. Palutikof (2008), Climate Change and Water: Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, Switzerland
- ¹² Huntington, T.G (2006), 'Evidence for intensification of the global water cycle: Review and synthesis', *Journal of Hydrology* 319: 83-95

-
- ¹³ UNEP/GRID-Arendal (2005), 'Number of flood events by continent and decade since 1950', UNEP/GRID-Arendal Maps and Graphics Library, [online], [Available: <http://maps.grida.no/go/graphic/number-of-flood-events-by-continent-and-decade-since-1950>], [Accessed 6 January 2011]
- ¹⁴ See also: Molden, David (ed) (2007), *Water for food – Water for life: A Comprehensive Assessment of Water Management in Agriculture*, International Water Management Institute, Colombo and Earthscan, London
- ¹⁵ World Water Assessment Programme (2009), *The United Nations World Water Development Report 3: Water in a Changing World*, UNESCO, Paris and Earthscan, London
- ¹⁶ Cogan, Doug; Good, Megan and McAteer, Emily (2009); *Addressing Climate Risks – Financial Institutions in Emerging Markets – A Best Practices Report*; Commissioned by DEG, A Ceres Report, Authored by RiskMetrics Group; Cologne, Germany
- ¹⁷ See www.fao.org/nr/water/aquastat/water_res/index.stm
- ¹⁸ See www.cdproject.net/water-disclosure for more information
- ¹⁹ Morrison, Jason, Morkawa, Mari, Murphy, Michael and Peter Schulte (2009), *Water Scarcity and Climate Change: Growing Risks for Business & Investors*, Ceres, Boston and Pacific Institute, Oakland
- ²⁰ Vörösmarty, C.J., McIntyre, P.B., Gessner, M.O., Dudgeon, D., Prusevich, A., Green, P., Glidden, S., Bunn, S.E., Sullivan, C.A., Reidy Liermann, C. & P.M. Davies (2010), 'Global threats to human water security and river biodiversity', *Nature*, Vol. 461: 555-561
- ²¹ Wallace, J.S. and P.J. Gregory (2002); 'Water resources and their use in food production systems', *Aquatic Science*, 64: 363 - 375
- ²² Vörösmarty, C.J., B. M. Fekete, M. Meybeck, R. Lammers (2000), 'A simulated topological network representing the global system of rivers at 30-minute spatial resolution (STN-30)', *Global Biogeochemical Cycles* 14, 599-621
- ²³ United Nations (1997), *Comprehensive assessment of the freshwater resources of the world (overview document)*, World Meteorological Organization, Geneva, Switzerland
- ²⁴ Vörösmarty, C. J., E. M. Douglas, P. A. Green, and C. Revenga (2005), 'Geospatial indicators of emerging water stress: an application to Africa', *Ambio*, 34 (3): 230-236
- ²⁵ WBCSD Global Water Tool, CDP Water Initiative, CERES and Pacific Institute

DEG – Deutsche Investitions- und Entwicklungsgesellschaft mbH (DEG), a member of KfW Bankengruppe (KfW banking group), finances investments of private companies in developing and transition countries. As one of Europe’s largest development finance institutions, they promote private business structures to contribute to sustainable economic growth and improved living conditions.

WWF Germany is part of the World Wide Fund for Nature –the largest independent conservation organisation in the world. The WWF global network is active in more than 100 countries across the globe.

WWF’s mission is to stop the degradation of the planet’s natural environment and to build a future in which humans live in harmony with nature, by:

- conserving the world’s biological diversity
- ensuring that the use of renewable natural resources is sustainable
- promoting the reduction of pollution and wasteful consumption.

This report was edited by Jochem Verberne (WWF International) and Kevin Smith (consultant to WWF Germany) and co-authored by Stuart Orr (WWF International), Guido Schmidt, Rafael Seiz-Puyuelo and Rafael Sánchez-Navarro (TYPESA Group).

The authors wish to thank Ute Sudmann, Jens Hönerhoff and Peter Thimme of DEG, Martin Geiger of WWF Germany for contributing to this report and providing valuable insights and editing suggestions. Thanks also to Ashok Chapagain of WWF-UK, Mark Eckstein and Jeff Malcolm of WWF-US for contributing to this report as well as providing valuable insights and editing suggestions. Special gratitude goes to Charles Vörösmarty for providing data used in this project and granting reproduction of the resulting map.

The project was co-financed by DEG with public funds from the Ministry for Economic Cooperation and Development (BMZ) and WWF Germany and managed by Ute Sudmann (DEG), Jens Hönerhoff (DEG), Martin Geiger (WWF Germany), Stuart Orr (WWF International) and Kevin Smith (consultant to WWF Germany).

For more information please contact:

Dr. Peter Martin Thimme

Head of Sustainable Development/Environment | DEG
+49 (0)221 4986 – 1503
peter.thimme@deginvest.de

Ute Sudmann

Investment Manager Special Programmes | DEG
+49 (0)221 4986 – 1591
ute.sudmann@deginvest.de

Jens Hönerhoff

Senior Environmental Specialist | DEG
+49 (0)221 4986 - 1771
jens.hoenerhoff@deginvest.de

Martin Geiger

Director of Freshwater
WWF Germany
+49 (0)69 79144 – 140
martin.geiger@wwf.de

Stuart Orr

Freshwater Manager
WWF International
+41 (0)22 364 9014
sorr@wwfint.org

Jochem Verberne

Manager, Network Development & Corporate Relations
WWF International
+41 (0)22 364 9284
jverberne@wwfint.org

Authors Stuart Orr, Rafael Sánchez-Navarro, Guido Schmidt, Rafael Seiz-Puyuelo, Kevin Smith and Jochem Verberne

Project Coordination Jens Hönerhoff, Ute Sudmann (both DEG), Martin Geiger (WWF Germany), Kevin Smith, (Consultant to WWF Germany), Thomas Köberich (WWF Germany) and Stuart Orr (WWF International)

Editors Kevin Smith and Jochem Verberne

Publisher WWF Germany, Berlin

Publication date Januar 2011

Layout Thomas Schlembach, WWF Germany

Production Rainer Litty, Panda Fördergesellschaft

Printing medialogik, Karlsruhe



Cover photo: Michel Gunther/WWF-Canon [M]



Unser Ziel

Wir wollen die weltweite Zerstörung der Natur und Umwelt stoppen und eine Zukunft gestalten, in der Mensch und Natur in Harmonie miteinander leben.

wwf.de

WWF Deutschland

Reinhardtstr. 14
10117 Berlin

Tel.: +49 (0)30 311 777 0
Fax: +49 (0)30 311 777 199