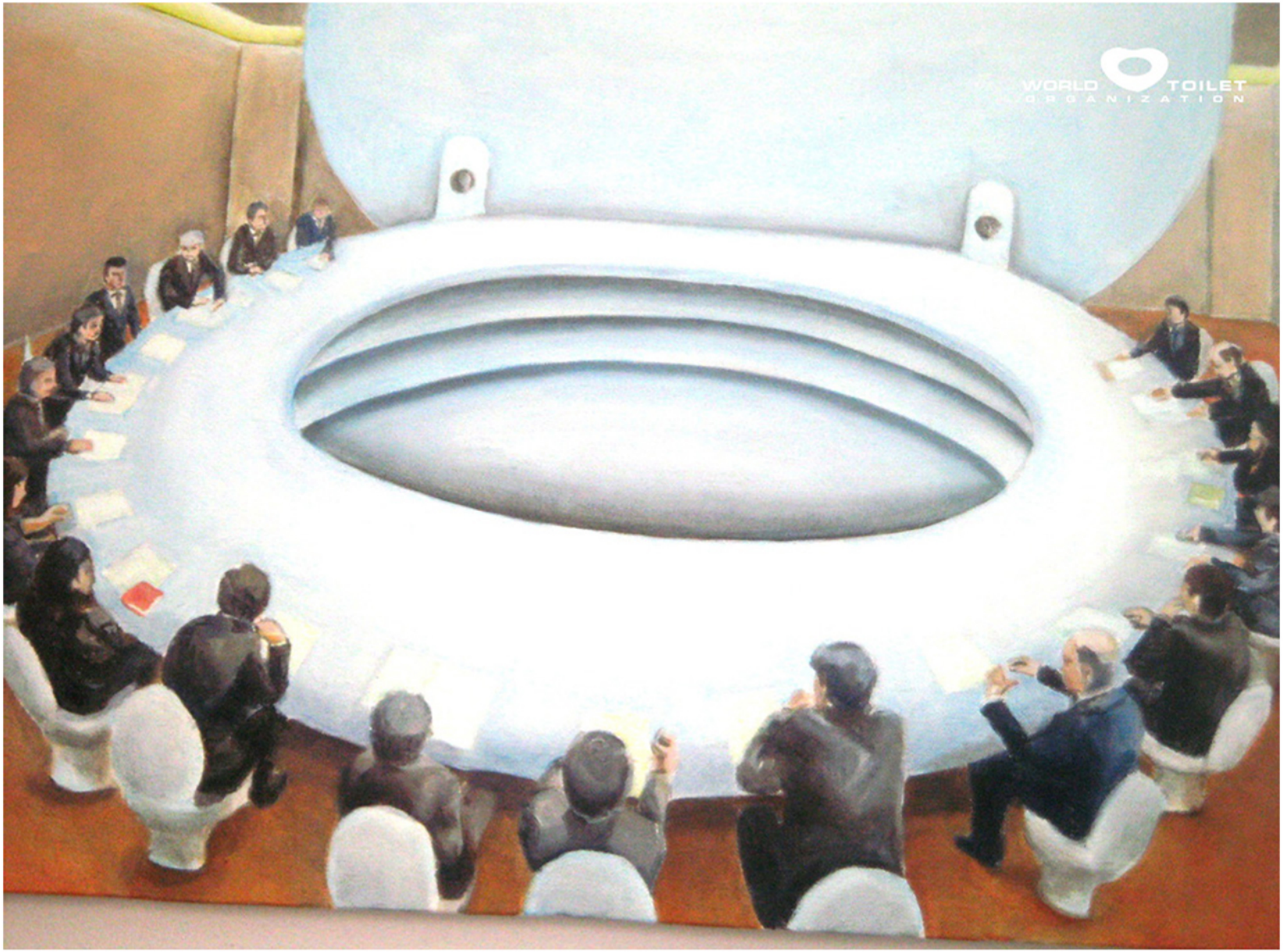
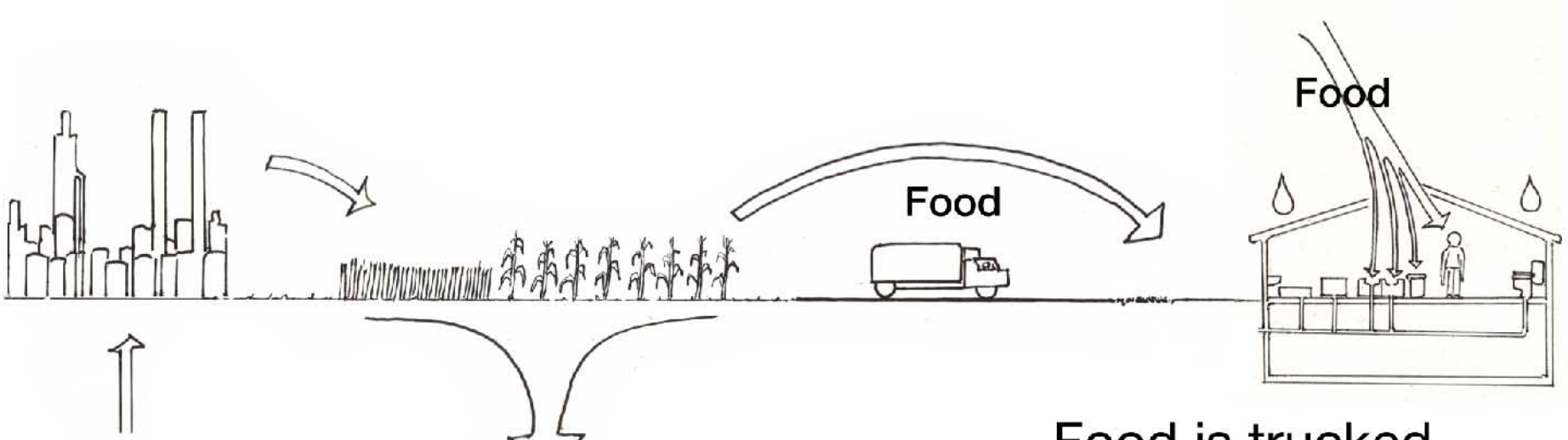


Planning Our Wastewater Options

Follow the Nitrogen

From Factory to Farm to Food to .....

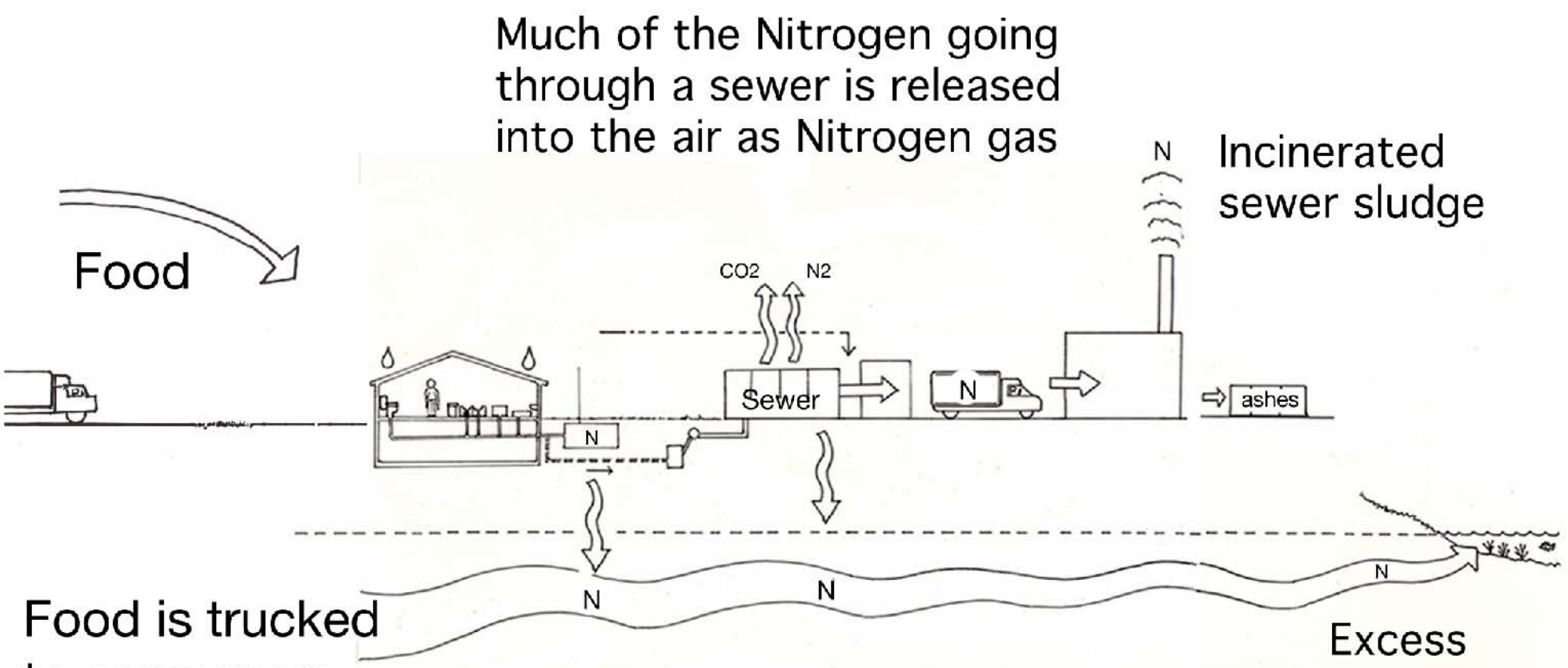


3-5% of world's natural gas is used to make nitrogen fertilizer

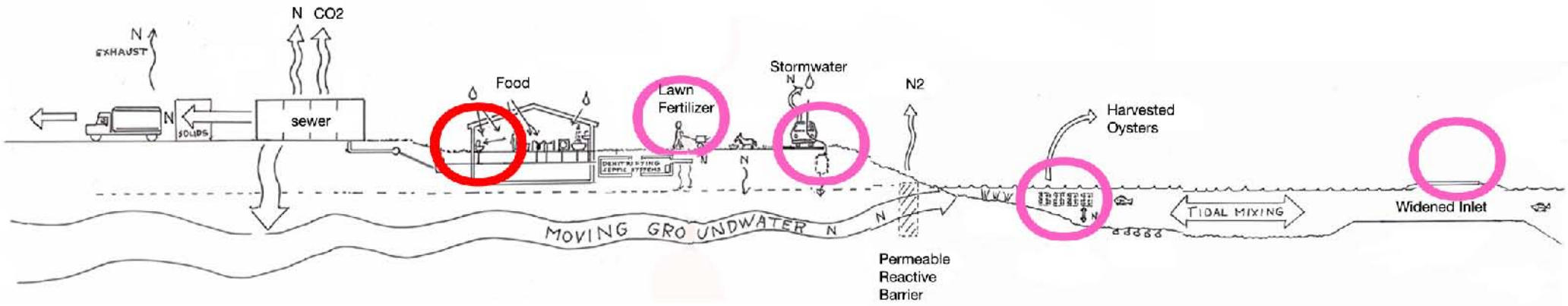
Excessive nitrogen fertilizer on fields sends nitrogen into rivers and the ocean

Food is trucked from farms to remote consumers

Follow the Nitrogen..... from Food to Waste



Points of Intervention To Remove Nitrogen



Human waste

contributes the most nitrogen
to groundwater and coastal ponds.

Nitrogen in Household Wastewater

6% Bath, Shower, Sinks, Laundry

6% Kitchen Sink

8% Feces

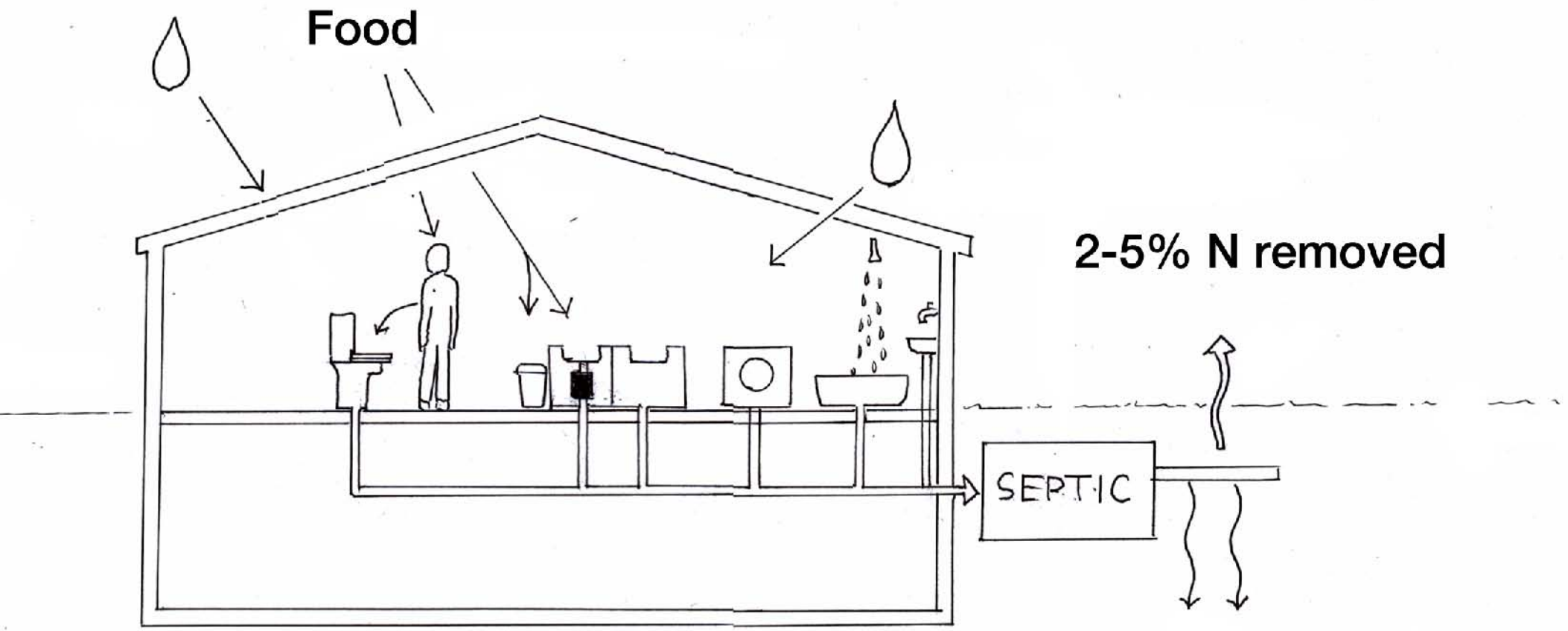
===

20%

Urine 80%

House without
Garbage Disposal

Septic Tank Removes only 2-5% of Nitrogen



2-5% N removed

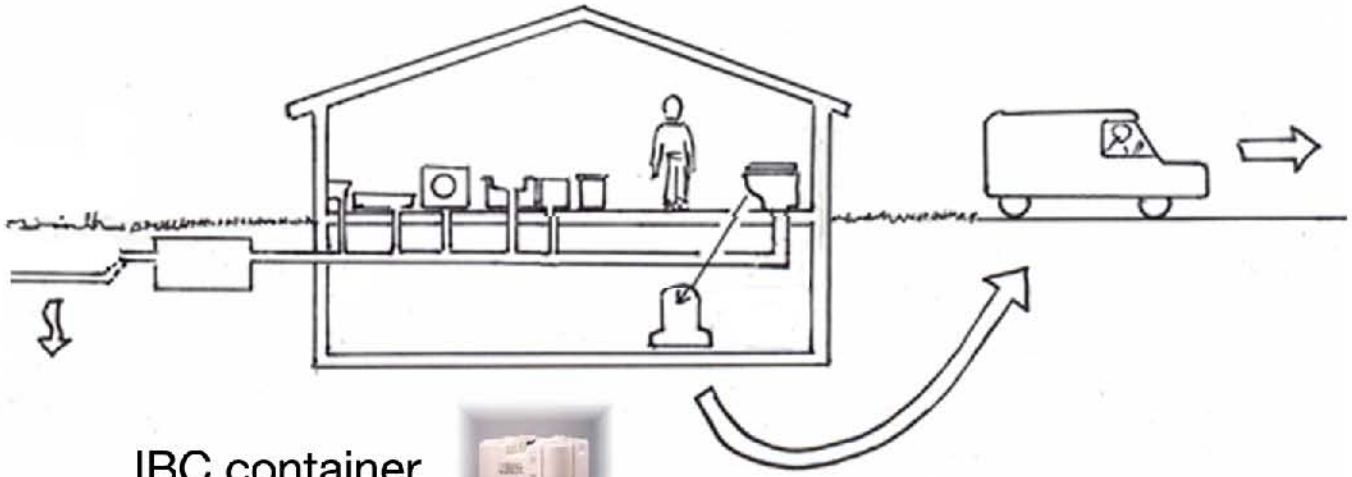
95-98% N into groundwater

Urine-Diverting, Flush Toilet

Two Swedish Urine Separating Toilets (EcoSan and Novaquatis)

- part of the time operates like a common flush toilet, flushing with water.
- part of the time the front section is used as a waterless, urine-diverting toilet, directing urine to basement storage.
- can capture 80% of total nitrogen from a house
- reduces water used in house
- uses no electricity
- approx. 90 gallons urine/person/year is produced; removed several times a year.

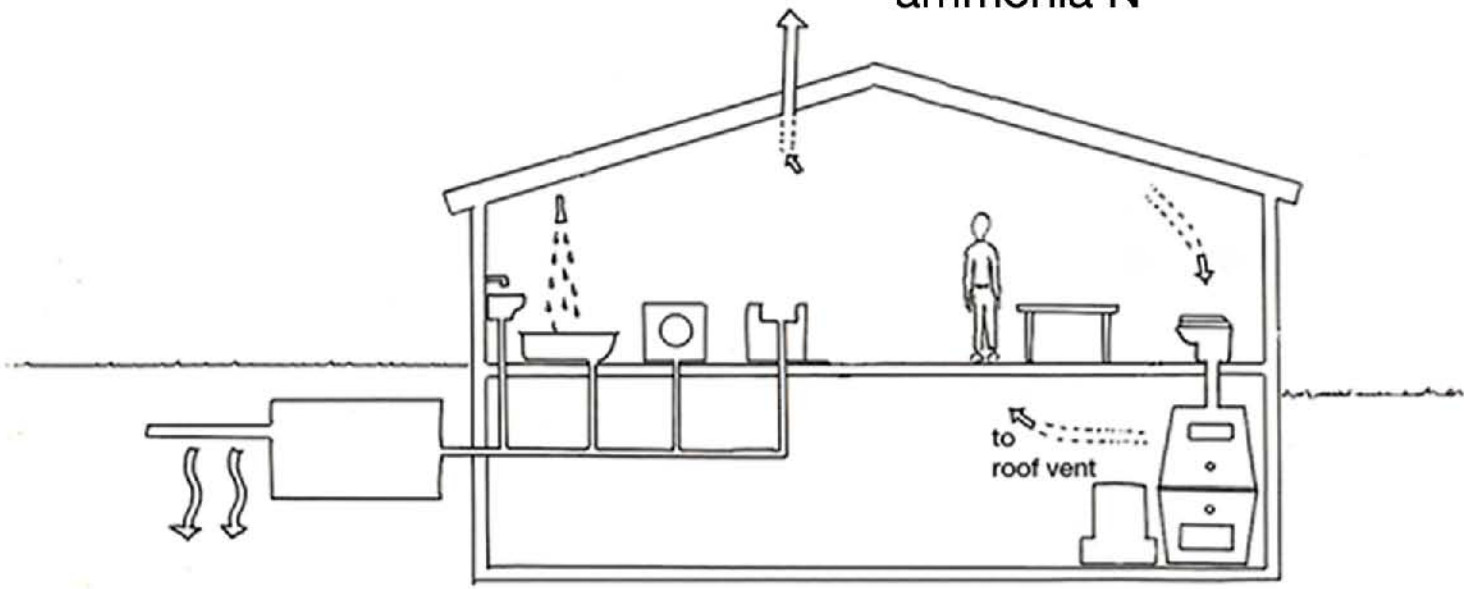
Waterless Urinal



IBC container (220 gallons)

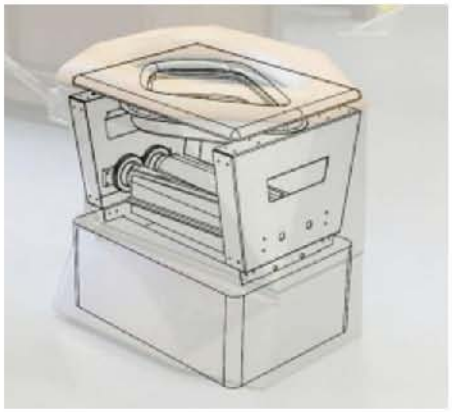
Composting Toilet

'Phoenix'



- uses no water - house uses 30% less water.
- captures 88% of nitrogen from house
- after composting, only 10% of volume remains; a fan (5-10 watts/hour ; $12-24/year) exhausts 90% of volume out the roof vent as gases
- approx. 90 lbs of compost/person/year is produced

PACTO®

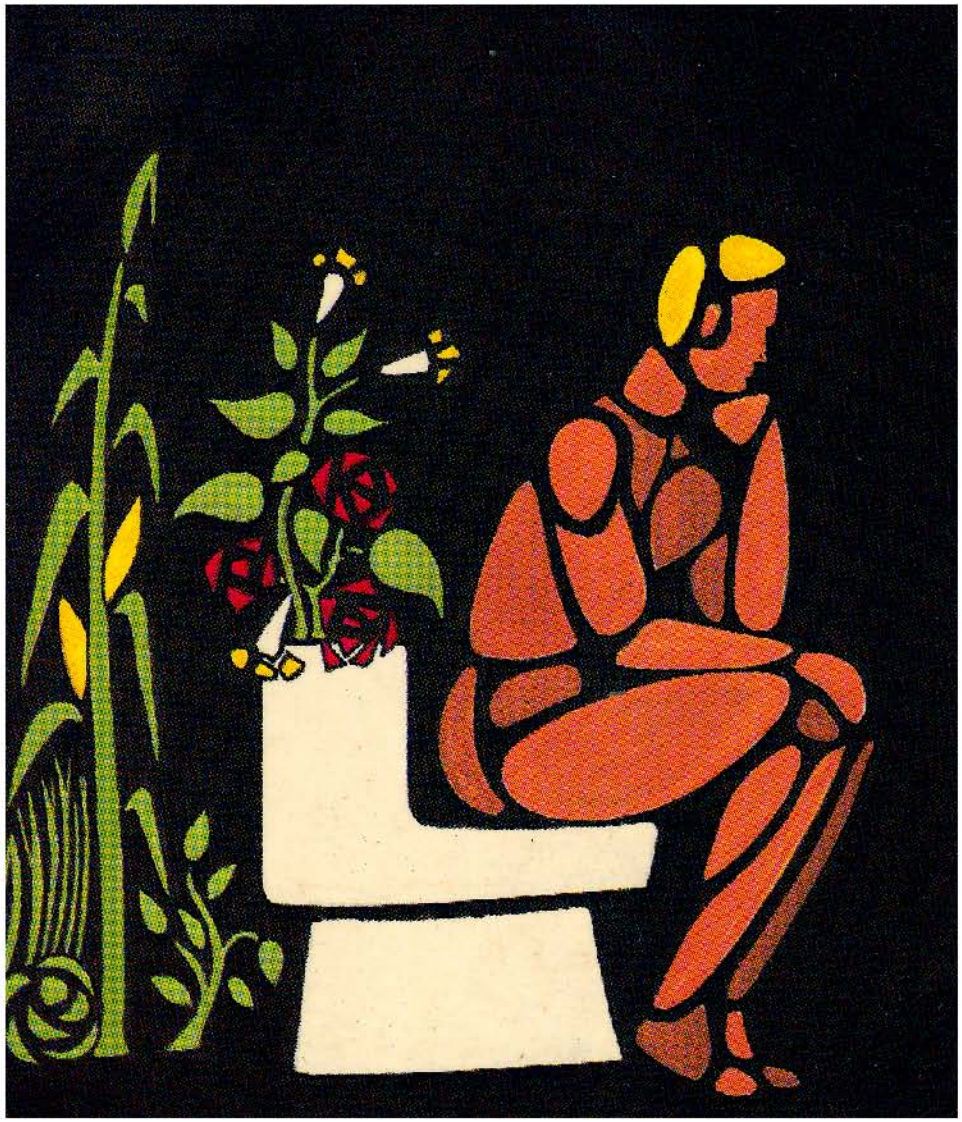


Packaging Toilet

A packaging toilet directs human wastes into a biodgradable package, that is sealed after each use and stored at the base of the toilet.

No plumbing
No water
No electricity
Movable
Installed immediately, anywhere
Diverts all nitrogen into the toilet

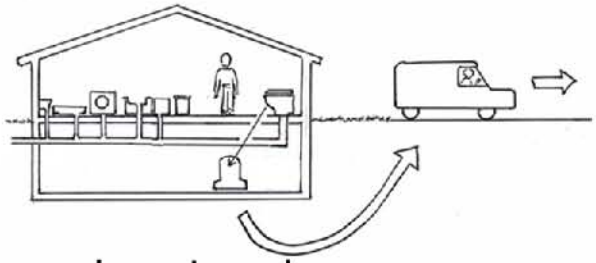
LOOWATT



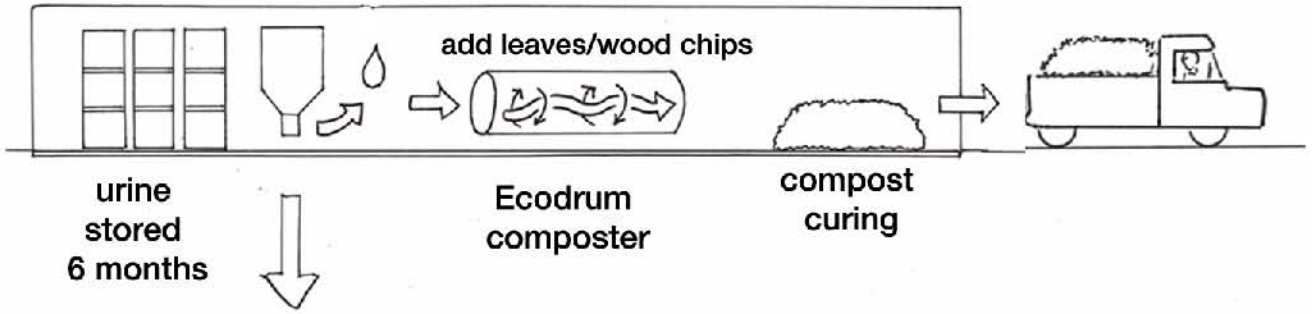
What next?

How do we recycle recovered nutrients safely back into natural and agricultural ecosystems?

Struvite Fertilizer Made From Urine

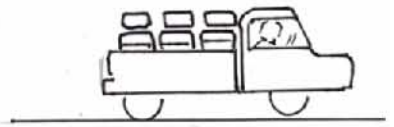


urine stored
& collected



Urine-Diversion
Captures 80%
of Total Nitrogen
From House

**struvite fertilizer
precipitated
from urine**



120-230
gallon IBC

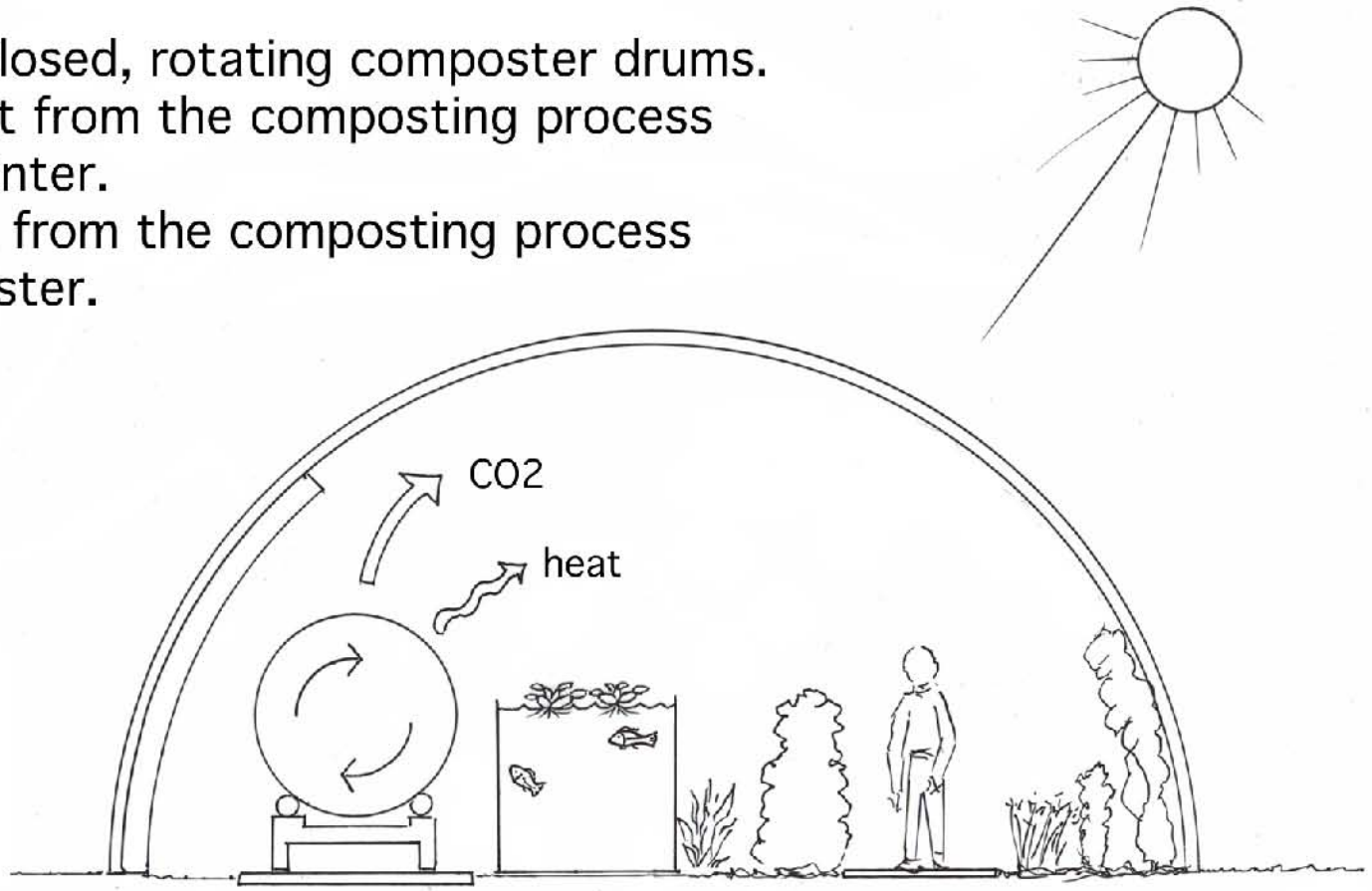
STRUVITE FERTILIZER

$MgNH_4PO_4.6(H_2O)$

N:P:K = 6 : 29 : 0 + 10 Mg

Composting in a Greenhouse

- Compost is made in closed, rotating composter drums.
- In a greenhouse, heat from the composting process adds useful heat in winter.
- In a greenhouse, CO2 from the composting process makes plants grow faster.

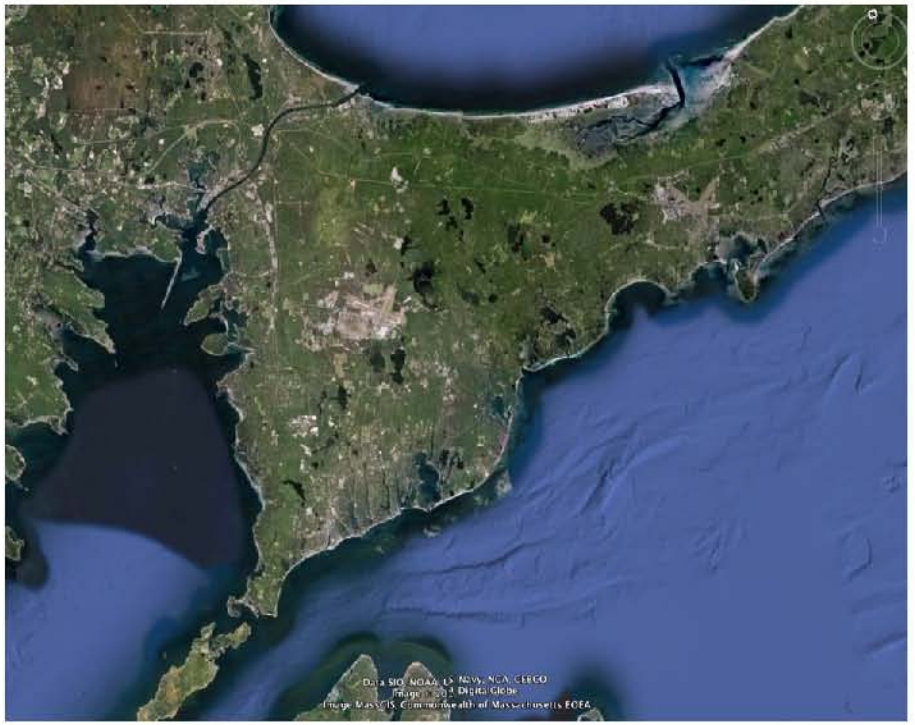


'Ecodrum' rotating composter mixes compost and moves it slowly to end. Heat is produced by the composting process.

Solar Ponds
- store heat
- water grows fish, irrigates plants, and heats greenhouse in winter

food crops & ornamental plants

Planning the Cape's Future

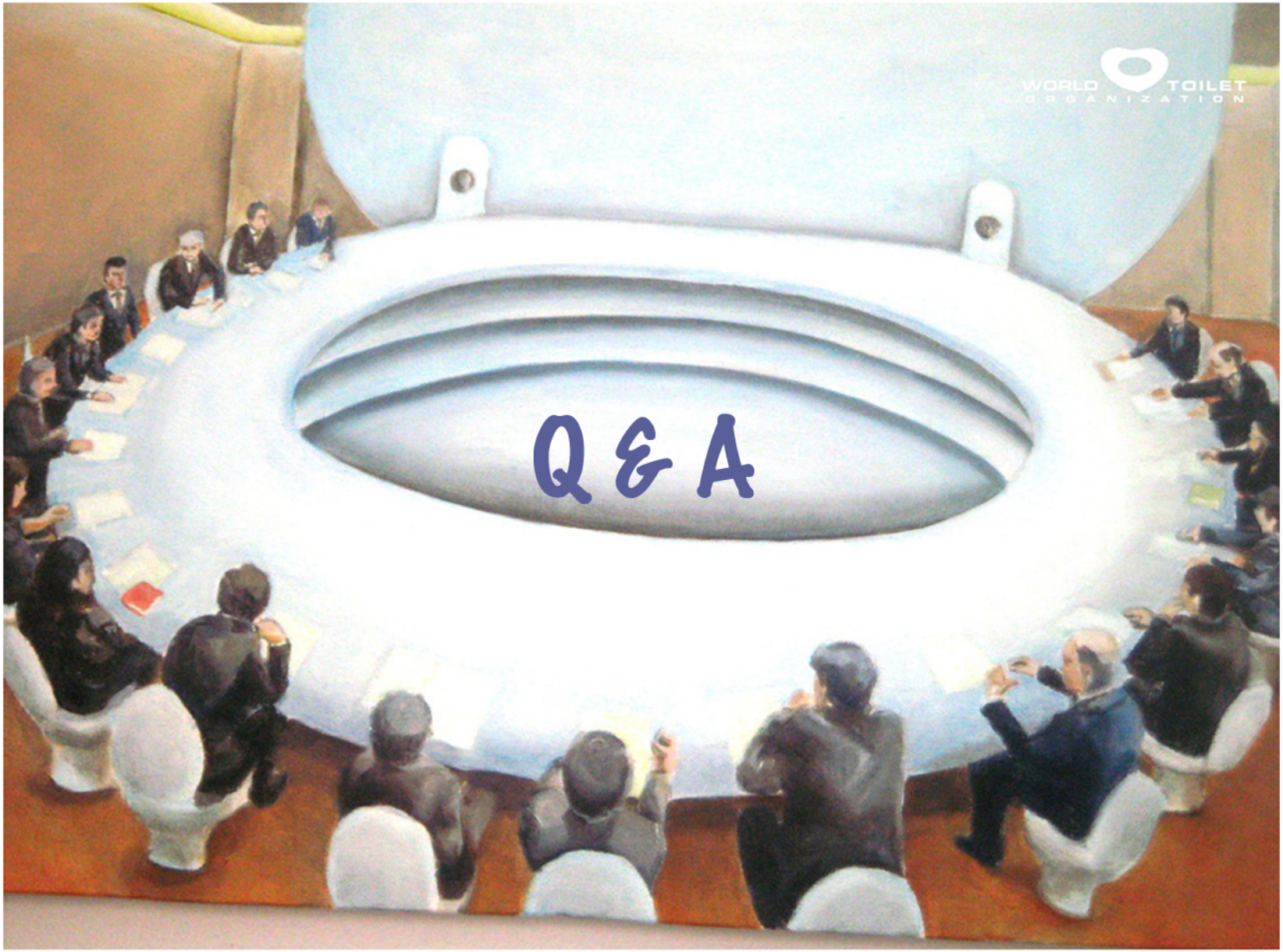


Decisions will be made soon by most Cape Cod towns that will drastically affect its future economy and will determine how water and nutrients will be managed for generations to come.

We have the opportunity to choose options that:

- can be implemented quickly
- reduce water use while also reducing water pollution
- recover and recycle 'waste' nutrients safely into natural & agricultural ecosystems
- are simple, modular, movable and adaptable to changing population patterns
- adapt to future higher energy costs and economic trends
- provide long-term employment opportunities in a wide a range of services.
- invest money in jobs and food production instead of pipes and disposal systems
- lead to long-term, sustainable solutions to water, nutrient, and food management

efficient, ecological and resilient


WORLD TOILET ORGANIZATION
Q & A