

Quantifying the Global Non-Revenue Water Problem

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Water Loss
Specialist Group



Introduction

- **Objective:** review and improve NRW estimates previously made for World Bank and Asian Development Bank (2006 and 2010)
- **Latin America:** Data set from Wyatt/IDB was used to verify the assumptions in the model
 - they were looking at specific utilities where reasonable quality information could be found. Thus it makes a useful comparison

Approach

- Supplied population (piped)
- Average per capita consumption (country specific)
- Assumption: add 30% of domestic consumption as a provision for non-domestic consumption
- Average % NRW (country specific)
- Calculate system input volume
- Calculate volume of NRW

Data sources

- Supplied population: WHO/UNICEF Joint Monitoring Program (JMP) <https://washdata.org/>
- Per capita consumption:
 - IBNET
 - IWA
 - Country reports
 - EU data
 - Own sources
- Average NRW levels
 - Mainly IBNET
 - Country reports
 - Own sources

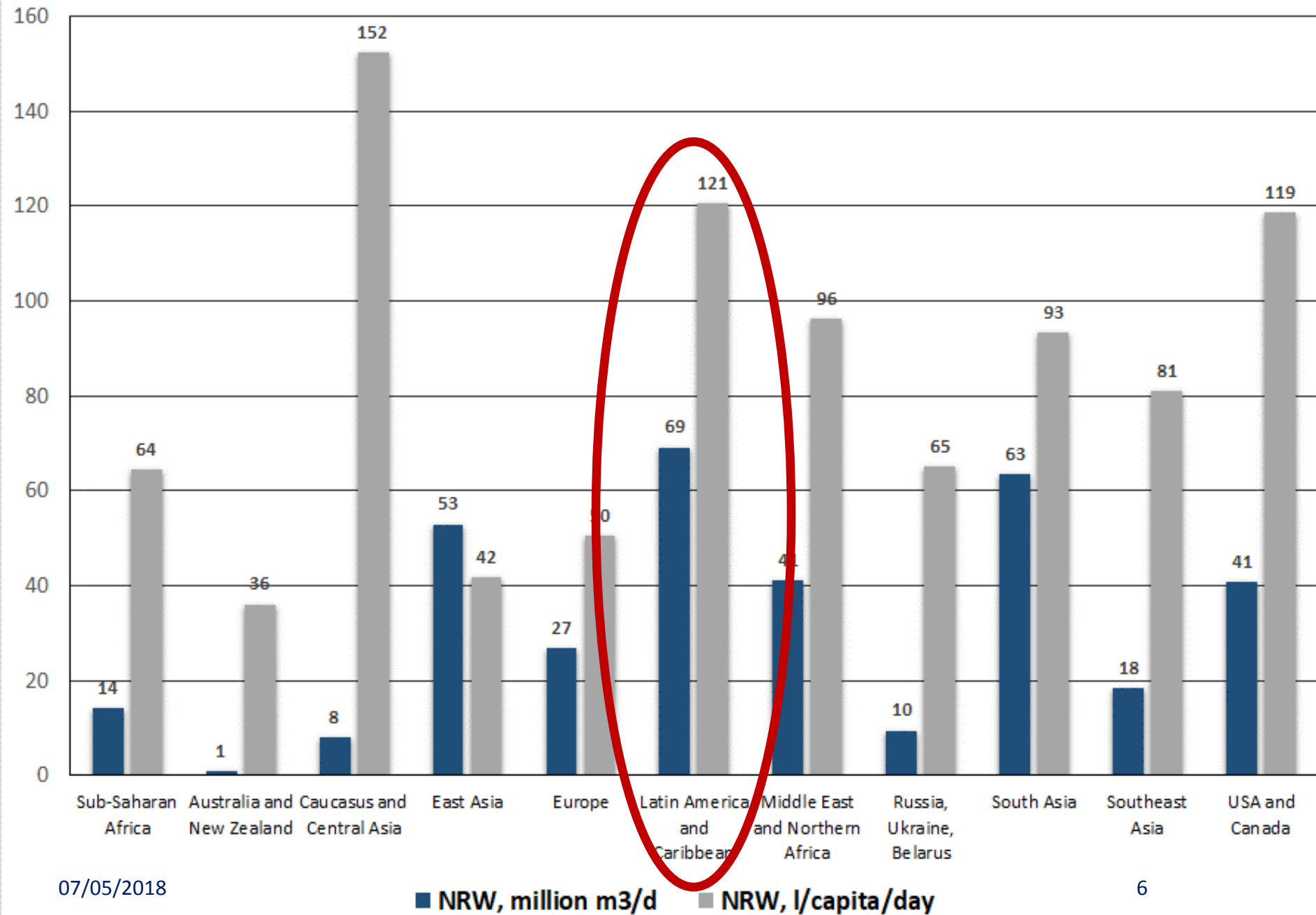
Global NRW estimates

126 billion m³/year

346 million m³/day

77 liters per capita per day

NRW per world region



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	Population Served	NRW in l/capita/d			NRW in 1000 m3/day			Percent Difference
		Model	Wyatt/IDB	Difference	Model	Wyatt/IDB	Difference	
Argentina	43,019,152	183	189	5	7,894	8,113	-219	3%
Bahamas	369,918	98	98	0	36	36	0	0%
Barbados	278,577	286	300	14	80	84	-4	5%
Belize	297,949	37	37	0	11	11	0	0%
Bolivia	7,915,294	70	63	-7	554	502	52	-9%
Brazil	199,750,809	94	90	-5	18,872	17,879	993	-5%
Cayman Islands	51,572	53	52	0	3	3	0	0%
Chile	17,847,512	91	84	-6	1,620	1,505	115	-7%
Colombia	42,381,111	118	107	-11	4,997	4,547	450	-9%
Costa Rica	4,768,368	206	220	14	982	1,048	-67	7%
Dominica	54,444	69	97	28	3.8	5.3	-1.5	40%
Ecuador	13,833,220	173	174	1	2,388	2,403	-15	1%
El Salvador	5,367,444	106	104	-2	568	556	12	-2%
Grenada	96,055	104	91	-13	10.0	8.7	-1.8	-13%
Guyana	506,840	332	348	17	168	176	-8	5%
Honduras	7,213,368	111	106	-4	798	768	30	-4%
Jamaica	2,259,016	289	261	-28	652	590	62	-10%
Mexico	119,478,951	104	99	-5	12,426	11,817	609	-5%
Nicaragua	4,234,942	206	208	2	874	882	-7	1%
Panama	3,617,503	204	327	123	738	1,183	-445	60%
Paraguay	5,936,257	206	193	-12	1,220	1,147	74	-6%
Peru	26,032,349	94	97	4	2,437	2,528	-92	4%
Puerto Rico	3,465,481	349	357	8	1,209	1,238	-29	2%
St Lucia	176,678	186	205	19	33	36	-3	10%
St.Vincent and the Grenadines	101,763	94	104	10	10	11	-1	11%
Suriname	364,343	69	142	73	25	52	-26	105%
Trinidad and Tobago	1,253,202	310	359	49	389	450	-61	16%
Uruguay	3,384,329	152	147	-5	514	496	18	-3%
Total Population	514,056,447							
Weighted Average NRW l/capita/day		116	113	-2.7				
Total NRW Volume 1000 m3/day					59,510	58,070	1,430	-2.4%

Main differences - some explanations

- **Dominica** – this is due to large consumption from cruise ships
- **Panama** – higher consumption (wastage) due to low level of metering, high illegal consumption
- **St. Lucia** – high consumption from cruise ships
- **Suriname** – not completely clear. But presumably because Wyatt/IDB had only one data set from a mainly urban region

Comparison to previous NRW estimates

	2005		2009		2016
Billion cubic meters per year	World Bank Publication	New Model	Asian Development Bank Publications	New Model	New Model
World	48.6				
Asia			28.7		

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	2005		2009		2016
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Billion cubic meters per year	World Bank Publication	New Model	Asian Development Bank Publications	New Model	New Model
World	48.6	98			126
Asia			28.7	47	64

Valuing NRW

- In reality: could only be done on a case by case basis
- To make a global estimate an extreme simplification has been used:

$$\text{Value of NRW(USD/m}^3\text{)} = \ln(\text{per capita GDP}) \times 0.035$$

- Result:
 - Poorest countries: USD 0.20/m³
 - Maximum (Liechtenstein): USD 0.41/m³

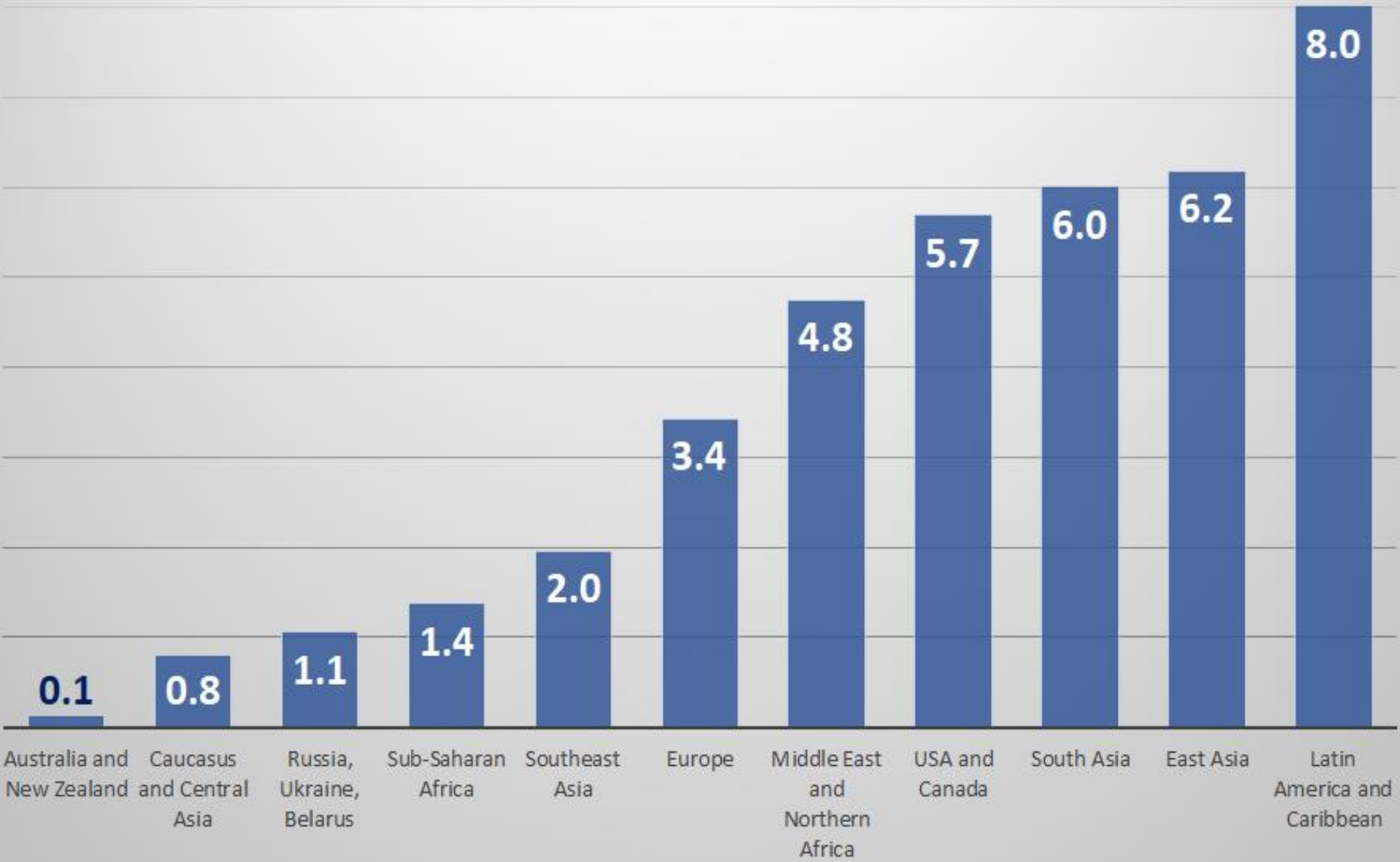
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Total cost/value:

USD **39** billion per year

Annual cost/value of NRW (billion USD)



New Sources of Water

1. New Dams
2. River Sharing
3. Rain Water Harvesting
4. Desalination
5. Icebergs

JUST PLUG THE LEAKS!!

