Economic considerations of water in the cotton supply chain: the risk of shortage

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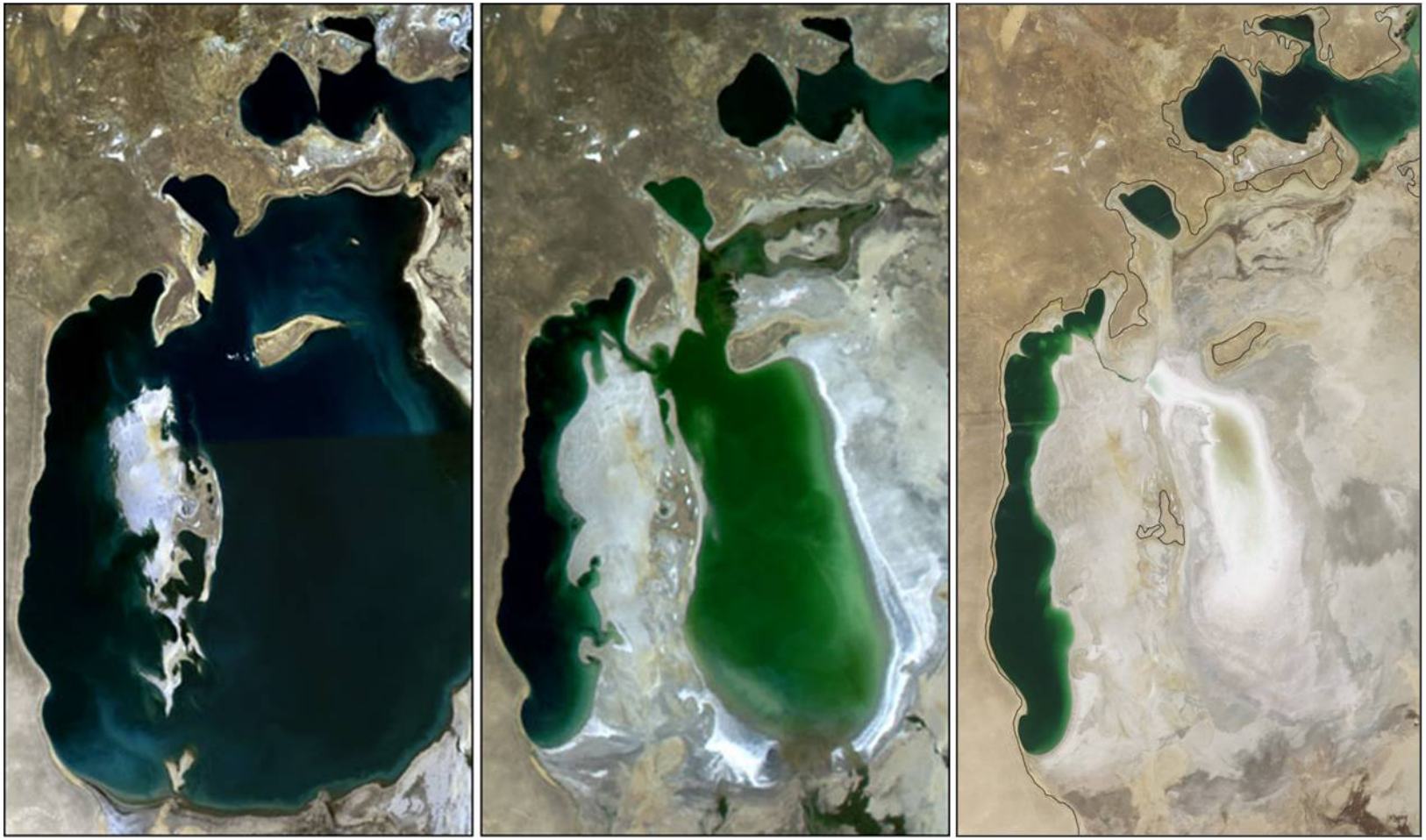
Overview

- 70 % of cotton is grown in arid regions: China, USA, India, Pakistan, and Uzbekistan
- It is processed through a complex supply chain with access to clean water being vital to many processes
- Production, laundering, dyeing and consumer washing are the most significant water users
- Opportunities and solutions exist but often require large capital investments and/or collective action

Cost of inaction is greater than the cost of action



July – September, 1989 **August 12, 2003** **August 16, 2009**

Cotton cultivation has had a significant role in the depletion of the Aral Sea (above).

Credit: University of Maryland Global Land Cover Facility and NASA Goddard Level 1 and Atmospheric Archive and Distribution System.

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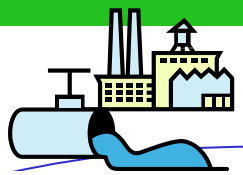
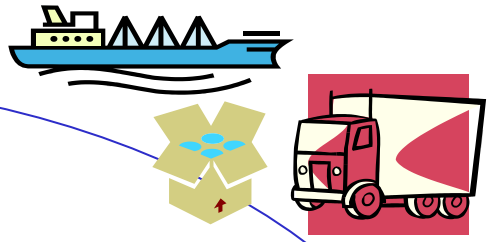
The cotton supply chain uses water at various stages



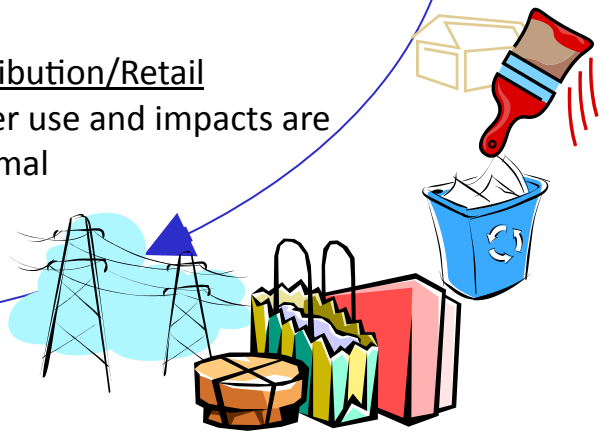
Product Production
Water is used for dyeing, laundering and energy production
Wastewater treatment is needed



Transportation of Goods
Water use and impacts are minimal

Production
The most water-intensive segment of the cotton supply chain

Distribution/Retail
Water use and impacts are minimal



Consumer Use
Second most water-intensive segment of the cotton supply chain

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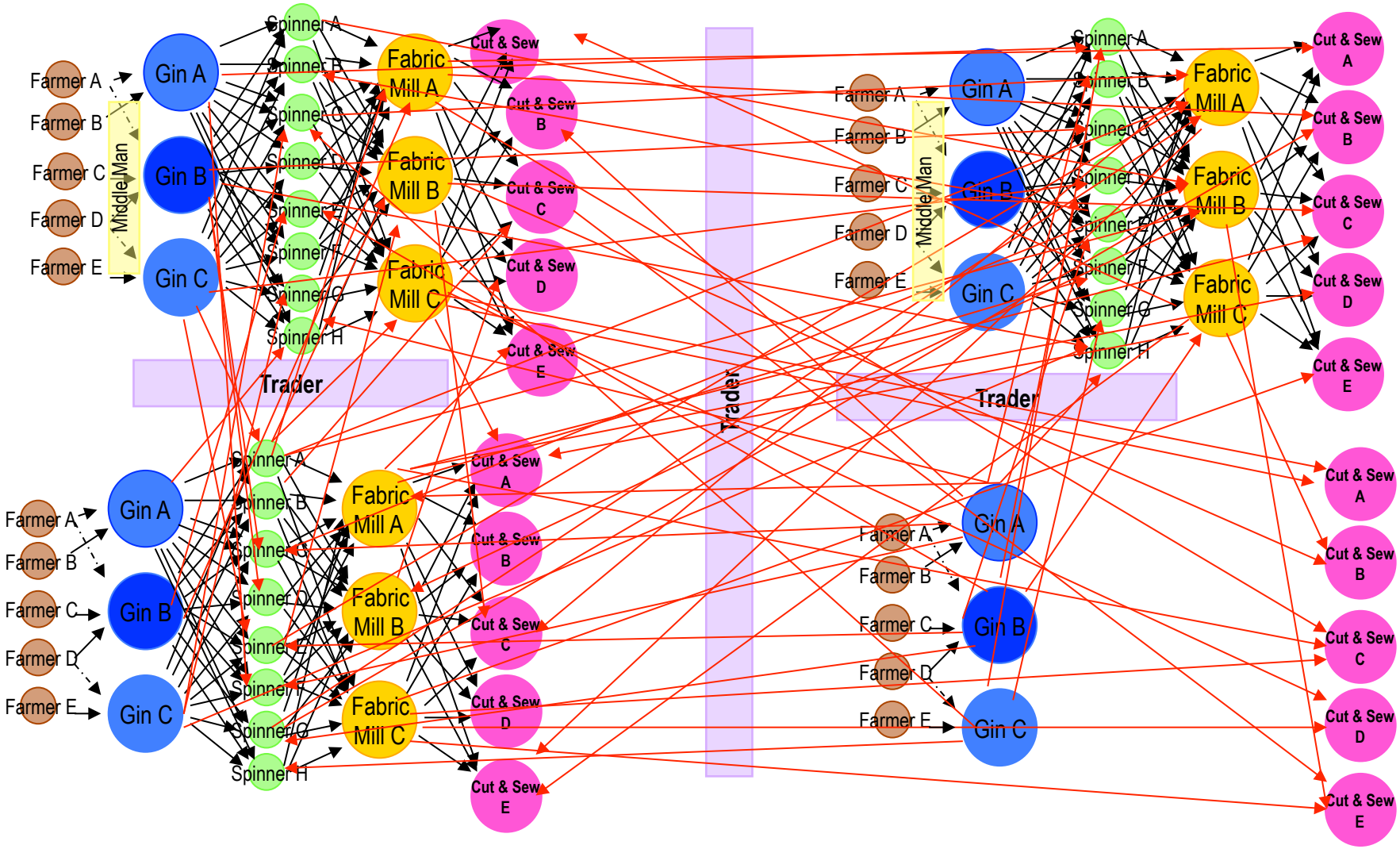
Global Cotton Supply Chain (it is really a web)



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Water Footprint Network frames the development of a water footprint assessment in four phases

- Phase 1: Setting goals and scope
- Phase 2: Accounting
- Phase 3: Sustainability assessment
- Phase 4: Response formulation

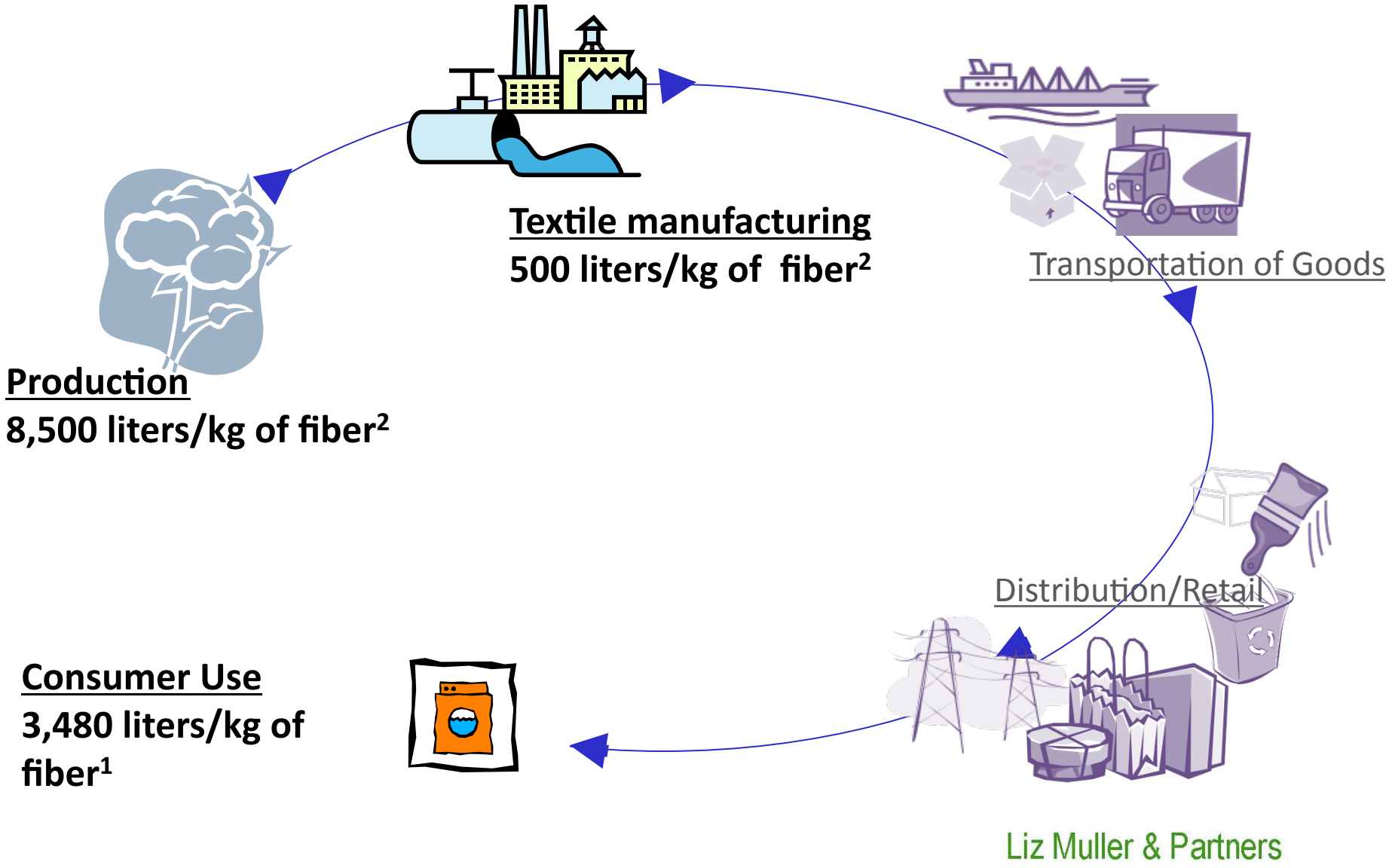
Industry will face increasing competition for water

- Water availability will be impacted by:
  - Climate change
  - Increasing demand (agricultural and rural)
  - Shifts in water allocation and rights

Water related risks come in various forms

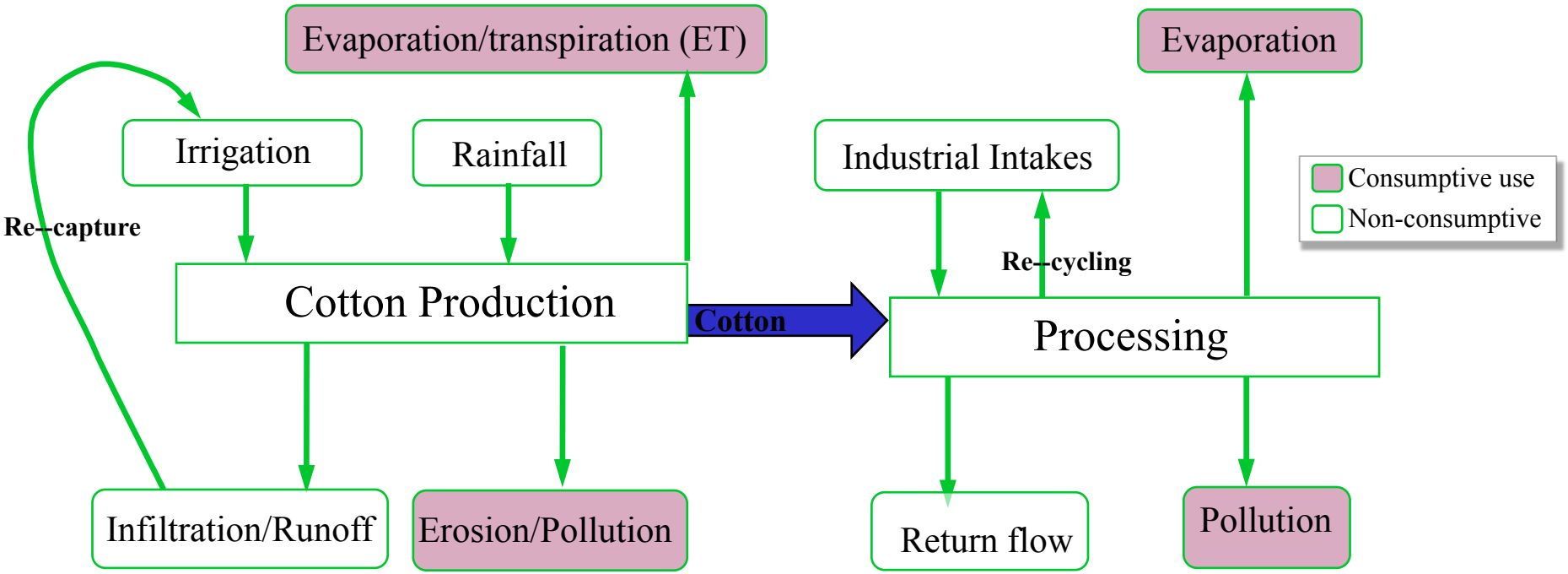
- Supply chain risks
- Regulatory risks
- Reputational risks

Focus should be given to the production and processing segments of the supply chain



Sources: [1] Levi Strauss & Co. (March, 2009); [2] (Chapagain et al., 2006)

Cotton Production: consumptive and non-consumptive uses exist in the cotton life cycle



Source: Biofuels and Water:impact assessment across regions and along the supply chain (Fingerman, 2010)

Water demands will be greater for irrigated production

- **Rain-fed cotton:** cotton that is grown without supplemental irrigation. Approximately 45% of cotton is rain-fed or partially irrigated (Chaudhry n.d.)

- **Irrigated cotton***:* cotton that is irrigated from canals, groundwater, or other bodies of water. This comprises approximately 55% of the world's cotton area (Chaudhry n.d.)

Water use during production varies considerably

	Volume of Water Used (1997-2001)	
Country	**Water withdrawl** (L/kg of cotton seed)	**Rain water** (L/kg of cotton seed)
China	760	1258
USA	576	1673
India	2150	6512
Pakistan	3860	1054
Uzbekistan	4377	83

Good agricultural practices are cost effective ways to save water

- Maximize storage, distribution and application efficiency
- Deepen farm dams to reduce evaporation (losses can range from 15-45%)
- Monitor water use and calculate efficiencies
- Achieve uniform application
- No till farming to help retain soil moisture
- Use new, more efficient methods of irrigating (e.g. overhead irrigators, bank-less channels)
- Grow appropriate cotton varieties that require less water

Efficient irrigation will be needed

	Drip Irrigation	Furrow-Irrigation
Irrigation Water Applied (inches of water/acre)	20-25	60
WUE (.lbs of lint produced	70-80	20-25

Subsurface drip can increase efficiency by an additional 10 percent

Source: E.R. Norton and J.C. Silvertooth ,2001

Building resiliency in cotton production

- Advance research efforts directed toward developing countries, raising efficiencies, productivity, and yields
- Support efforts to promote better agricultural practices
- Use more appropriate varieties of seeds (e.g. drought tolerant)
- Finance and/or install irrigation in water-stressed cotton producing regions
- Provide more affordable crop insurance

Water-intensive processes include dyeing, bleaching, mercerizing, and scouring

- Only 10% of facilities are reusing their water for purposes such as irrigation and toilets
- Recycling water for apparel processing must meet stringent quality parameters and is cost prohibitive
- Wastewater is often treated at the facility level then discharged into the municipal treatment facility

Industry-level action should be supported

NRDC Clean by Design findings:

- Considerable opportunities exist for low-cost improvements in time, materials, water and energy
- Increases in production efficiency equal increased profits due to reductions in energy usage, time and materials

BSR Sustainable Water Group study:

- Current government regulations and enforcement offer little incentive to improve water management; thus, factories managers have little to no rationale for improvement
- Most factories believe that regulatory compliance meets the brands' management requirements

Source: Business for Social Responsibility: Water Management in China's Textile and Apparel Factories, Ross School of Business at the University of Michigan study

Wastewater treatment is a costly investment

- Wastewater 600 liter/kg of textiles
- Wastewater treatment averages $0.30 - $1.50/ kg of textile
- **$1,226,993 - $61,234,965/factory**

Source: (Bluesign Technologies, 2007)

Industry solutions are charting the course forward

- Better Cotton Initiative - agriculture production
- NRDC Clean by Design - water efficiency in processing and pollution prevention
- BSR's Sustainable Water Group - water effluent /pollution prevention in processing

Questions

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