What Happens When the Pit is Full?

Developments in on-site Faecal Sludge Management

14-15 March 2011

Garden Court Marine Parade Hotel, Durban, South Africa

Human Waste

for how long can we afford to throw it away

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Scary Facts
and then join the dots

- 2004 2.6 billion, i.e. 42% lacked adequate sanitation.
- 330 million, i.e. 5% have advanced sewage treatment
- malnutrition is 14% of global burden of disease (DALYs)
- sanitation-related diseases 3.4%
- sub-Saharan Africa excreta production is more than 100% of the local application of mineral fertilisers

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Annika Nordin
Ammonia Sanitisation of Human Excreta Treatment Technology for Production of Fertiliser, Doctoral Thesis, Swedish University of Agricultural Sciences, Uppsala (2010)

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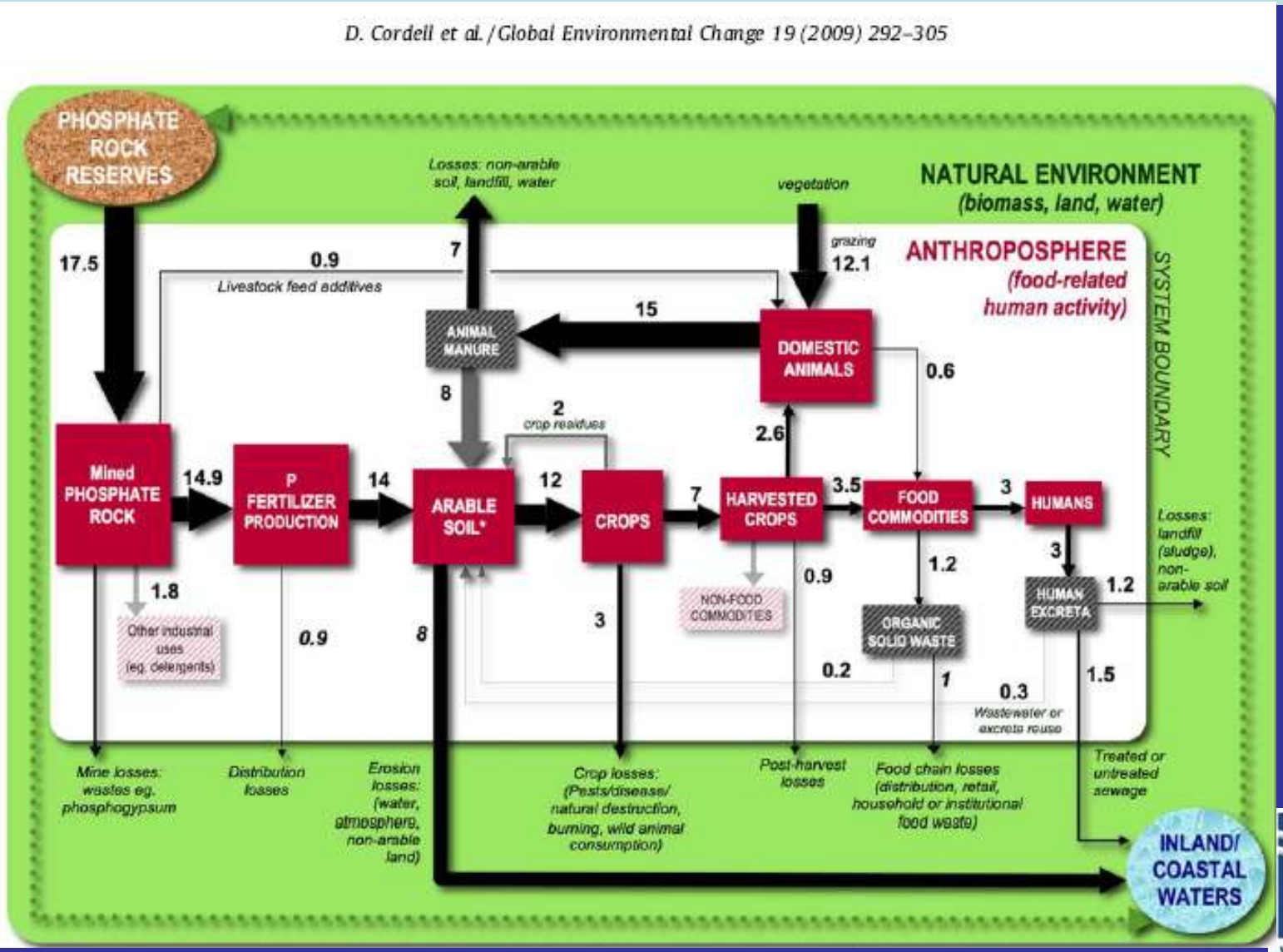
Effect of Phosphate Fertilizer

phosphate addition

control no phosphate

UNEP Yearbook 2011

Phosphorous Flow and Global Food Production



D.Cordell et al / Global Environmental Change 19 (2009) 292-305

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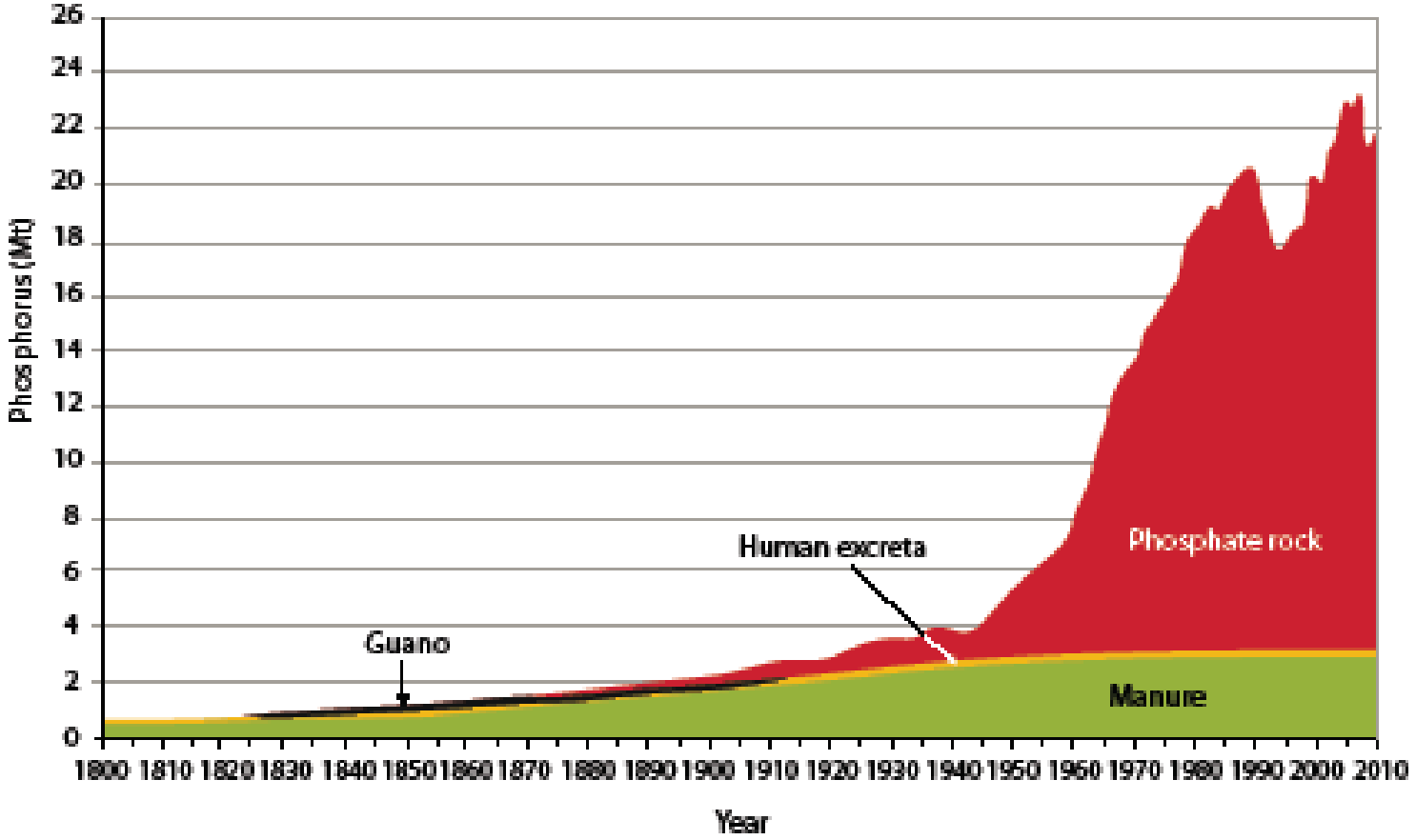
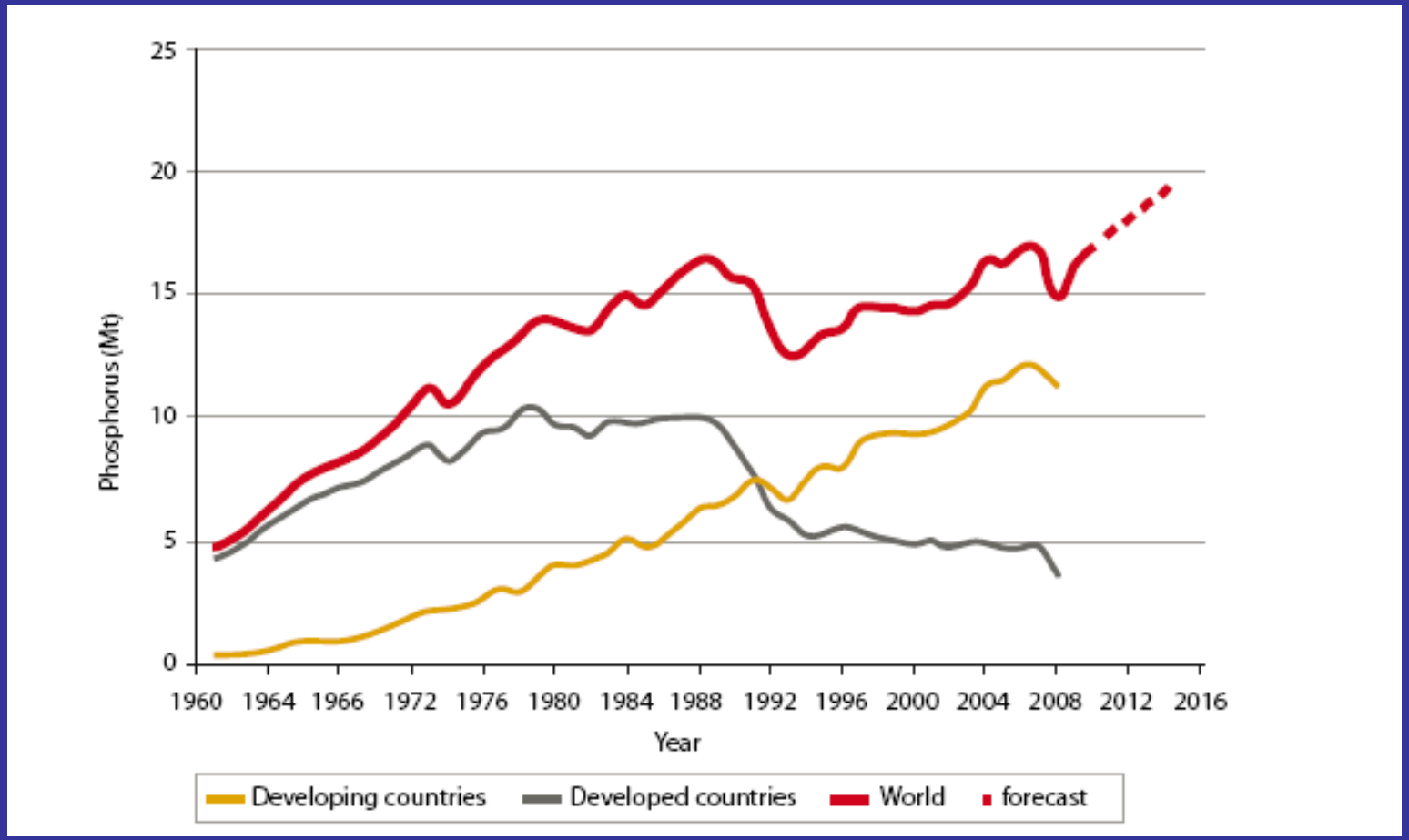
Global Sources of Phosphorous Fertilizer



Global Phosphorous Fertilizer Consumption



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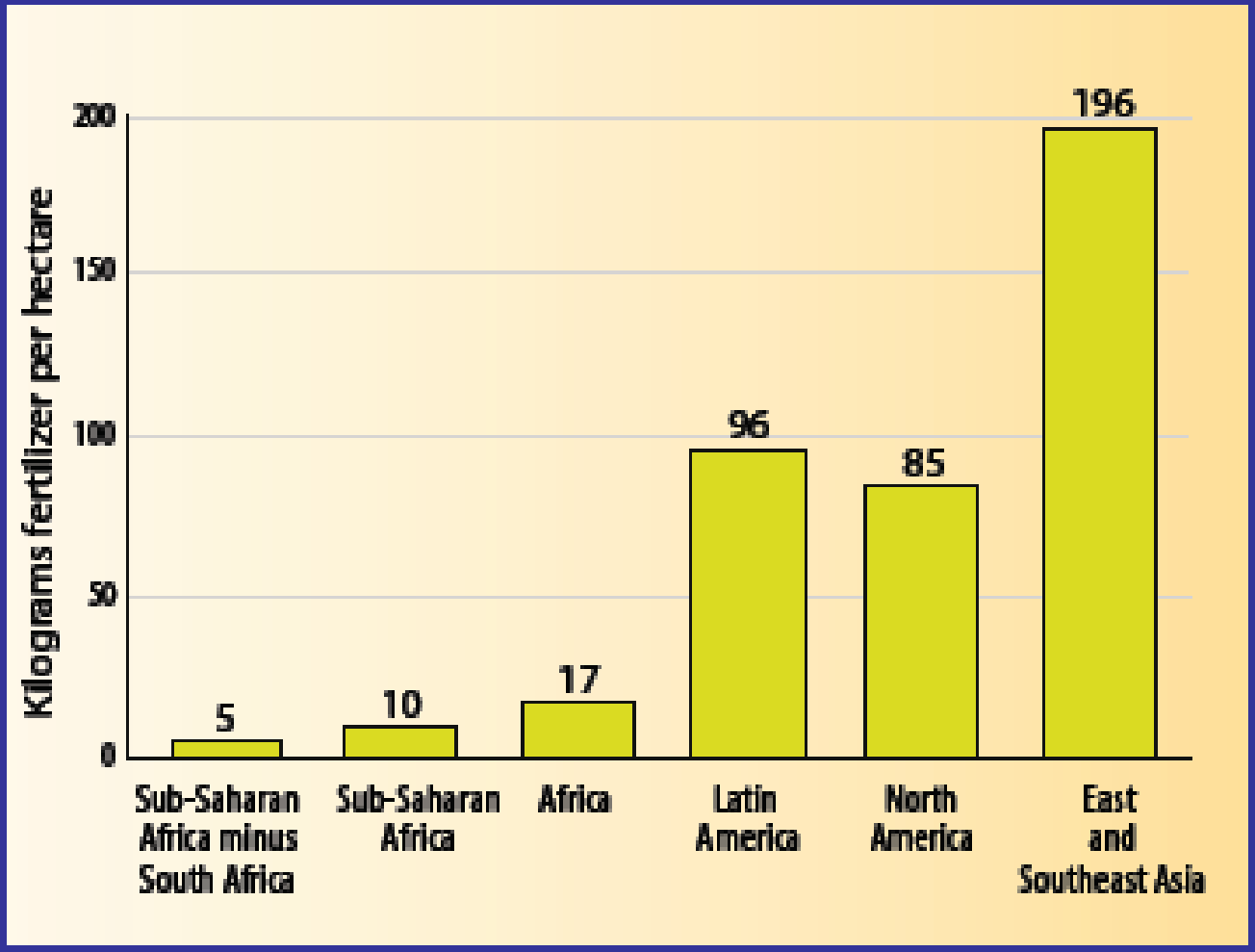
Regional Disparities
use of phosphate fertiliser



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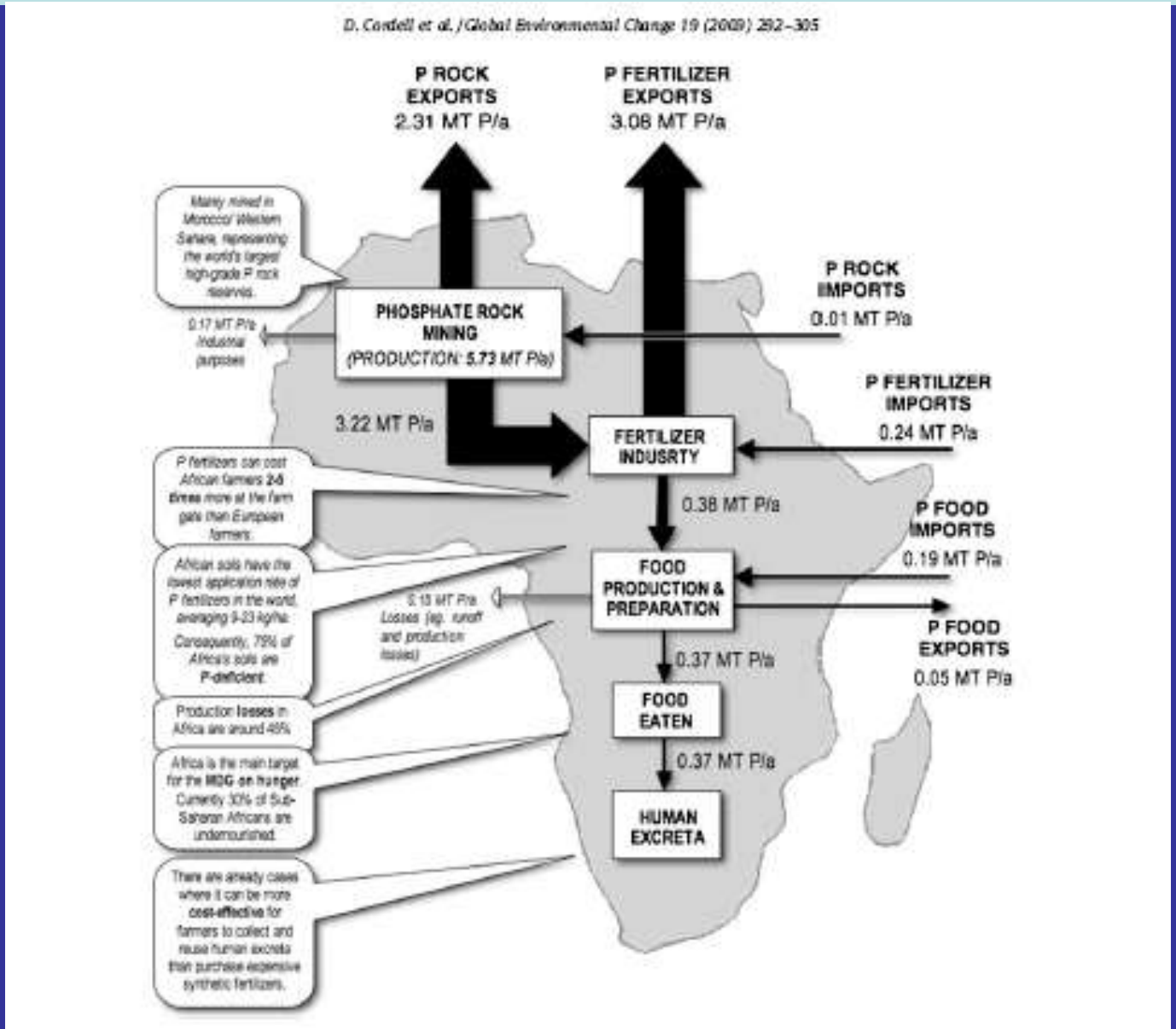
Phosphorous flow in Africa



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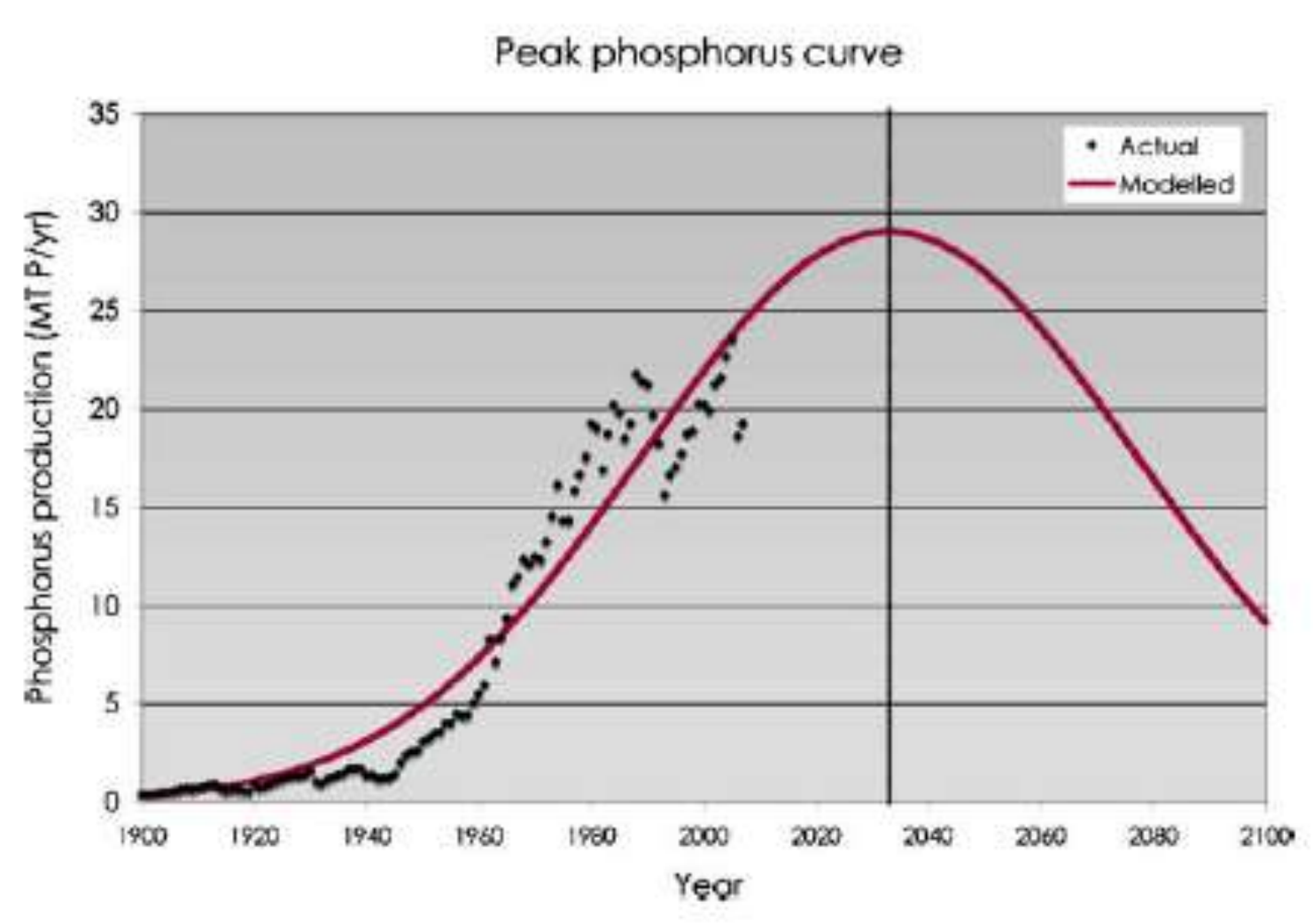
Peak Phosphorous?



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Nutrient content of excreta

Table 1. Proposed new Swedish default values for excreted mass and nutrients (Vinnerås, 2002)

Parameter	Unit	Urine	Faeces	Toilet paper	Blackwater (urine+faeces)
Wet mass	kg/person,year	550	51	8.9	610
Dry mass	kg/ person,year	21	11	8.5	40.5
Nitrogen	g/ person,year	4000	550		4550
Phosphorus	g/ person,year	365	183		548

Table 3. Estimated excretion of nutrients per capita in different countries (Jönsson & Vinnerås, 2004)

Country		Nitrogen kg/cap, yr	Phosphorus kg/cap, yr	Potassium kg/cap, yr
China, total		4.0	0.6	1.8
	Urine	3.5	0.4	1.3
	Faeces	0.5	0.2	0.5
Haiti, total		2.1	0.3	1.2
	Urine	1.9	0.2	0.9
	Faeces	0.3	0.1	0.3
India, total		2.7	0.4	1.5
	Urine	2.3	0.3	1.1
	Faeces	0.3	0.1	0.4
South Africa, total		3.4	0.5	1.6
	Urine	3.0	0.3	1.2
	Faeces	0.4	0.2	0.4
Uganda, total		2.5	0.4	1.4
	Urine	2.2	0.3	1.0
	Faeces	0.3	0.1	0.4

Jönsson, H, Richert Stintzing, A, Vinnerås, B, and Salomon, E (2004) Guidelines on the Use of Urine and Faeces in Crop Production, Stockholm Environment Institute, www.ecosanres.org

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Sanitation and Phosphorous

- phosphorous recovery
  - urine diversion toilets
  - urine diverting VIP toilets
  - urine diverting flush toilets
  - direct reuse of wastewater
- phosphorous reuse
  - direct application
  - recover struvite
  - complete evaporation

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Plate 1. Cartref (Cf), Inanda (Ia) and Sepane (Se) with no added fertilizer at 6 weeks after planting.

W – water; E – effluent

can we afford to waste this resource?

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Acknowledgements

- Water Research Commission

- eThekwini Water and Sanitation