

CONDOMINIAL (SIMPLIFIED) SEWERAGE

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Periurban areas: inadequate sanitation

Open stormwater drains (if there are any)
receive raw wastewater discharges

Simplified sewerage

Rigorous hydraulic design based on:

- **a minimum sewer diameter of 100 mm**
- **a minimum tractive tension ($\tau_{\min}$) of 1 N/m²**
- **a minimum value for peak wastewater flow of 1.5 litres/second**

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- This results in a minimum gradient of 1 in 200, and a 100-mm dia. sewer being able to serve 234 households of 5 people with a water consumption of 100 litres per person per day

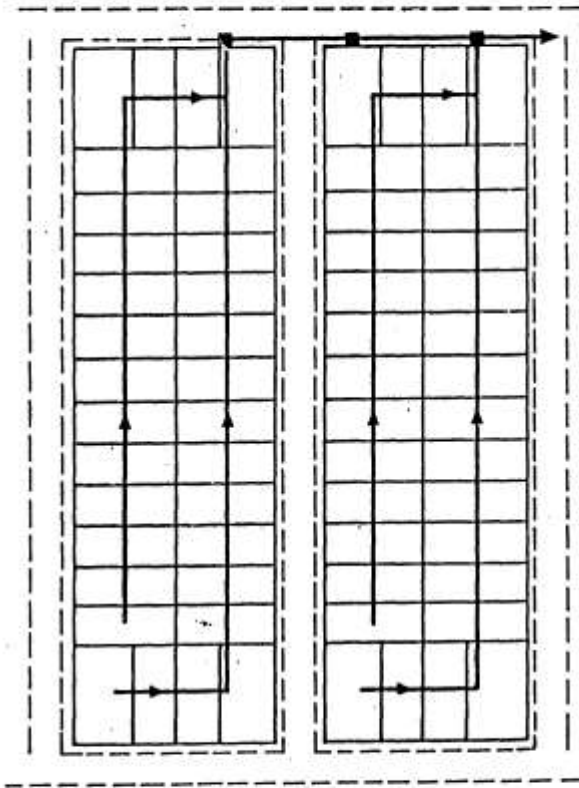
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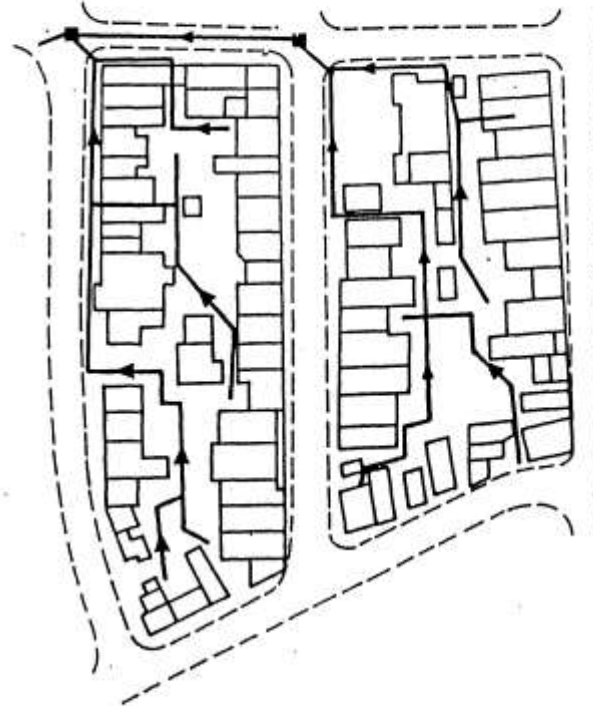
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“Small flows flow better in small pipes”

* CONDOMINIAL SEWERAGE *



Planned Area



**Unplanned Area
(retrofit)**

Case study: Development of Simplified Sewerage in Brazil



**Simplified
sewerage was first
installed in
'Quadra 90', Natal
in 1981**



Rocas, Natal, northeast Brazil



**‘Quadra 90’
before
simplified
sewerage
installed**



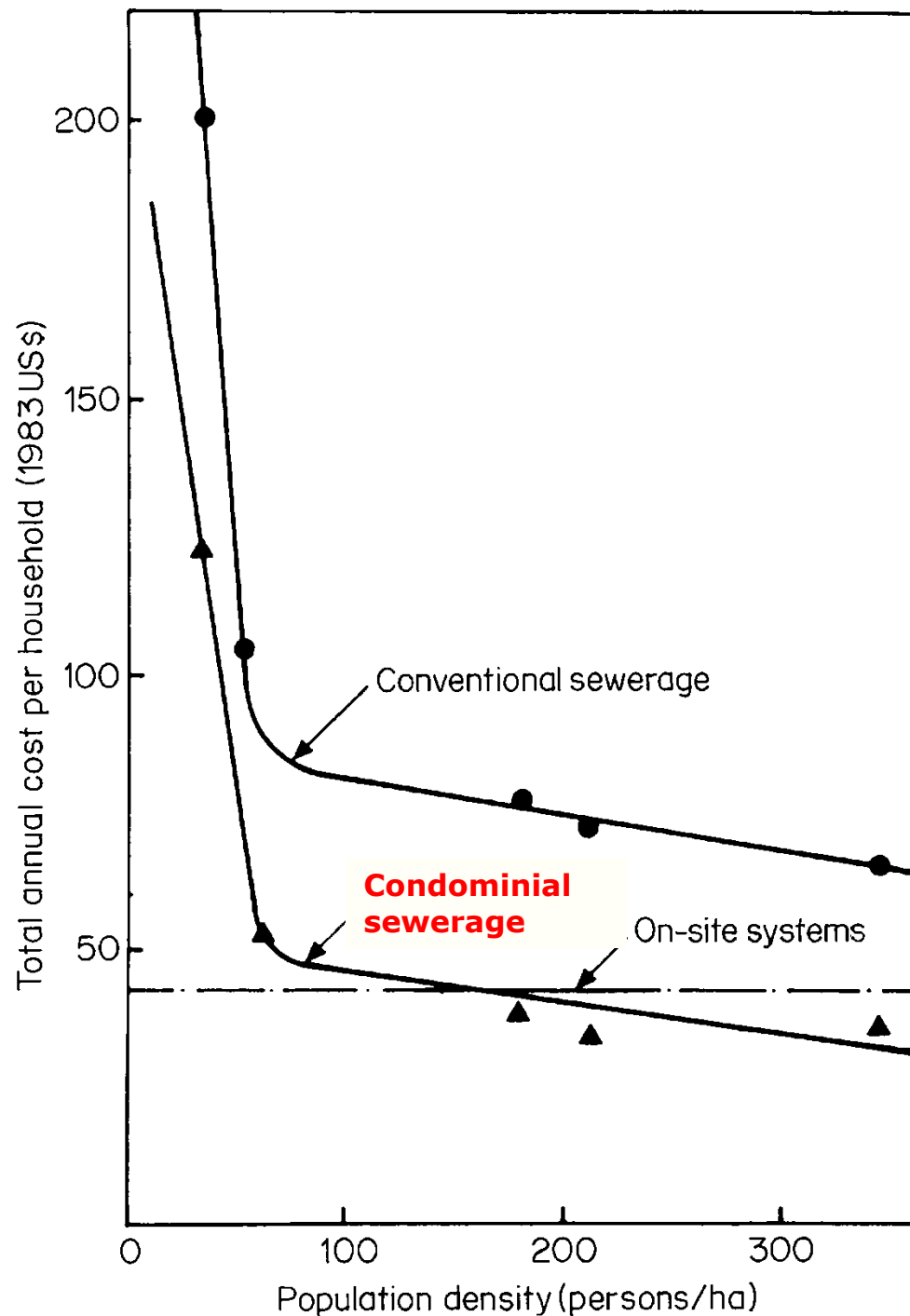
Quadra 90

Community meeting



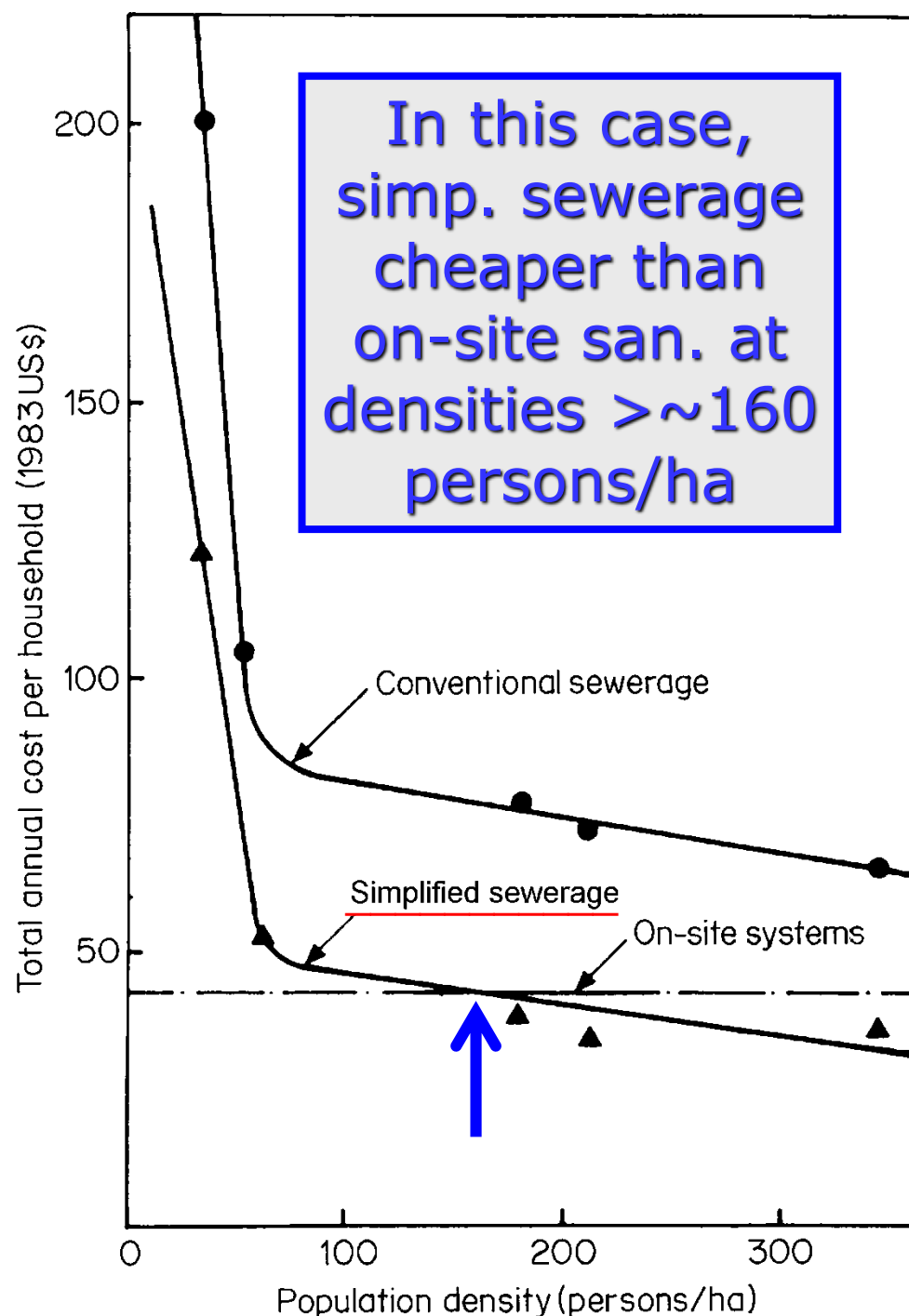
Natal, Northeast Brazil, 1983

Condominial sewerage



Natal, Northeast Brazil, 1983

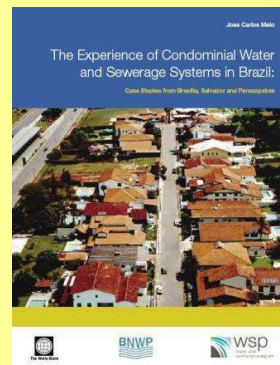
Condominial sewerage



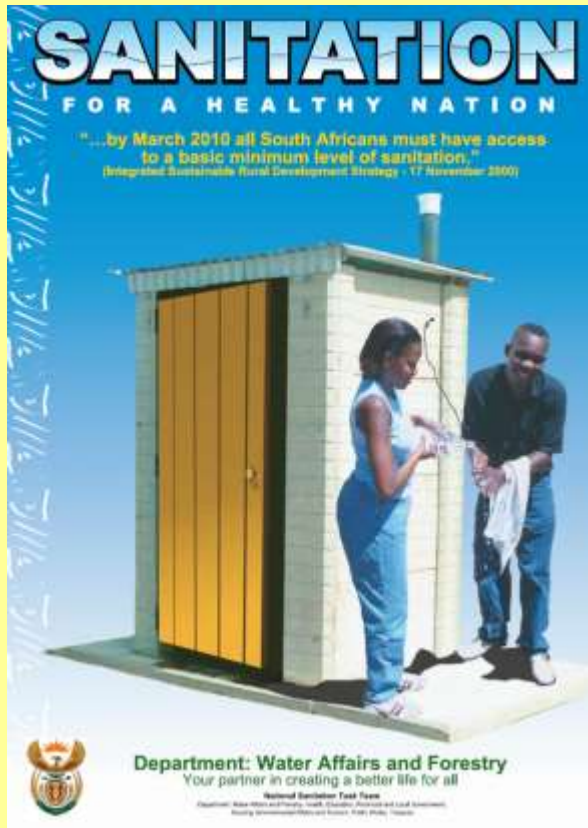
Comparative costs (1997 US\$) of conventional and condominial sewerage in Parauapebas, Pará, north Brazil

Item	Conventional sewerage		Condominial sewerage	
	Total cost	Cost per connection	Total cost	Cost per connection
Excavation	263,000	39	186,000	28
Inspection chambers	181,000	27	85,000	13
Sewers	185,000	28	102,000	15
Total	629,000	94	373,000	56

Source: Melo (2005):



Costs in South Africa, 2002



Sanitation technology	Construction cost (ZAR)
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Simplified sewerage	2500–3000
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EcoSan toilet	3000–4000
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Conventional sewerage	6000–7000
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Average exchange rates in 2002:
ZAR 1000 = USD 87 = EUR 100

Condominial sewerage: Monthly cost to householder

**State of Rio Grande do Norte in northeast
Brazil, 2017:**

**Minimum water tariff for 'social' housing
(up to 10 m³ per month – i.e., 67 litres per
person per day for a family of 5):**

BRL 7.73

35% surcharge for condominium sewerage:

BRL 2.71 – 0.3% of minimum wage



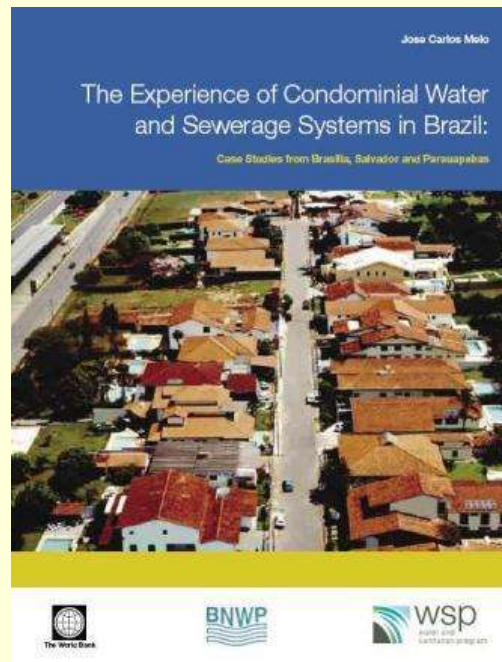
Brasília: a very rich area being served with condominium sewerage



**Hillside favelas in Rio de Janeiro city,
where condominial water supply and sewerage
were installed in 1990s (first in Rocinhas)**

Health aspects

**Condominial and conventional sewerage
in Salvador, serving ~1 million people**



Health aspects

Condominial and conventional sewerage in Salvador, serving ~1 million people

- **Reduction in diarrheal disease in children under 3: 22%, but 43% in poor areas served by condominial sewerage**

Health aspects

Condominial and conventional sewerage in Salvador, serving ~1 million people

- Reduction in **diarrheal disease** in children under 3: 22%, but 43% in poor areas served by condominial sewerage
- Reduction in **ascariasis** in children aged 1–4: from 24% to 12%; in **trichuriasis**, from 18% to 5%; and in **giardiasis**, from 14% to 5%.

Reasons why simplified sewerage now used widely throughout Brazil

- ❑ CAERN's success with condominial sewerage in Natal presented at the 1983 ABES Congress, followed by papers in ABES's journal *Engenharia Sanitária* [ABES: Brazilian Assoc. of Sanitary & Environmental Engineering]
- ❑ ABES set up a Low-cost Sanitation Committee (1983-86) which produced the 1986 Brazilian Design Manual for Simplified Sewerage

Reasons why, cont' d

- ❑ **The 1986 revision of the Brazilian National Sewerage Design Code** adopted a minimum sewer diameter of 100 mm [before then min. dia. was 150 mm] and a $\tau_{\min}$ of 1 N/m²
- ❑ **A few very good, very committed and politically well-connected (and young) low-cost sanitation engineers**
- ❑ **Positive interest in condominial sewerage by the World Bank acted within Brazil to give it a 'seal of international approval'**

Thank you!

Thank you!

and special thanks to
José Carlos Melo
who developed
condominial sewerage
in Brazil.

