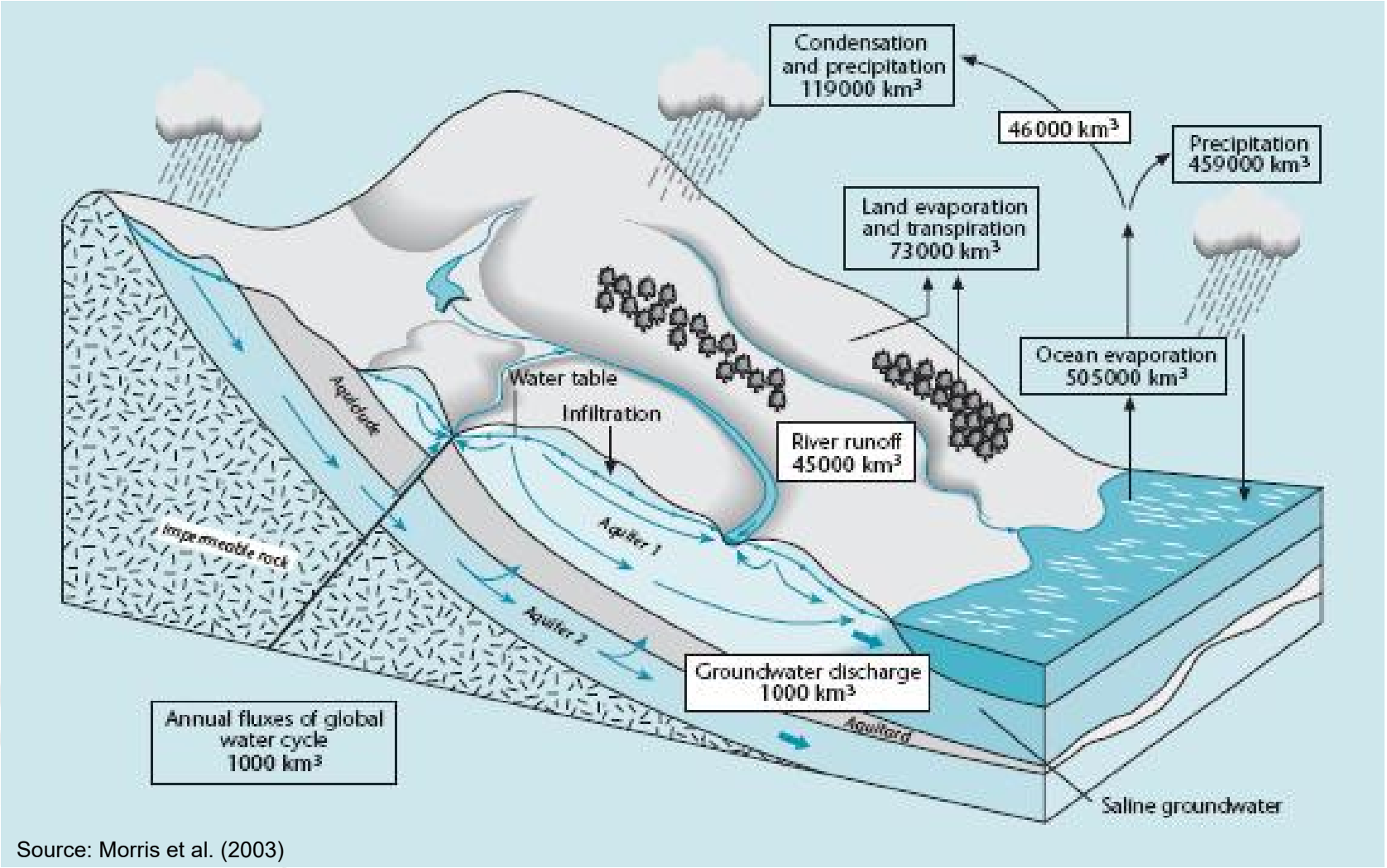
"*Selamatkan Air Tanah*"

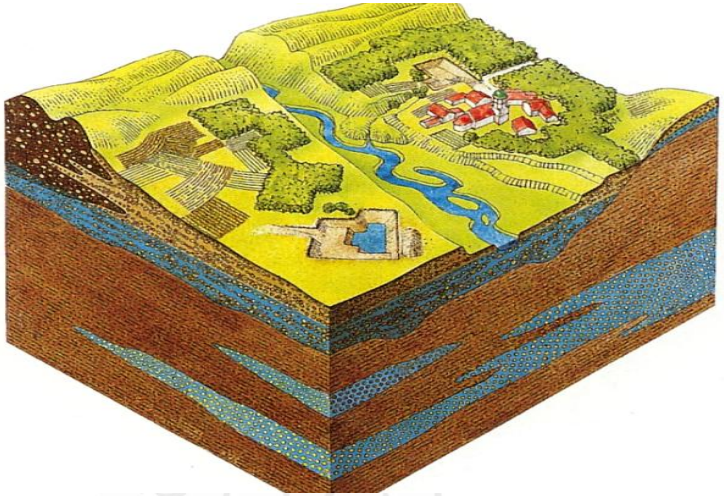
Dr.rer.nat Doni Prakasa Eka Putra

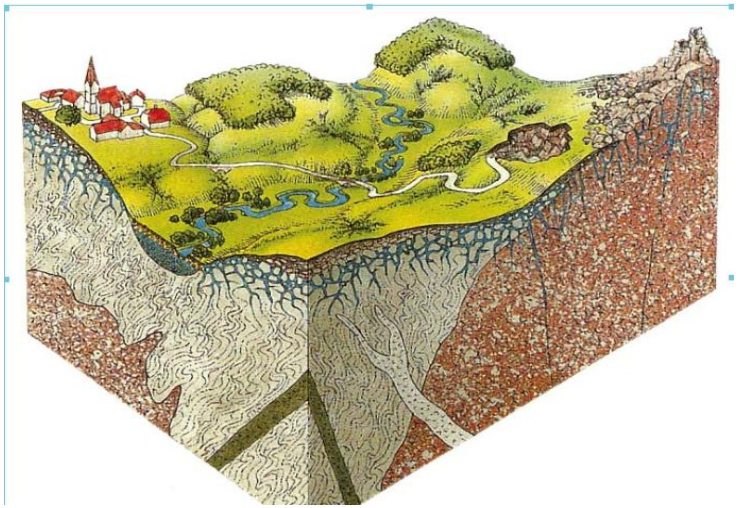
Air Tanah (*Hidden Part of Hydrology Cycle)*

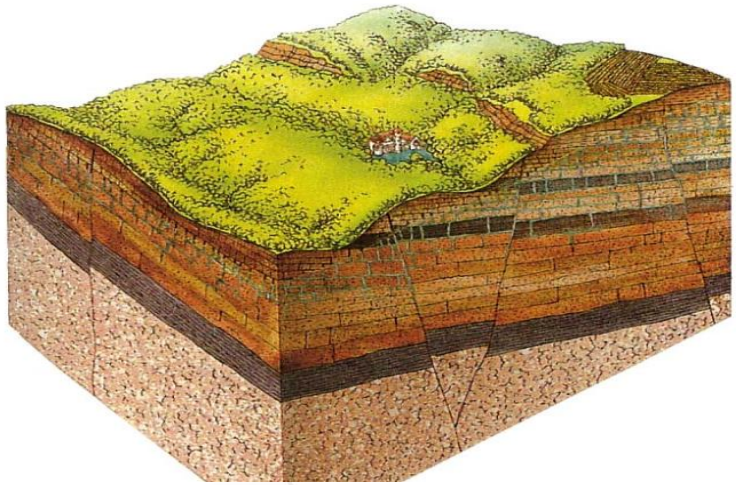


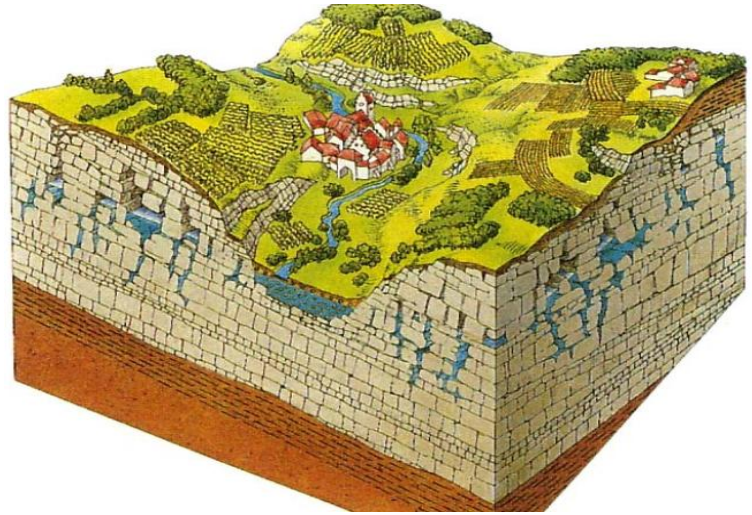
Source: Morris et al. (2003)

Geologi dan Keberadaan Air Tanah









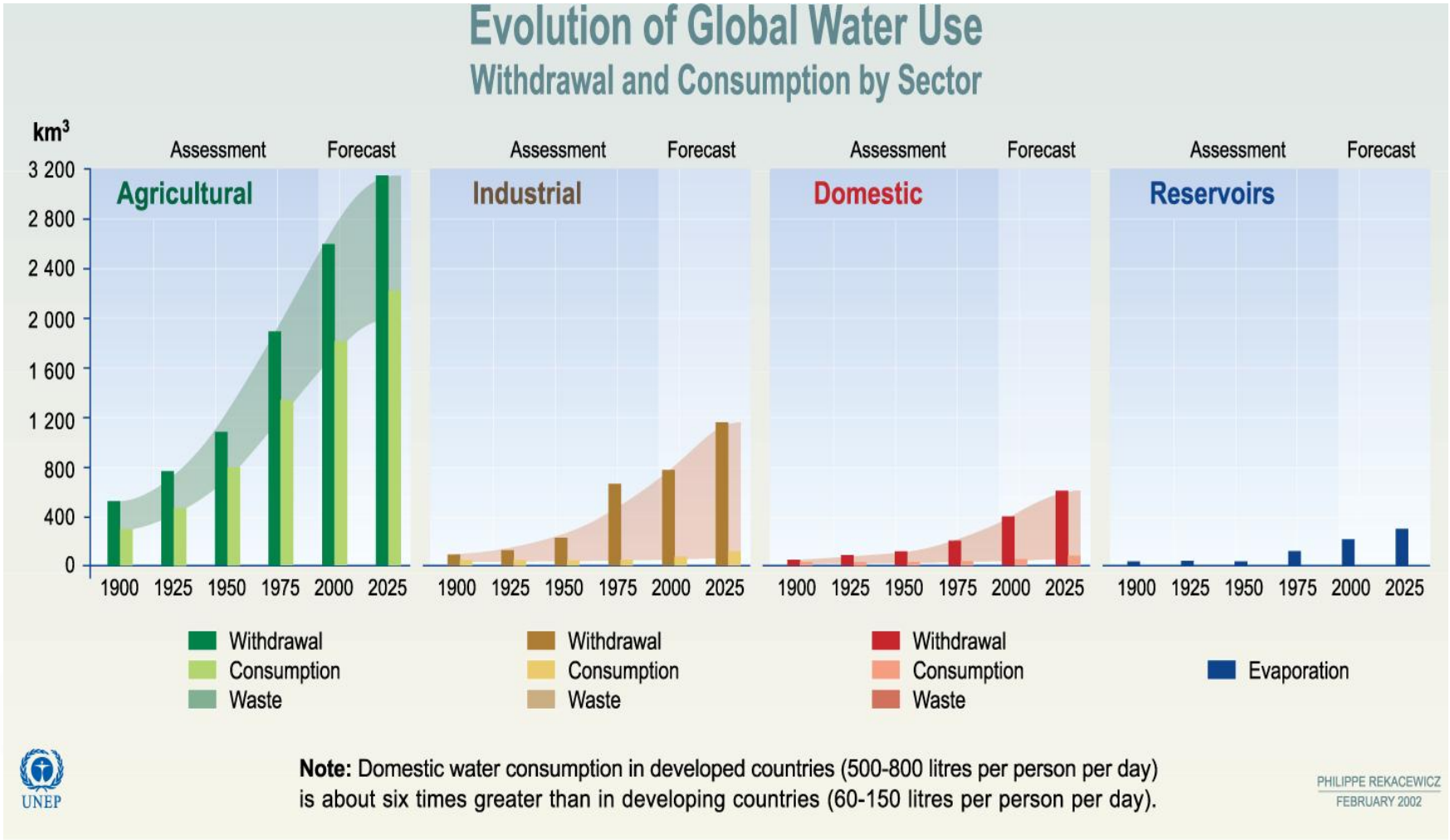
Air Tawar dan Air Tanah (The world's hidden water resources)

TABLE 11.1 **Fresh Water of the Hydrosphere**

Parts of the Hydrosphere	Volume of Fresh water (km^3)	Share of Total Volume of Fresh water (percent)	Rate of Water Exchange
Ice sheets and glaciers	24,000,000	84.945	8000 years
Groundwater	4,000,000	14.158	280 years
Lakes and reservoirs	155,000	0.549	7 years
Soil moisture	83,000	0.294	1 year
Water vapor in the atmosphere	14,000	0.049	9.9 days
River water	1,200	0.004	11.3 days
Total	28,253,200	100.000	

SOURCE: U.S. Geological Survey Water Supply Paper 2220, 1987

Kebutuhan Air Global



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

Proporsi Air Tanah Sebagai Pemenuhan Sumber Air Minum

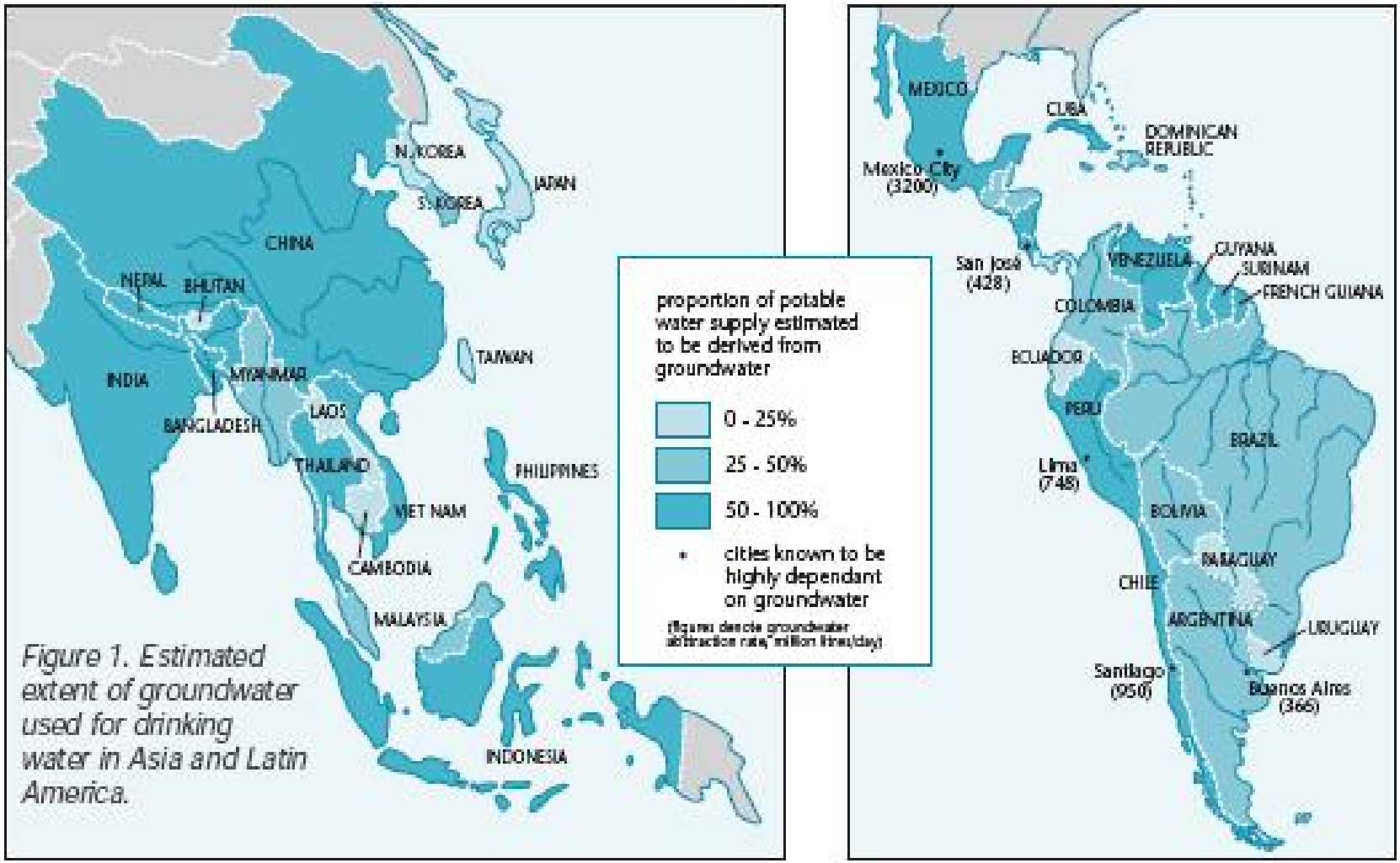
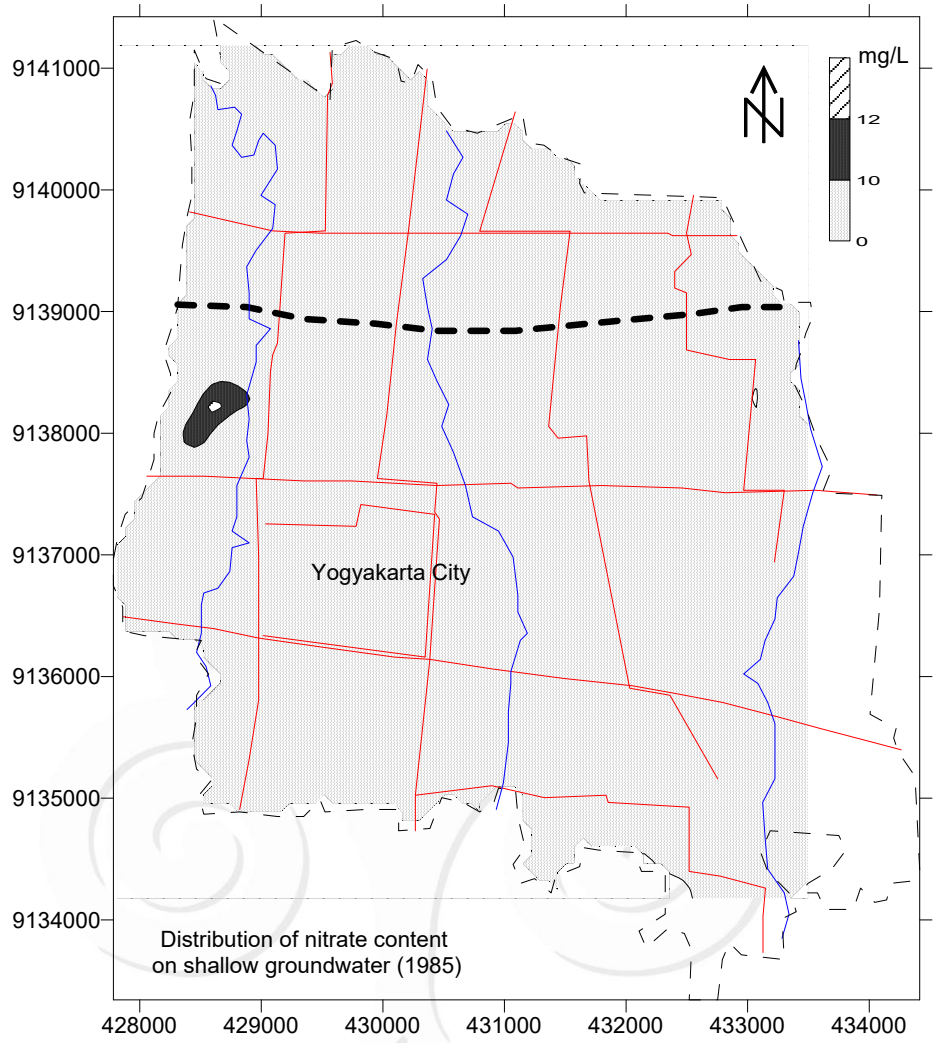
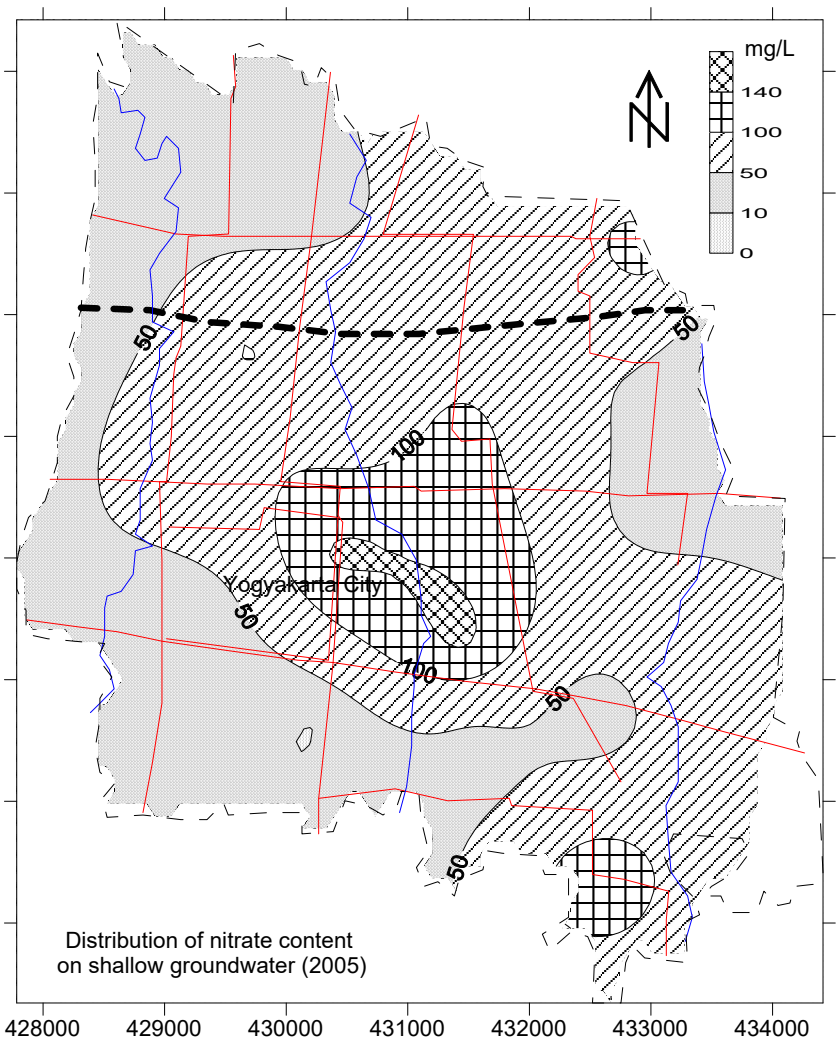


Figure 1. Estimated extent of groundwater used for drinking water in Asia and Latin America.

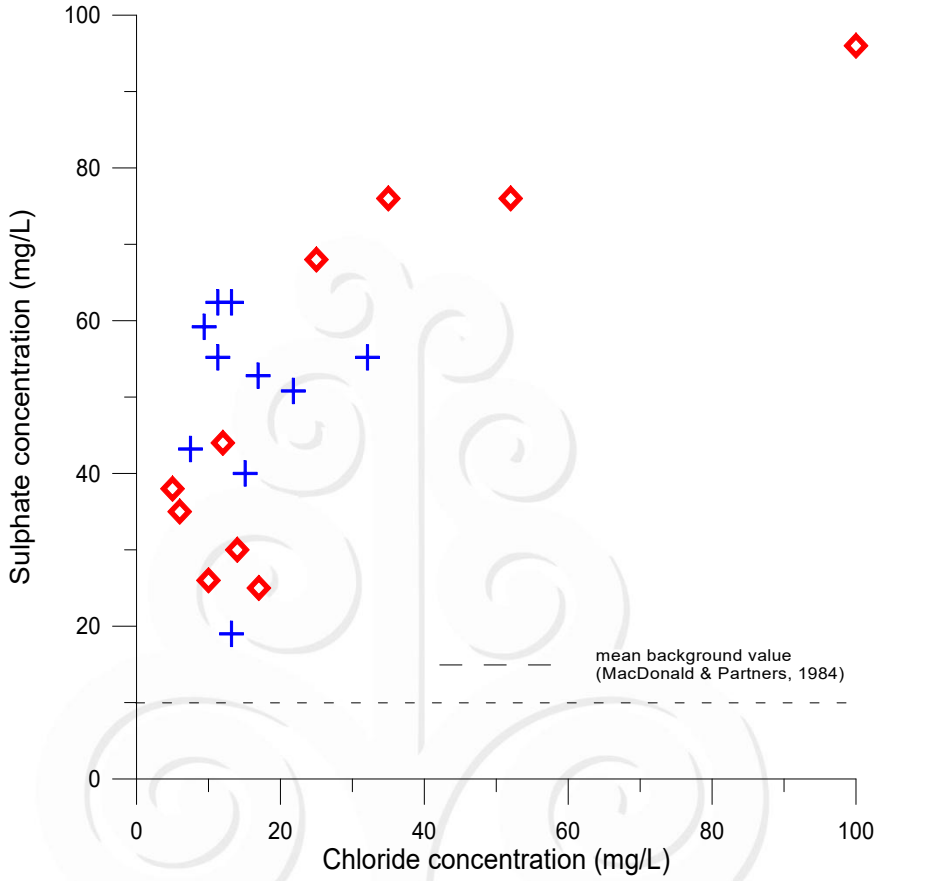
Source: Morris et al. (2003)

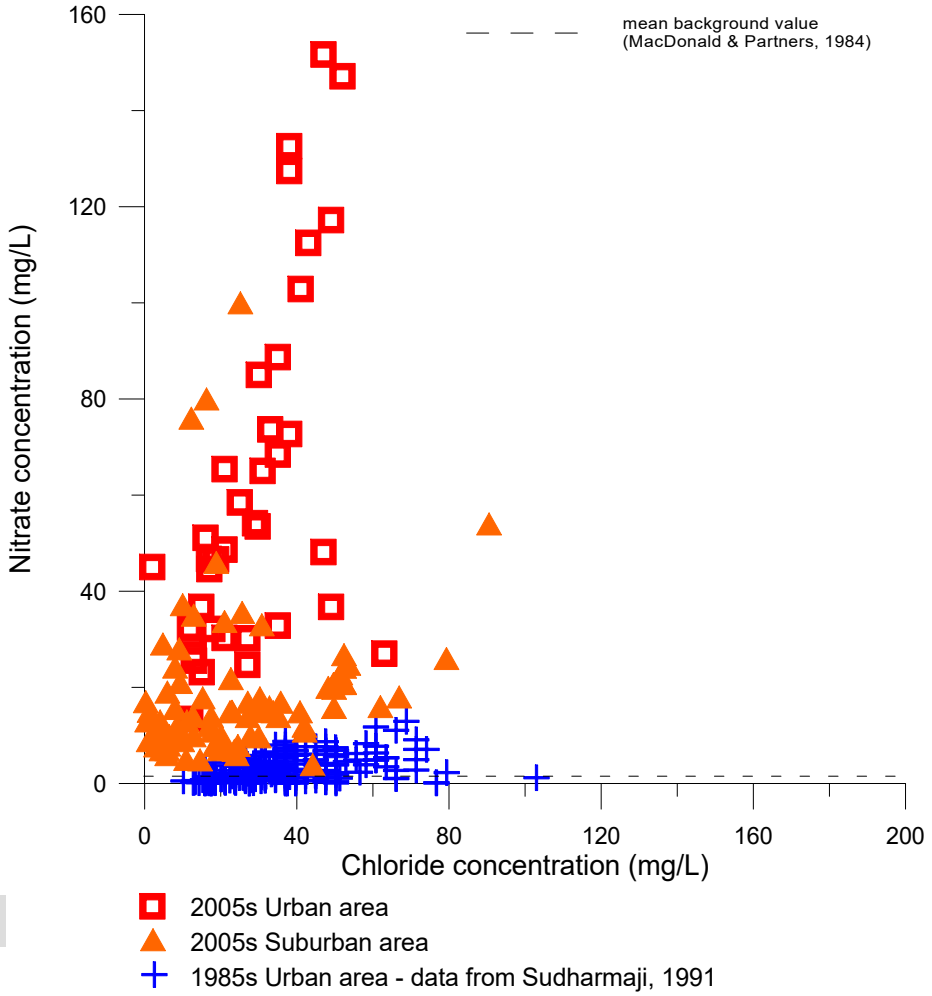
Perubahan Kadar Nitrat Pada Air tanah di Kota Yogyakarta (Putra, 2011)

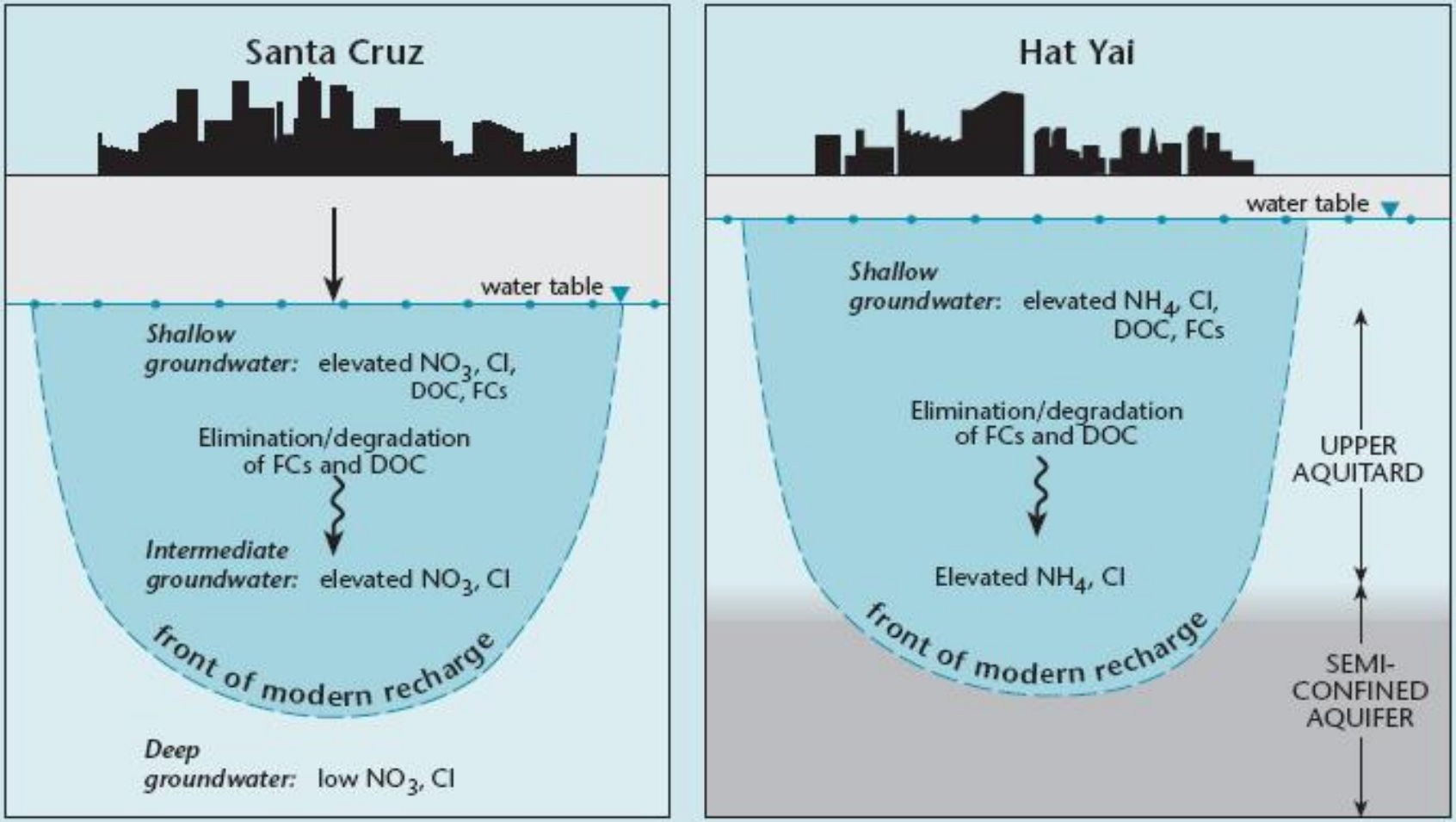




Perubahan Kadar Sulfat, Klorida dan Nitrat Pada Air tanah di Kota Yogyakarta (Putra, 2011)



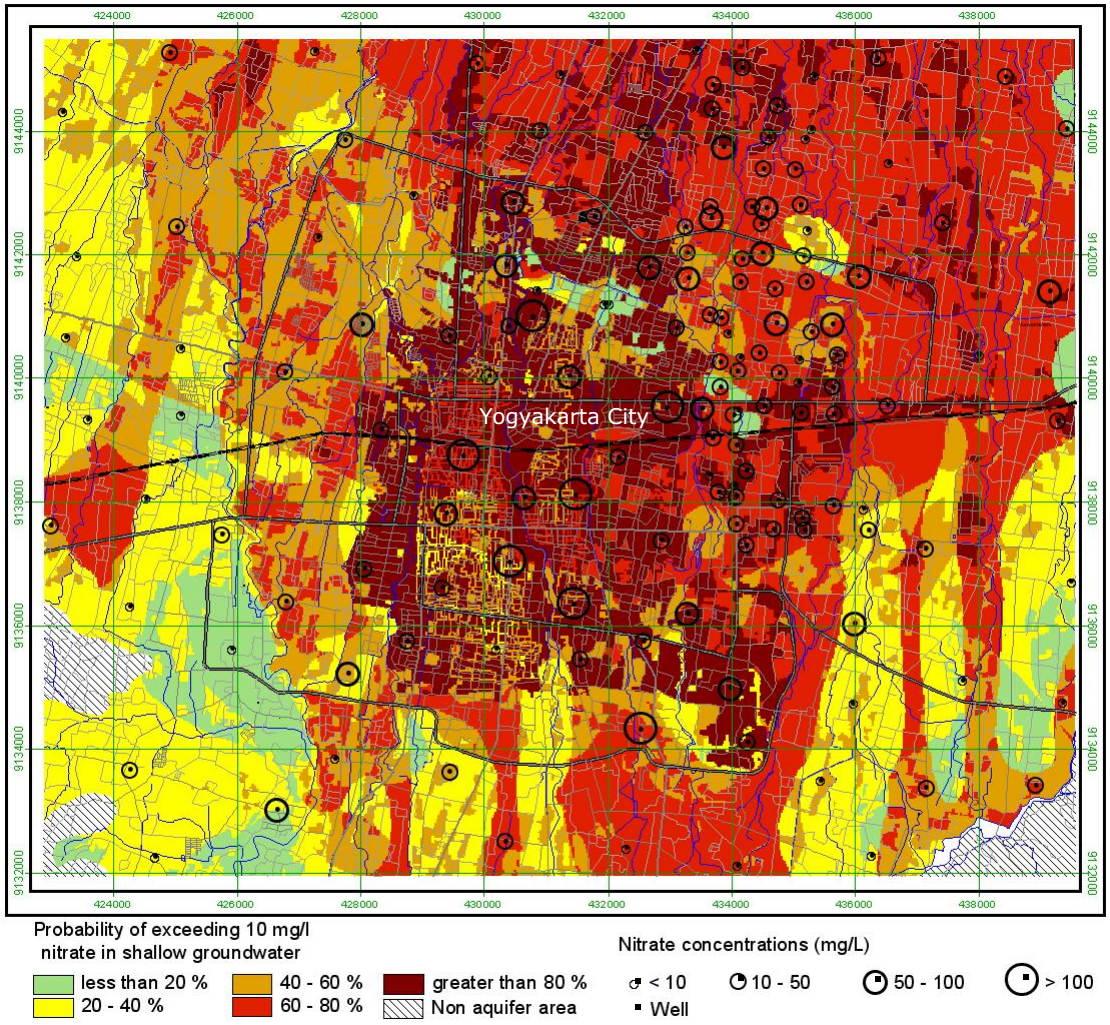




Impact on water quality from penetration of urban recharge in Santa Cruz and Hat Yai.

* *Since the case-study in Santa Cruz in the mid-1990s, piped sewerage has been significantly extended*

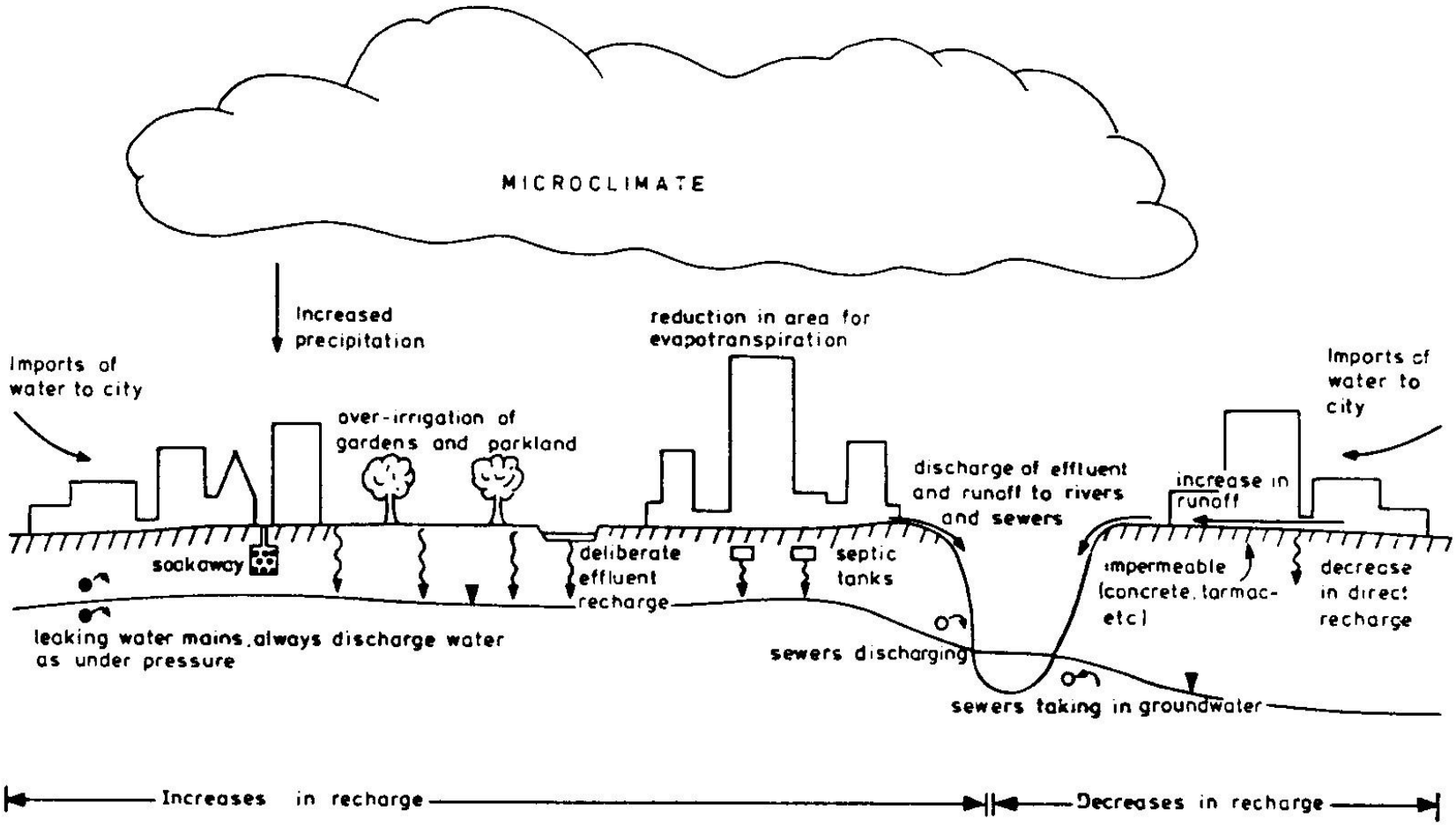
PETA BAHAYA PENCEMARAN NITRAT PADA AIR TANAH DANGKAL



Probability of exceeding 10 mg/L nitrate in shallow groundwater

- greater than 80%
- 60 – 80 %
- 40 – 60 %
- 20 – 40 %
- less than 20 %

“Urban Recharge” Sebagai Sumber Kontaminasi Air Tanah



Lerner et al. 1990

Contoh Estimasi Besaran "Urban Recharge"

Table 2.4 Component of urban recharge in the study area.

No.	Component of urban recharge	Q (million m^3/a)
1	[a]Total domestic use (Q_D); about 70% demand is fulfilled by local shallow groundwater abstraction and less than 30% of demand can be supplied from the existing water supply system	51.17
2	[a]Domestic consumptive use (Q_c)	6.92
3	Potential domestic waste water ($W_P = Q_D - Q_c$)	44.25
4	[a]Domestic waste water exported via existing sewer system (W_S)	2.56
5	Domestic waste water not exported ($W_{NE} = W_P - W_S$)	41.69
6	[b]Leakage from water supply system (L_I)	5.76
7	[a]Leakage from sewer system (L_S)	0.37
8	[c]90 % not exported domestic waste water ($L_W = 0.9 \times W_{NE}$)	37.5
9	[c,d]90 % non domestic wastewater (L_{nd})	1.95
10	Net urban groundwater recharge ($U_U = L_I + L_S + L_W + L_{nd}$)	45.6

Description:

a. see Sub Chapter 4.2.1
b. data from RDPRP (2005); Yogyakarta City – 5.22×10^6 m^3/a, Sleman Agglomeration – 0.36×10^6 m^3/a (21.5% from the total leakage of piped water in the Sleman District), Bantul Agglomeration – 0.18×10^6 m^3/a (13.7% from the total leakage of piped water in the Bantul District)
c. as suggested by Lerner et al. (1990)
d. Total non domestic water demand of small-medium commercial/industries: 2.17×10^6 m^3/a, data from BPS Kodya Yogyakarta (2001), BPS Sleman (2001) and BPS Bantul (2001). Heavy/large commercial/industries are commonly have their own wastewater treatment system and discharged the treated wastewater to the rivers.

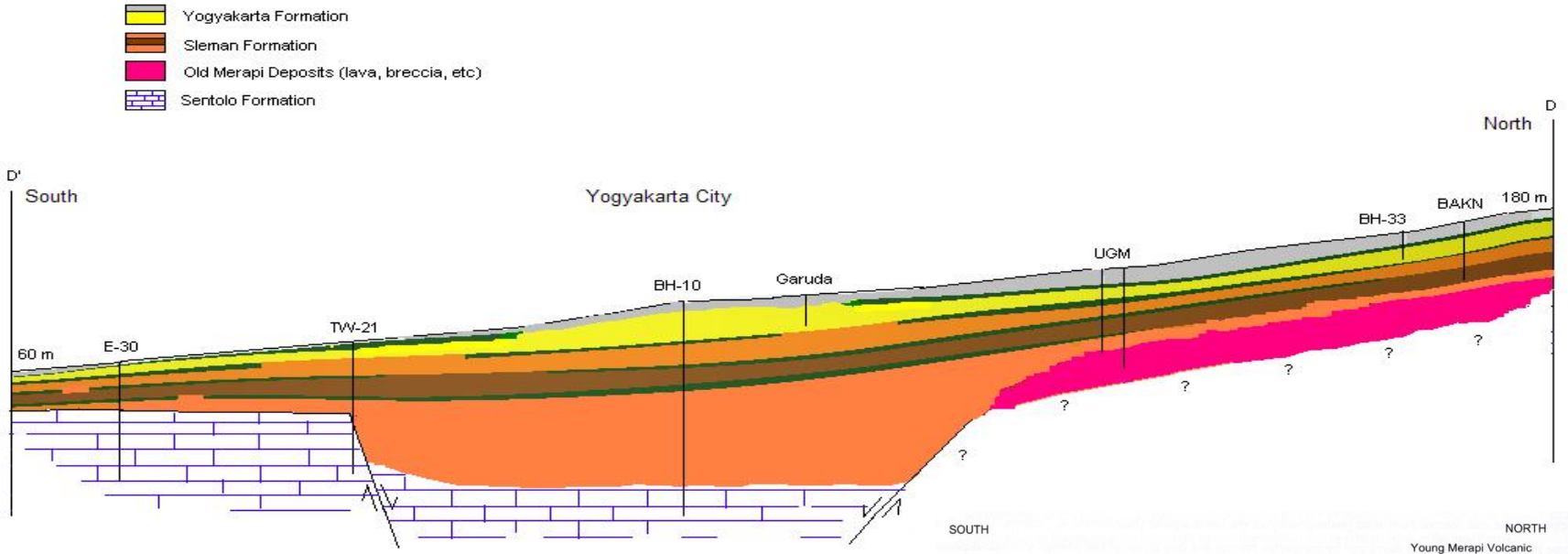
(Putra, 2007)

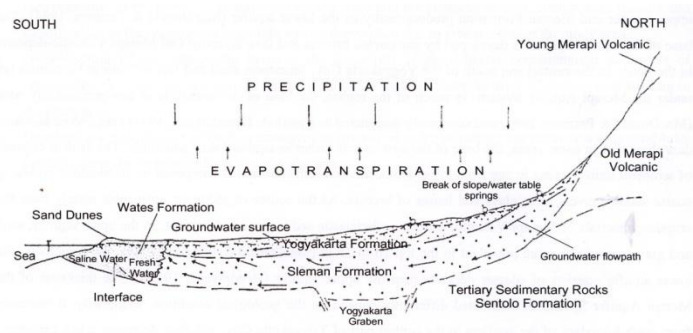
"Urban Recharge" dan Dampaknya Pada Kualitas Air Tanah

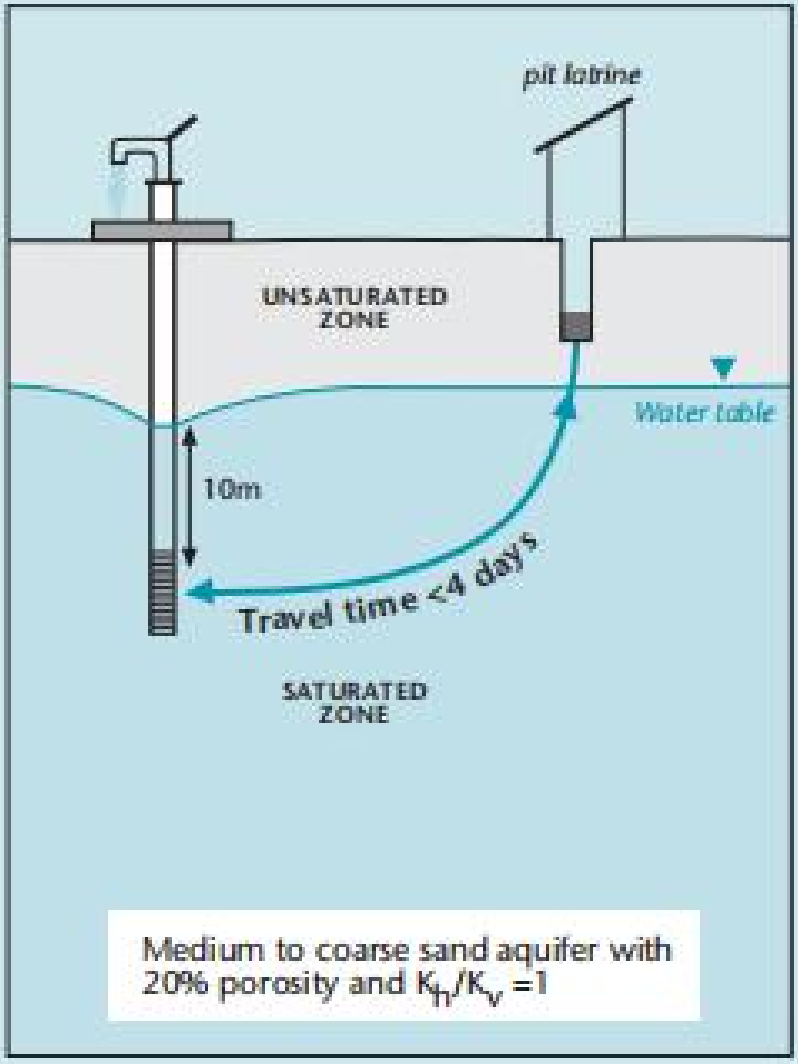
Recharge source	*Importance*	*Water Quality*	*Pollutants/pollution indicators*
Leaking water mains	Major	Excellent	Generally no obvious indicator
On site sanitation systems	Major	Poor	N, B. Cl, FC, DOC
On site disposal / leakage of industrial waste water	Minor to Major	Poor	HC, diverse industrial chemicals, N, B, Cl, FC, DOC
Leaking sewers	Minor	Poor	N, B, Cl, FC, SO4, diverse industrial chemicals
Pluvial drainage from surface by soakaway drainage	Minor to Major	Good to poor	N, Cl, FC, HC, DOC, diverse industrial chemicals
Seepage from canals and rivers	Minor to Major	Moderate to poor	N,B, Cl, FC, SO4, DOC, diverse industrial chemicals
B Boron Cl Chloride and salinity general DOC dissolved organic carbon (organic load) FC Faecal coliforms		HC Hydrocarbons (Fuels, Oils and Greases) N Nitrogen compounds (nitrate or ammonium) SO4 Sulpahte	

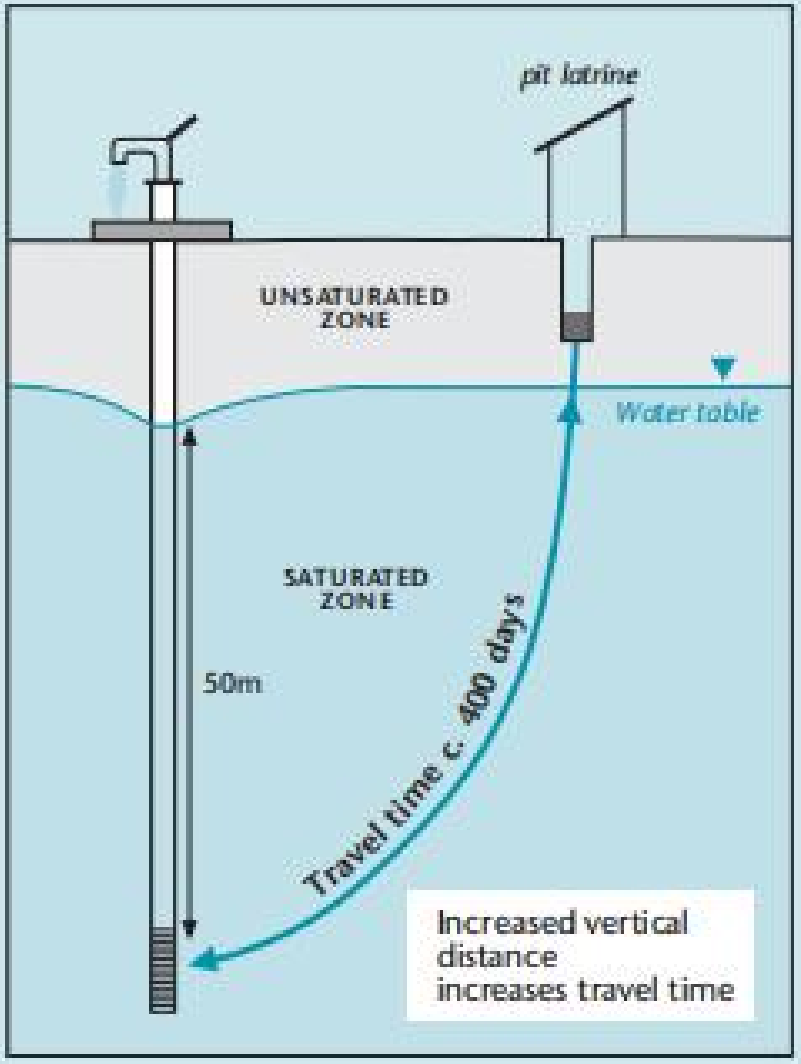
(UNEP, 1996 from Morris, et al., 2003)

MEMAHAMI WADAH AIR TANAH
UNTUK PENGELOLAAN AIR TANAH



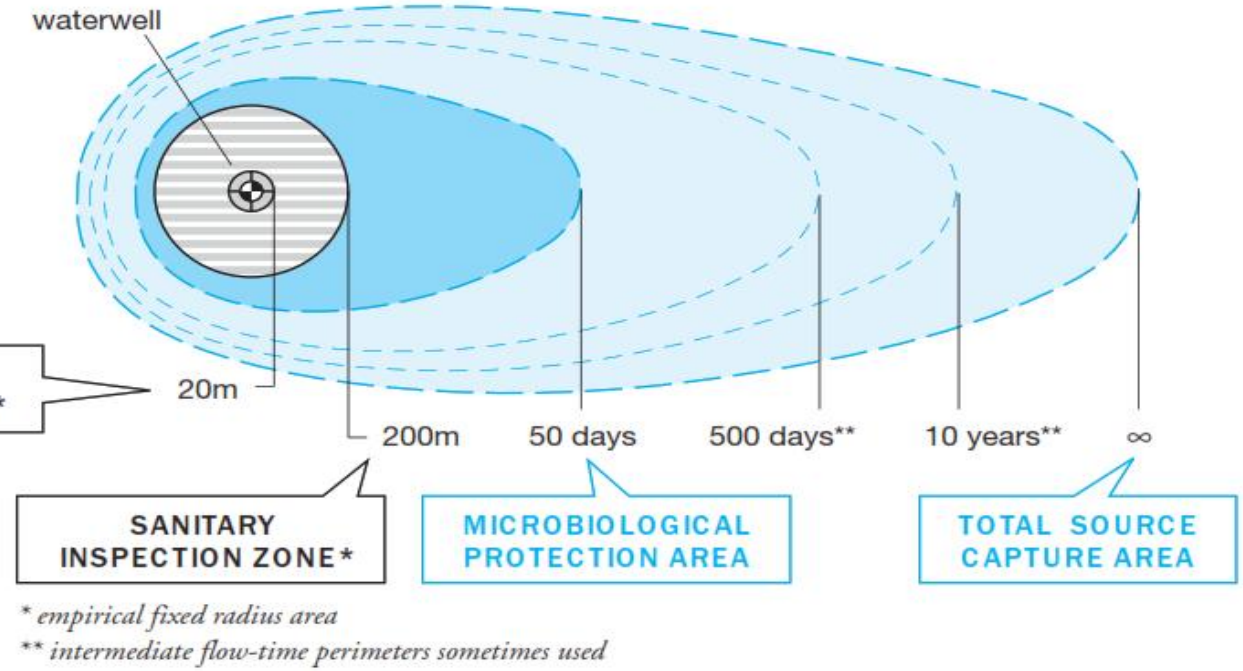






Source: Morris et al. (2003)

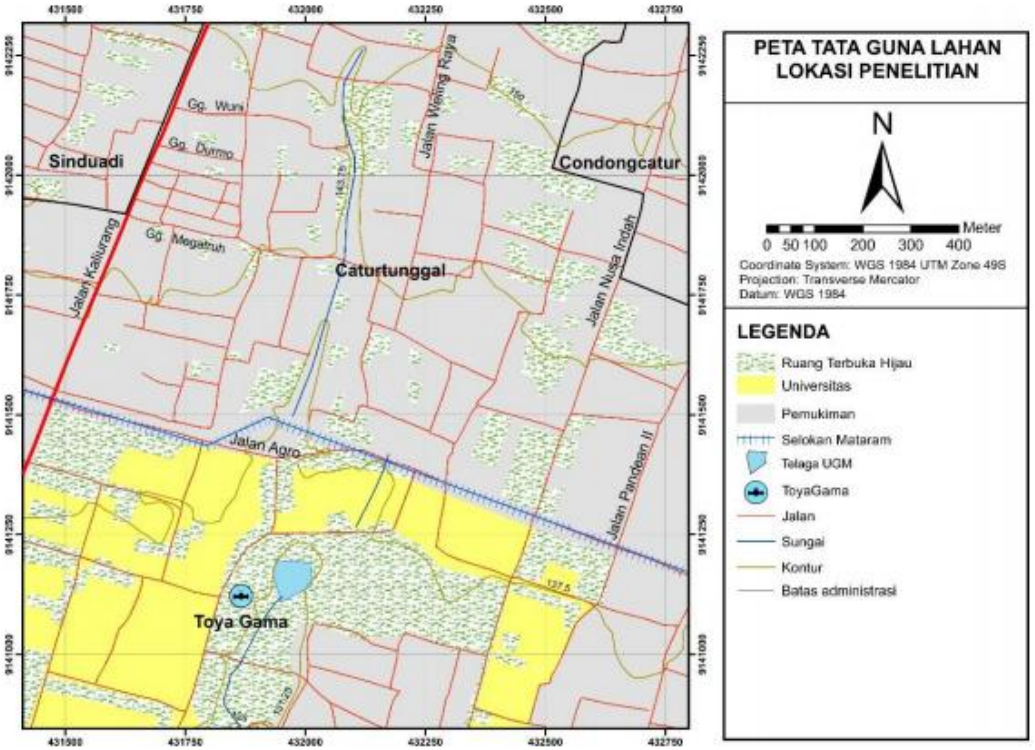
MENGIMPLEMENTASIKAN ZONA PERLINDUNGAN SUMBER AIR BAKU (AIR TANAH)



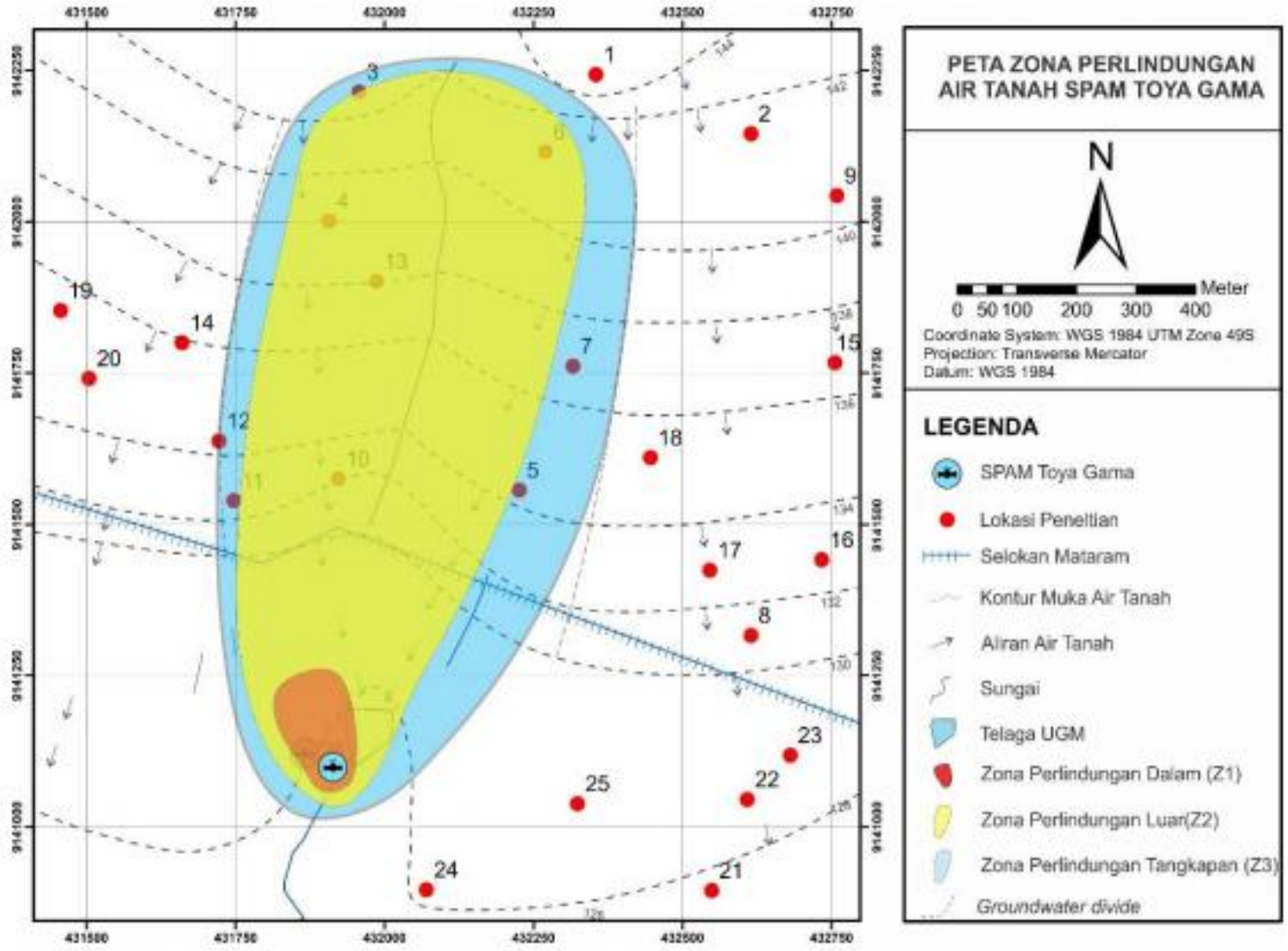
* *empirical fixed radius area*

** *intermediate flow-time perimeters sometimes used*

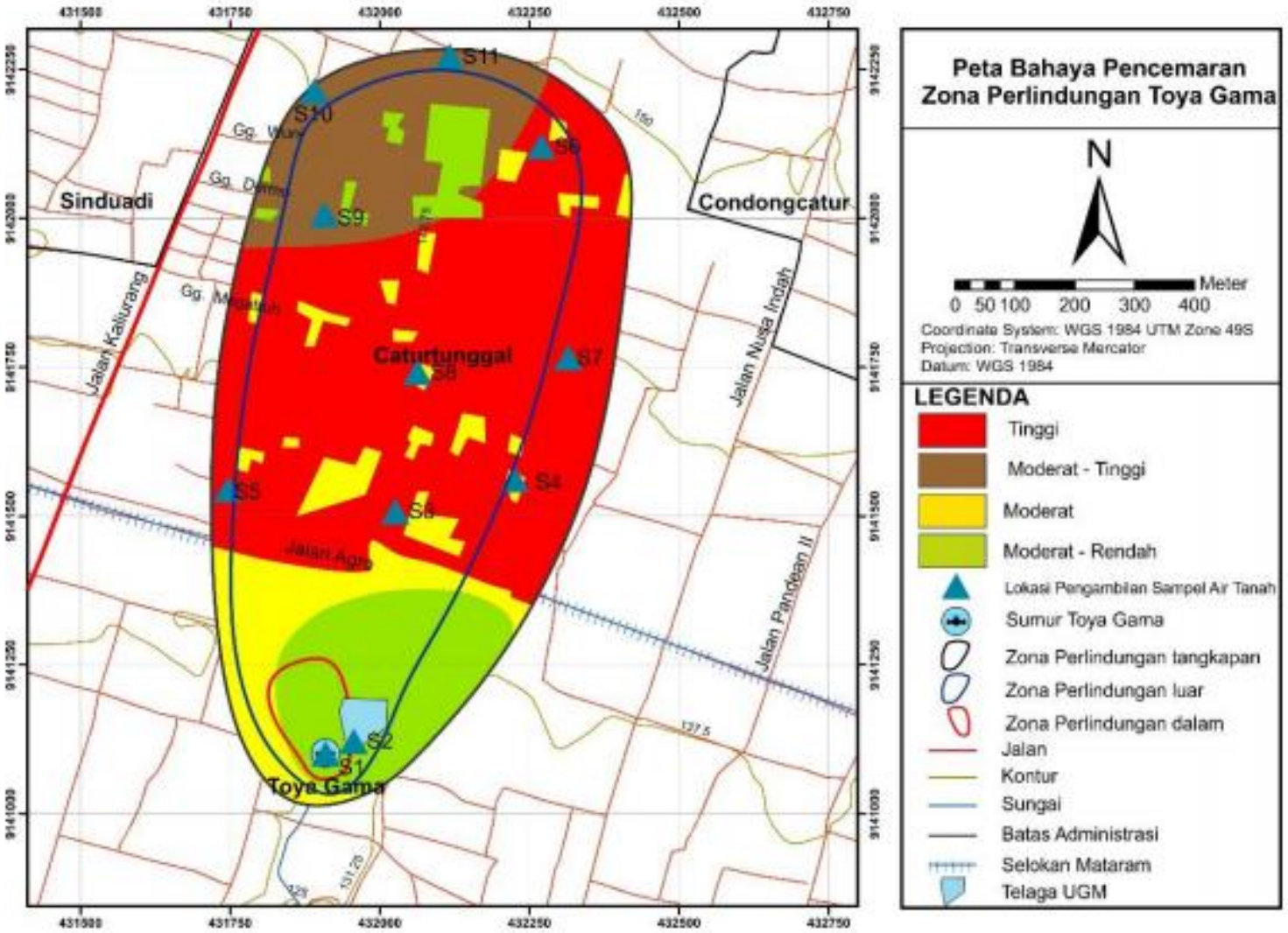
Toya Gama UGM



Source: Haq (2019)



Source: Haq (2019)



Source: Haq (2019)

Kesimpulan

- Air tanah adalah sumber daya air yang penting, berharga dan sumber daya terbarukan.
- Air tanah berada di bawah ancaman degradasi baik oleh kontaminasi dan penggunaan yang tidak tepat.
- Air tanah perlu dikelola dengan hati-hati jika penggunaannya harus dipertahankan untuk generasi mendatang.

THANK YOU

Mengakar Kuat
Menjulang
Tinggi