



Water Footprints

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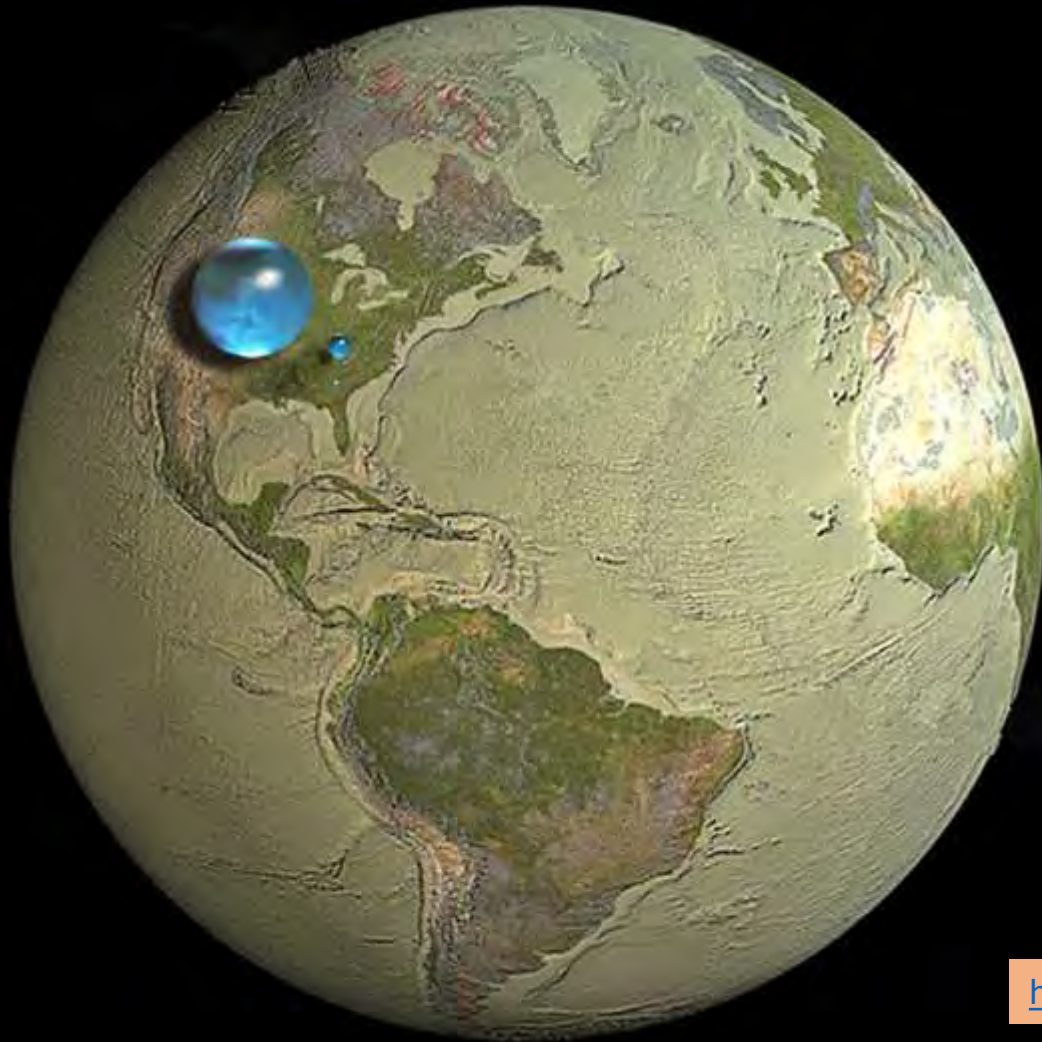


- Industrial Footprint = area of development
- Water Footprint = litres/kg, m³/tonne, l/kcal,
 - green, blue, virtual,
- Carbon Footprint = CO₂e/kg
- Ecological Footprint = hectares/person (input+output)
- Life Cycle Analysis = environ impacts of process from cradle to grave (all inputs and outputs)
 - Life Cycle Impact Analysis

Water Footprint Factoids - from [Siemens](#) (USA site)

- It takes about 37 gallons of water to grow the coffee beans and process them to make one cup of coffee.
- More than 1,300 gallons is required to produce a 12oz steak.
- About 6,800 gallons of water is required to grow a day's food for a family of four.
- It takes 52 gals of water to produce one glass of pasteurized milk. The ratio is 1,000:1 so to produce 1 gallon of milk in the fridge takes 1,000 gallons out in the fields
- It takes more than 10 gallons of water to produce one slice of wheat bread. If you eat the bread with a slice of cheese then you add another 13 gallons.





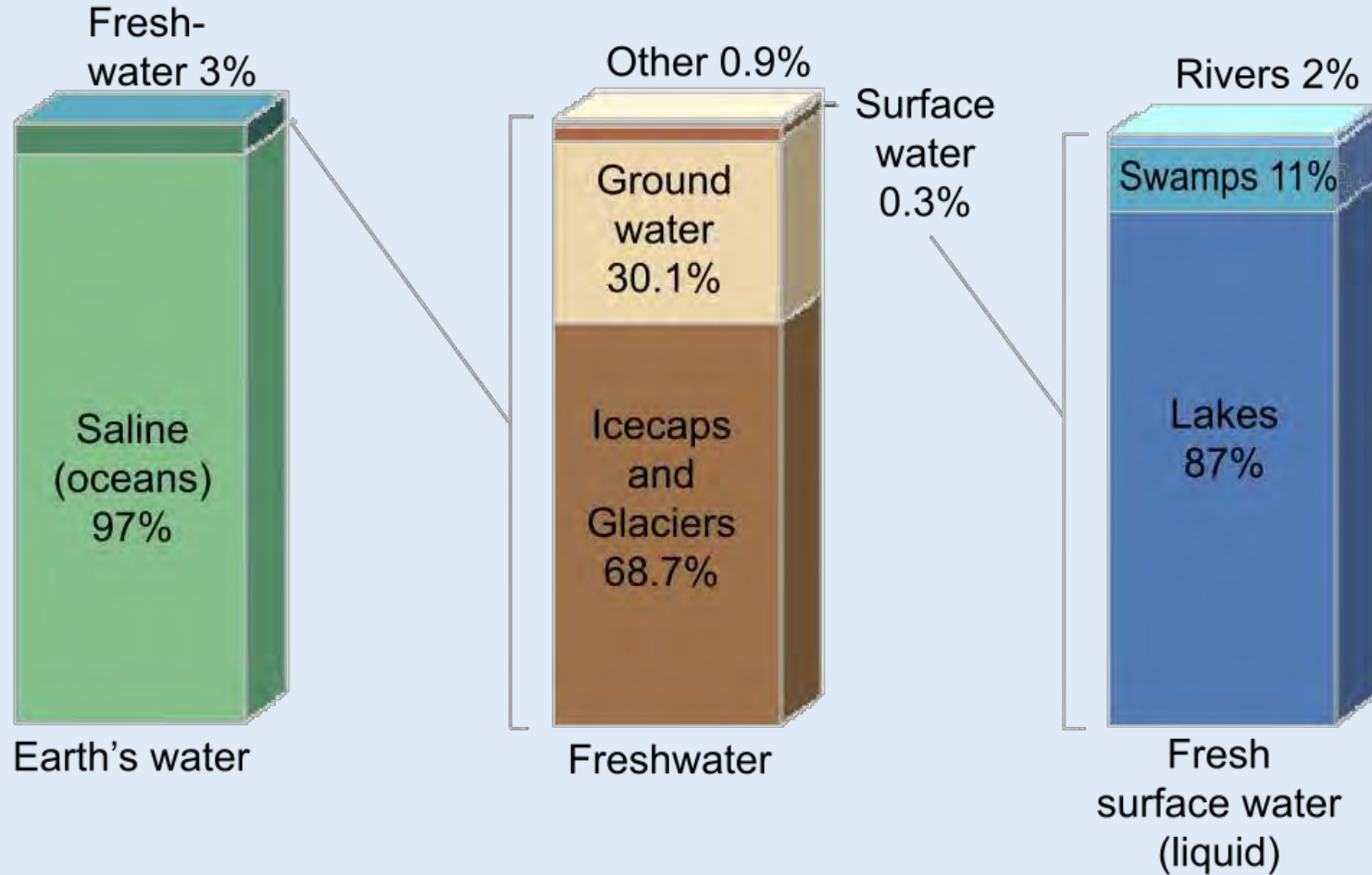
Relative Volume

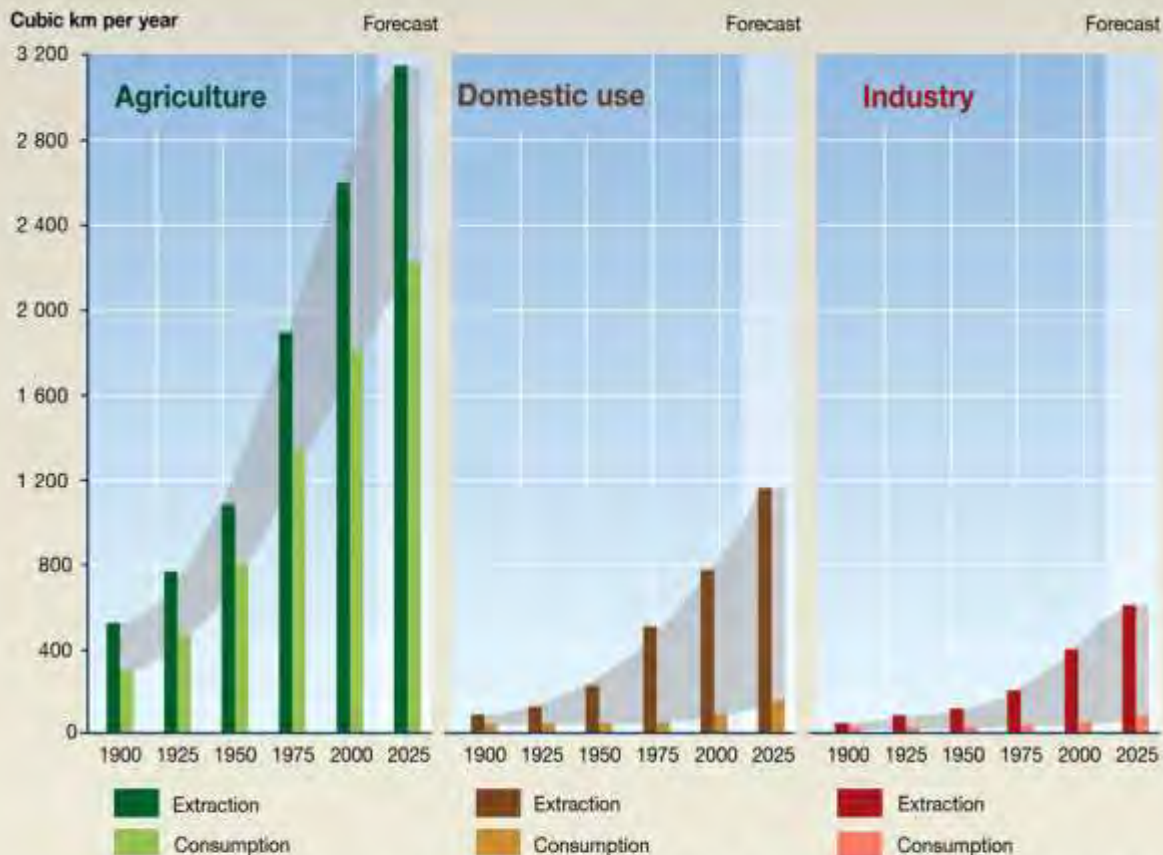
Total water

Fresh water

Lakes & rivers

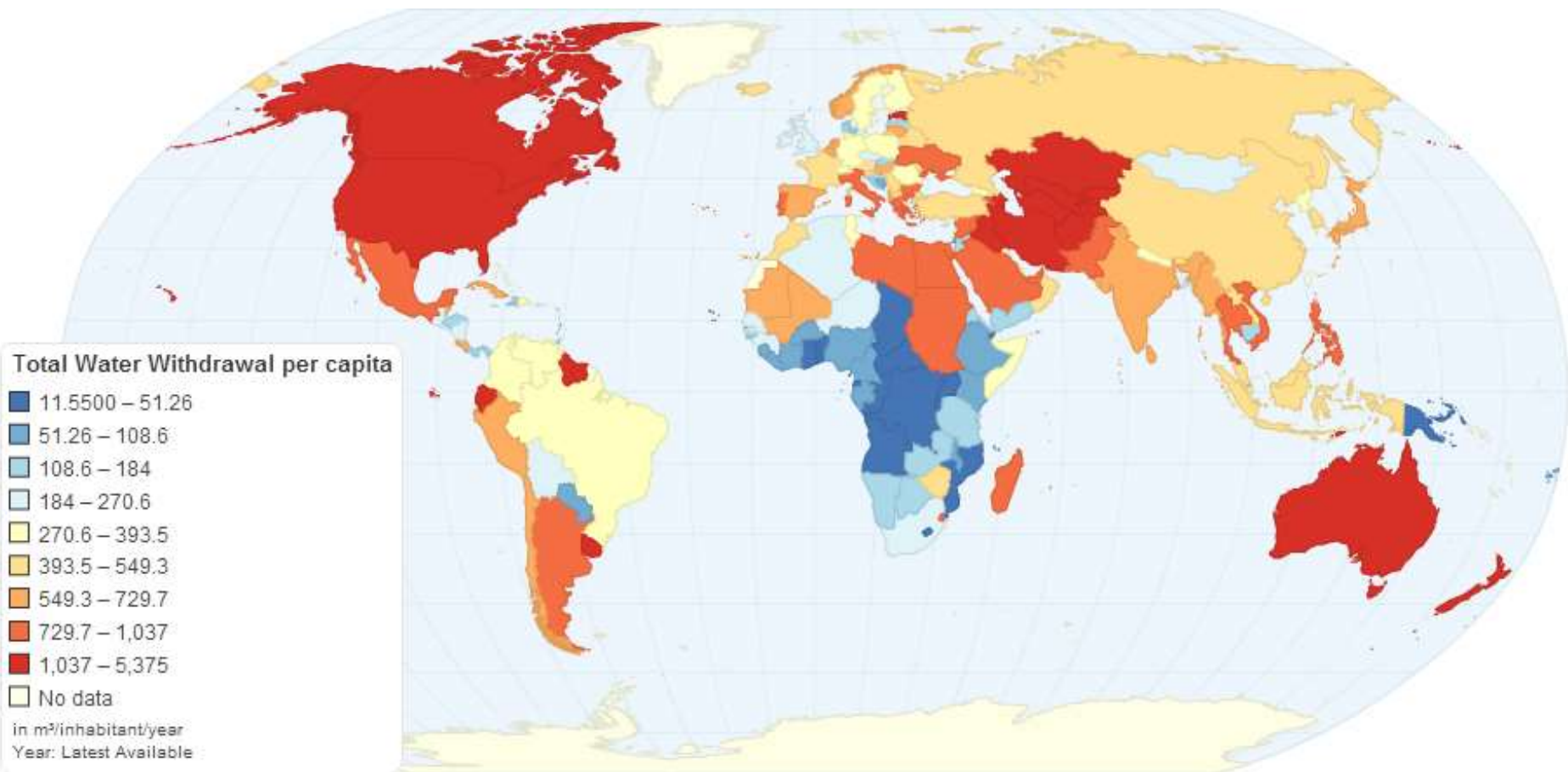
Distribution of Earth's Water



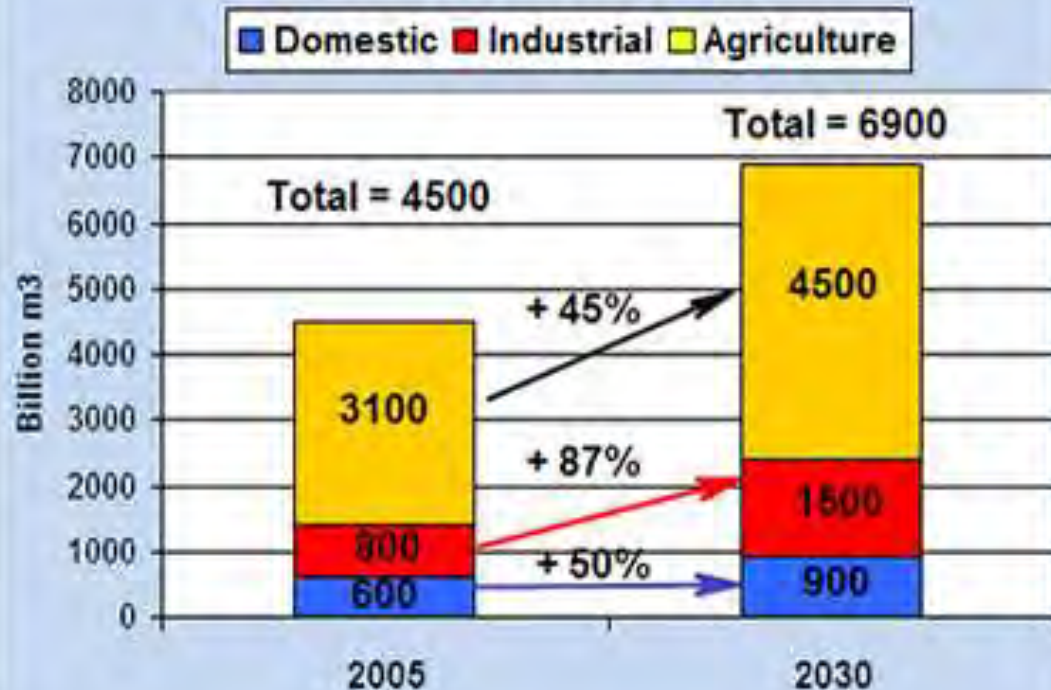


The grey band represents the difference between the amount of water extracted and that actually consumed. Water may be extracted, used, recycled (or returned to rivers or aquifers) and reused several times over. Consumption is final use of water, after which it can no longer be reused. That extractions have increased at a much faster rate is an indication of how much more intensively we can now exploit water. Only a fraction of water extracted is lost through evaporation.

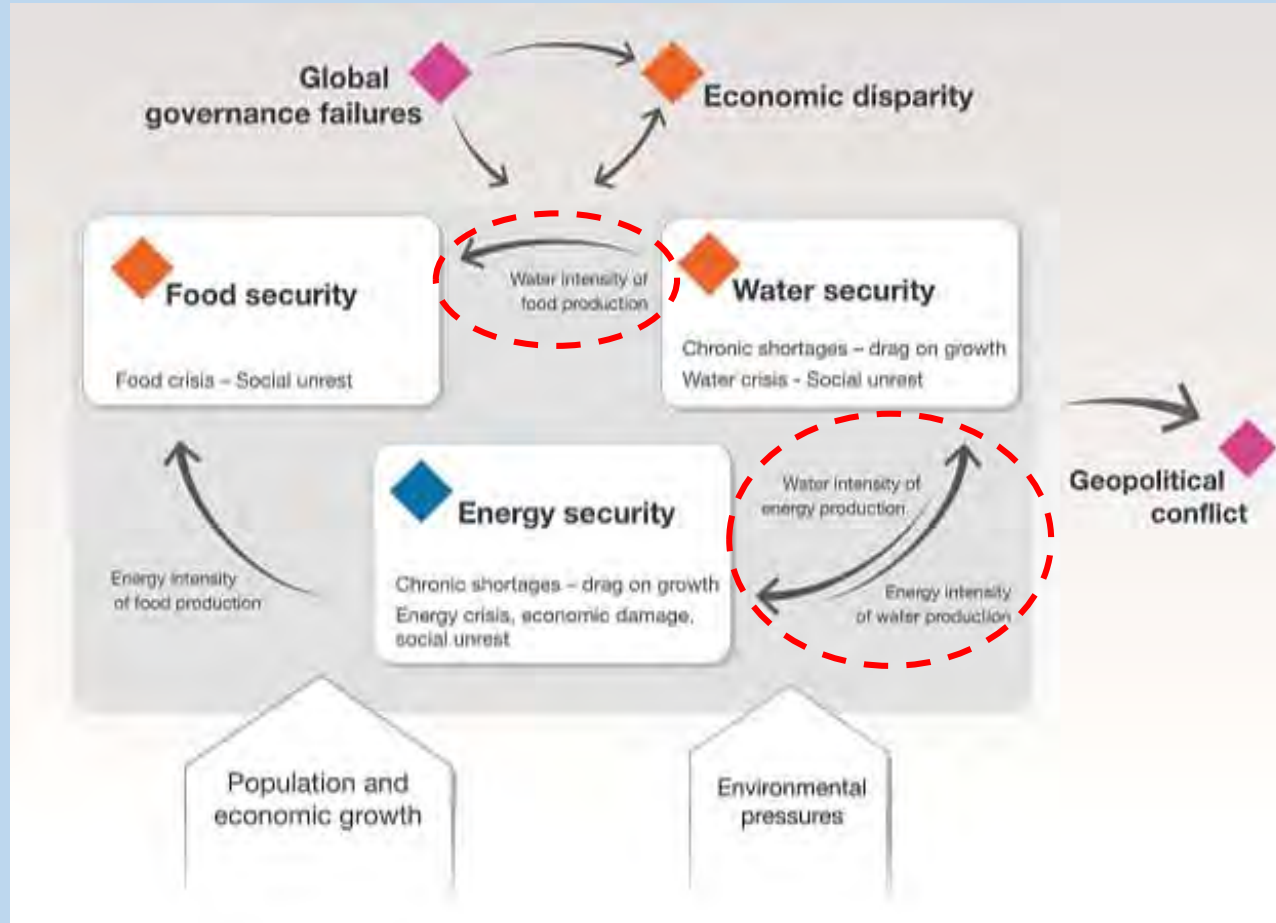
Source: Igor A. Shiklomanov, State Hydrological Institute (SHI, St. Petersburg) and United Nations Educational, Scientific and Cultural Organisation (UNESCO, Paris), 1999.



Global Water Demand 2005-2030 (Existing vs. Projected)



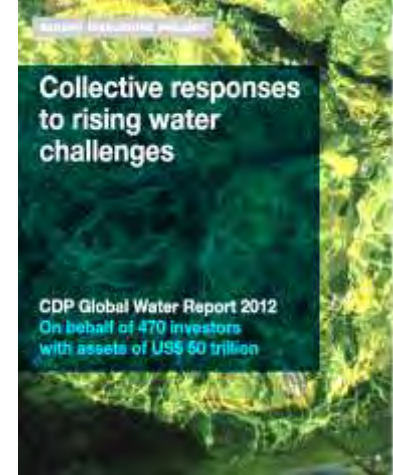
“Global Risks: The Water-Food-Energy Nexus”, (World Economic Forum, 2011)



Carbon Disclosure Project - Global Water Report

2012 – On behalf of 470 investors with assets of US\$ 50 trillion

- Water risk is a prominent and rising issue among 2012 respondents
- Water represents a strategic opportunity to improve financial and brand performance
- Water is still not receiving the boardroom attention it deserves
- Assessing and addressing exposure to water-related supply chain risk is on the rise
- Setting the stage – Collective action as an approach to addressing risks and opportunities



ABOUT US

FOOTPRINT BASICS

FOOTPRINT SCIENCE

PARTNERSHIPS

RESOURCES



Footprint Calculator

How much land area does it take to support your lifestyle? Take this quiz to find out your Ecological Footprint, discover your biggest areas of resource consumption, and learn what you can do to tread more lightly on the earth.



- Ecological
- Carbon
- Water
- Industrial
- ?

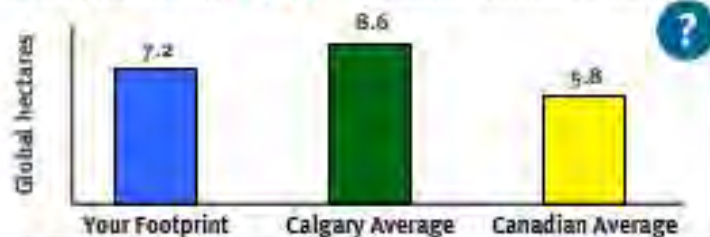
YOUR PERSONAL ECOLOGICAL FOOTPRINT

[print results](#)

Congratulations on completing the first step to reducing your Ecological Footprint.

Your Ecological Footprint is: **7.2** global hectares

Your current consumption requires an area of productive land equivalent to **8.8** Canadian football fields.



The imagineCalgary objective is to reduce Calgary's Ecological Footprint 30% by 2036.

Your Ecological Footprint based upon your consumption: (hover over each section for additional information):



Some ideas to reduce your Footprint – follow the “take action” link below for detailed suggestions:

Energy (70% of Calgary's Footprint):

- Reduce your household energy use – turn down your thermostat when not occupied and at night, use energy efficient bulbs and replace appliances with Energy Star® rated models, add insulation and draft proofing.
- Use public transit, carpool, ride a bike or walk. Keep tires properly inflated, have your vehicle properly tuned and avoid idling.

Local Foods:

- In season, purchase locally grown foods that require less transportation and processing to get products to market.

Goods:

- Reduce consumption of one-time use products. Purchase re-usable products when possible. Avoid products that produce excess waste. Purchase goods that are made locally to reduce their transportation Footprint.

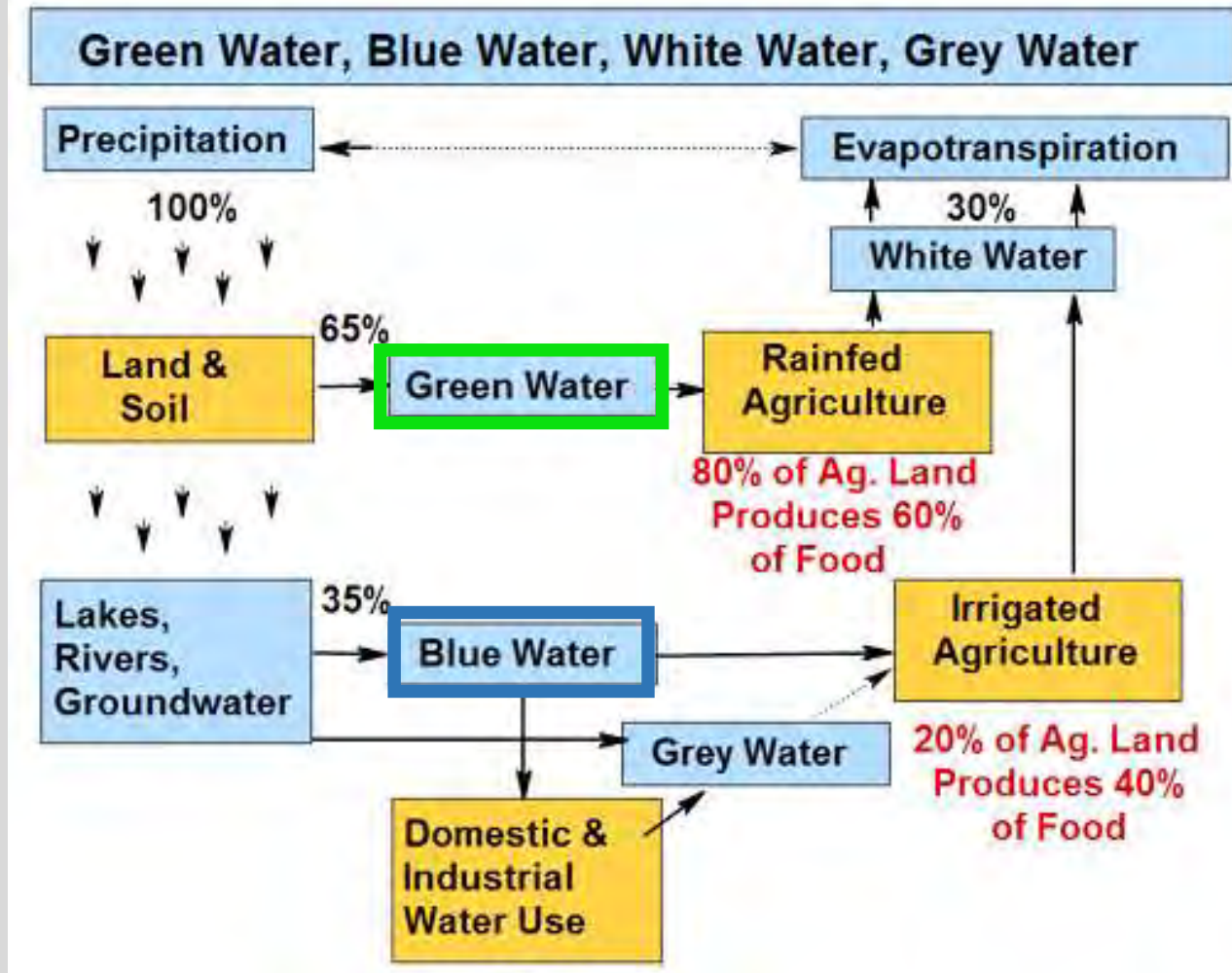
[edit footprint](#)[go back and retake parts of the quiz](#)[take action](#)

Return to Calgary.ca/footprint to find out what you can do to take action to reduce your footprint



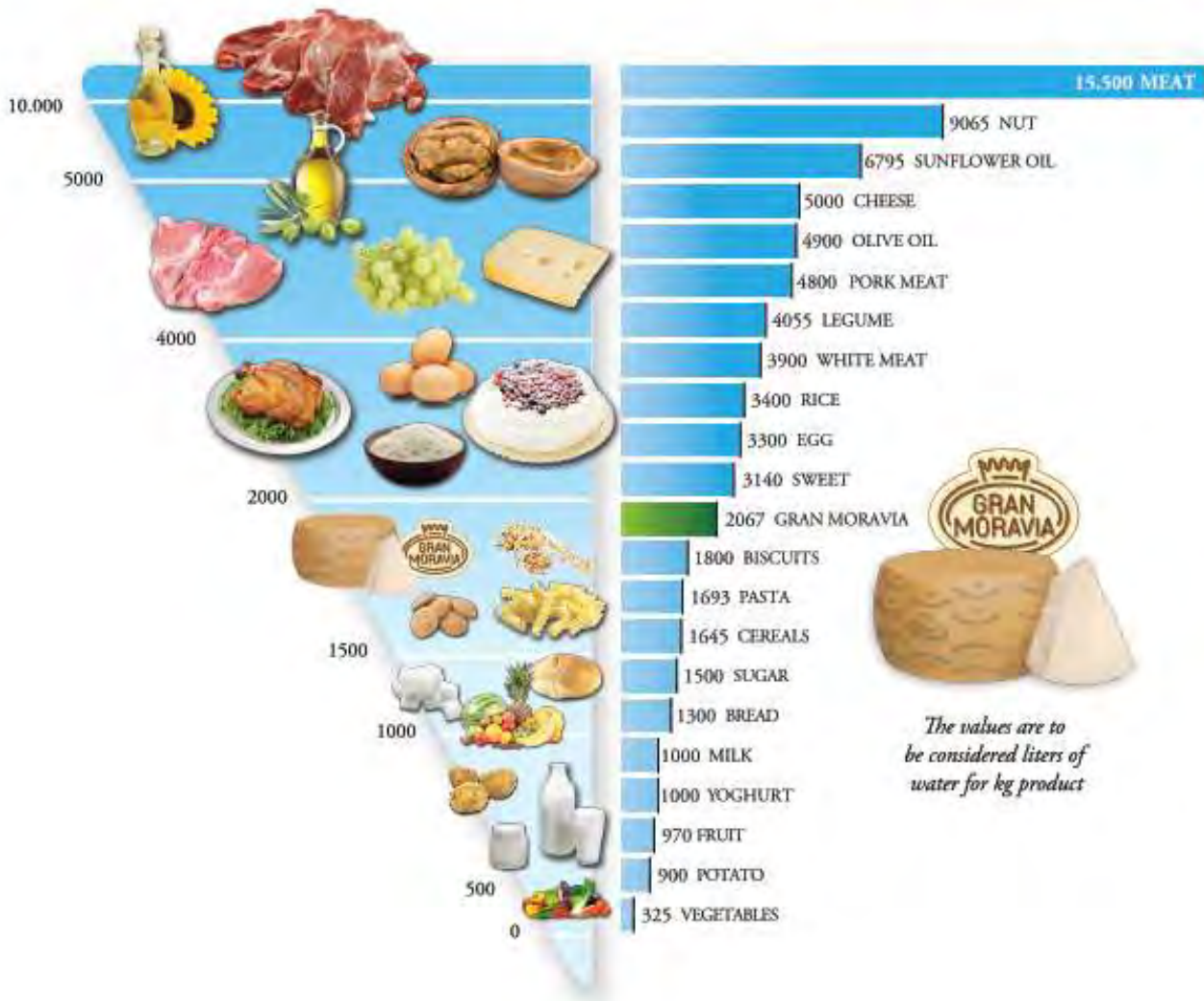
www.calgary.ca/footprint

Water Colours



Primary crop category	Water footprint (m ³ ton ⁻¹)				Caloric value* (kcal kg ⁻¹)	Water footprint (l kcal ⁻¹)
	Green	Blue	Grey	Total		
Sugar crops	130	52	15	197	290	0.68
Fodder crops	207	27	20	253	—	—
Vegetables	194	43	85	322	240	1.34
Roots and tubers	327	16	43	387	830	0.47
Fruits	727	147	93	967	460	2.10
Cereals	1232	228	184	1644	3200	0.51
Oil crops	2023	220	121	2364	2900	0.81
Tobacco	2021	205	700	2925	—	—
Fibres, vegetal origin	3375	163	300	3837	—	—
Pulses	3180	141	734	4055	3400	1.19
Spices	5872	744	432	7048	3000	2.35
Nuts	7016	1367	680	9063	2500	3.63

Food Pyramid According to the Water Footprint



Environmental Footprinting Project

(Kerrienne Koehler-Munro, Roger Bryan, ARD, 2014)

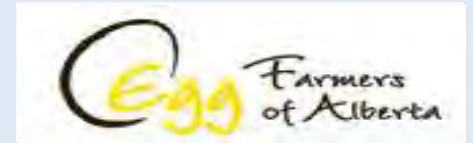
- The project will use a life cycle approach for primary production level sustainability assessment and reporting for four agriculture commodities in Alberta
 - Canola
 - Potato
 - Chicken
 - Egg

Previous LCAs: Pork, Beef



Collaborative Approach

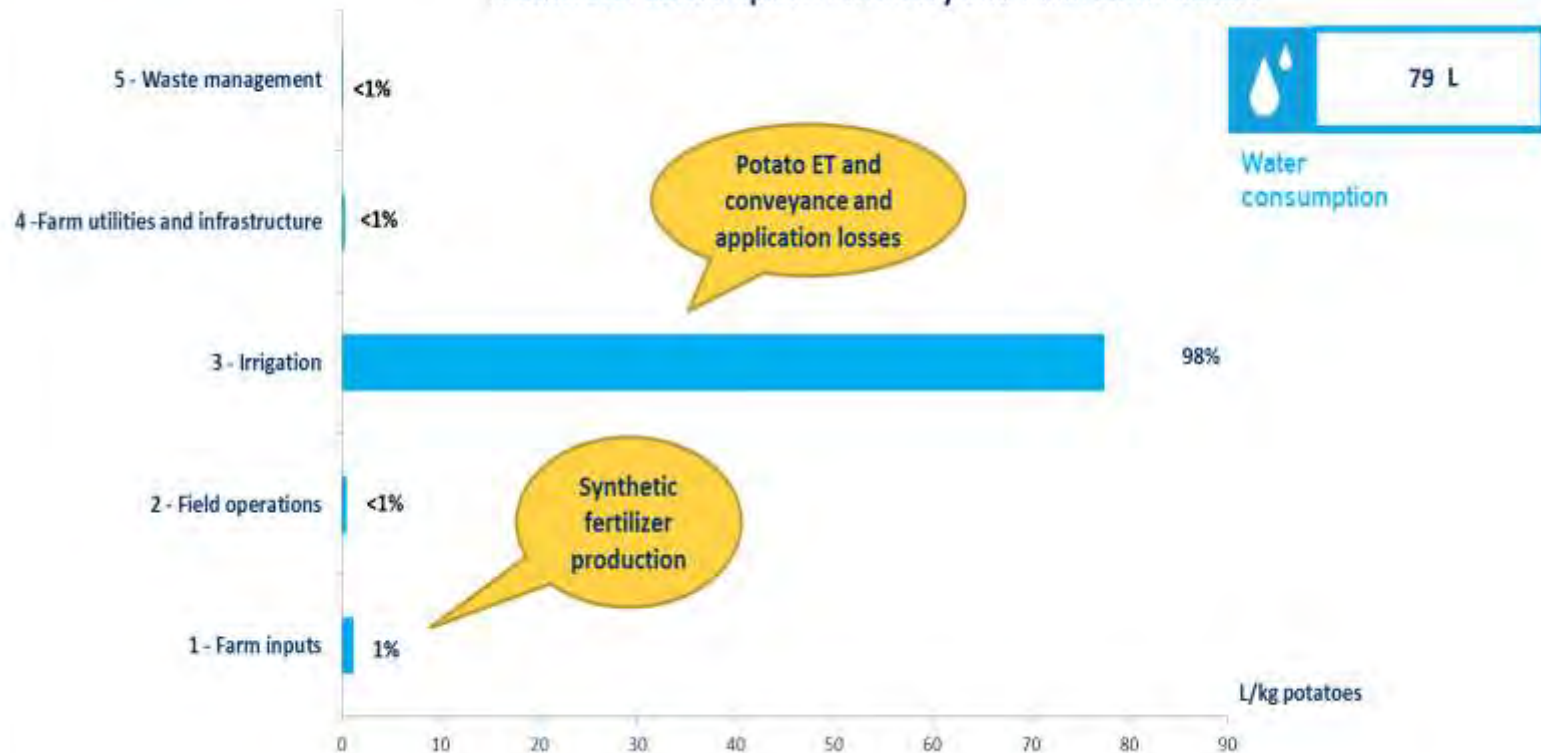
- Advisory Committee
- Industry advisors and collaborators
- Quantis Canada



Agriculture and
Agri-Food Canada



Freshwater consumption inventory and main contributors



$$W_{\text{watershed}} = W_{\text{at farm}} + W_{\text{return}} + W_{\text{loss-res}} + W_{\text{loss-canal}} + W_{\text{other uses}}$$

$$W_{\text{delivered at farm}}[\text{dam}^3] = \frac{W_{\text{watershed}} \times e_c}{100}$$

$$W_{\text{district}} \left[\frac{\text{freshwater consumption (m}^3\text{)}}{\text{water delivered on farm (m}^3\text{)}} \right] = \frac{w_{\text{loss-res}} + w_{\text{loss-canal}}}{W_{\text{at farm}}}$$

$$W_{\text{consumption-delivery}} \left[\frac{\text{freshwater consumption (inches)}}{\text{water delivered on farm (inches)}} \right] = \frac{0.08 + 0.03}{1} = 0.11$$

$$W_{\text{return-delivery}} \left[\frac{\text{freshwater return}}{\text{water delivered on farm}} \right] = 1 - (e_a/100) - w_{\text{consumption-delivery}}$$

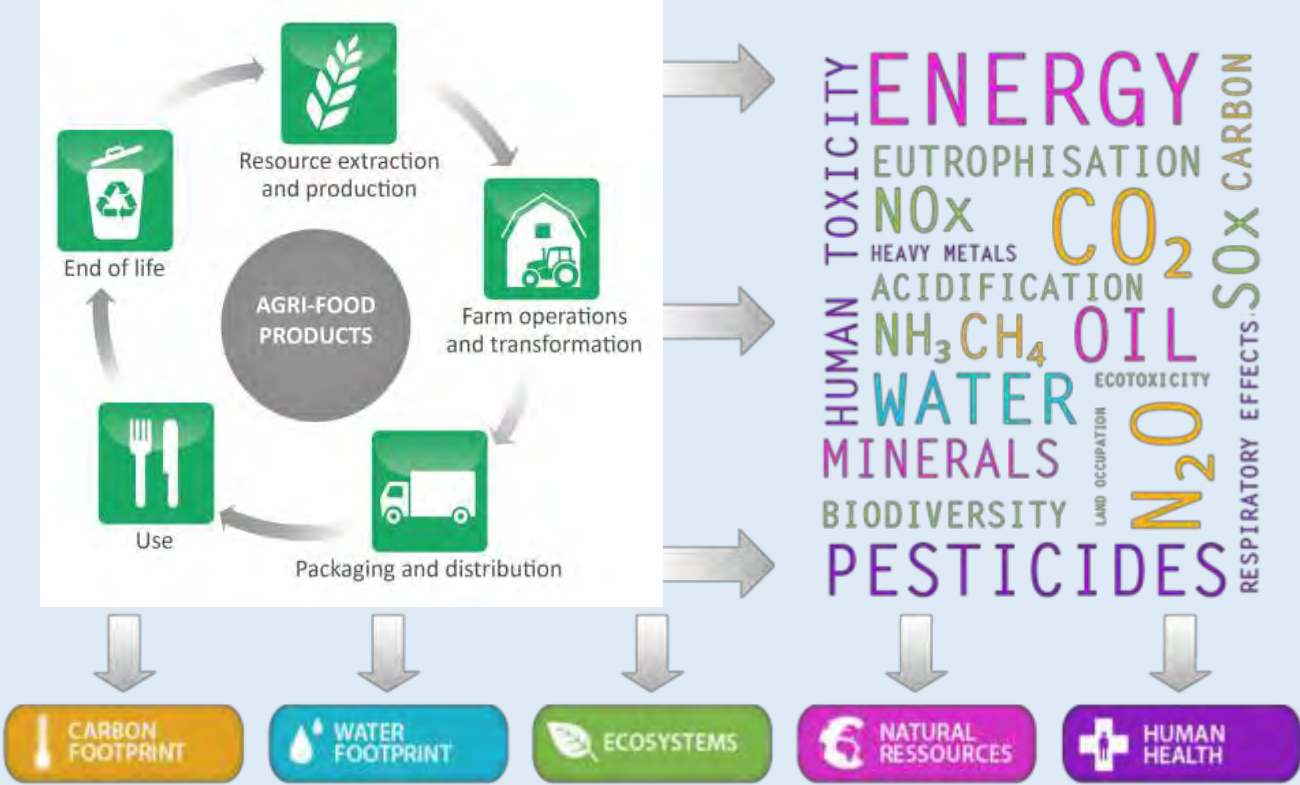
$$W_{\text{withdrawal-delivery}} \left[\frac{\text{freshwater withdrawal (inches)}}{\text{water delivered on farm (inches)}} \right] = w_{\text{consumption-delivery}} + w_{\text{return-delivery}}$$

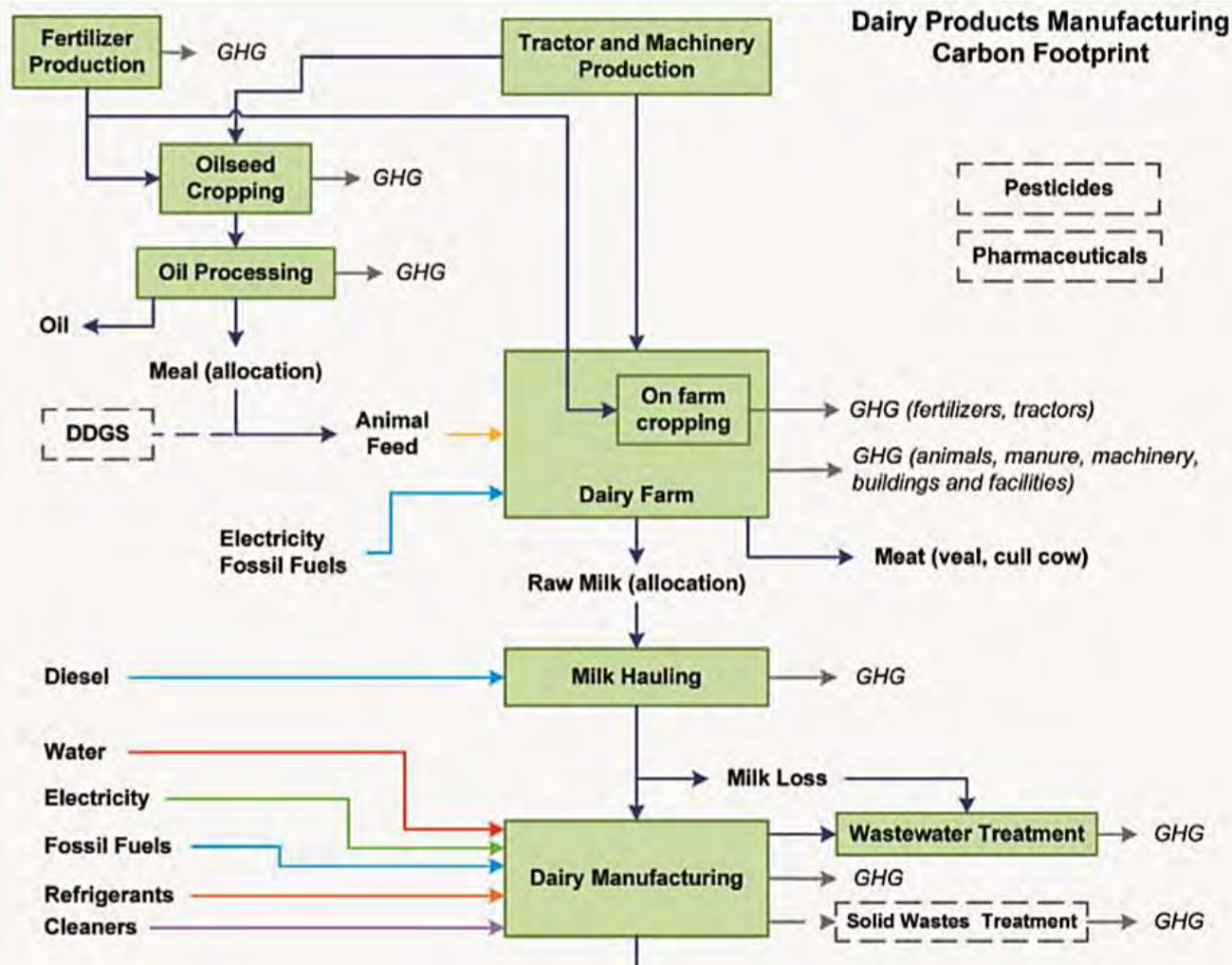
$$W_{\text{ET}} [\text{freshwater consumption (m}^3\text{)}] = W_{\text{use}} - (W_{\text{use}} \times w_{\text{withdrawal-delivery}})$$

$$W_{\text{TOT}} [\text{m}^3] = (w_{\text{conveyance}} \times W_{\text{use}}) + (w_{\text{consumption-delivery}} \times W_{\text{use}}) + W_{\text{ET}}$$

$$WS [\text{m}^{\text{eq}}] = WSI \times W_{\text{tot}}$$

Life Cycle Impact Assessment





Canadian dairy GHG LCA to farm gate

- Boundaries and
calculation paths.

excluded processes

excluded paths

(Vergé et.al. 2013, J. Dairy Sci 96)

“Only five countries possess the ‘Goldilocks’ combination of relatively ample precipitation and low ratios of population to arable land, which would allow them to significantly increase food production:

Canada, Brazil, Argentina, Russia and the United States.”

Actions:

- 1) Develop Drought/Flood Contingency Plans**
- 2) Provide Incentives for Innovation in Water Efficiency**
- 3) Establish Virtual Water and Water Footprint Pilot Projects**
- 4) Create a National Virtual Water Inventory and Risk Assessment Tool**
- 5) Support Farm Level Research, Education and Access to Information**
- 6) Implement True Cost Accounting to Capture Externalities**
- 7) Evolve Toward Full Water Footprint/Life Cycle Assessment**



([Schreier & Wood](#), 2013)

Challenges

- Irrigation vs dryland water footprints
- It's more than a water footprint
- Water per protein/vitamin/calorie/functional nutritional unit?
- Co-benefits of food production
- Who informs who?

On your farm?

- Awareness/strategy/positioning/requests of your producer group, farm group, buyers?
- It's about Efficiencies.
 - Regional, sector, farm levels.
 - What can you influence on the farm? For your sector?
- Show leadership...

Further Reading/Links:

[USGS water science](#) introduction document (bubbles of water on Earth)

[Water Footprint Network](#) – home base for water footprinting.

Global Risks 2011 – World Economic Forum

<http://www.weforum.org/reports/global-risks-report-2011>

Video - <http://www.weforum.org/videos/risks-focus-3-water-food-energy-nexus>

UN intl year of water 2012

[2030 water resources group](#) – “charting our water future” (McKinsey&Co)

ARD Agriflex [Footprinting project](#).

[Better by the Drop](#) – revealing the value of water in Canadian Agriculture.

[Alberta Water Portal](#).

Pulse Canada [Sustainable Business Guide](#) (new this week)