MULTI DIMENSION IMPACT ACCOUNTING (MDIA)

Natural Capital – Water

January 2015

Introduction

There is a reason that scientists are looking for signs of water on Mars. If there is or has been water, then it is possible that life can exist. Without water, there can be no life.

In our modern society and economy, water is taken for granted. The language of the modern industrial economy was developed in Europe where there was an abundance of rainfall and easy access to river water. For all practical purposes, water was a free good.

In many other parts of the world water is scarce, but no less important.

Water has many uses

Water has many uses, it is used for:

- Human consumption … drinking water
- Other household uses
    - Cooking
    - Personal hygiene
    - Laundry
    - Toilet flushing
    - Gardens / car washing
- Animal consumption
- Irrigated crop agriculture
    - Traditional irrigation
    - Smart irrigation
- Industrial use
    - Production of beverages
        - Bottled water
        - Soda, etc.
    - General industrial processes
    - Abandoned industrial sites

What value is water?

The value of water depends very much on the situation. The value of water depends on the supply and the demand.

Classical economics was initially articulated in Western Europe and the UK where water was abundant and sufficient for all needs. It was reasonable in these circumstances to treat water as a 'free' good.

> *I never thought much about this until some 20 years into my career when I was doing consulting work for the United Nations in connection with refugees and displaced people after the Somali/Ethiopian conflict of 1978, and then again in the subsequent famine arising from the Sahel drought in the 1980s.*

No water and the vegetation doesn't grow, animals can't eat and drink and die, and then people die. In this situation the value of water is 'priceless' … it is the difference between life and death.

> *I did some work in Namibia, formerly South-West Africa (SWA) immediately after independence in 1991. Before the 1st World War, SWA had been a German colony and the Germans had built a water canal some 400 miles from the Caprivi River in the North of the country to Windhoek the capital. One of the questions to be resolved was whether or not this canal would be sufficient for a growing city almost 100 years later, because, without it, there could not be a prosperous city and economy. 'Water' was, in fact, the top priority for the new government of Namibia, and for good reason.*

Where and when there is a chronic shortage of water the impact value of water is huge. This is because water is essential for life itself … for people, animals and plants of all sorts.

Where and when there is an excess of water, then the impact value of water is often negative. A large excess of water causes floods which drown people and animals, destroys crops and does damage to physical property.

More or less water is needed for almost every economic activity. Responsible economic activity should have these characteristics with respect to water:

- Be located where there is an abundance of water
- Have a minimum and small net consumption of water
- Have no discharge of water into the environment post process that contains pollutants;
- To the extent that the process consumes product, there should be zero net consumption in the supply chains
- To the extent that the process produces product there should be net value add for all the capitals

State and Flow … the Case of Water

These are the elements that must be taken into consideration:

- The amount of water in a place is part of 'state'. There is clean water and there is polluted water.
- Rainfall, or water flowing into the place as a river is part of 'flow'.

- The use of water by people (household) and by economic processes (agriculture and industry) are parts of 'flow'
- Discharge of water by economic processes and households is part of 'flow'. The quality of these effluents is a factor that must be taken into consideration.
- There is net flow of clean water and there is net flow of polluted water which results in 'change of state'

There are places in the world where there is no rainfall, but a lot of water underground in aquifers. Libya is an example.

> *The rainfall in Libya is minimal and as a result a large part of the country is desert. The population of Libya survives using water that is 'mined' from aquifers. This water is old water that accumulated many thousands of years ago and as it is consumed it is not being replenished. This is a depleting resource.*

How much water is needed for human survival?

One way to calculate this is to assess the loss of water from a human body in the course of a day. In order to survive this loss of water must be balanced with an intake of liquid.

> *This results in a person needing an intake of 2 liters of liquids daily. This may be in the form of water, other beverages or food (most of which contains water). Some people refer to the 8:8 rule, that is, 8 glasses of 8 oz of water/fluid per day.*

How much water is needed for a comfortable life?

Water is used for many purposes in a domestic setting:

- Cooking
- Personal hygiene (washing, bathing, showers)
- Toilet flushing
- Laundry

In Germany the consumption of water per person per day is 122 liters

By contrast the consumption of water per person per day in Africa is just 20 liters

QUESTION? Is this because these numbers are including industrial use?

In Africa water use is estimated to be:

- Agriculture … 85%
- Households... 10%
- Industry … 5%

Water … the Life Cycle

Water goes round and round and round in a cycle, natural and man-made that has the following elements:

- Rainfall
- Storage
  - Domestic rain barrels

    - Reservoirs
    - Aquifers
    - Birkas
- Extraction
    - Shallow well
    - Borehole
- Distribution
    - Aquaducts and canals
    - Water treatment
    - Water distribution pipes and pumps
- Use
    - Household use
    - Agricultural use
    - Industrial use
- Post use remediation
    - Sewage systems
    - Water treatment
- River (watershed and natural water flows)
    - Collects pollution
    - Habitat for aquatic life (or not)
    - Flows downstream to other water bodies
    - Natural pollution remediation
    - Flows into aquifers
- Ocean
    - Water storage but salt water (dissolved minerals)
    - Habitat for huge diversity of marine life
    - Locus for wild capture fisheries
    - Locus for ocean floor industrial activity
    - Growing number of dead zones where all marine life has died
    - Heat sink that has role in regulating weather
- Evaporation … go back to rain

Water use … household and domestic use

Water use … crop agriculture

There is a wide variation in the amount of water required for different crops. This is shown in the following table:

Water use … livestock agriculture

The example of Libya

The population of Libya is N.N million people.

Most of the population live in urban centers:

Tripoli ...

Benghazi ...

Tobruk ...

The need for water for the population based on a consumption per capita of N liters per day is going to be N,N million liters per day

The rainfall in Libya is very low ... over a typical year averaging only N.N million litres per day.

The difference is made up by 'mining' water. This is the extraction of old water from aquifers that were created thousands of years ago and are not being replenished.

A future trade in water

It is entirely predictable that there will be an international trade in water, just as there is an international trade in fossil fuels like coal, crude oil and natural gas. Millions of barrels of oil are routinely shipped around the world in supertankers, and it would be easy to do the same for millions of barrels of water.

This does not happen because conventional economic metrics put no price on water, while there is a price on gasoline (and other derivatives of crude oil) and financial profit can be accounted for and reported.

Quantifying the role of water

The common numbers in a domestic context are:

- Money paid for water. This is paid to the entity supplying the water.
- Amount of water input in the period
- Amount paid for sewer service
- Amount of sewage (sometimes this is assumed to be the same as the input)

Value is a function of place

The value dynamic of this depends on the water situation in the place.

In the event that the water use for the population as a whole is small relative to the amount of water flowing through the place, then the impact of water use is inconsequential … not material and analysis is moot.

In certain cases where the available water is sufficient in the place but is drawn from a river that also supplies other populations, then the analysis must include the impact water use in one place will have on the populations in other places.

- Example: The River Nile which flows from Uganda and Ethiopia through South Sudan and Sudan to Egypt.
- Example: The Colorado River in the United States where all the water is extracted from the river before it reaches the ocean in Mexico (see URL: <a href= 'http://truevaluemetrics.org/DBadmin/DBtxt001.php?vv1=txt00009010' > Open file 9010 /a>

Conclusion: This suggests that water should have a standard impact value that varies according to the place.

Impact value should be based on net consumption

Net consumption in an economic activity or process is the difference between the good potable quality water that is taken in and the good potable quality water that is available after the process.

Impact value should reflect dynamic of any toxic discharge

It has been normal for operators of industrial processes and including agriculture to take in potable quality water and discharge water that has been polluted by the process. In many cases this discharge has been ejected into the environment with no cleanup and the toxins or other pollutants become incorporated into the downstream water flows.

This dynamic is complicated. A small amount of concentrated toxic water being discharged into a larger water flow can compromise the larger water flow.

> *A leakage of chemical solution into a river in Tennessee poisoned the drinking water for a community of over 300,000 people. It was several weeks before the river could be used as a source of drinking water for the water supply for the community. (See http://en.wikipedia.org/wiki/2014_Elk_River_chemical_spill)*

It has been customary to think of things as good or bad, and to have a single number to reflect value (or cost or price). In the emerging MDIA framework, there should be multiple numbers to reflect the characteristics of the element. With this idea there is a number for the good AND there is a number for the bad.

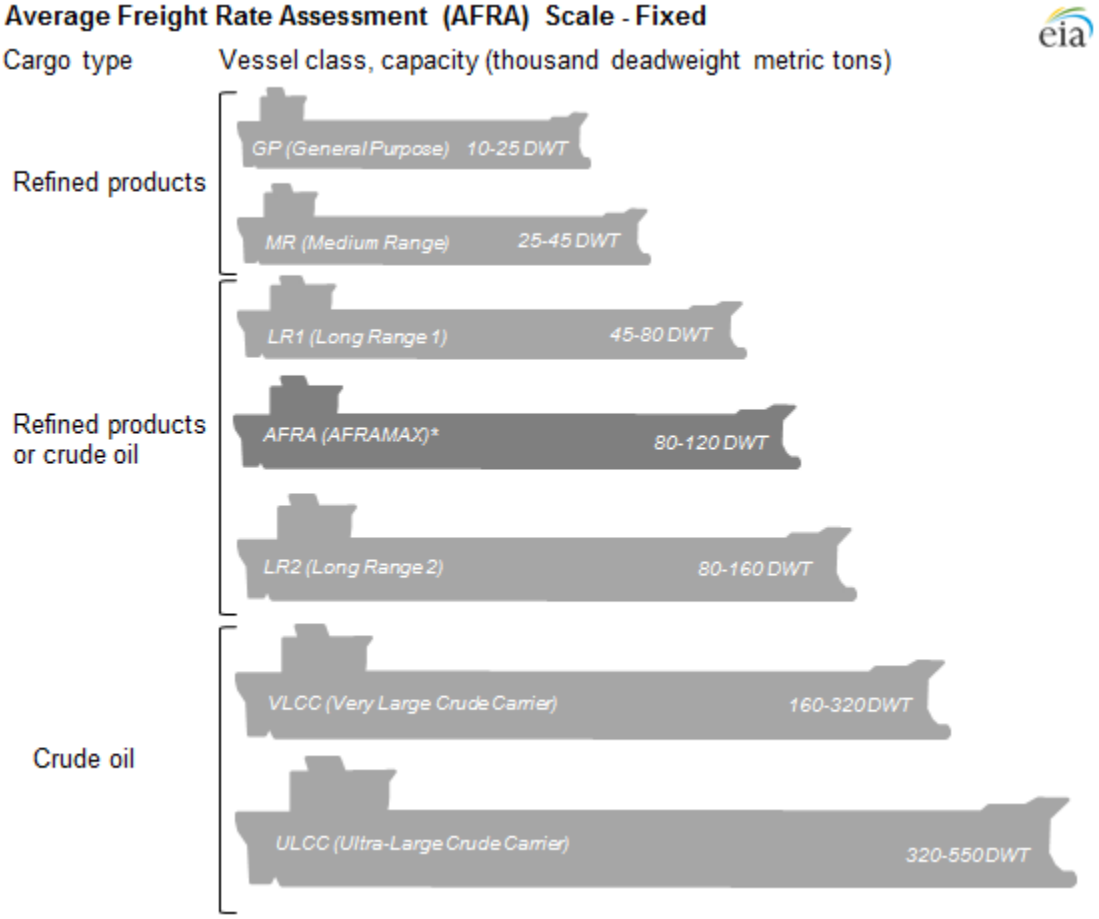
The beneficial impact

Transporting water from one place to another

Energy, which has always had a 'price' is moved around the world on a massive scale.

> *I have memories as a child growing up in the UK seeing coal trains moving round the country from the collieries in the North of England to power stations around the country. More recently I have observed coal trains moving coal from coalfields in the United States to power stations and to export ports.*

Moving coal and moving crude oil and petroleum distillates, not to mention liquified natural gas (LNG) around the world is the norm. Crude oil from the Middle East is routinely shipped in tankers ranging in size from quite small to as big as 320-550 DWT to refineries in Europe, the Far East and the United States.



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Natural Capital … Water

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