

National Standards for wastewater treatment

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Research Questions

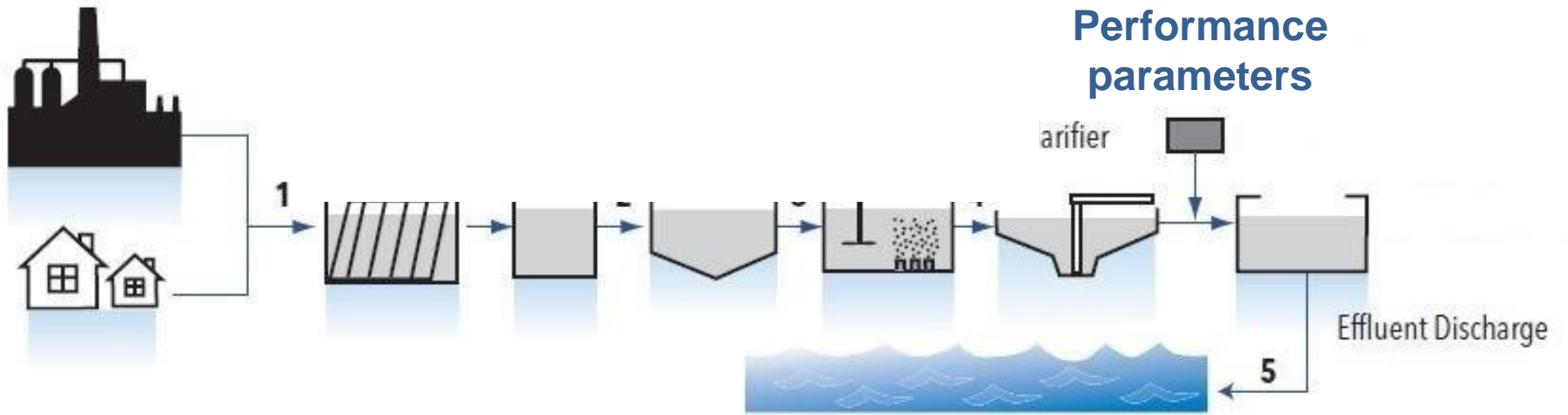
Target 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, *halving the proportion of untreated wastewater* and substantially increasing recycling and *safe reuse* globally

6.3.1 Percentage of wastewater *safely treated*

Research Questions

- **How do countries define safely treated?**
- **Safe for ecosystems? Safe for human health?**
- **What sources and which uses are covered?**
- **Who issues and regulates the standards?**
- **How does this inform our engagement with regulators?**

Sources



Disposal or use

Methods and limitations

- **Web Searches**
- **WHO Regional and Country Offices**
- **Regulator networks**
- **National regulations only**
- **No additional qualitative information extracted**

Examples of national standards

Jordan

Parameter	Cooked vegetables A	Fruit & forestry trees, crops & industrial products B	Irrigation of fodder crops C	Irrigation of cut flower	Discharge to streams, wadis & reservoirs	Ground water recharge
BOD ₅ (1)	30	200	300	15	60	15
COD	100	500	500	50	150	50
DO	>2	-	-	>2	>1	>2
TDS	1500	1500	1500	1500	1500	1500
TSS	50	200	300	15	60	50
PH	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0
Turbidity	10	-	-	5	-	2
NO ₃ ⁻ N	30	45	70	45	-	30
Total-N	45	70	100	70	70	45
E.coli	100	1000	-	< 1.1	1000	< 2.2
Intestinal Helminthes eggs	≤ 1	≤ 1	≤ 1	≤ 1	≤ 0.1	≤ 1

Jordanian standard JS 893/ 2006 for treated domestic wastewater

Zimbabwe

Parameter	Blue		Green	Yellow	Red	Test Methods		
	Sensitive	Normal				1	2	3
Alkalinity	*	*	*	*	*<500	SAZS 606		
Aluminium	*	*	*	*	≤5			
Ammonia (N)	≤0.5	≤0.5	≤1.0	≤1.5	≤2.0	SAZS 582	SAZS 483	IC
Arsenic (As)	≤0.05	≤0.05	≤0.1	≤0.15	≤0.3	SAZS 583	SAZS 492	
Barium (Ba)	≤0.1	≤0.05	≤1	≤1.5	<2	SAZS 584	AA	
BOD	≤15	≤30	≤50	≤100	≤120	SAZS 496		
Boron (B)	≤0.5	≤0.5	≤1.0	≤1.5	<2	SAZS 585		
Ca + Mg	*	*	*	*	*	SAZS 579	SAZS 485	IC
Cadmium (Cd)	≤0.01	01	≤0.05	≤0.1	≤0.3	SAZS 586	SAZS 488	
Chloride (Cl)	≤200	50				SAZS 587		IC
Chlorine residual (free Chlorine)	Nil	1				SAZS 588		
Chromium (Cr (hex))	≤0.05	05				SAZS 604		
Chromium total (Cr)	≤1.0	0				SAZS 589	SAZS 494	
Cobalt (Co)	*					SAZS 488		
COD	≤30	0				SAZS 574	SAZS 495	
Colour (TCU)	≤15	5				SAZS 477		
Conductivity (uS/cm)	≤200	000				SAZS 643		
Copper (Cu)	≤1.0	0				SAZS 590	SAZS 488	
Cyanides & related compounds (CN)	≤0.07	07				SAZS 591		
Cynide (as free CN)	≤0.07	07						
Detergents***	≤0.2	0				SAZS 592/593S		
DO % saturation	≤75	0				SAZS 573		
Faecal coliforms (No./100ml)**	≤1000	000				SAZS 692s		

Environmentally safe disposal

Low Environmental hazard

Medium Environmental hazard

High Environmental hazard

中华人民共和国国家标准

GB 8978—1996

污水综合排放标准

代替 GB 8978—88

Integrated wastewater discharge standard

表4 第二类污染物最高允许排放浓度
(1998年1月1日后建设的单位)

mg/L

序号	污染物	适用范围	一级标准	二级标准	三级标准
1	pH	一切排污单位	6~9	6~9	6~9
2	色度(稀释倍数)	一切排污单位	50	80	—
3	悬浮物(SS)	采矿、选矿、选煤工业	70	300	—
		脉金选矿	70	400	—
		边远地区砂金选矿	70	800	—
		城镇二级污水处理厂	20	30	—
		其他排污单位	70	150	400
4	五日生化需氧量 (BOD ₅)	甘蔗制糖、苧麻脱胶、湿法纤维板、染料、洗毛工业	20	60	600
		甜菜制糖、酒精、味精、皮革、化纤浆粕工业	20	100	600
		城镇二级污水处理厂	20	30	—
		其他排污单位	20	30	300
5	化学需氧量(COD)	甜菜制糖、合成脂肪酸、湿法纤维板、染料、洗毛、有机磷农药工业	100	200	1 000
		味精、酒精、医药原料药、生物制药、苧麻脱胶、皮革、化纤浆粕工业	100	300	1 000
		石油化工工业(包括石油炼制)	60	120	500
		城镇二级污水处理厂	60	120	—
		其他排污单位	100	150	500
6	石油类	一切排污单位	5	10	20



Russian Federation

д) образующихся при бурении скважин для добычи нефти и газа, эксплуатации платформ и судов, за исключением сточных вод, прошедших очистку и обеззараживание на судовых установках до следующих показателей:

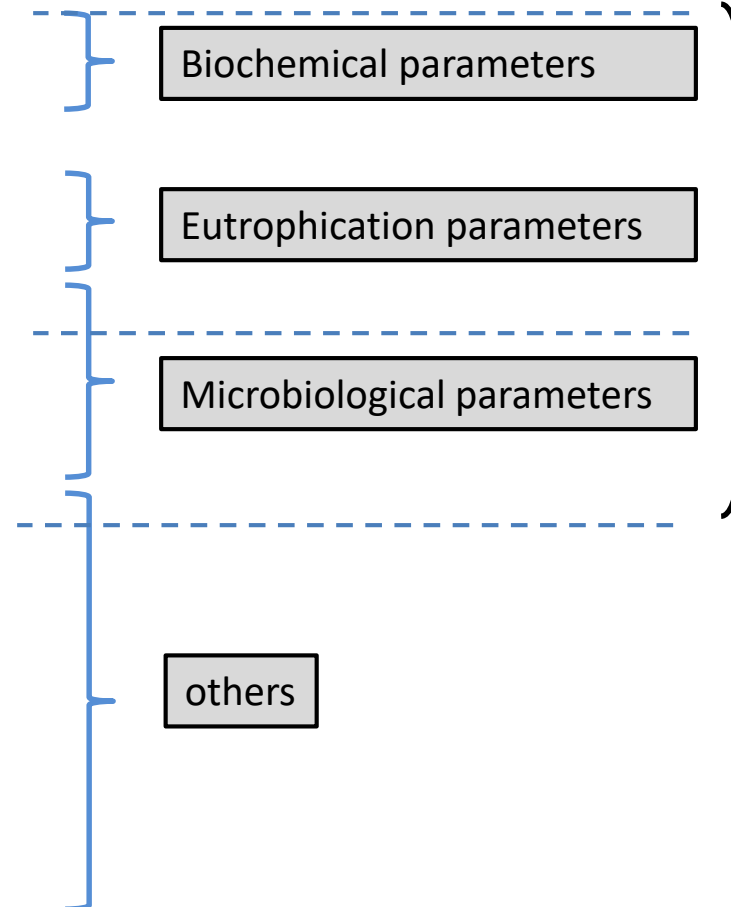
— БПК ₅	50 мг O ₂ /л
— взвешенные вещества	100 мг/л
— количество лактозоположительных кишечных палочек (коли-индекс)	1000 кл/дм ³
— остаточный хлор	от 1,5 до 5,0 мг/л

E) the wells formed for drilling oil and gas,
Platforms and vessels, with the exception of sewage,
And disinfection at ship installations up to the following parameters:

- BOD ₅	50 mg O ₂ / l
- Suspended solids	100 mg / l
- the amount of lactose-positive ki- She-rod sticks (coli-index)	1000 cells / dm ³
- residual chlorine	From 1.5 to 5.0 mg / l

Parameters extracted

Biochemical Oxygen Demand: BOD5 [mg/L] Chemical Oxygen Demand: COD [mg/L] Total Suspended Solids: TSS [mg/L]
Total Nitrogen: N_{tot} [mg/L] Total Phosphorus: P_{tot} [mg/L]
Esherichia coli: E.coli [MPN/100ml] Total Coliforms: TC [MPN/100ml] Fecal Coliforms: FC [MPN/100ml] Fecal Streptococci: FS [MPN/100ml]
Chlorine: free total residual chlorine [mg/L] Dissolved Oxygen: DO [mg/L] Nitrogen: as NH_4 -N (Ammonium) [mg/L] Nitrate: NO_3 -N [mg/L] Phosphate: PO_4 -P [mg/L] Fat, Oil, Grease: FOG [mg/L] Fluoride: F [mg/L] Arsenic: As [mg/L]

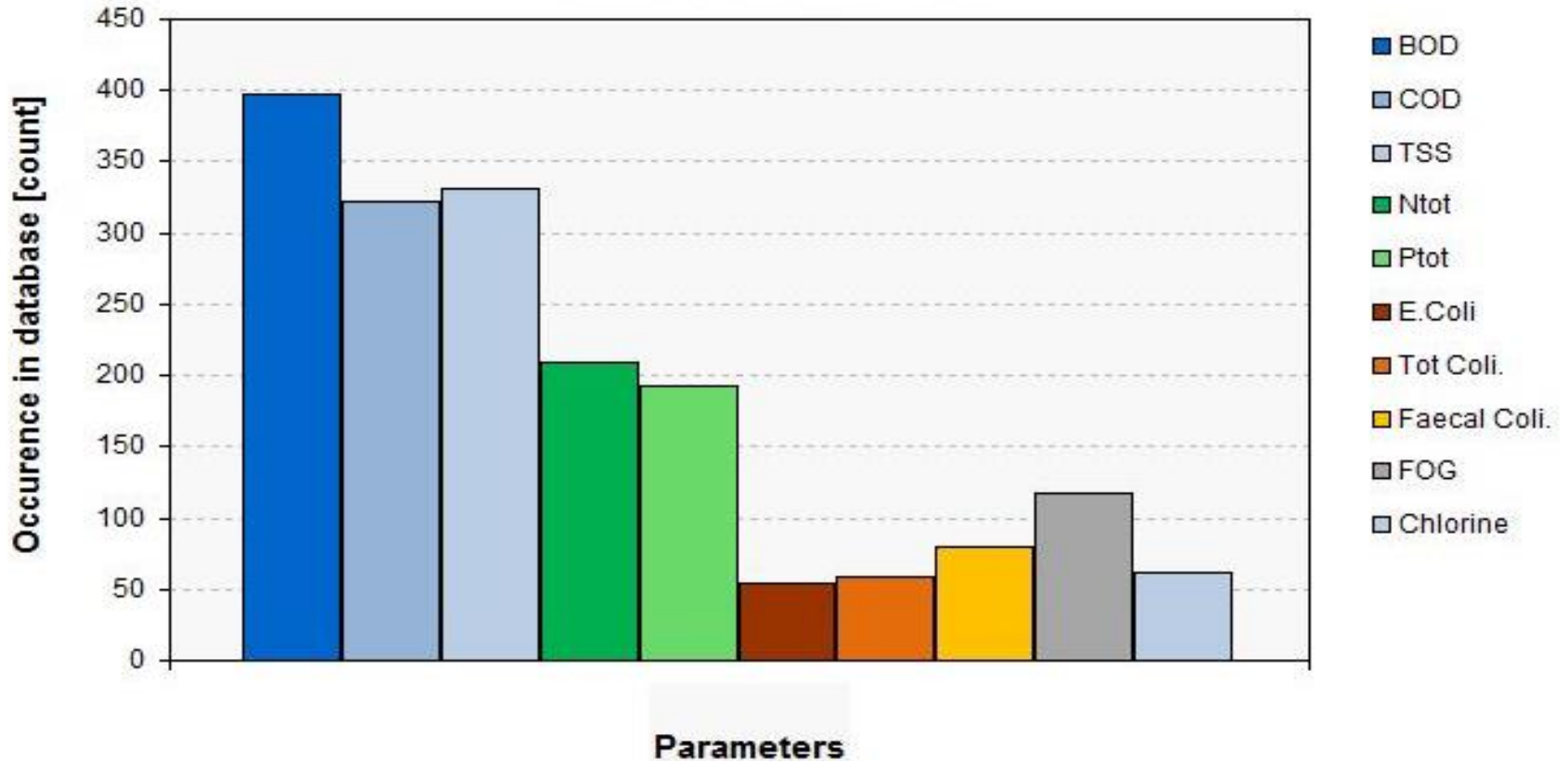


National Standards extracted

Document type	Occurrence [count]	Percentage [%]	Country [count]
Official	76	28%	51
Indirect	66	24%	45
Compendiums	50	18%	37
UWWD	33	12%	33
Int. Conventions	23	8%	17
Reviews	4	1%	4
Other	23	8%	16
Total	275	100%	100

	Official	Indirect	Compendiums	UWWD	Int. Conventions	Reviews	Other
1	Argentina	Austria	Algeria	Austria	Belarus	Bangladesh	Angola
2	Australia	Belgium	Australia	Belgium	Cameroon	Nigeria	China
3	Austria	Benin	Bangladesh	Bosnia and Herzegovina	Chad	Serbia	Croatia
4	Belgium (Flanders)	Botswana	Botswana	Bulgaria	Côte d'Ivoire	Sudan (Rep. of Sudan)	Democratic Rep. of the Congo
5	Benin	Bulgaria	Burkina Faso	Croatia	Denmark		Ethiopia
6	Bulgaria	China	China	Cyprus	Estonia		Finland
7	Burundi	Côte d'Ivoire	Cyprus	Czech Republic	Ethiopia		Gambia (Islamic Rep. of)
8	Cameroon	Croatia	Dem. Republic of the Congo	Denmark	European Union		Germany
9	Canada	Estonia	Egypt	Estonia	Germany		Malta
10	Chad	Ethiopia	European Union	European Union	Ghana		Netherlands
11	China	France	Finland	Finland	Hungary		Pakistan
12	Croatia	Gambia (Islamic Republic of)	Ghana	France	Kazakhstan		Poland
13	Czech Republic	Germany	India	Germany	Latvia		Serbia
14	Denmark	Ghana	Ireland	Greece	Lithuania		South Africa
15	Egypt	Greece	Israel	Hungary	Poland		Sweden
16	France	Guinea	Jordan	Ireland	Russian Federation		Viet Nam
17	Germany	Italy	Kenya	Italy	Sweden		
18	Ghana	Jamaica	Kuwait	Latvia	United States of America		
19	Honduras	Japan	Lesotho	Lithuania			
20	India	Jordan	Madagascar	Luxembourg			
21	Indonesia	Kuwait	Mauritius	Malta			
22	Ireland	Lebanon	Morocco	Netherlands			
23	Italy	Lithuania	Mozambique	Norway			
24	Jamaica	Malawi	Namibia	Poland			
25	Japan	Mali	Oman	Portugal			
26	Jordan	Morocco	Pakistan	Republic of Moldova			
27	Kenya	Netherlands	Palestinian Territory, Occupied	Romania			
28	Kuwait	New Zealand	Saudi Arabia	Serbia			
29	Malawi	Nigeria	Senegal	Slovakia			
30	Malta	Poland	Spain	Slovenia			
31	Morocco	Romania	Sudan (Rep. of Sudan)	Spain			
32	New Zealand	Russian Federation	Russian Federation	Swaziland			
33	Niger	Slovakia	Tunisia	Ukraine			
34	Nigeria	Slovenia	Uganda	United Kingdom			
35	Philippines	Spain	United Arab Emirates				
36	Portugal	Sudan (Rep. of Sudan)	United Republic of Tanzania				
37	Republic of Moldova	Sweden	United States of America				
38	Reunion Island	Switzerland	Zambia				
39	Russian Federation	Tunisia					
40	Rwanda	Turkey					
41	Slovakia	Ukraine					
42	South Africa	United Rep. of Tanzania					
43	Spain	Viet Nam					
44	Switzerland	Zambia					
45	Thailand	Zimbabwe					
46	Turkey						
47	Uganda						
48	United Kingdom						
49	United Rep. of Tanzania						
50	United States of America						
51	Viet Nam						

Findings



BOD	COD	TSS	Ntot	Ptot	E.Coli	Tot Coli.	Faecal Coli.	FOG	Chlorine
397	322	331	209	193	54	59	80	117	62

Responsible Authorities

Official regulations: national standards for wastewater

Region	Health	Environment	Agriculture	Water Resources	Public Works	Joint Ministries
AFRO	Niger	Cameroon; Ghana; Kenya; Nigeria; Uganda; Un. Rep. Tanzania; Zambia		Malawi; Rwanda; South Africa; Zimbabwe		Benin; Burundi
AMRO	Argentina	Canada; Jamaica; USA				
EMRO		Kuwait		Egypt; Jordan	Kuwait	Morocco
EURO	Italy; Rep. Moldova; Russian Fed.; Ukraine	Belgium; Czech Rep.; Denmark; France; Germany; Ireland; Malta; Portugal; Spain; Switzerland; UK	Austria	Croatia		Austria; Bulgaria; Turkey
WPRO	Australia	China; Japan; New Zealand; Philippines; Viet Nam				
SEARO		India; Indonesia; Thailand				
Countries:	8	32	1	7	1	6

Variations in limits values

E. Coli	Total Coliforms	Faecal Coliforms	Faecal Streptococci	COD	BOD	TSS	N tot	P tot	FOG	Chlorine
Frequency:										
16	21	29	6	88	99	97	35	23	57	35
Average:										
1207	2378	1168	1233	214	85	100	39	7	16	11
Minimum values:										
0	30	0	400	10	3	5	2	0.1	0	0
Maximum values:										
10000	10000	5000	2000	2000	800	1000	150	50	200	250
MPN/100ml (Most Probable Number)	MPN/100ml	MPN/100ml	MPN/100ml	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L

UWWWD:

125	25	60	15	2
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Sources and Uses

Sources of wastewater

Domestic Wastewater

Municipal WW, Onsite systems

Industrial Wastewater

Factories: textile, tanneries, breweries, milk dairies, pulp and paper, etc...

Agricultural Wastewater

Point sources: piggery, poultry, etc...
Non-point sources: commercial fertilizers, sediment run-off, etc...

wastewater regulations: depending on destination

Urban

Non-potable

Drinking water

WWTP size (p.e.)

Reuse, recharge, disposal

- Discharge into surface water
- Irrigation
- Stock watering
- Groundwater recharge (surface/sub-surface)

Industrial

- Processes
- Cooling
- Aquaculture
- Specific industries (textile, tanneries,...)

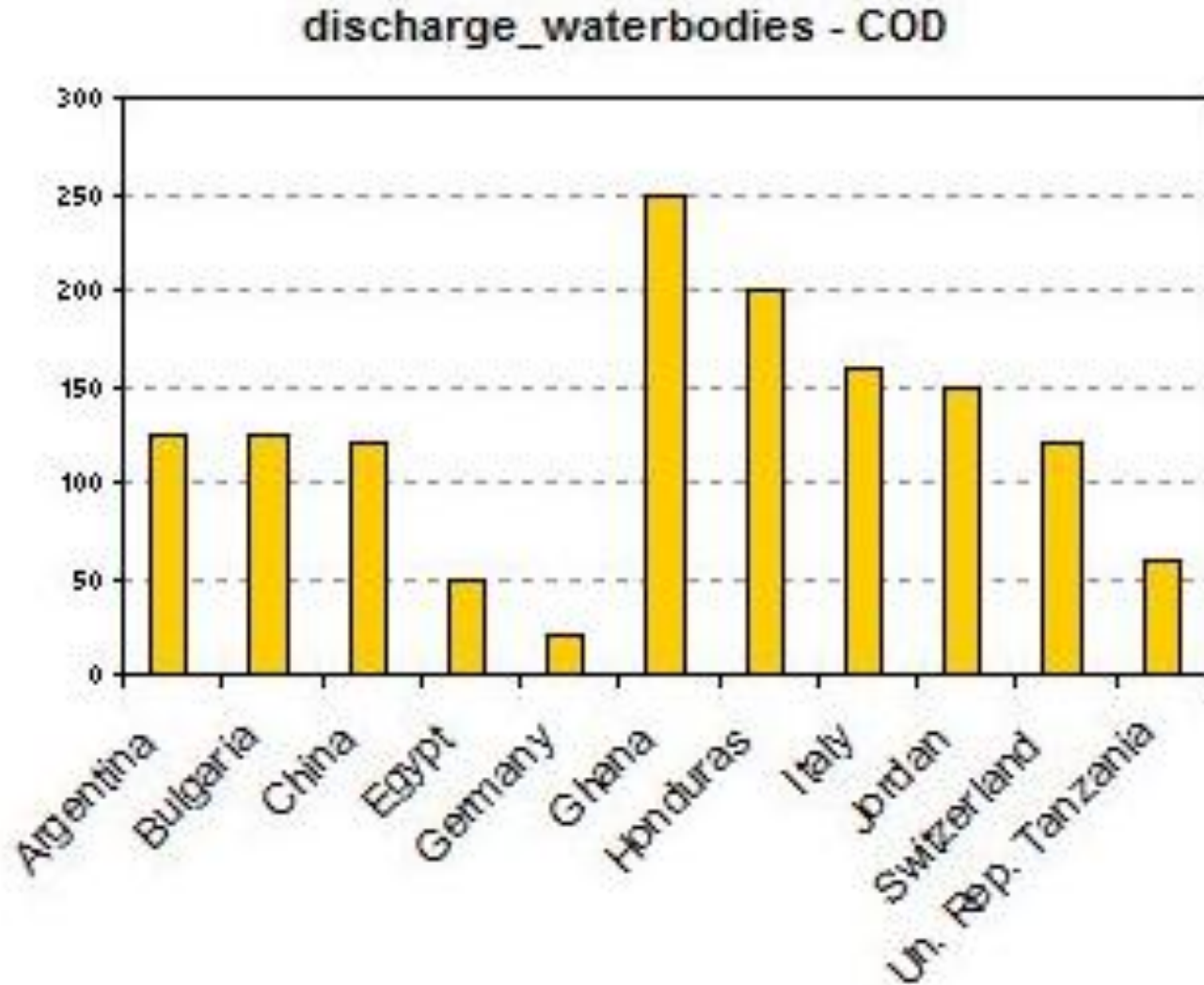
Agricultural, Application to crops

- Crops consumed raw
- Crops consumed after processing
- Seed crops, fodder, fiber
- Vineyards, orchards

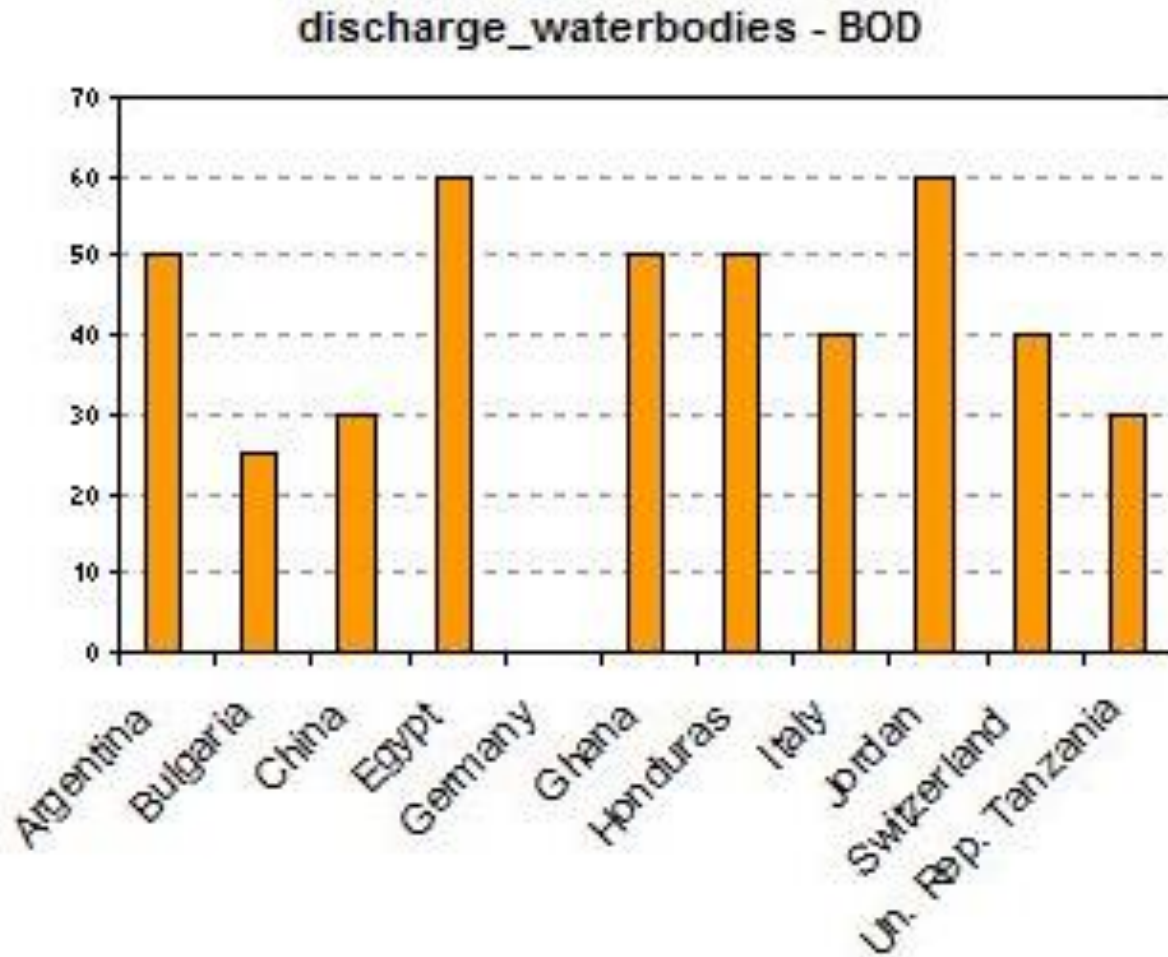
Recreational

- Swimming
- Boating
- Sport resorts (golf, soccer)
- Fishing

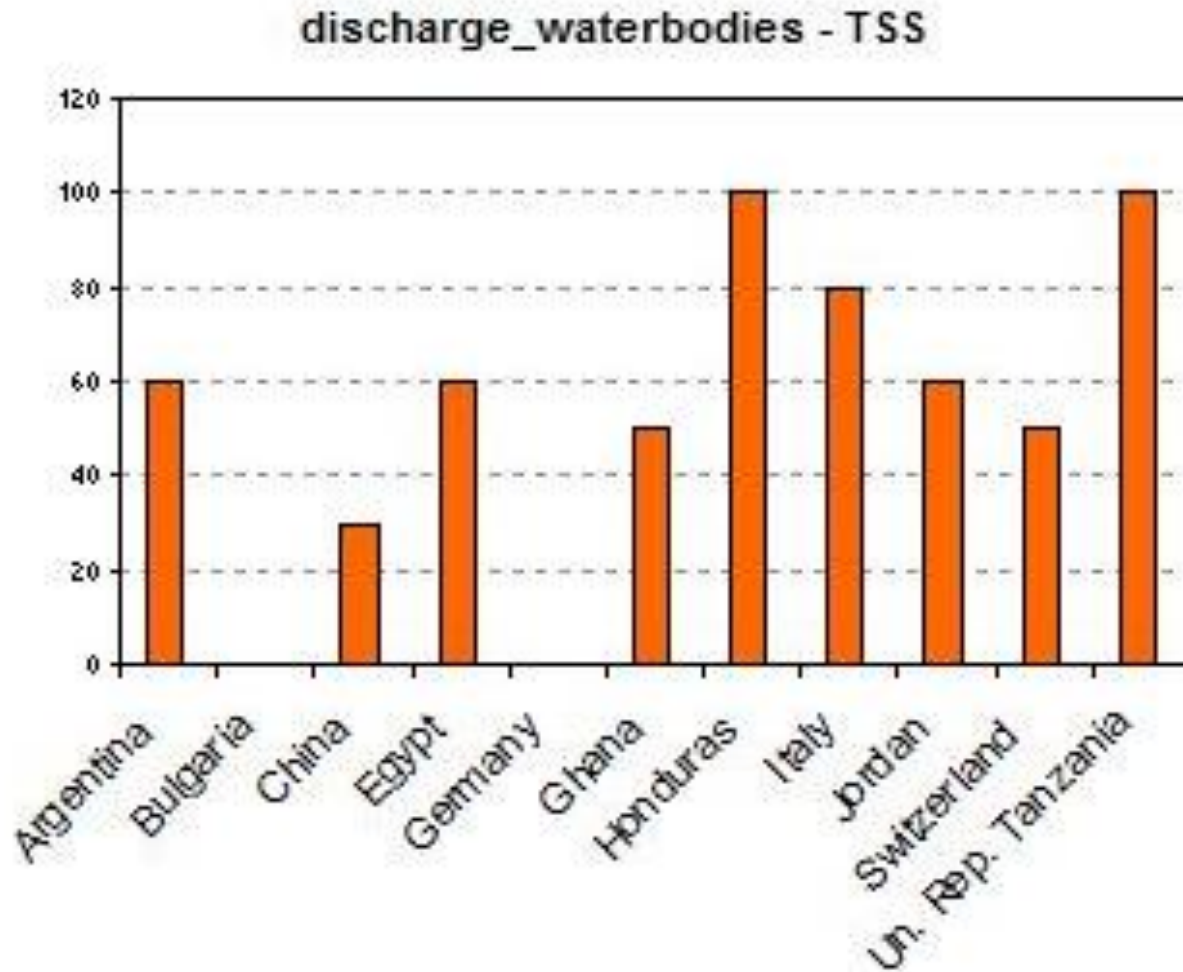
Variations in levels for the same use type



Variations in levels for the same use type



Variations in levels for the same use type



Public Health: Microbial parameters

e.coli	faecal coliforms	total coliforms	total coliforms only
Australia	Argentina	Argentina	Egypt
Burundi	Burundi	Croatia	Indonesia
Ghana	China	Egypt	Japan
Jordan	Croatia	Ghana	Kuwait
Kenya	Egypt	Indonesia	Nigeria
Philippines	Honduras	Italy	Rwanda
Russian Federation	Italy	Jamaica	Uganda
Rwanda	Jamaica	Japan	Viet Nam
South Africa	Kenya	Kenya	
Spain	Portugal	Kuwait	
Uganda	Rwanda	Nigeria	
United Rep. of Tanzania	South Africa	Portugal	
Viet Nam	Thailand	Rwanda	
	Uganda	Thailand	
		Uganda	
		Viet Nam	
13	14	16	8
26%	28%	32%	16%

Conclusion and next steps

- **Effluent performance limits vary by source and disposal/use.**
- **Initial findings indicates public health is not widely reflected in national standards and Ministries of Health have a limited role.**
- **Where public health indicators are included they don't appear to be well connected to good practice and WHO norms.**
- **Additional data analysis is needed to understand inconsistencies, disposal /use types, and qualitative data.**
- **Deeper engagement with Regulators – though RegNet – on country needs for on updating and implementing national standards for public health protection.**



Thank you