Plumbing tales from around the world

An introduction to the problem of Non-Revenue Water

Roland Liemberger

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30 years dedicated to NRW reduction

1988

1998

2008

2017

1958: Born in Vienna, Austria
1985: MSc (Water and Sanitary Engineering) Vienna
1988: First NRW project in Kathmandu, Nepal
2008: joined the Miya Group
2015: 2009-2015 based in Manila, Philippines
2017: NRW Management Advisor based in Austria

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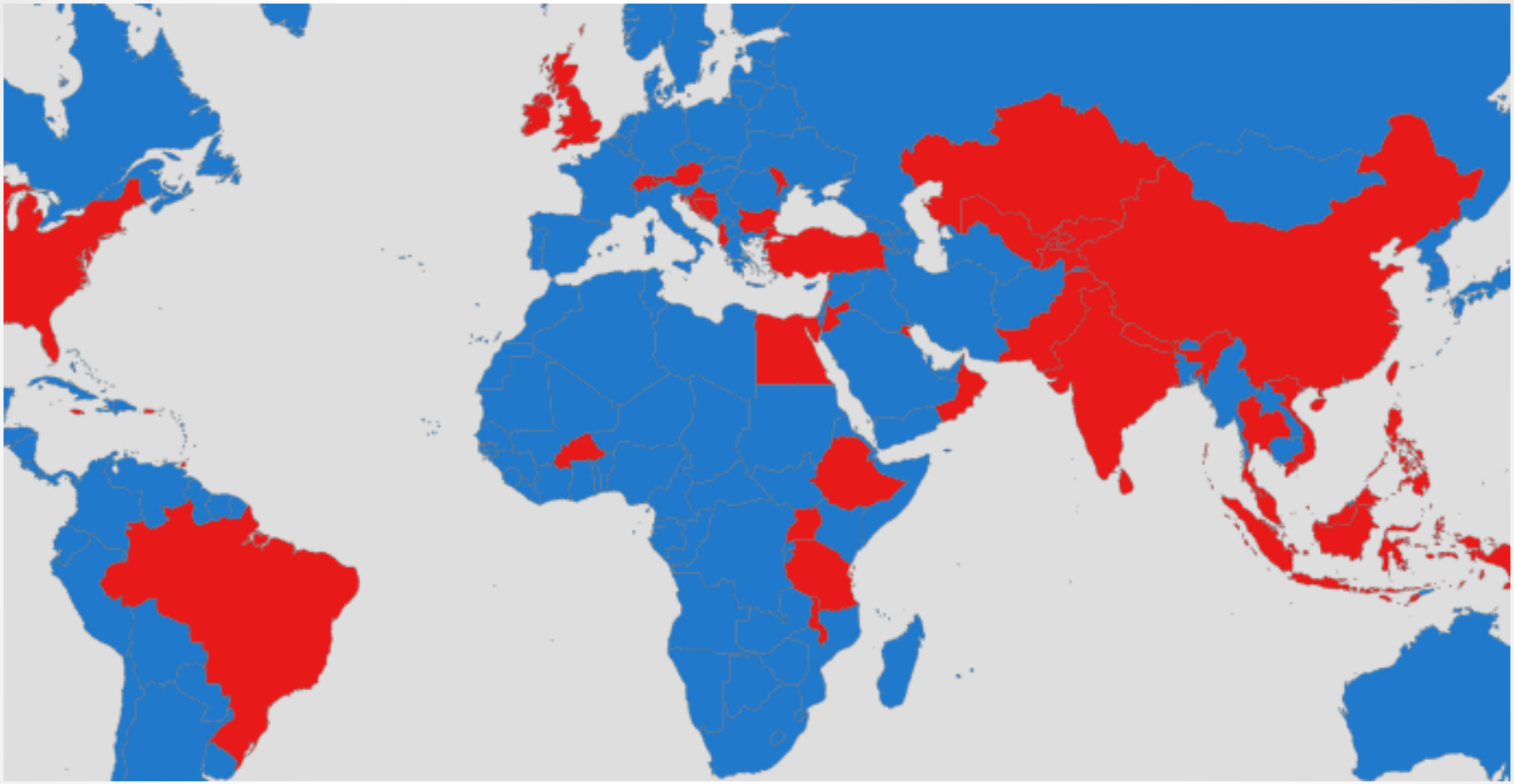
NRW experience in 40 countries!



Americas	5	Asia	19
Africa	6	Europe	10

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Estimating global water losses – 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

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Comparison to previous NRW estimates

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

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Comparison to previous NRW estimates

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World	48.6	**98**			
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Comparison to previous NRW estimates

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World	48.6	**98**			
Asia			28.7	**47**	

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Comparison to previous NRW estimates

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

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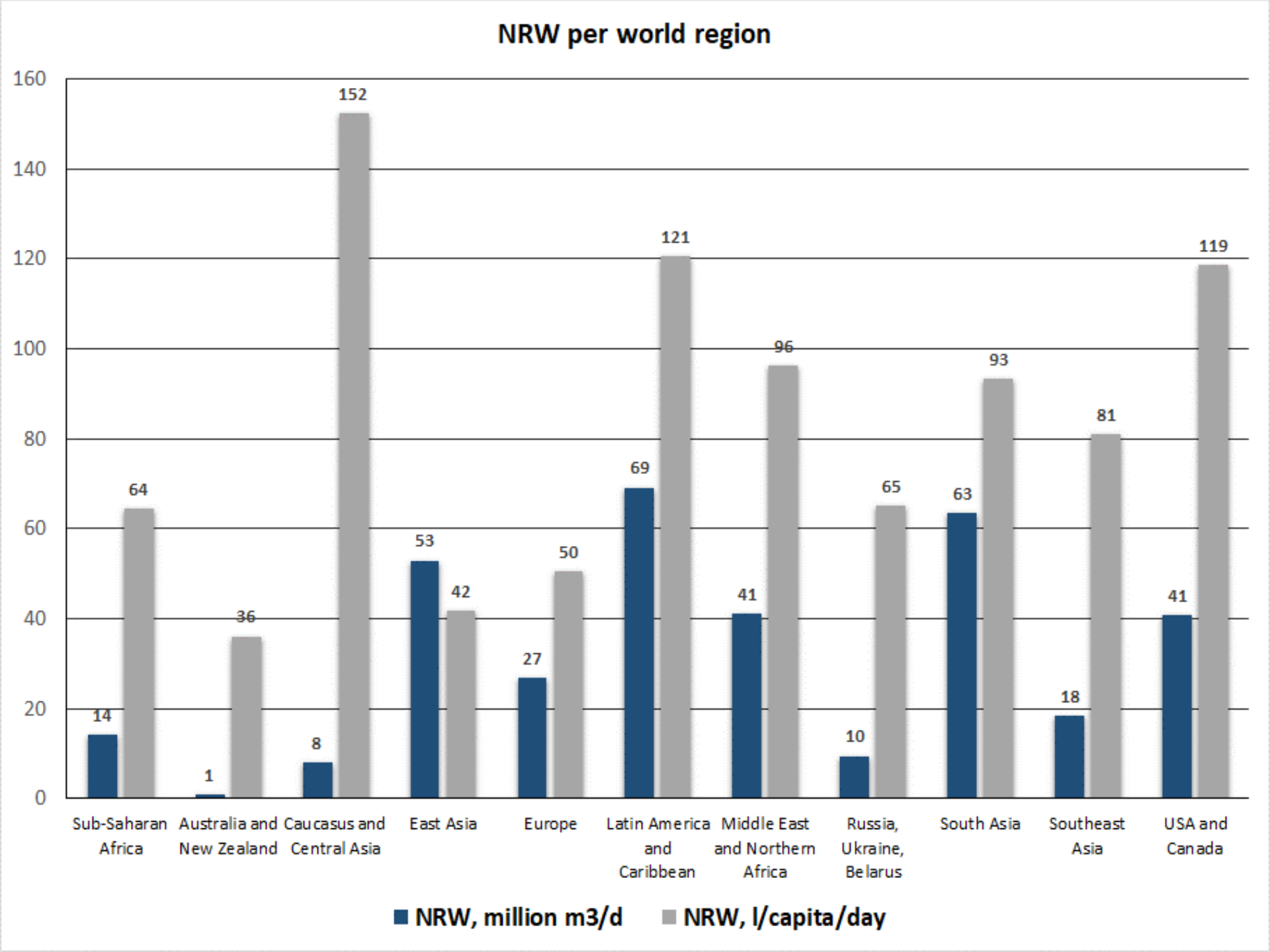
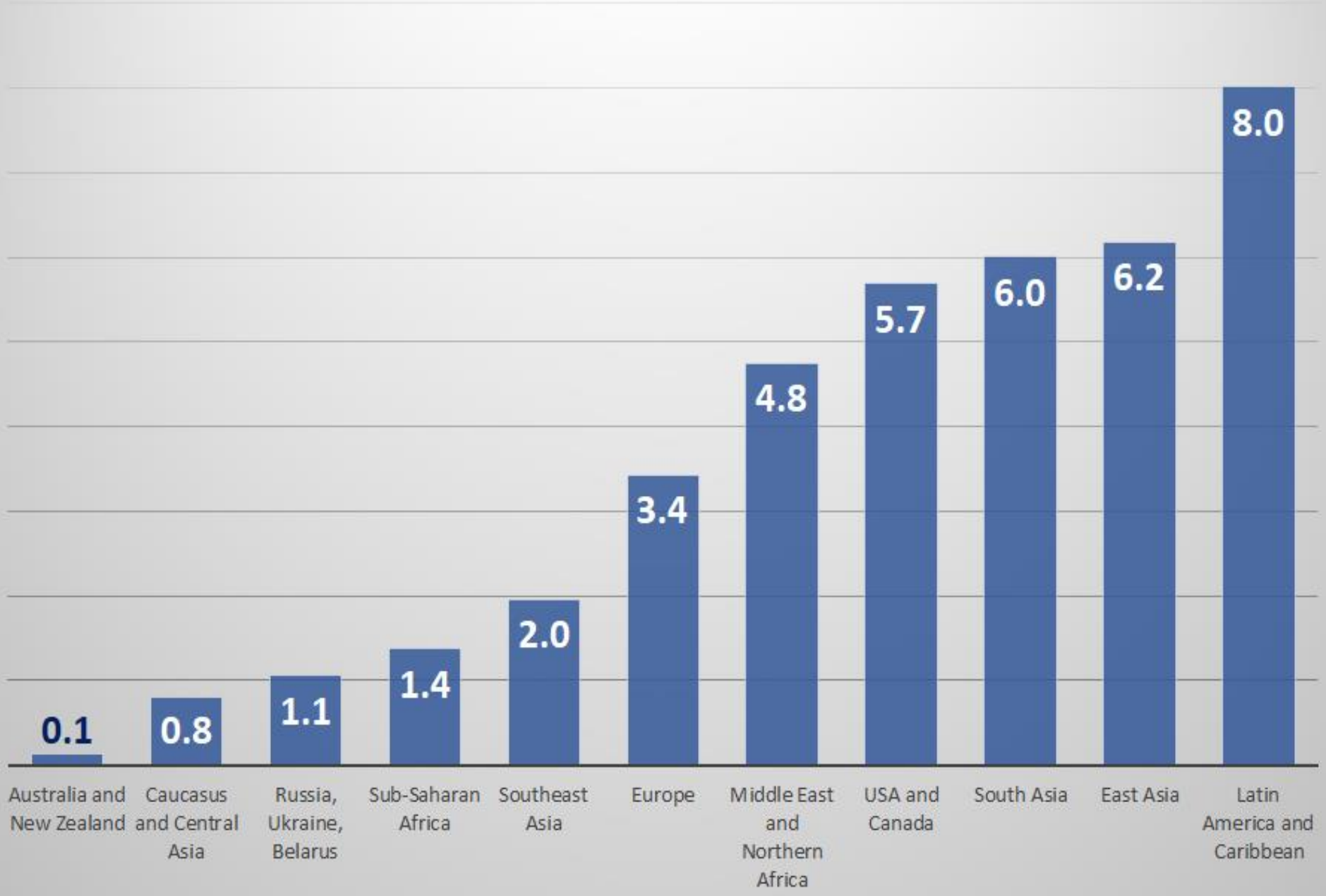
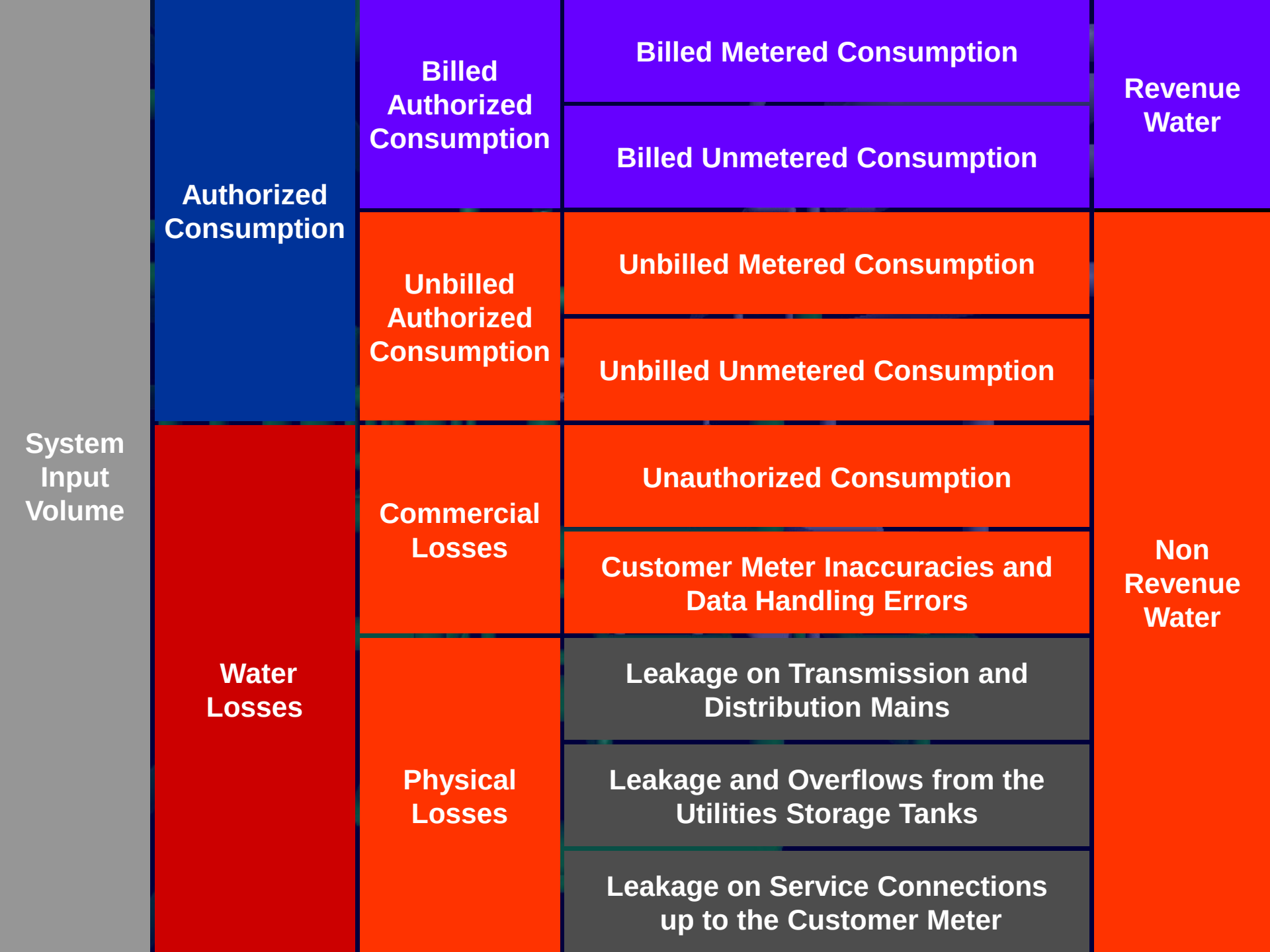

NRW per world region
160
140
120
100
80
60
40
20
0
14
64
1
36
8
152
53
42
27
50
69
121
41
96
10
65
63
93
18
81
41
119
Sub-Saharan Africa
Australia and New Zealand
Caucasus and Central Asia
East Asia
Europe
Latin America and Caribbean
Middle East and Northern Africa
Russia, Ukraine, Belarus
South Asia
Southeast Asia
USA and Canada
NRW, million m3/d
NRW, l/capita/day

Annual cost/value of NRW (billion USD)




System Input Volume
Authorized Consumption
Billed Authorized Consumption
Billed Metered Consumption
Billed Unmetered Consumption
Revenue Water
Unbilled Authorized Consumption
Unbilled Metered Consumption
Unbilled Unmetered Consumption
Water Losses
Commercial Losses
Unauthorized Consumption
Customer Meter Inaccuracies and Data Handling Errors
Physical Losses
Leakage on Transmission and Distribution Mains
Leakage and Overflows from the Utilities Storage Tanks
Leakage on Service Connections up to the Customer Meter
Non Revenue Water

Key issues about leaks

- Most leaks (in most utilities > 90%)
  - do **NOT** come to the surface
  - are caused by leaking service connections
- Factors affecting the volume of water lost from a leak:
  - Size ?
  - Time ?
  - Pressure ?

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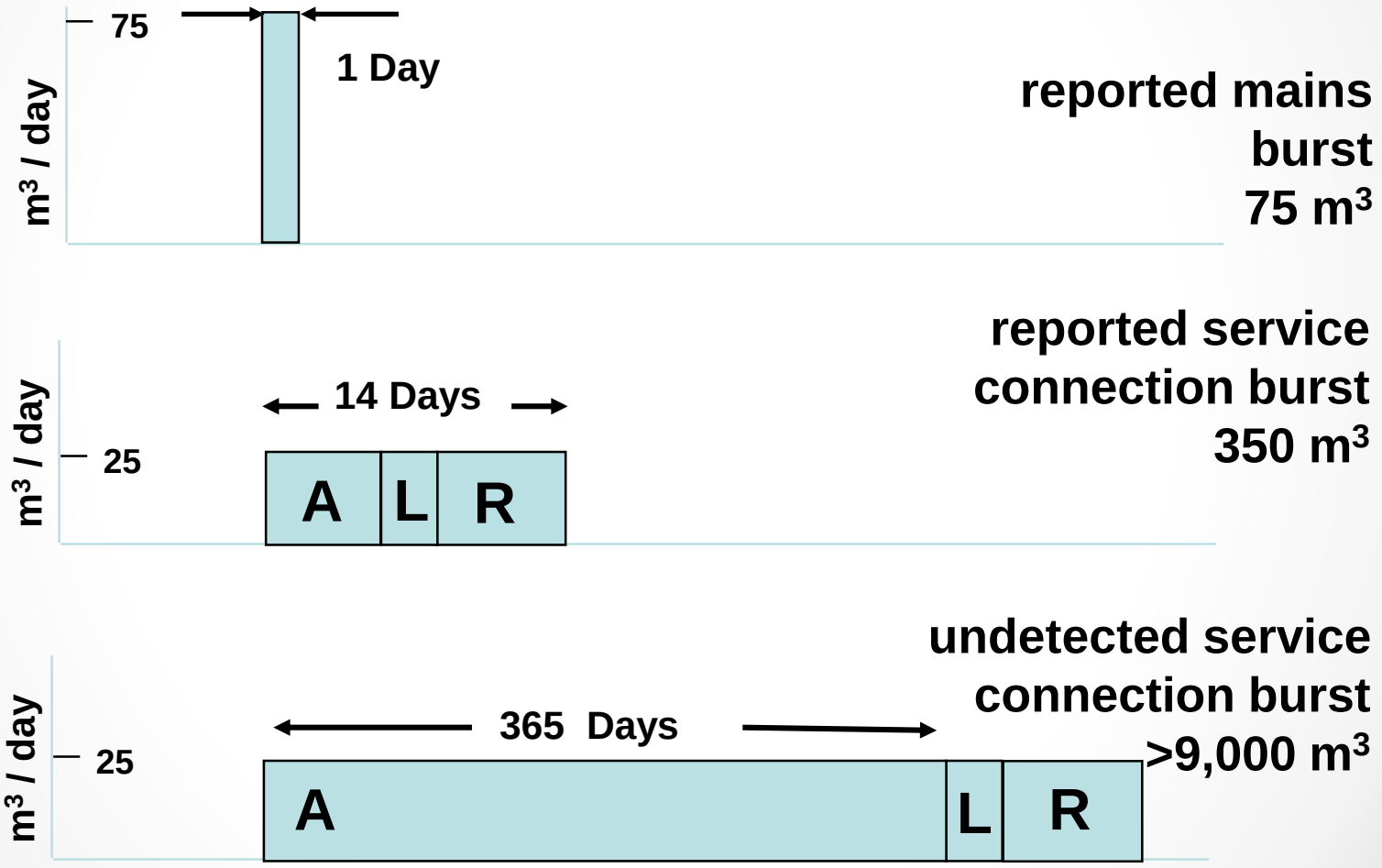
But TIME matters MORE!



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And PRESSURE matters A LOT!

- The higher/lower pressure the higher/lower leakage
- Relationship complex, but a good first assumption is a linear relationship:

10% MORE pressure = 10% MORE leakage

20% LESS pressure = 20% LESS leakage

- Pressure management an essential tool for leakage reduction
- Pressure level and pressure cycling strongly influence burst frequency

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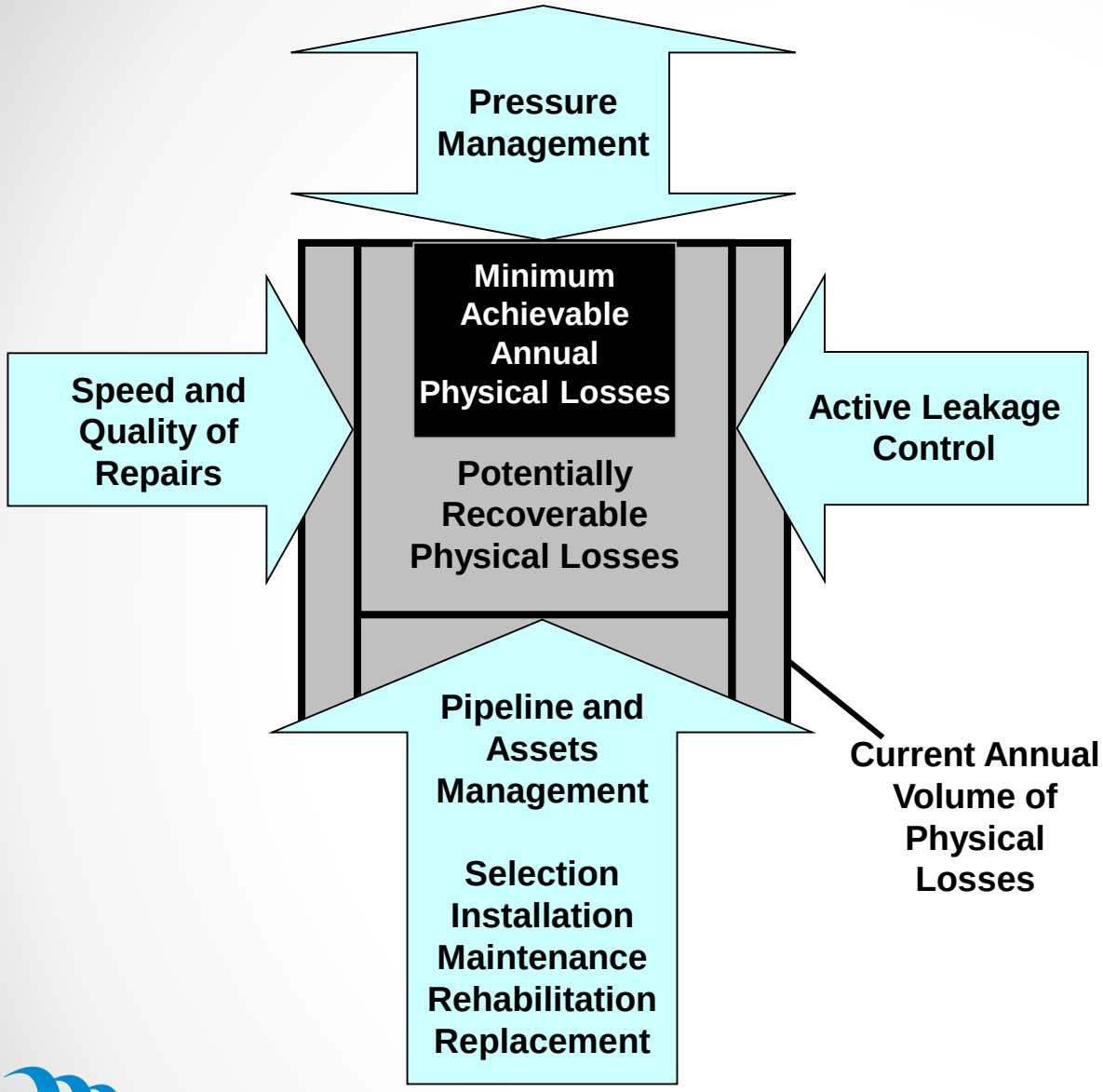

The 4 Elements of a Sustainable Leakage Control Strategy

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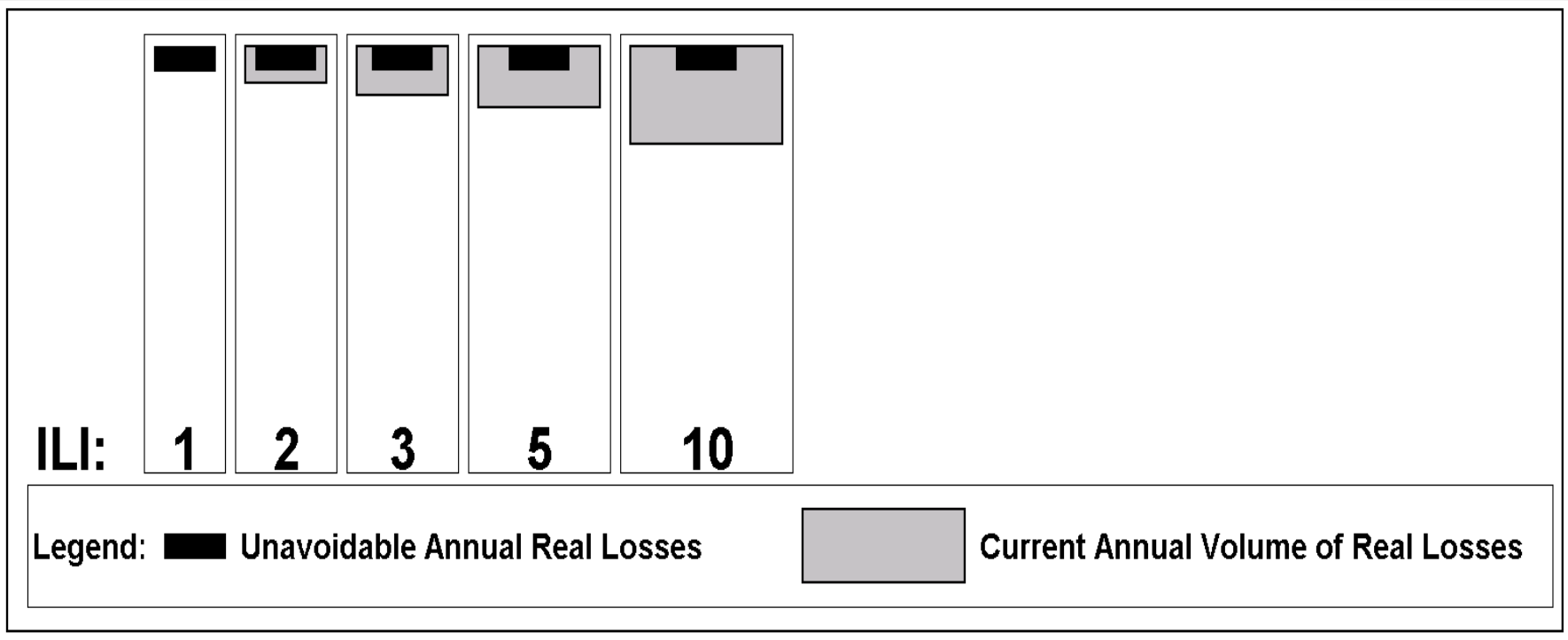
Infrastructure Leakage Index (ILI) from 1 to . . . . . .?



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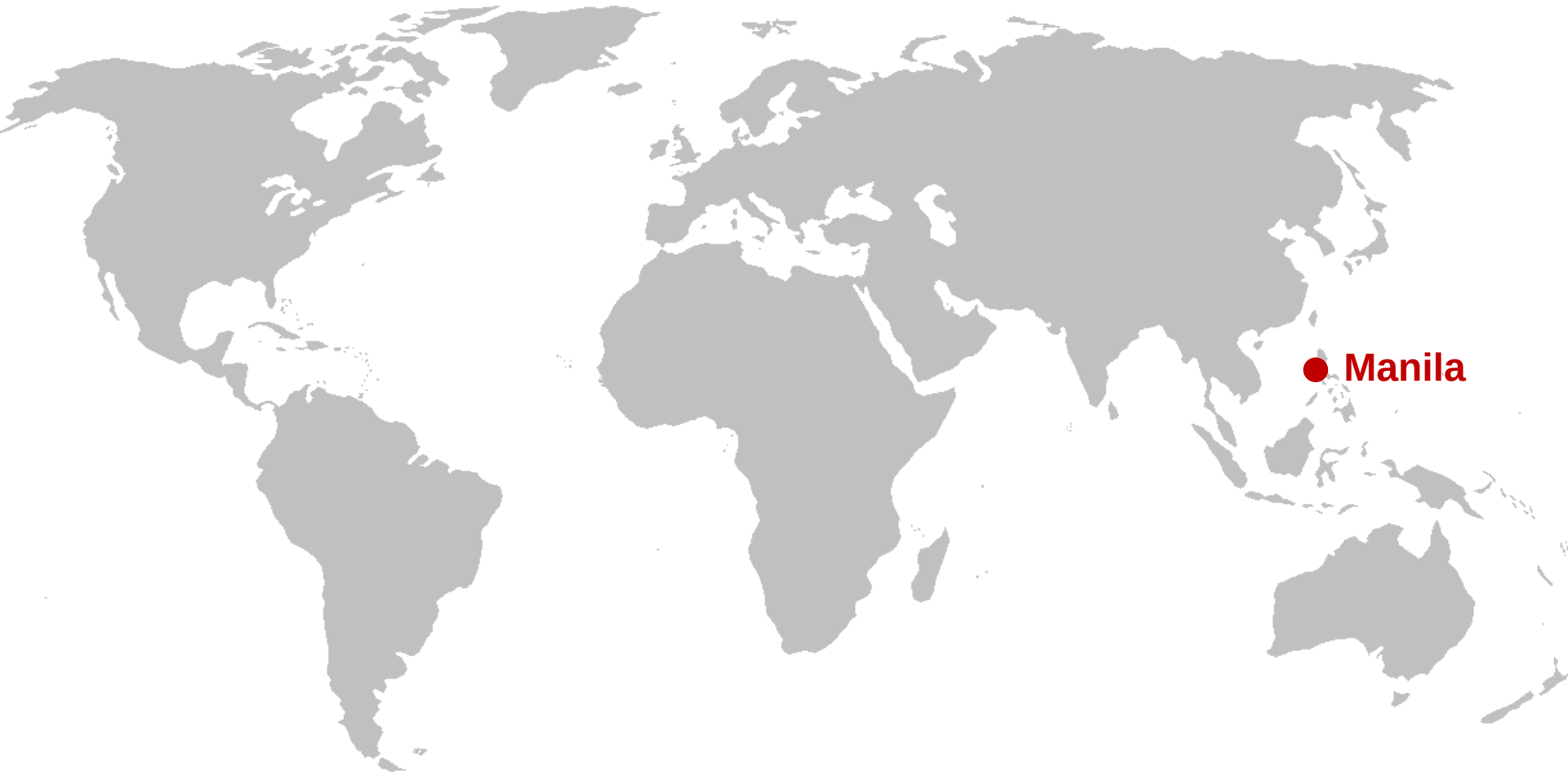

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The starting point: Maynilad, 2007

Water Losses

1,580,000 m3 per day

4 X Water demand of the City of Vienna!

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The starting point: Maynilad, 2007

- Population in the service area: 9 M
- 67% of water produced was lost
- ~ 70% of all customers had only a few hours water supply per day
- Very low water pressure
- 3 million people not connected to the system
- No additional water resources easily available

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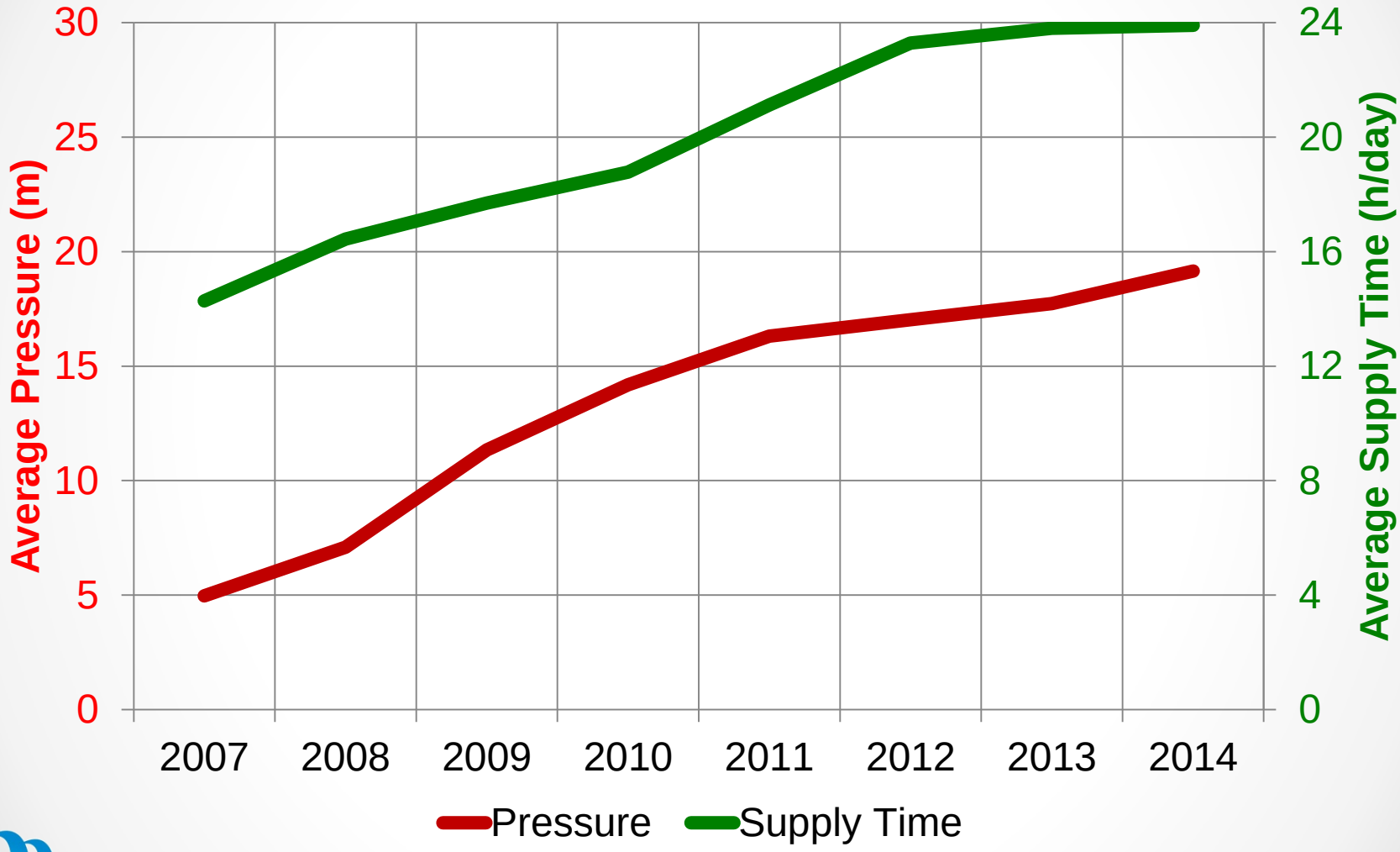
Average Pressure and Supply Time



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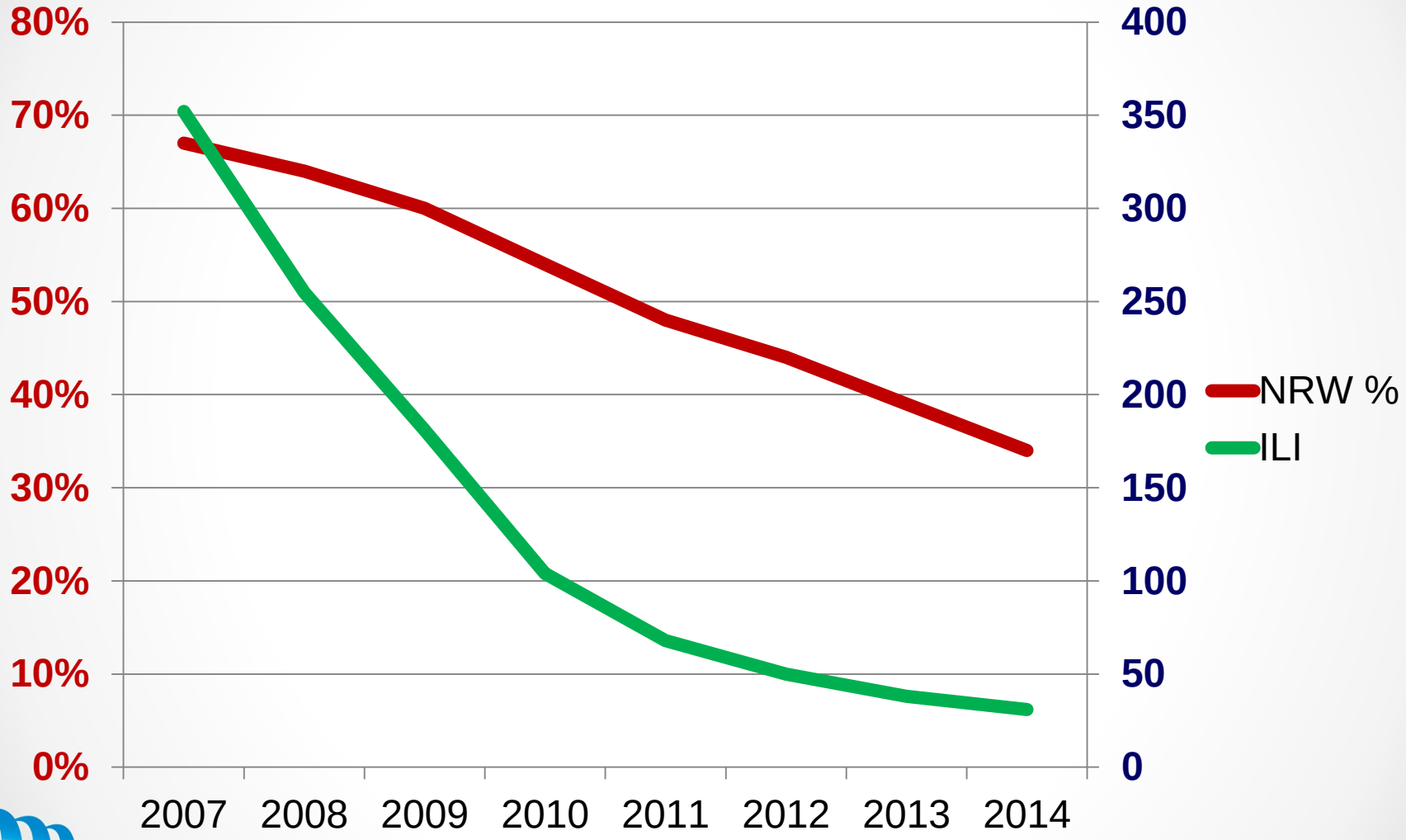
NRW reduction progress (2)



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Maynilad-Miya achievement (2007-2014)

Water Losses **reduced** by

930 million liters per day

2.5 x Water demand of the City of Vienna!

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Big numbers!

- 277,000 leaks repaired
- 1,500 km pipelines replaced
- 214,000 service connections replaced
- 1,500 DMAs established
- 3,700 large customer meters improved
- USD 410 M CAPEX and OPEX
- .... and still a long way to go!

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1,250 cubic meters per day!


London 2012


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AND ASIA PAC
AWARDS
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IWA 2014 Project Innovation Awards
EAST ASIA AND ASIA PACIFIC
REGIONAL AWARDS CEREMONY AND RECEPTION
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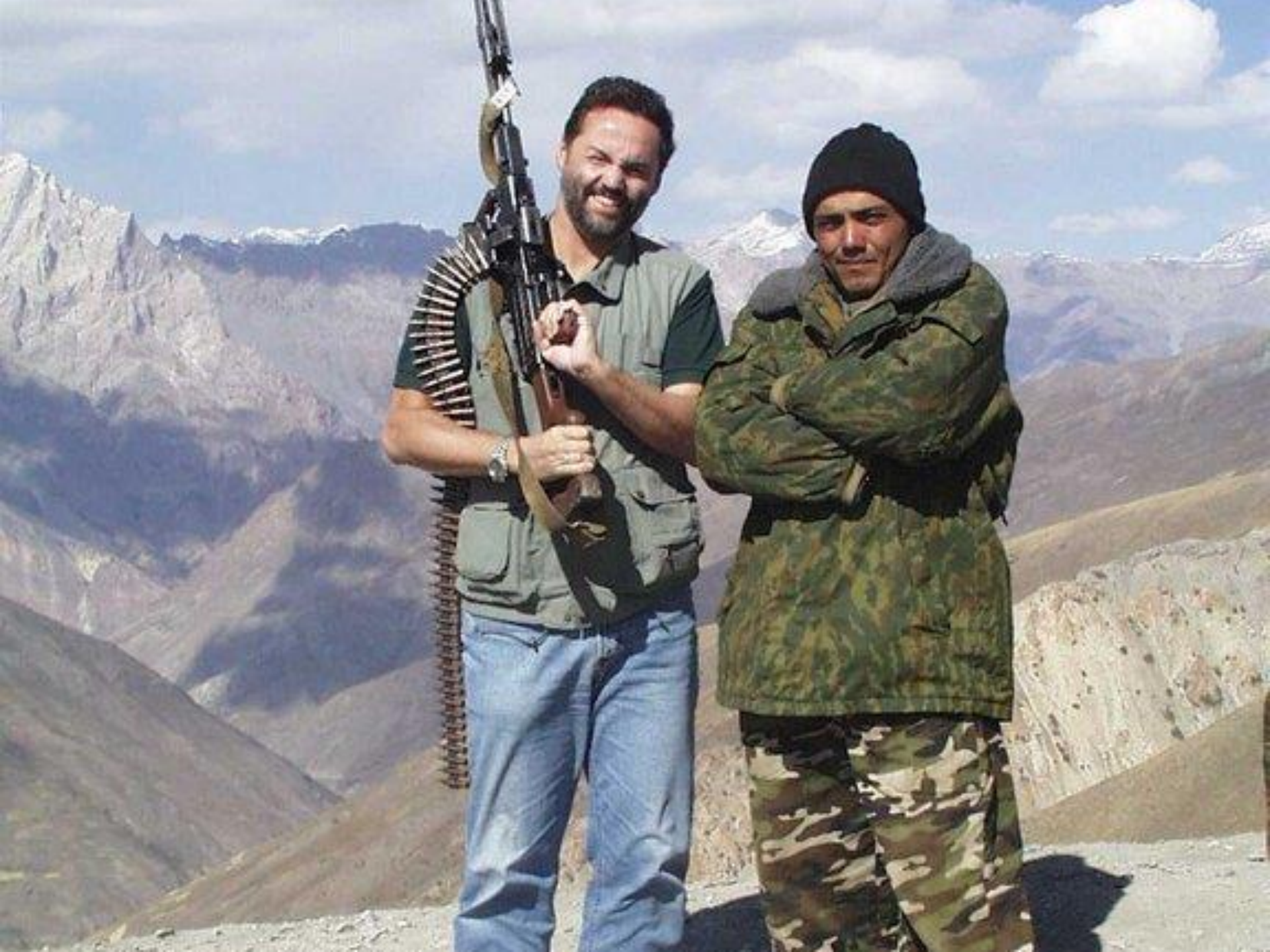
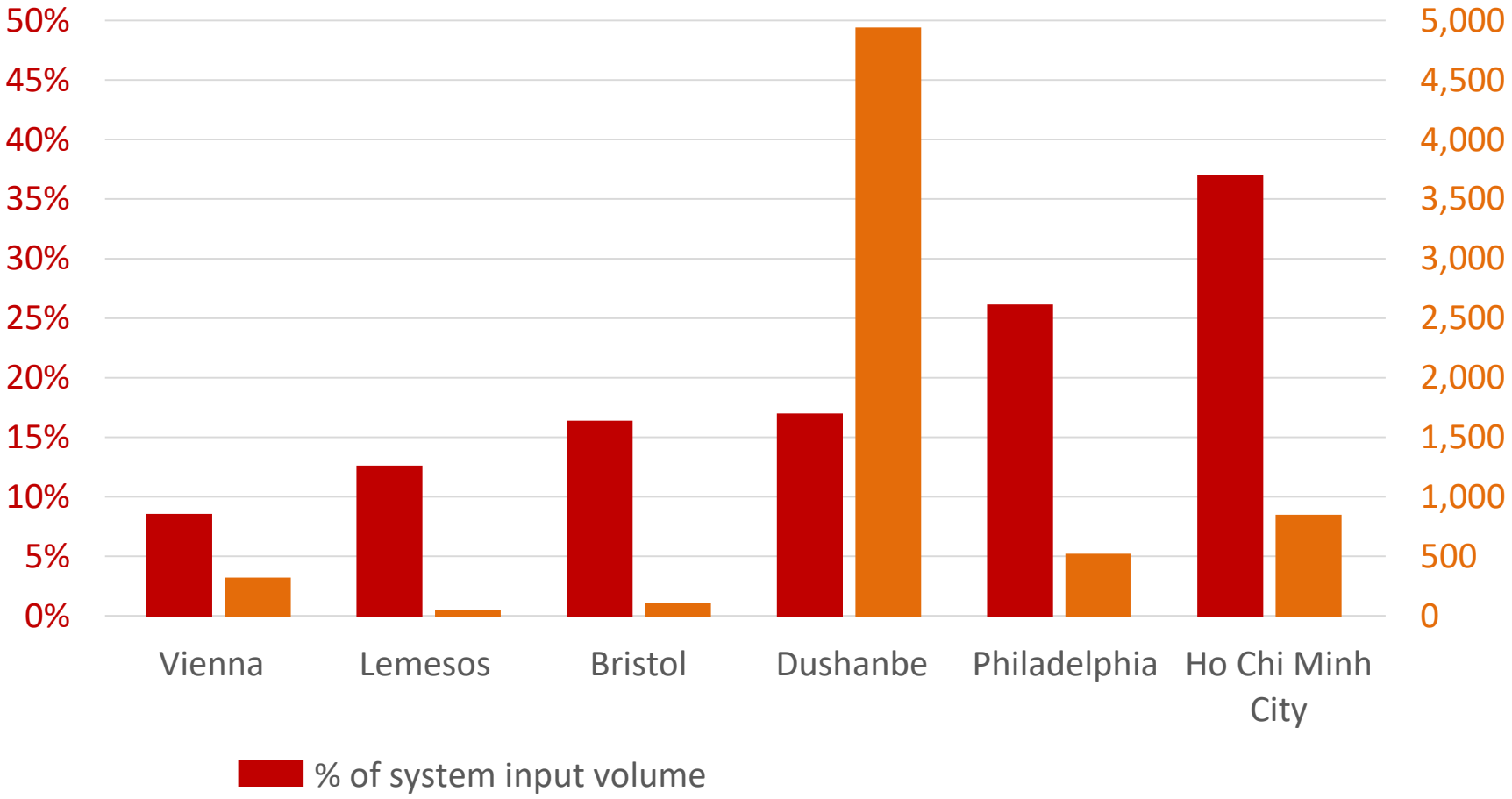
water association



Did Dushanbe have a problem?




New Sources of Water
1. New Dams
2. River Sharing
3. Rain Water Harvesting
4. Desalination
5. Icebergs
JUST PLUG THE LEAKS!!