2025

Water Technology Landscape Study

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Introduction

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Introduction

The objective of this report is to perform a patent landscape analysis and assessment of the technology sector described in the report titled 'Ventures to Value Chains – Water Technology.' Based on the value chain, the report has been divided into the following four modules:

- **Module A – Raw Water**
- **Module B - Use**
- **Module C - Outflows**
- **Module D – Environmental Water Cycle**

This report analyzes the worldwide patent landscape for the above four modules in the water sector. More specifically, patent publications disclosing sustainable techniques for water operations are studied in detail in this report. Further, market insights, including key mergers & acquisitions, key partnerships, key investments, key market players, etc., have been provided.

This report is primarily divided into the following sections:

- Technology Taxonomy
- Patent Insights
- Patent Litigations
- Market Insights
  - Key Players
  - Key Mergers and Acquisitions
  - Key Partnerships
- British Columbia-based Insights
- Conclusion and Recommendations
- Appendix

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Value Chain

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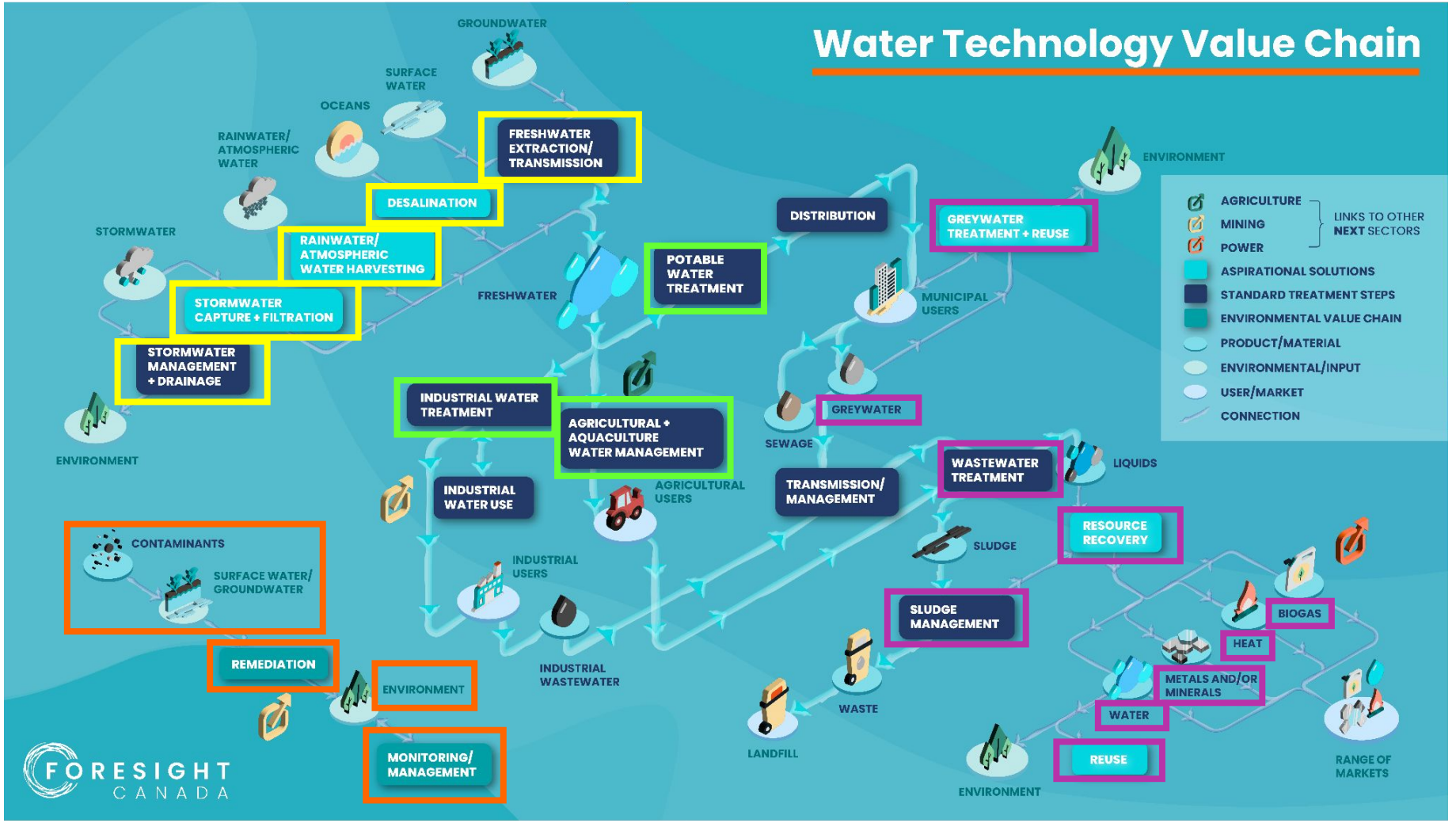
Water Technology - Value Chain



Module A: Raw Water

Module B: Use

Module C: Outflows

Module D: Environmental Water Cycle

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Methodology

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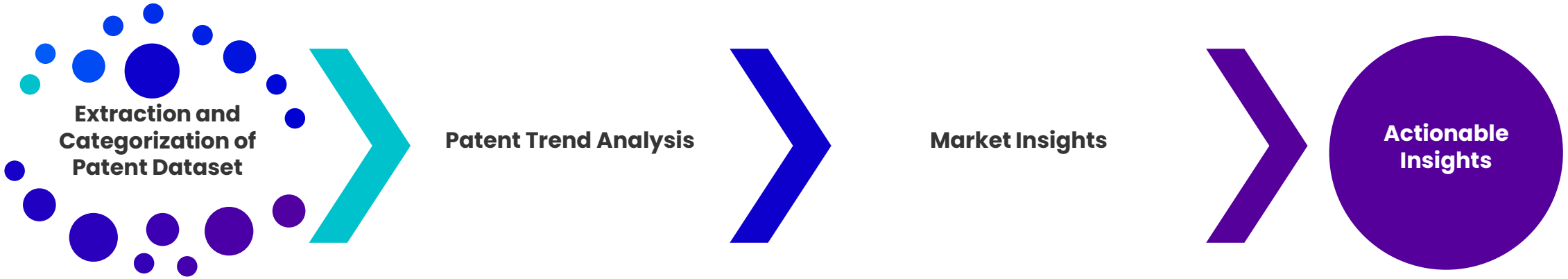
Methodology

The methodology used in the report involved the categorization of patent applications under multiple nodes of taxonomy and extracting useful insights from the categorized patent dataset. Further, performing market analysis to recommend actionable insights for Canada/British Columbia-based companies. The methodology includes the following steps:



Step 1: Used various search strategies (keywords, classes, citations, semantic, and similarity) to identify the global active assets relevant to the technology.

Step 2: Presented insights through different charts and graphs for the patent dataset. It includes technology/sub-technology-based trends, assignee-based trends, geography-based trends, filing vs. grant trends, *etc.*

Step 3: Identify key market players, key mergers & acquisitions, key partnerships, key investments, emerging technologies, government policies and initiatives, relevant standards, and standard essential patents, *etc.*

Step 4: Recommended actionable insights, performed whitespace analysis, and identified opportunity areas.

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Technology Taxonomy

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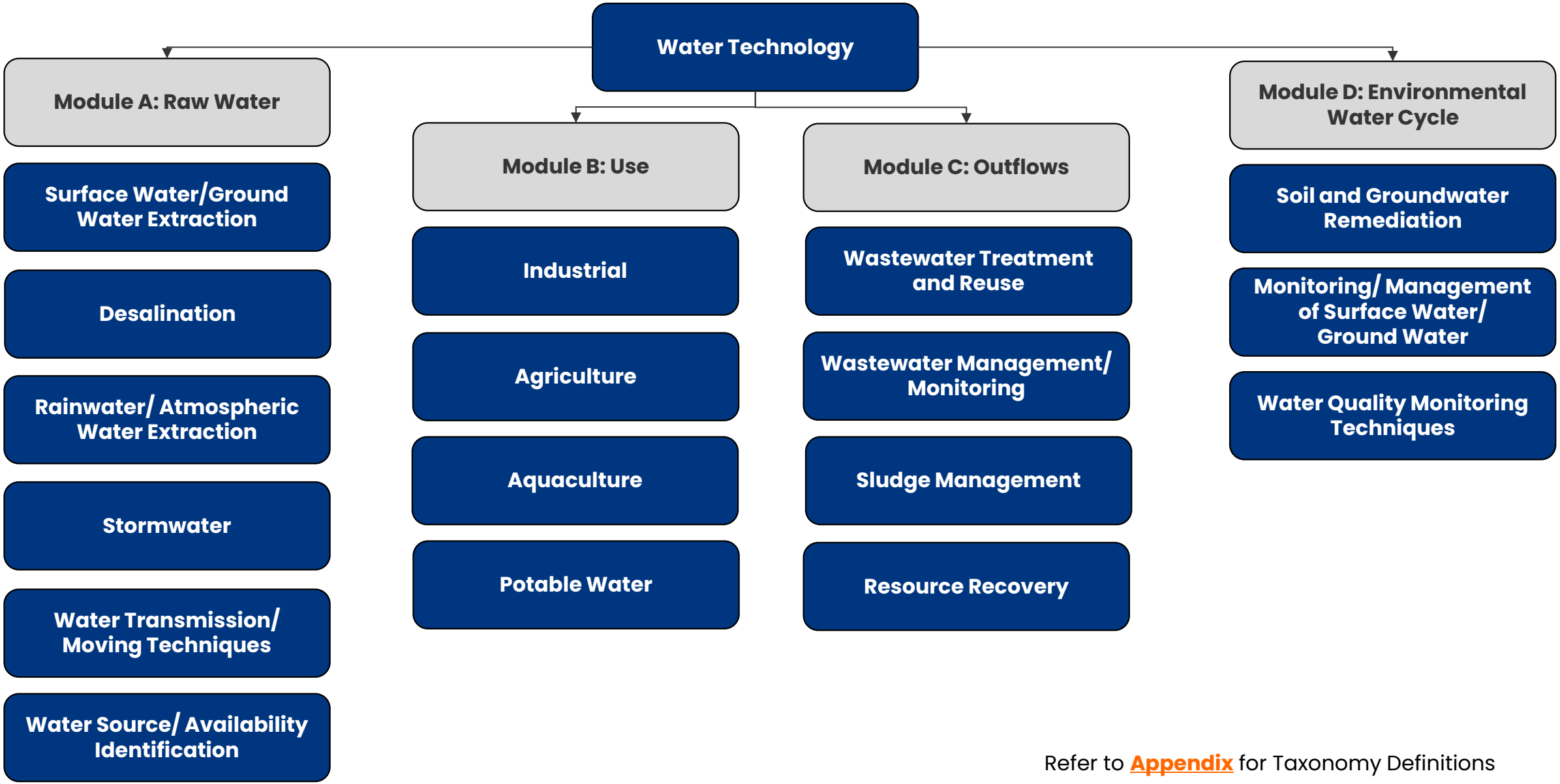
Technology Taxonomy – Water Technology



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Technology Taxonomy

Module A— Raw Water

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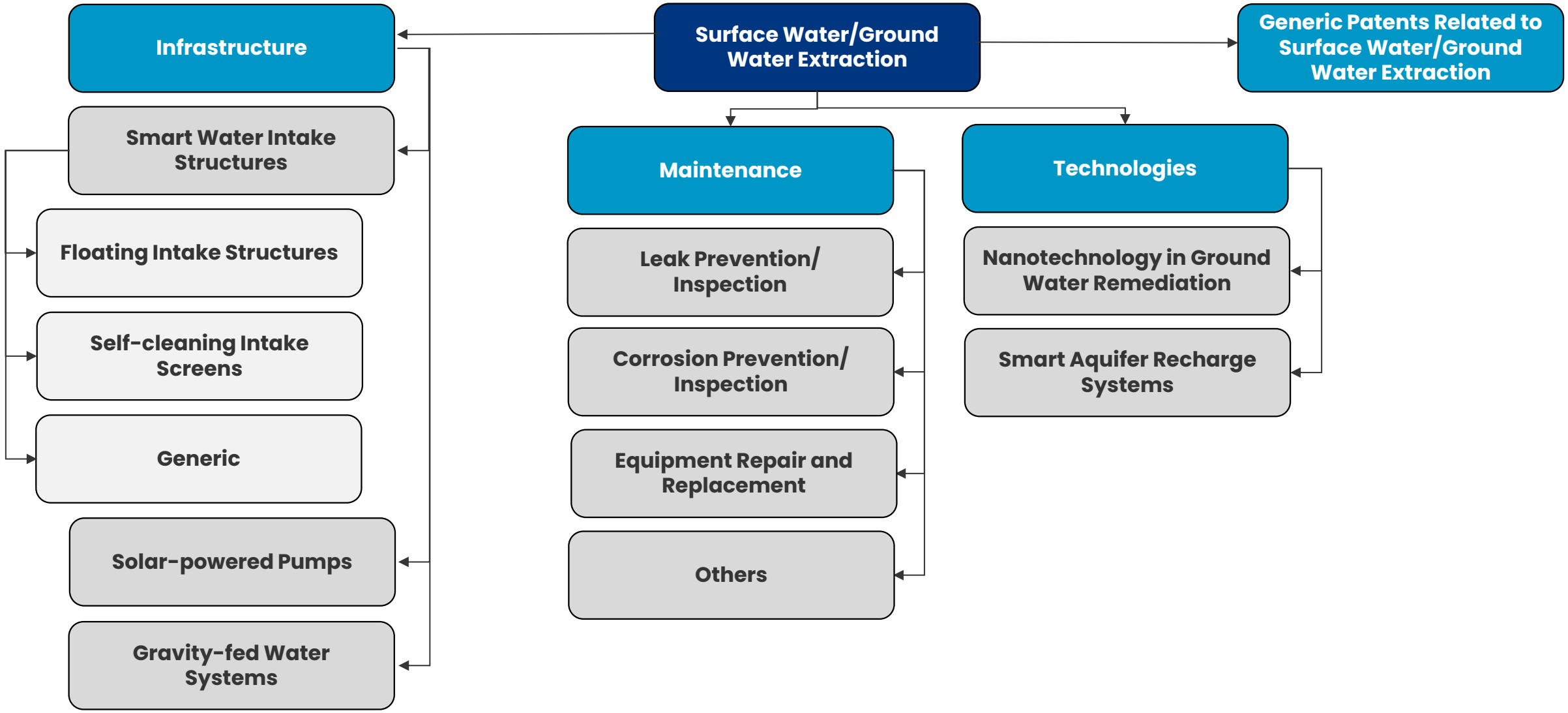
Technology Taxonomy – Module A – Raw Water (1/4)



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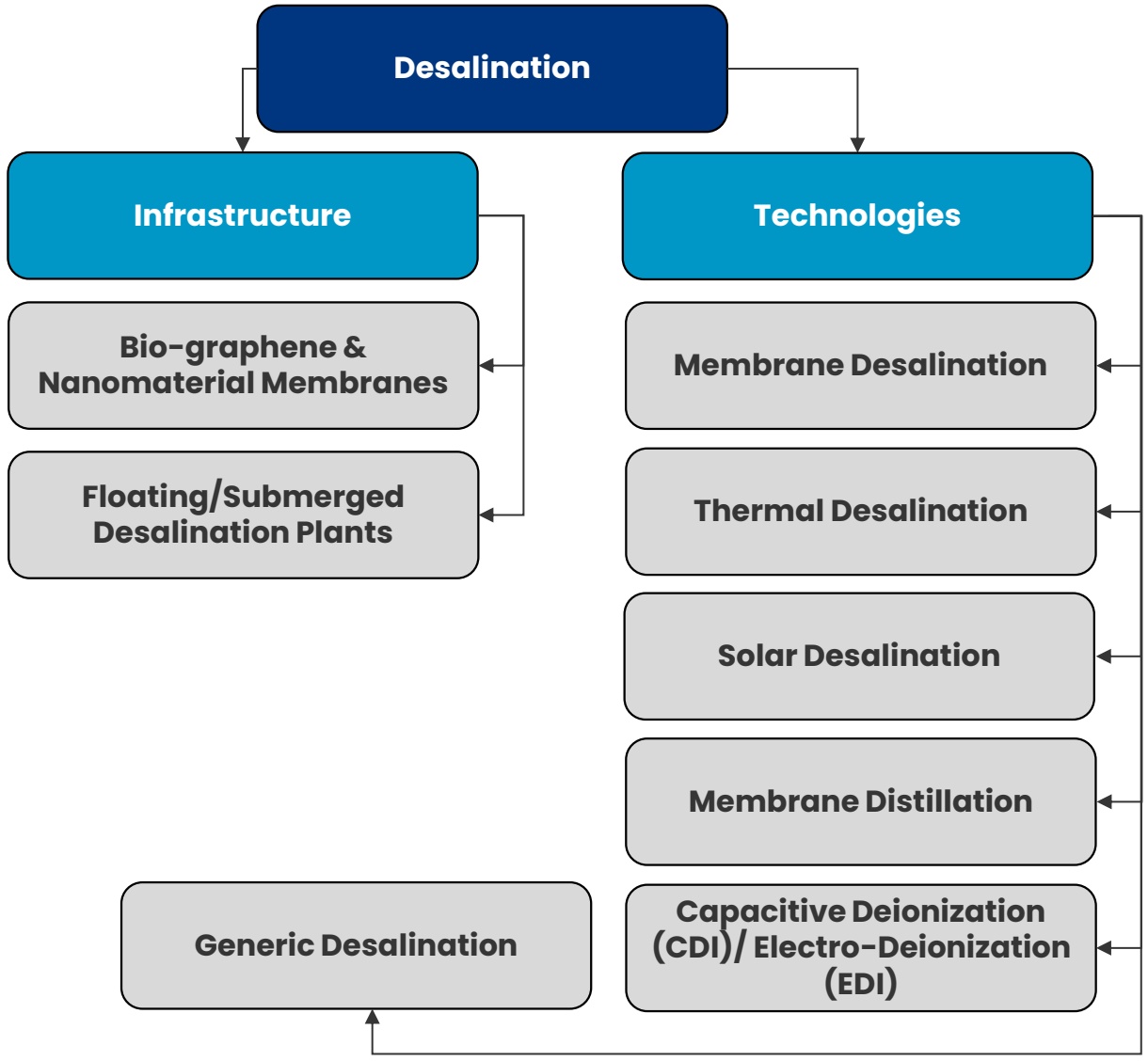
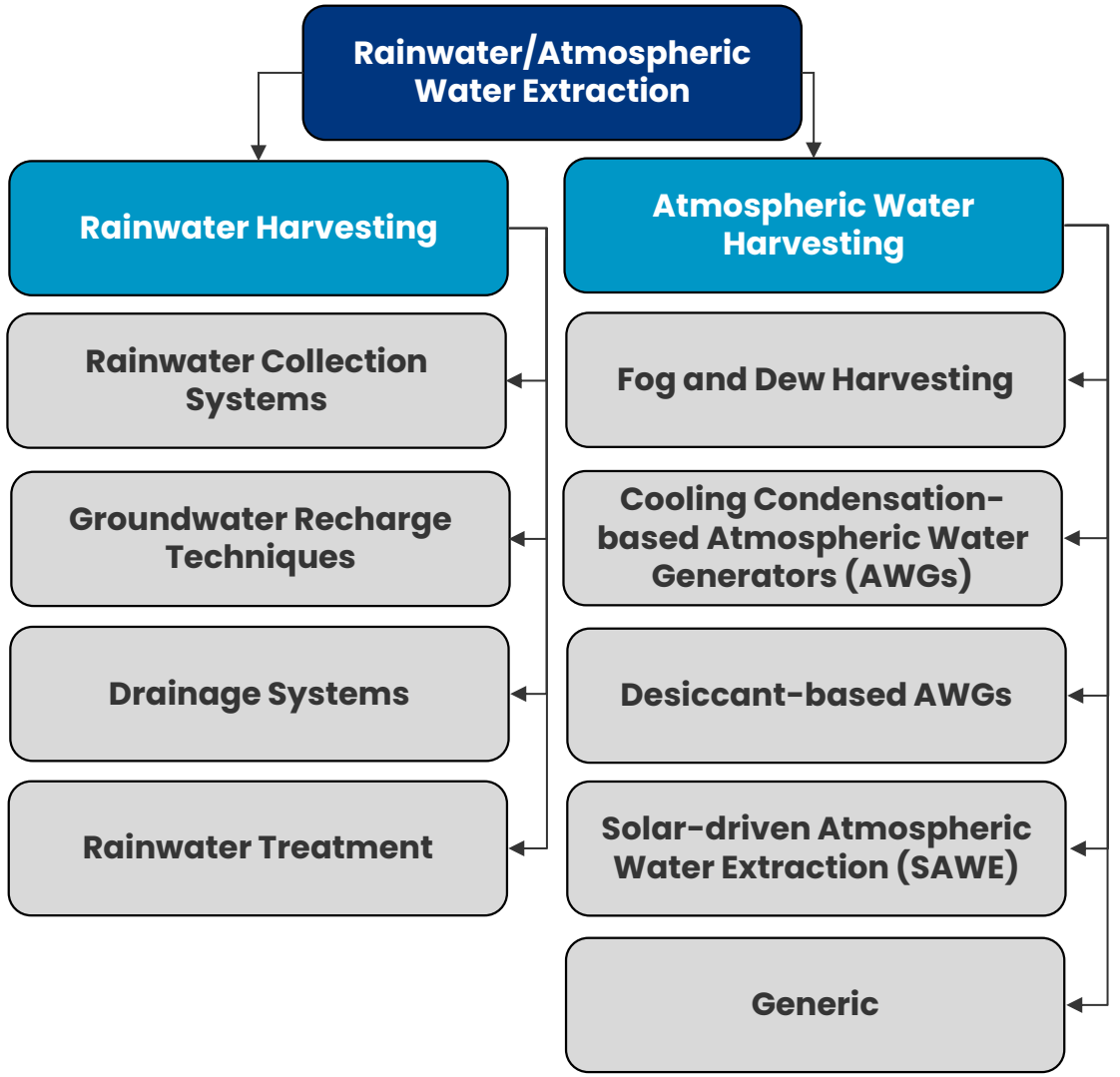
Technology Taxonomy – Module A – Raw Water (2/4)





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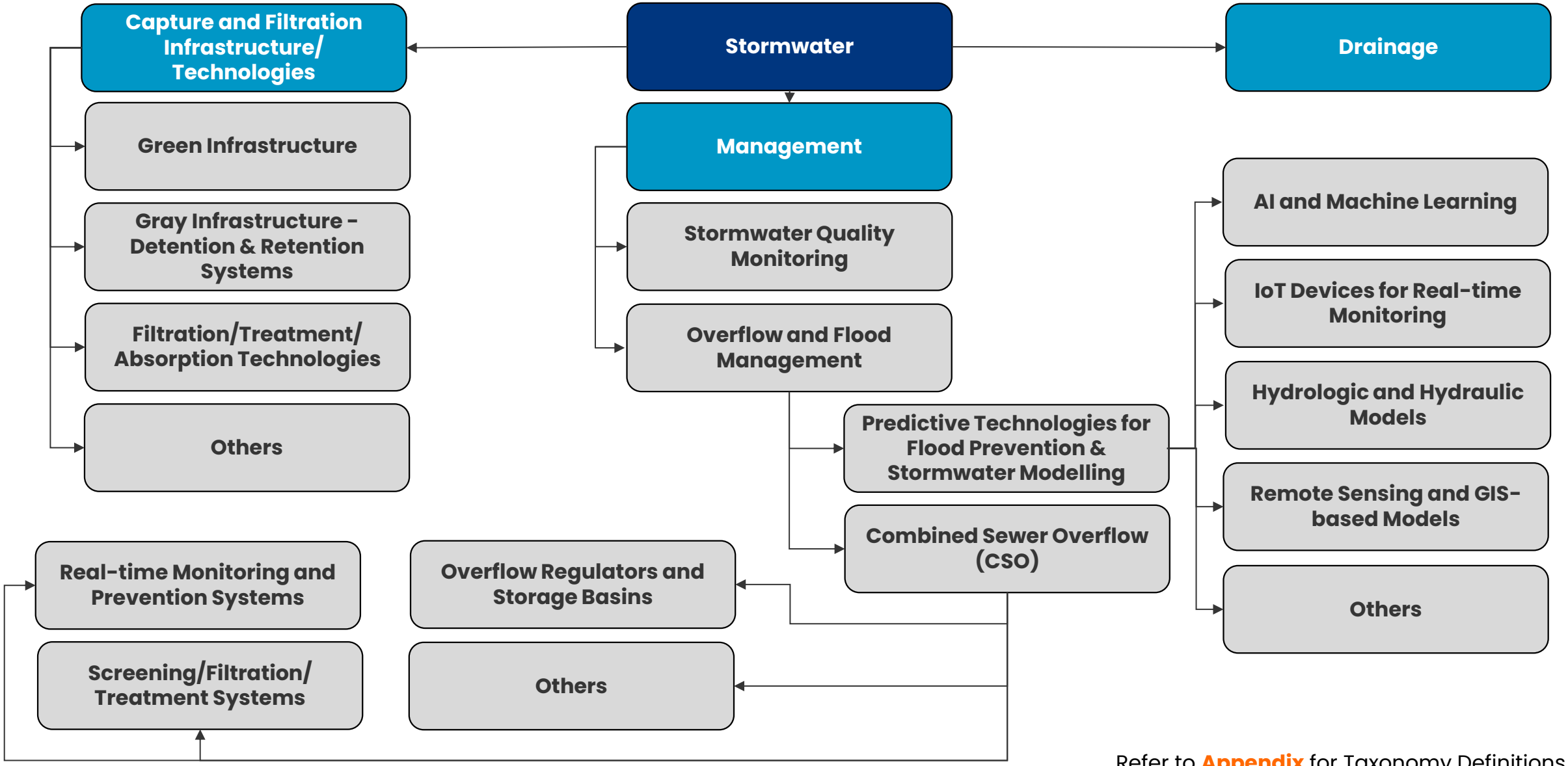
Technology Taxonomy – Module A – Raw Water (3/4)



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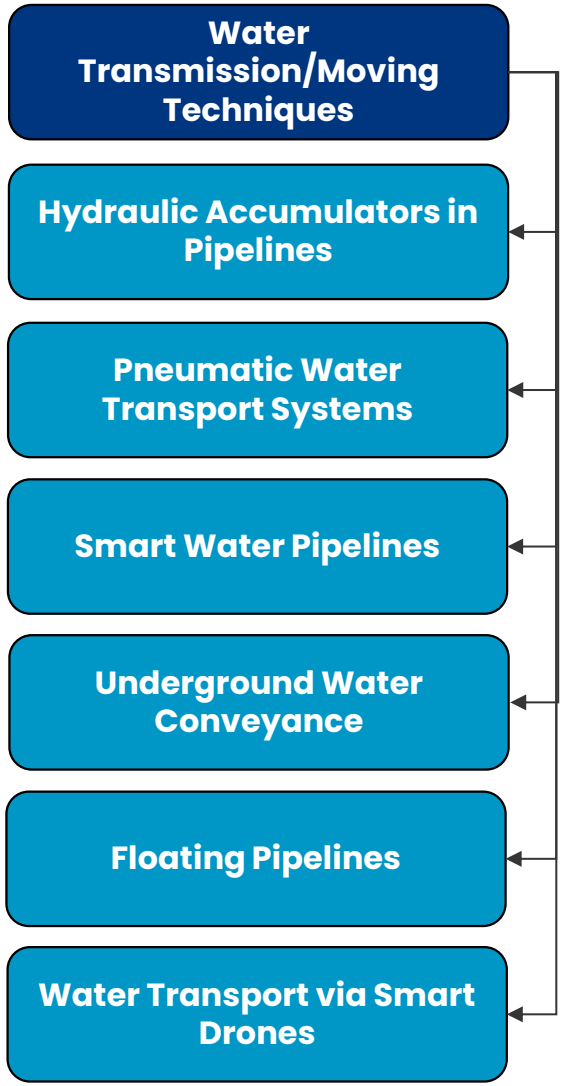
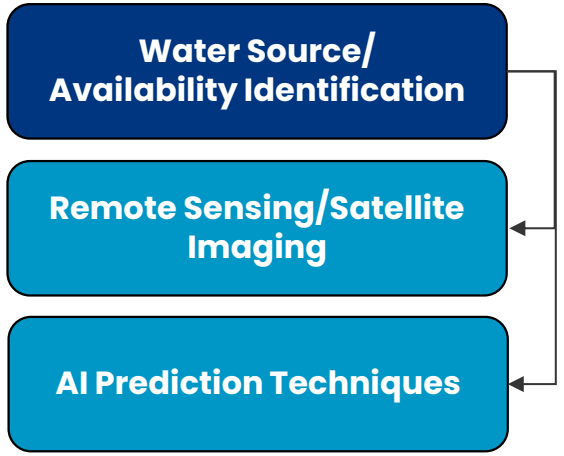
Technology Taxonomy – Module A – Raw Water (4/4)





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Technology Taxonomy

Module B — Use

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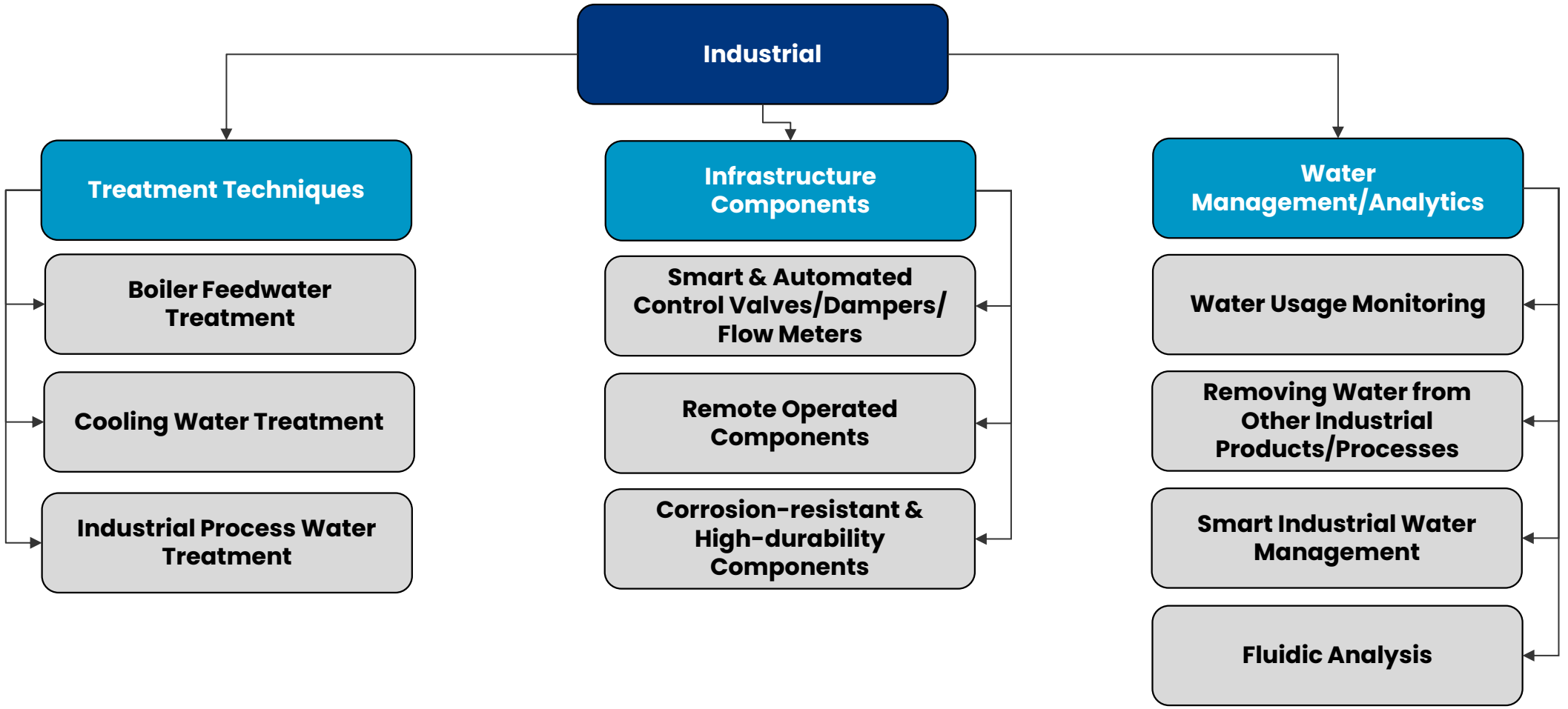
Technology Taxonomy – Module B – Use (1/5)



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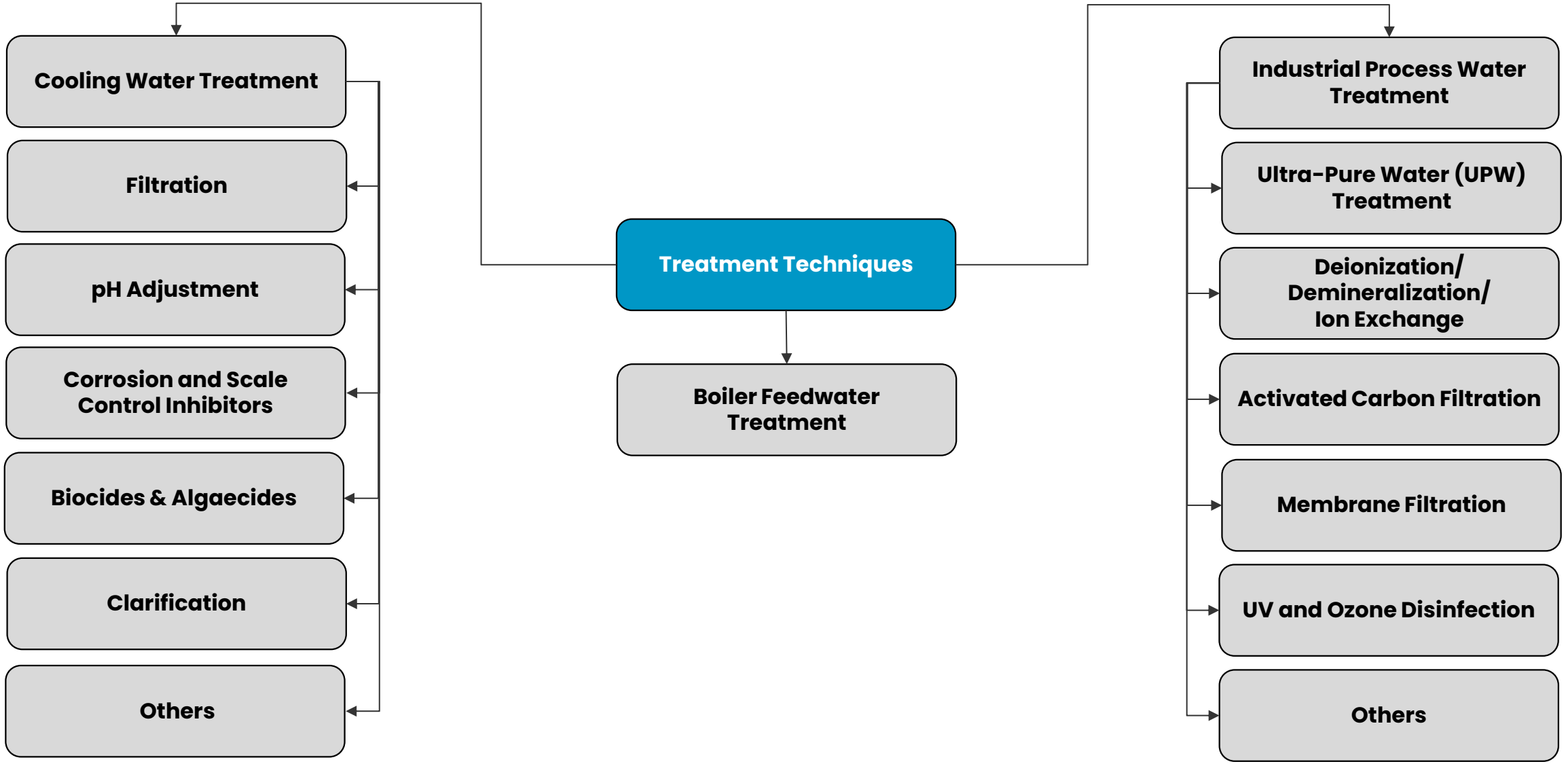
Technology Taxonomy – Module B – Use (2/5)



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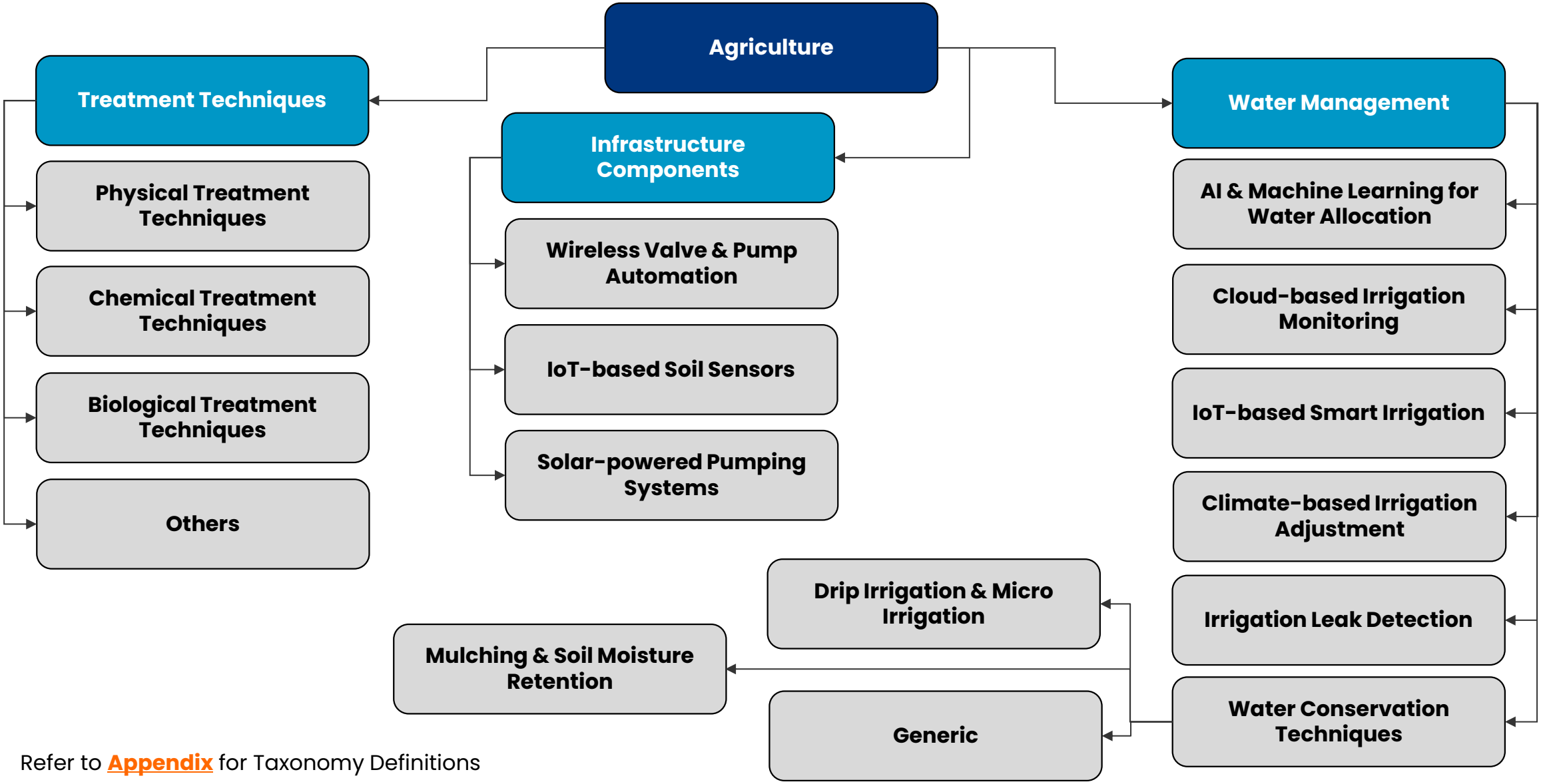
Technology Taxonomy – Module B - Use (3/5)



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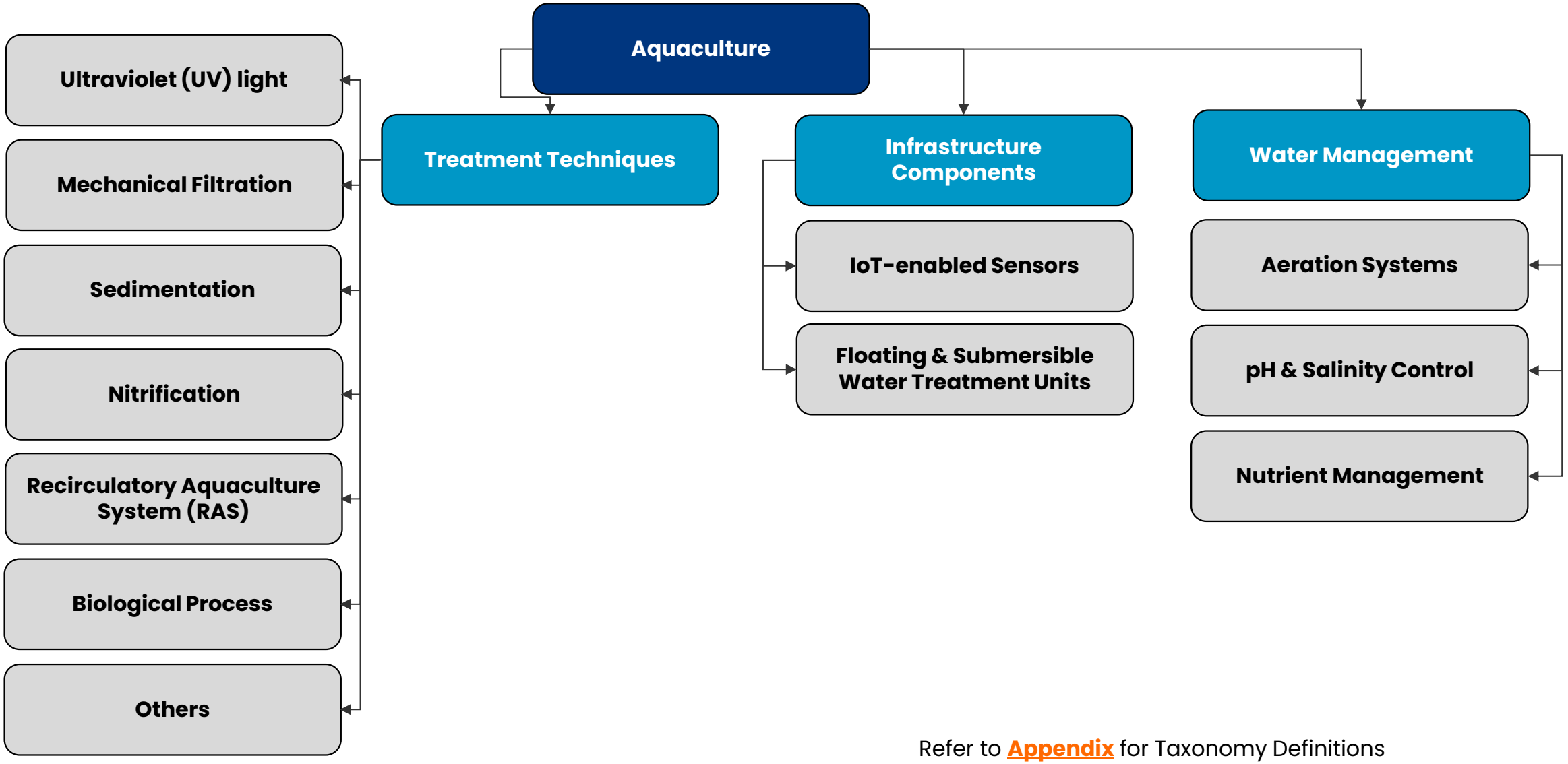
Technology Taxonomy – Module B - Use (4/5)



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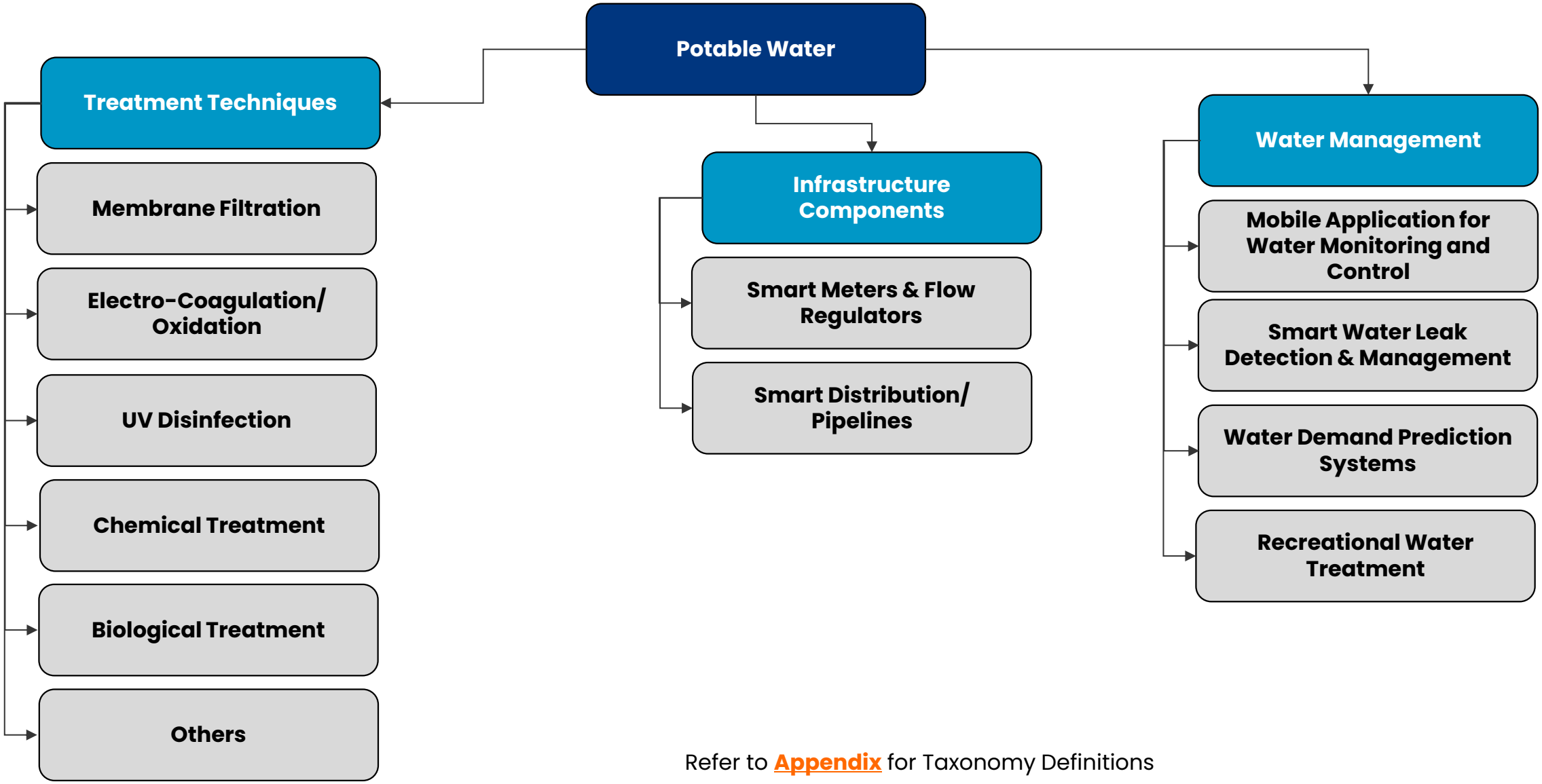
Technology Taxonomy – Module B - Use (5/5)



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Technology Taxonomy

Module C — Outflows

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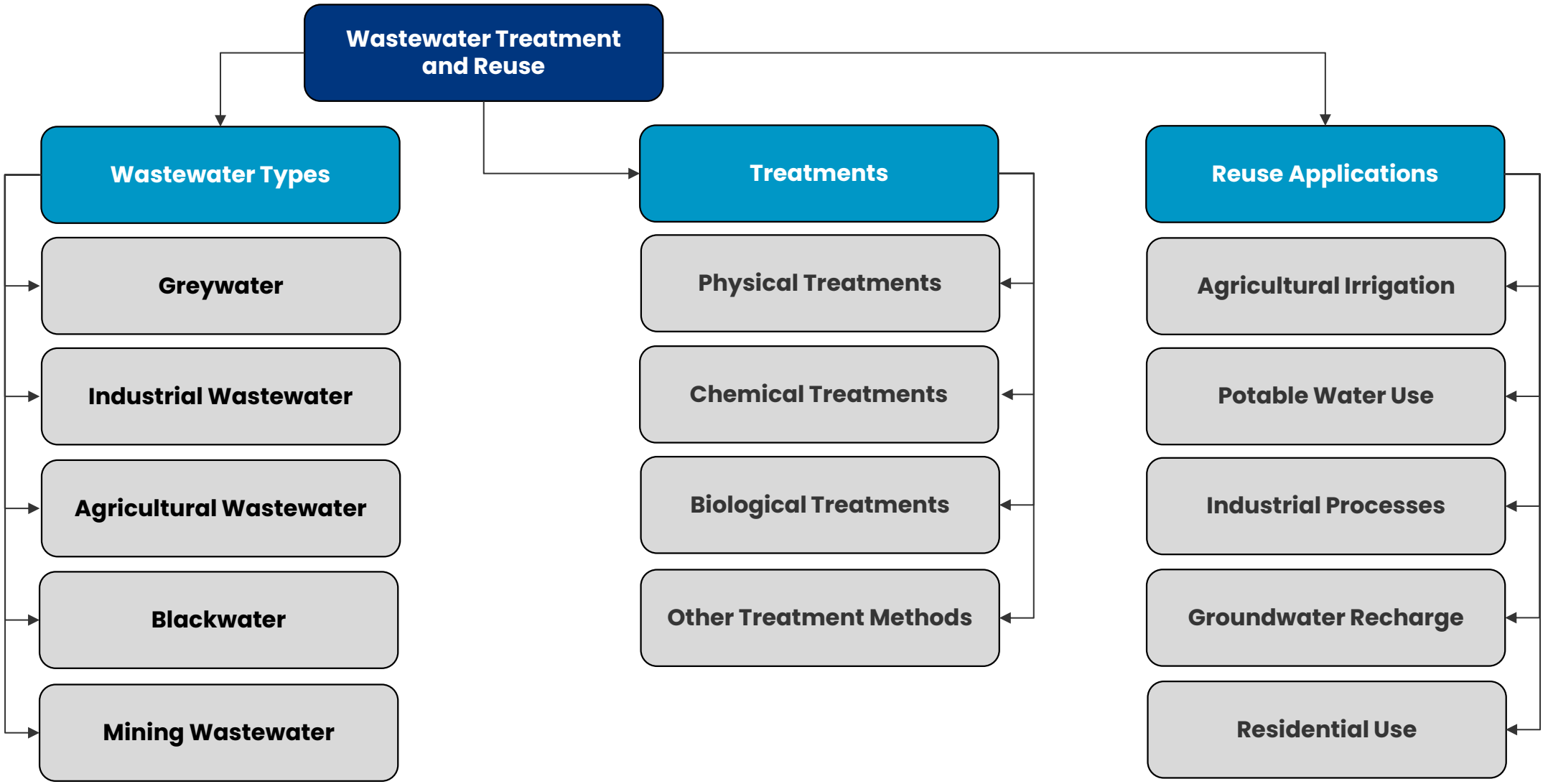
Technology Taxonomy – Module C – Outflows (1/6)



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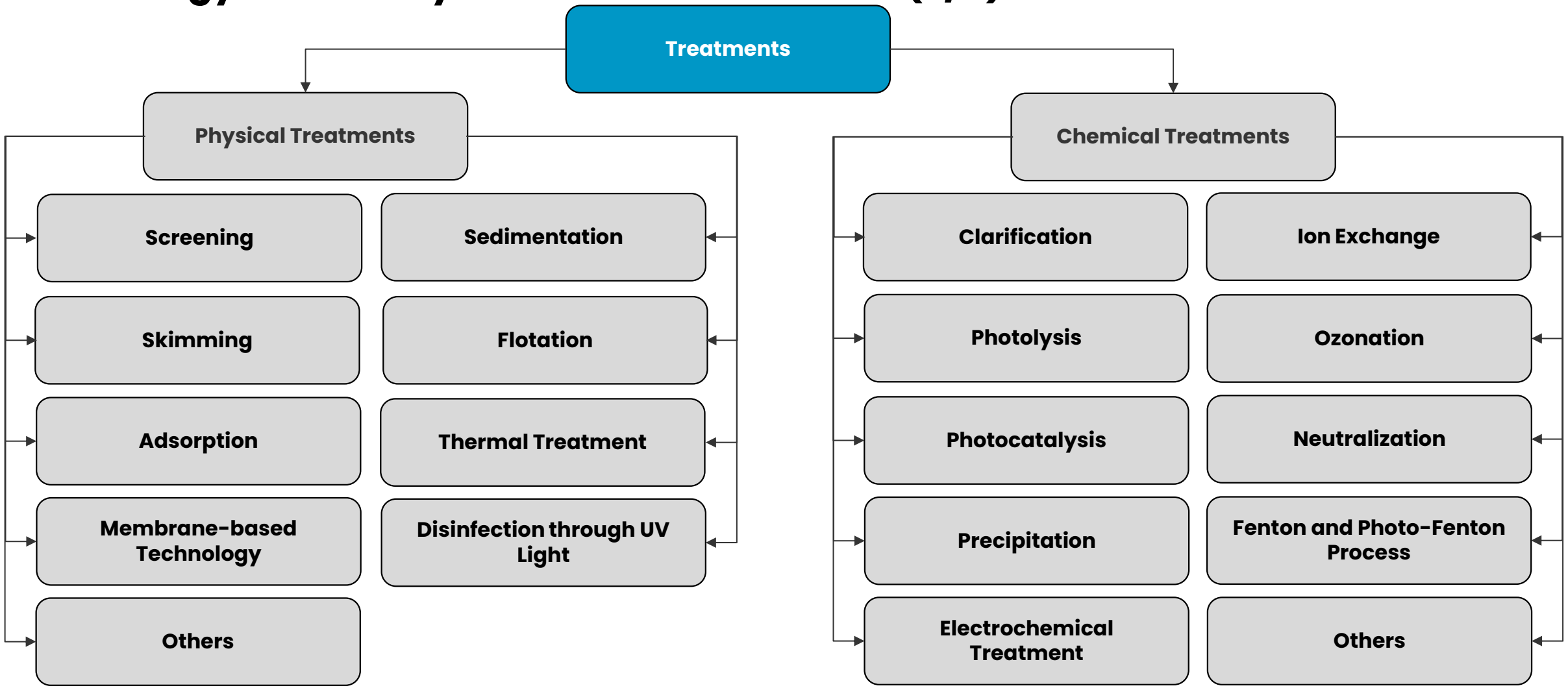
Technology Taxonomy – Module C – Outflows (2/6)



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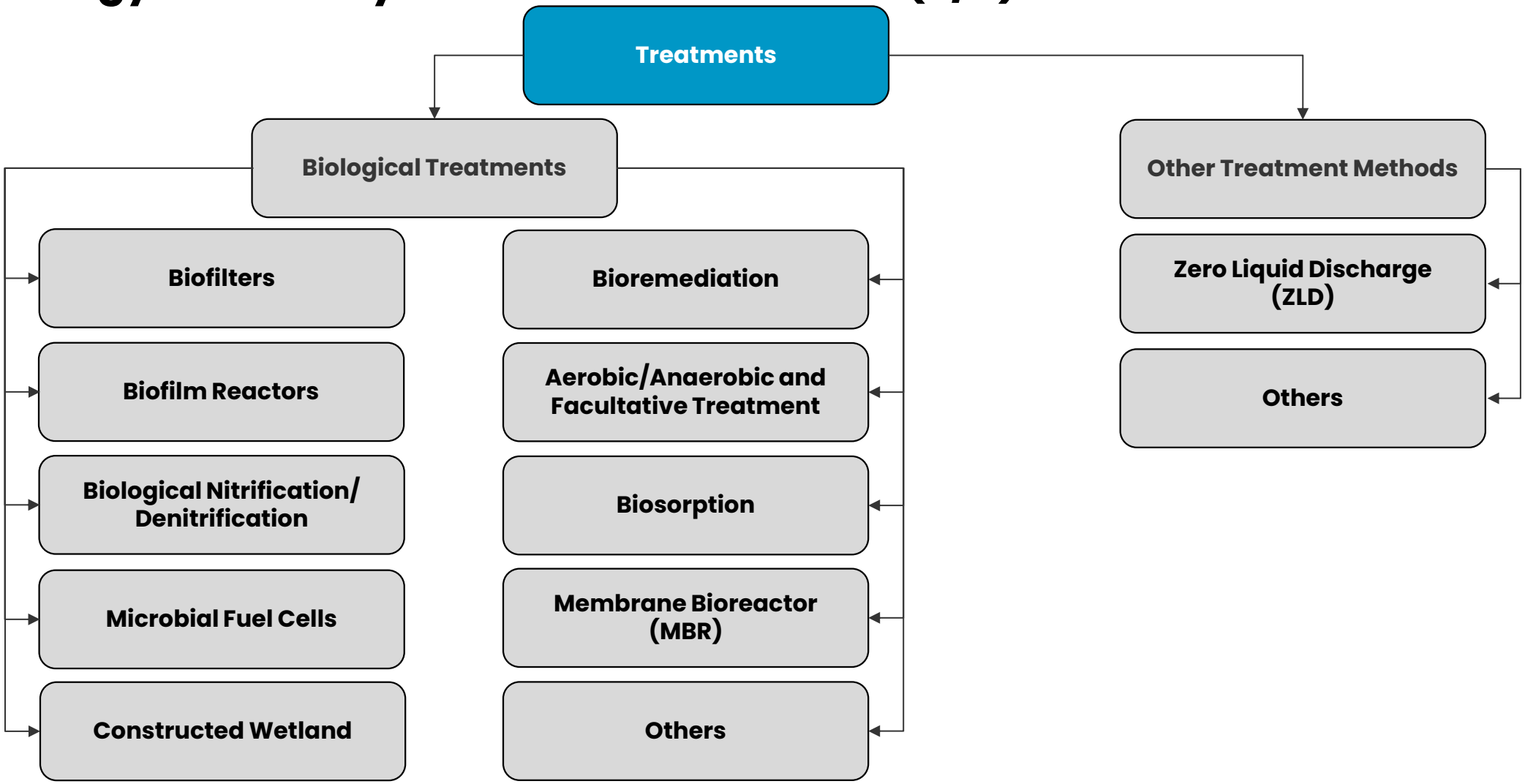
Technology Taxonomy – Module C – Outflows (3/6)



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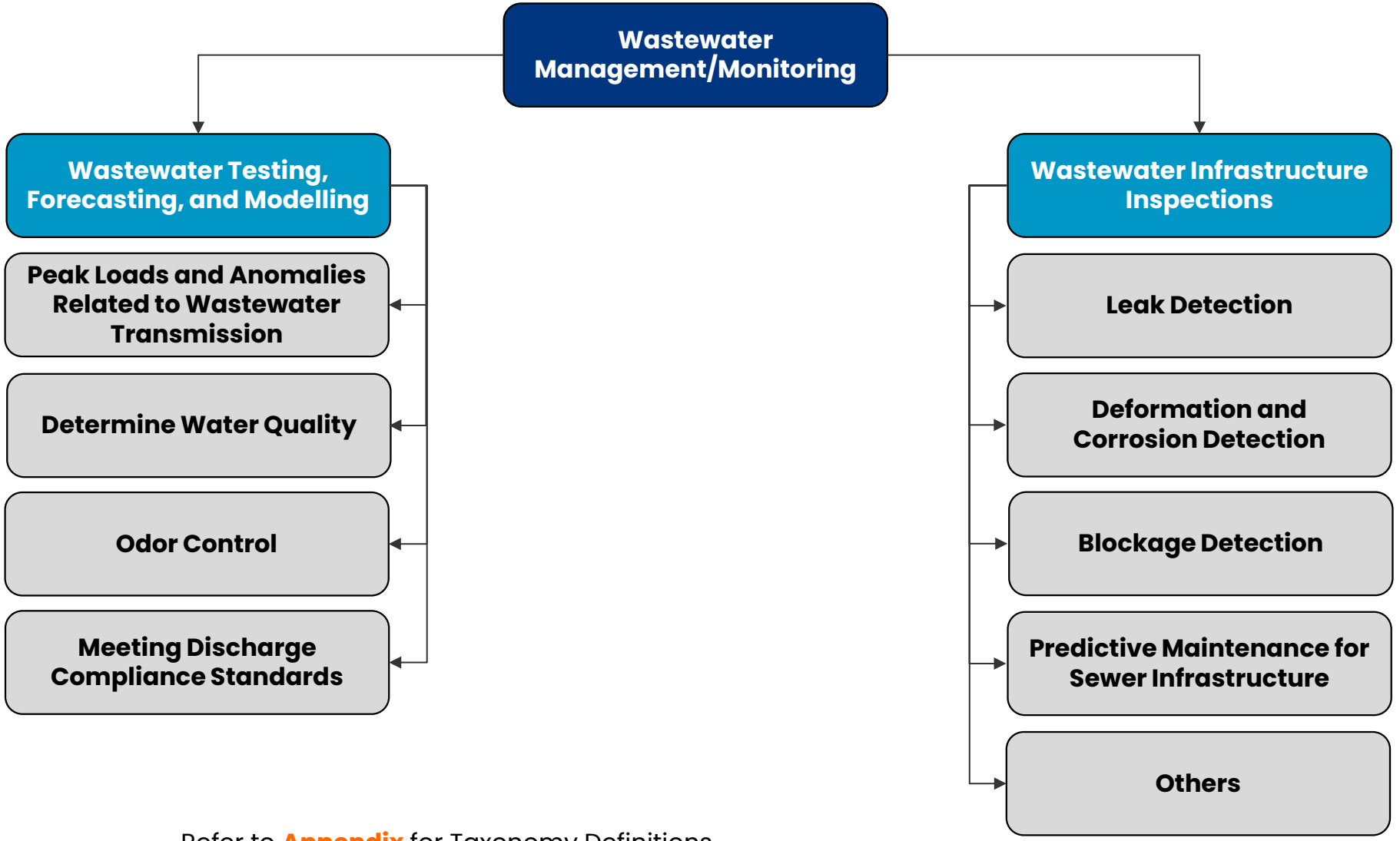
Technology Taxonomy – Module C – Outflows (4/6)



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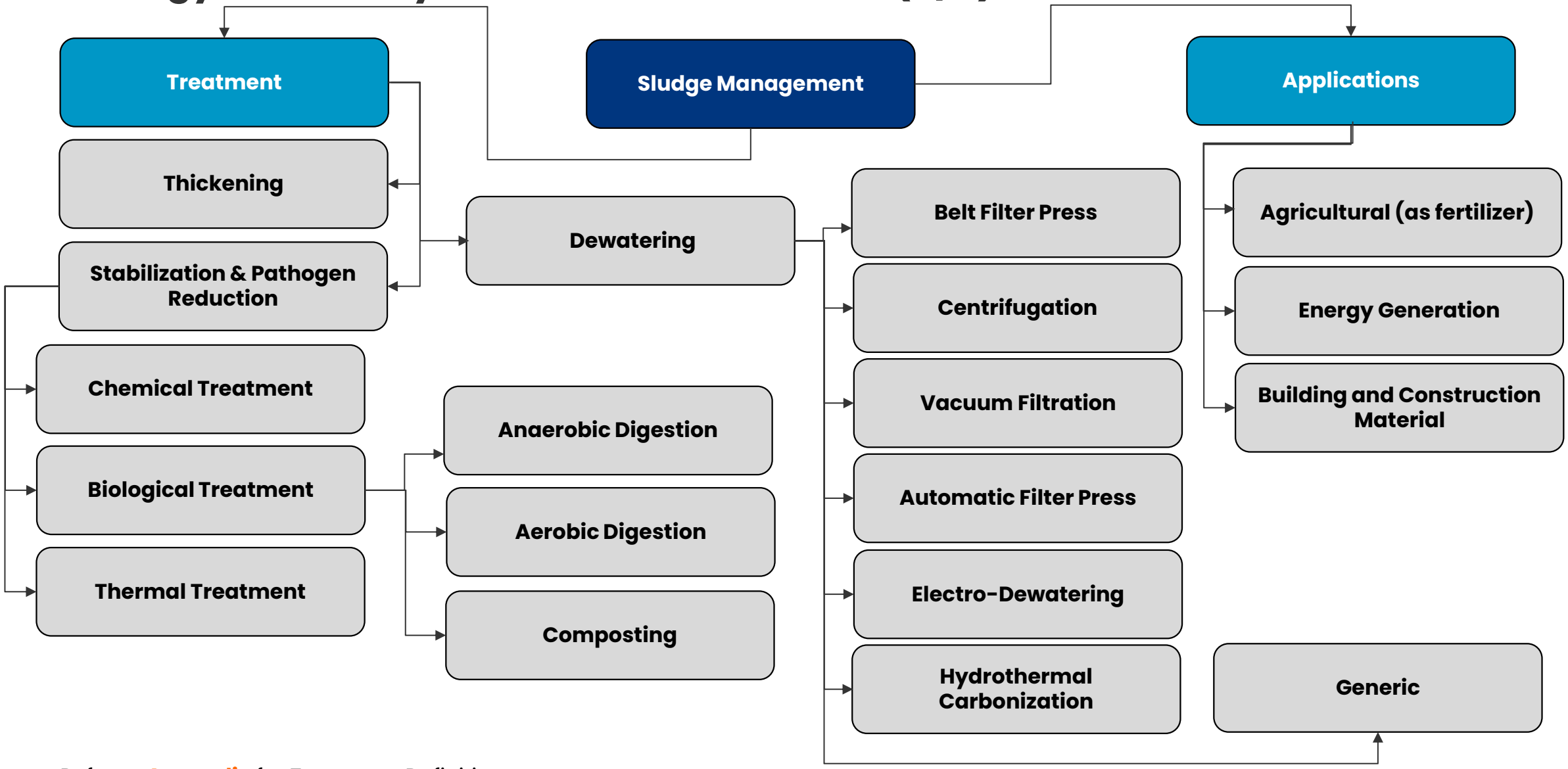
Technology Taxonomy – Module C – Outflows (5/6)



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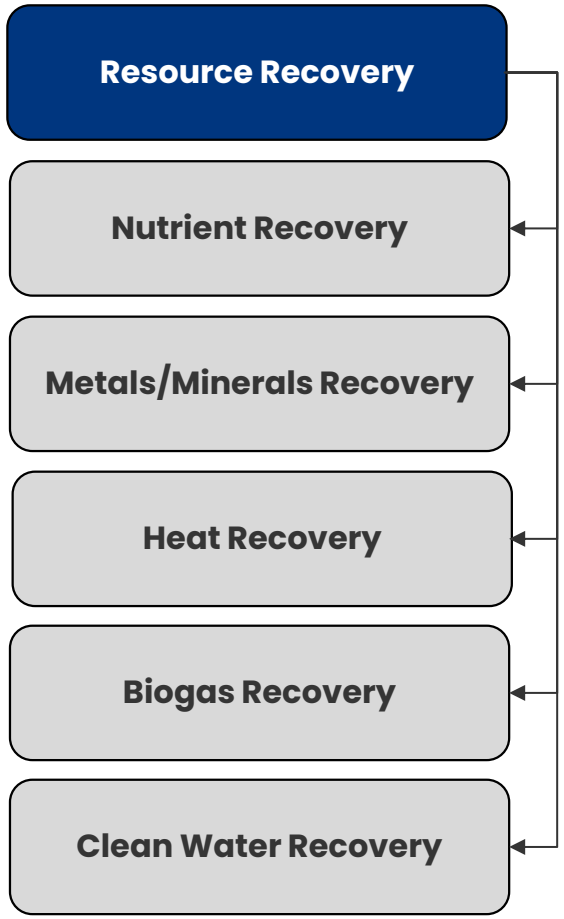
Technology Taxonomy – Module C – Outflows (6/6)



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Technology Taxonomy

Module D — Environmental Water Cycle

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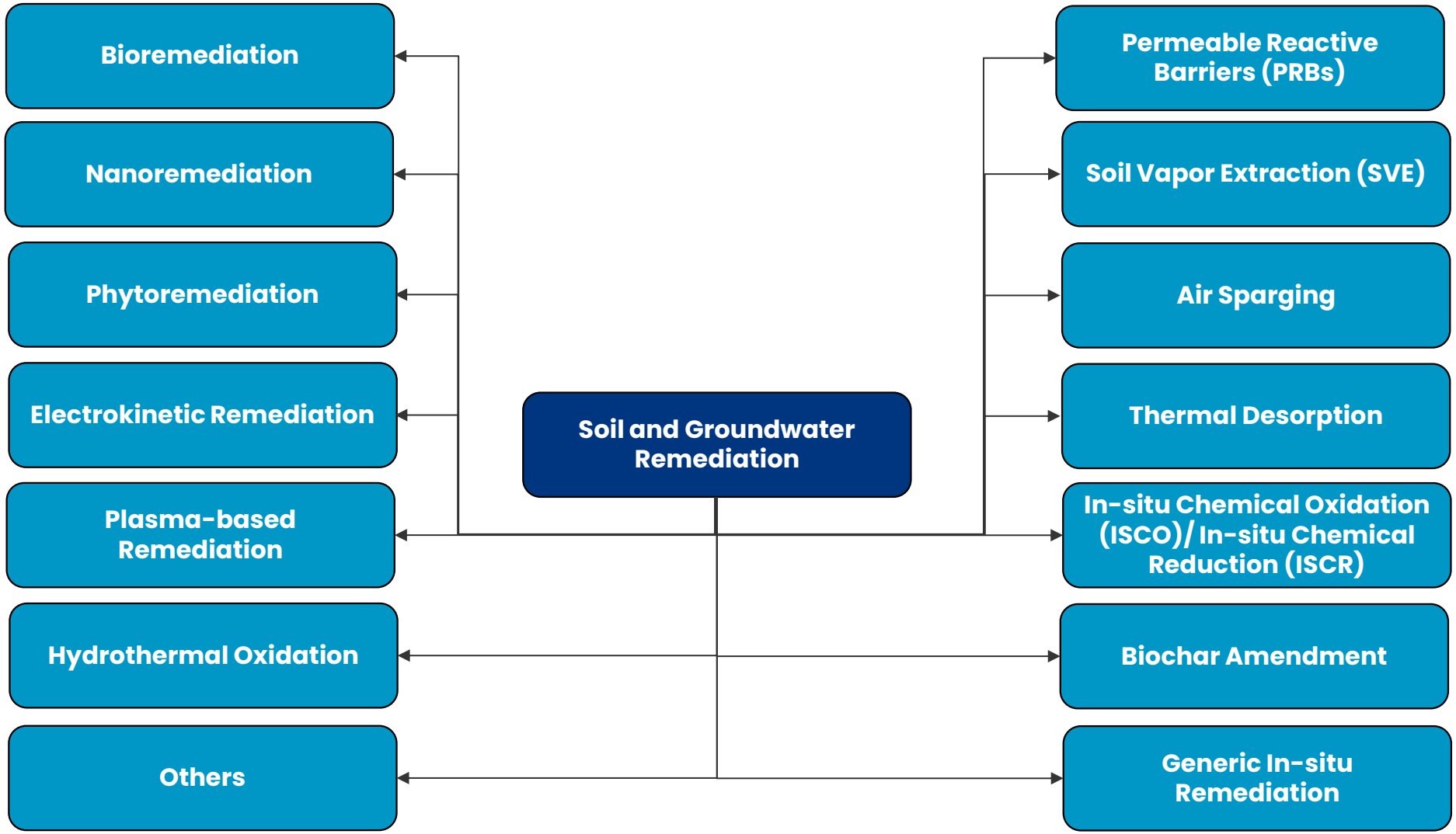
Technology Taxonomy – Module D - Environmental Water Cycle (1/3)



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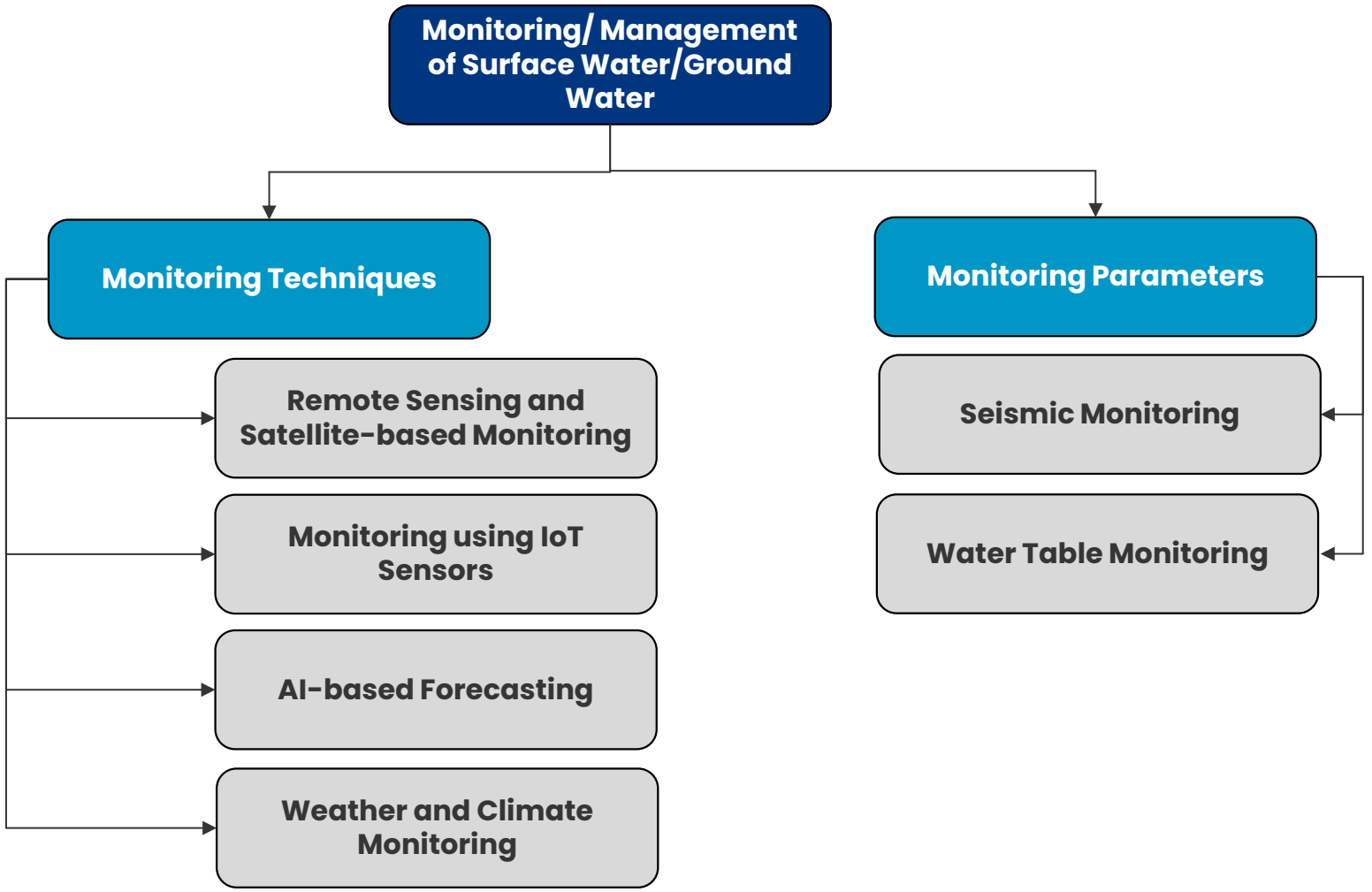
Technology Taxonomy – Module D - Environmental Water Cycle (2/3)



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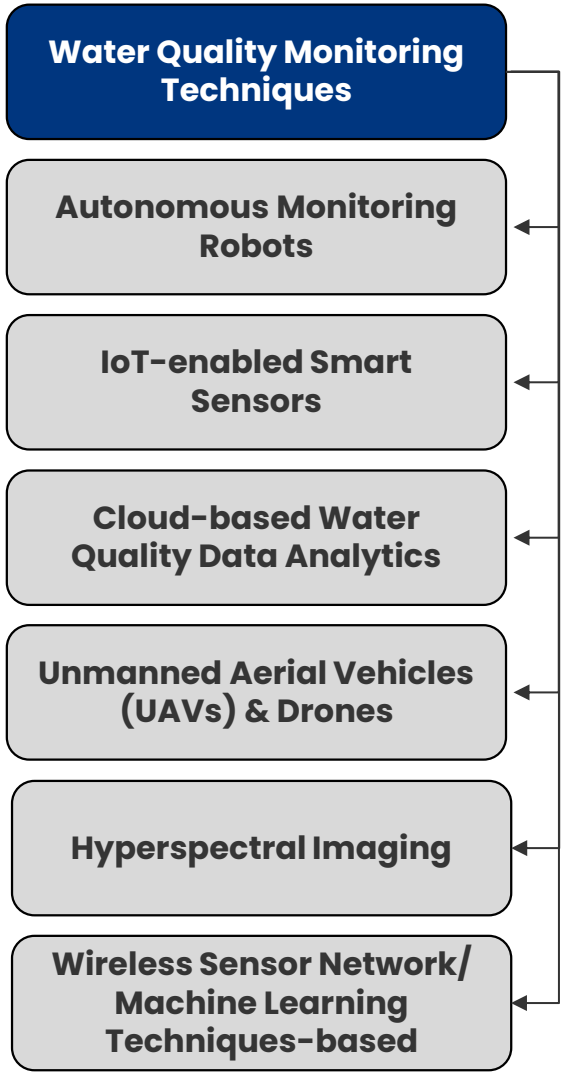
Technology Taxonomy – Module D - Environmental Water Cycle (3/3)



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Patent Insights

This section includes innovation trends, key assignees, geographical footprint, *etc.* Additionally, this section covers the technological progression trends, competitive positioning of different players in the industry, litigation insights, *etc.* These insights help in developing R&D strategy, identifying emerging technologies, assessing market potential, and guiding IP protection and investment decisions.

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Executive Summary

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Patent Insights - Executive Summary

The patent trends, such as filing trends, geography filings, key assignees, and technology fragmentations, have been studied for each module. The table below provides the approximate number of patents categorized in each module.

Modules	#Patent Assets
A-Raw Water	**54k**
B-Use	**22k**
C-Outflows	**116k**
D-Environmental Water Cycle	**17k**

Some key patent insights:

- **The United States, Korea, and Japan** are among the **overall top jurisdictions** after China, whereas the world's top freshwater resource countries include Brazil, Russia, Canada, the United States, and China. Canada's benchmarking has been provided against top countries by patent distribution and against top freshwater resource countries for each module.
- **Canada ranks among the top five jurisdictions globally** for patent filings across several areas, **including Stormwater Capture and Filtration Infrastructure/Technologies (Module A), Aquaculture Treatment Techniques (Module B), Sludge Management - Stabilization & Pathogen Reduction (Module C), and Soil and Groundwater Remediation - Bioremediation (Module D).** While Canada is also among the top five in other areas, these particular categories represent the highest concentration of Canadian patents within their respective modules.
- **Multiple universities have notable patent filings in this domain (~8-10% of filings were done by universities globally)**, where **Chinese and Korean universities** seem to have the **most filings**. **Canadian universities such as Queen's University at Kingston, Lakehead University, University of Guelph, University of Calgary, University of Manitoba, Université de Montréal, University of Alberta, and the University of British Columbia** also have patent filings in the water sector.
- The province of **Ontario** has the **highest patent filings** in most of the modules, **followed by British Columbia and Quebec**. **Axine Water Technology** has the highest filings among BC-based assignees, followed by Saltworks and Ostara Nutrient Recovery.

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Patent Insights

Module A – Raw Water

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Filing and Geography Trends

Module A— Raw Water

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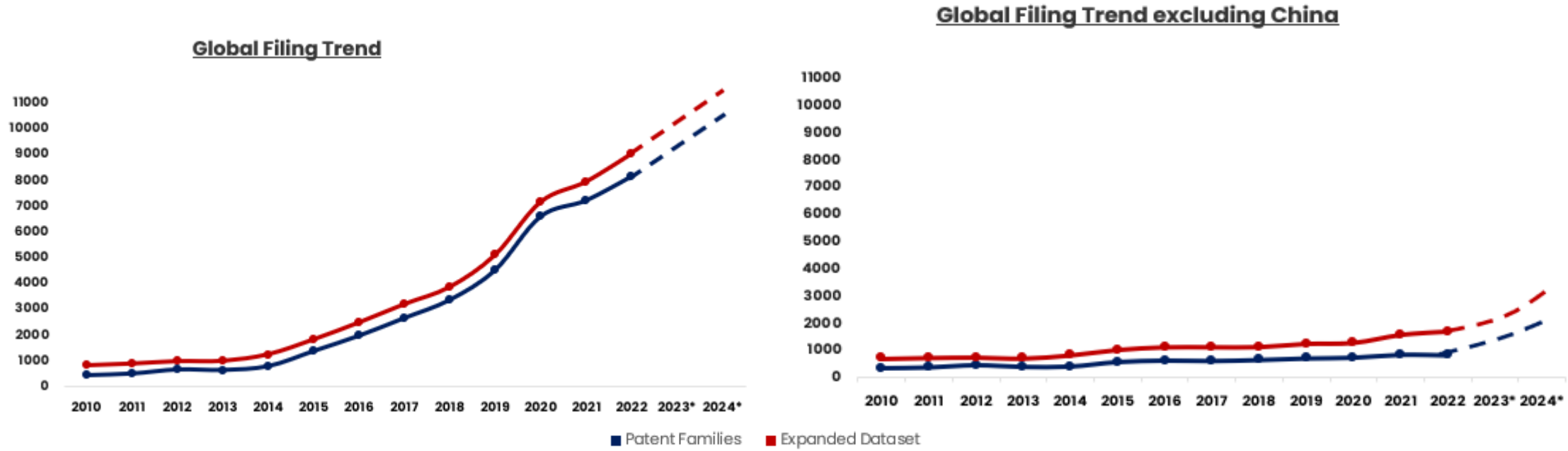
Overall Filing Trend



- The above graphs show a comparison between the global filing trend and the global filing trend excluding China, as China holds ~71% of the total patent assets.
- Including China, the total number of active patent families is ~54K, and the total active patent assets are ~63K. After excluding China, the number of active patent families is reduced to ~10K, and the total active patent assets are reduced to ~18K.
- More than 60% of the total patent assets have a remaining life above 5 years.

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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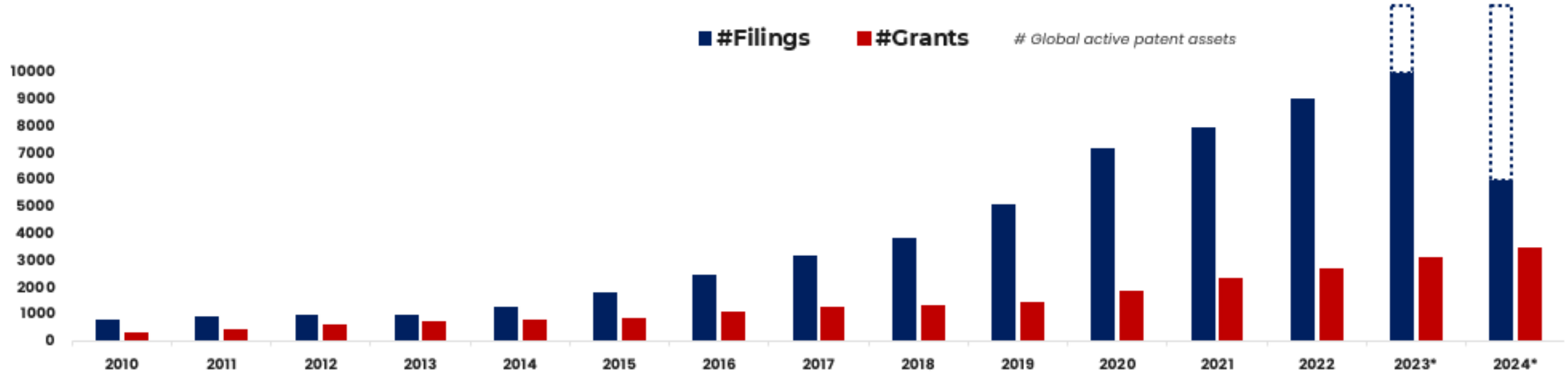
Filing Trend vs. Grant Trend



- The average number of filings per year for the last 5 years is ~8K, whereas the average number of grants per year for the last 5 years is ~2.7K (~33% of average filings per year).
- **Canada has ~190 pending applications and ~243 granted patents in this domain.**
- Companies (excluding China-based assignees) with the highest number of grants are Xylem Inc. (107) > Crystal Lagoons Curacao BV (101) > Doosan Enerbility (77) > BASF SE (770) > Sekisui Chemical Co. Ltd.(69).
- Jurisdictions with the highest number of grants are China (11,252) > Korea (3,482) > United States (2,321) > Japan (1,114). Brazil and Russia have around ~129 and ~218 granted patents, respectively.

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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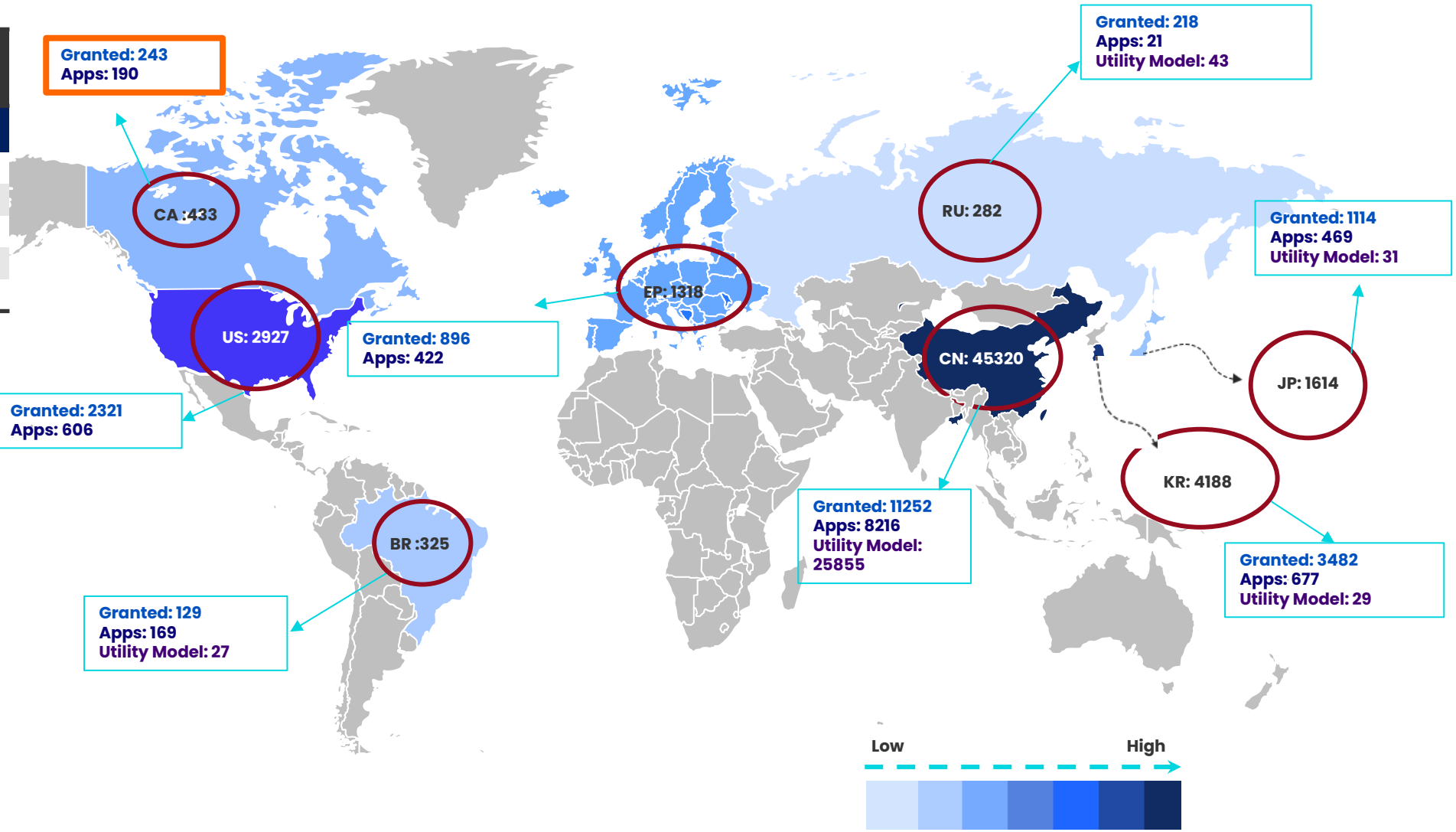
Top Jurisdictions

Top Countries by Patent Distribution	
Country	**Patent #**
China	45,323
Korea	4,188
United States	2,927
Japan	1,614
Europe	1,318

Top Countries with Freshwater Resources	
Country	**Patent #**
Brazil	325
Russia	282
Canada	433
United States	2,927
China	45,323

 # Global active patent assets



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Assignee-based Trends

Module A— Raw Water

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Key Assignees in Top Countries by Patent Distribution

The table below shows patent distribution among assignees in the below countries. The countries are chosen based on the highest patent counts (i.e., the top countries having the highest number of patent assets).

 # Global active patent assets

CN	KR	US	JP	EP
State Grid Corp. of China (1365)	Korea Institute of Industrial Technology (185)	Quikrete Holdings Inc. (54)	Sekisui Chemical Co. Ltd. (77)	Octopus Energy Heating Ltd. (28)
China Constr Second Eng Bureau (593)	LG Electronics Inc. (72)	Xylem Inc. (41)	Toshiba Corp. (26)	LG Electronics Inc. (19)
Chinese Academy of Science (504)	Korea Constr Technology Inst (69)	Saudi Arabian Oil Company (Saudi Aramco) (33)	Shimizu Constr Co. Ltd. (26)	HYDAC International GmbH (19)
China Mcc17 Group Co. Ltd. (476)	Seoul National University (49)	Fortera Corporation (Former Calera Corporation) (33)	Toto Ltd. (25)	Project Phoenix LLC (14)
China Water Resources & Hydropower Res (274)	Doosan Enerbility (Former Doosan Heavy Industries & Construction Co. Ltd) (47)	SLB.com (Former Schlumberger Ltd.) (32)	Hayashi Bussan Hatsumei Kenkyusho K.K. (24)	Weatherford Technology Holdings (F/K/A Weatherford International Ltd.) (13)
Road & Bridge Int Co. Ltd. (251)	Korea Institute of Energy Research (KIER) (44)	Kohler Co. (26)	Toagosei Co. Ltd. (22)	
China Railway Eng Equip Group Co. Ltd. (219)		Baker Hughes Inc. (25)	Itochu Corporation (22)	
China Yangtze Power Co. Ltd. (203)		Advanced Drainage Systems (25)	Toyota Motor Corp. (21)	
Xian Thermal Power Res Inst Co. Ltd. (175)		Octopus Energy Heating Ltd. (21)		
Shanghai Municipal Eng Design Inst (171)		King Fahd University of Petroleum & Minerals (21)		
China Railway Siyuan Survey & Design Gro (160)		Massachusetts Institute of Technology (20)		
Zhejiang University (141)				
Wuhan Shengyu Drainage Systems Co. Ltd. (139)				

Sectors
Oil and Gas Companies
Energy/Power Sector Companies
Water Process related Companies
Water Equipment/Machinery/Chemical Manufacturing Companies
Tech Companies
Universities/Institutes

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Key Assignees in Top Countries by Freshwater Resources

The table below shows patent distribution among assignees in the below countries. The countries are chosen based on the highest freshwater resources (i.e., countries having maximum freshwater resources).

 # Global active patent assets

BR	RU	US	CN	CA
Hydril USA Distribution LLC (9)	Rybakov Anatolij Aleksandrovich (8)	Quikrete Holdings Inc. (54)	China Constr Second Eng Bureau (593)	Fortera Corporation (Former Calera Corporation) (11)
Advanced Drainage Systems (9)	Federal State Budgetary Educational (6)	Xylem Inc. (41)	Chinese Academy of Science (504)	Saltworks Technologies Inc. (8)
Deere & Co. (6)	Univ Pskov State (4)	Saudi Arabian Oil Company (Saudi Aramco) (33)	China Mcc17 Group Co. Ltd. (476)	Weatherford Technology Holdings (F/K/A Weatherford International Ltd.) (7)
Baker Hughes Inc. (6)	Koninklijke Philips N.V. (4)	Fortera Corporation (Former Calera Corporation) (33)	China Water Resources & Hydropower Res (274)	Xylem Inc. (6)
GE Aerospace (F/K/A General Electric Company) (5)	Elektroram LLC (4)	SLB.com (Former Schlumberger Ltd.) (32)	Road & Bridge Int Co. Ltd. (251)	Verno Holdings LLC (6)
BASF SE (5)	Deere & Co. (4)	Kohler Co. (26)	China Railway Eng Equip Group Co. Ltd. (219)	Tata Motor Ltd.(6)
SLB.com (Former Schlumberger Ltd.) (4)		Baker Hughes Inc. (25)	China Yangtze Power Co. Ltd. (203)	Advanced Drainage Systems (6)
		Advanced Drainage Systems (25)	Xian Thermal Power Res Inst Co. Ltd. (175)	
		Octopus Energy Heating Ltd. (21)	Shanghai Municipal Eng Design Inst (171)	
		King Fahd University of Petroleum & Minerals (21)	China Railway Siyuan Survey & Design Gro (160)	
		Massachusetts Institute of Technology (20)	Zhejiang University (141)	
			Wuhan Shengyu Drainage Systems Co. Ltd. (139)	

Sectors
Oil and Gas Companies
Energy/Power Sector Companies
Water Process related Companies
Water Equipment/Machinery/Chemical Manufacturing Companies
Tech Companies
Universities/Institutes

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Benchmarking based on Origin Country of Assignees (Key Countries by Patent Distribution)

The table below shows patent distribution by the assignee's country of origin, indicating where the assignees are based. For example, assignees based out of China have filed 44,314 patent families. The countries are chosen based on the highest patent counts (i.e., the top countries having the highest number of patent assets).

Global Patent Insights/Country	Chinese Assignees	Korean Assignees	US Assignees	Japanese Assignees
Patent Families	44,314	2,851	1,055	559
Expanded Dataset	45,103	3,456	3,698	1,001
Granted Patents	10,995	2,759	2,488	804
Pending Applications	8,262	671	1,203	181
Utility Models	25,846	26	7	16
Key Assignees	State Grid Corp. of China, China Constr Second Eng Bureau, Chinese Academy of Science, China MCC17 Group Co. Ltd., China Water Resources & Hydropower RES	Korea Institute of Industrial Technology, LG Electronics, Doosan Enerbility, Korea Institute of Energy Research (KIER)	Advanced Drainage Systems, Xylem Inc. Fortera Corporation, Verno Holdings LLC	Sekisui Chemical Co. Ltd., Mitsubishi Heavy Industries Ltd., Toyota Motor Corp., Kurita Water Industries Ltd.
Key Jurisdictions	CN, US, WO, JP	KR, US, EP, CN	US, EP, CN, CA	JP, US, CN, EP

Notes:

1. *INPADOC families are considered for this report - An INPADOC patent family encompasses all patent documents that share a priority relationship, either directly or indirectly (via a third document).*
2. *Expanded dataset is the sum of granted patents, pending applications and utility models.*

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Technology Fragmentations

Module A— Raw Water

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Technology Taxonomy Fragmentations (1/2)

The below representation describes the distribution of patent assets across taxonomy nodes.

Raw Water

Surface Water/Ground Water Extraction

Infrastructure

- Smart Water Intake Structures
  - Floating Intake Structures (534 | 513)
  - Self-cleaning Intake Screens (165 | 154)
  - Generic (100 | 99)
- Solar-powered Pumps (35 | 35)
- Gravity-fed Water Systems (11 | 5)

Maintenance

- Leak Prevention/Inspection (567 | 522)
- Corrosion Prevention/Inspection (530 | 483)
- Equipment Repair and Replacement (709 | 575)
- Others (31 | 25)

Technologies

- Nanotechnology in Groundwater Remediation (21 | 10)
- Smart Aquifer Recharge Systems (750 | 621)

Desalination

Infrastructure

- Bio-graphene/ Nanomaterial Membranes (82 | 29)
- Floating/Submerged Desalination (236 | 187)

Technologies

- Membrane Desalination (4582 | 2980)
- Membrane Distillation (298 | 205)
- Solar Desalination (1348 | 1213)
- Thermal Desalination (623 | 322)
- Capacitive Deionization (CDI)/Electro-Deionization (EDI) (111 | 64)
- Generic Desalination (4795 | 3481)

Generic Patents related to Surface Water/ Ground water Extraction (7675 | 6774)

Rainwater/Atmospheric Water Extraction

Rainwater Harvesting

- Rainwater Collection Systems (31622 | 30692)
- Groundwater Recharge Techniques (554 | 549)
- Drainage Systems (2356 | 2289)
- Rainwater Treatment (2595 | 2501)

Atmospheric Water Harvesting

- Fog and Dew Harvesting (407 | 348)
- Cooling Condensation-based Atmospheric Water Generators (AWGs) (293 | 165)
- Desiccant-based AWGs (231 | 166)
- Solar-driven Atmospheric Water Extraction (SAWE) (227 | 118)
- Generic (303 | 182)

Note: Numbers in bracket (X | Y) represents (# global active expanded set | # global active patent families)

Link to Taxonomy Definitions

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Technology Taxonomy Fragmentations (2/2)

The below representation describes the distribution of patent assets across taxonomy nodes.

Raw Water

Stormwater

Capture and Filtration Infrastructure/Technologies

- Green Infrastructure (Rain Gardens, Bioswales, *etc.*) (140 | 89)
- Gray Infrastructure - Detention & Retention Systems (234 | 110)
- Filtration/Treatment/Absorption Technologies (607 | 352)
- Others (547 | 288)

Management

Overflow and Flood Management

Predictive Technologies for Flood Prevention and Stormwater Modelling

- AI and Machine Learning (496 | 465)
- IoT Devices for Real-time Monitoring (126 | 120)
- Hydrologic and Hydraulic Models (424 | 413)
- Remote Sensing and GIS-based Models (204 | 197)
- Others (2161 | 1969)

Combined Sewer Overflow (CSO)

- Real-time Monitoring and Prevention Systems (57 | 54)
- Screening/Filtration/ Treatment Systems (170 | 146)
- Overflow Regulators and Storage Basins (57 | 54)
- Others (152 | 130)

Stormwater Quality Monitoring (105 | 101)

Drainage (250 | 179)

Water Source/Availability Identification

- Remote Sensing/Satellite Imaging (34 | 34)
- AI Prediction Techniques (13 | 11)

Water Transmission/Moving Techniques

- Hydraulic Accumulators in Pipelines (2690 | 921)
- Pneumatic Water Transport Systems (379 | 106)
- Smart Water Pipelines (184 | 182)
- Underground Water Conveyance (99 | 99)
- Floating Pipelines (145 | 110)
- Water Transport via Smart Drones (1 | 1)

Link to Taxonomy Definitions

Note: Numbers in bracket (X | Y) represents (# global active expanded set | # global active patent families)

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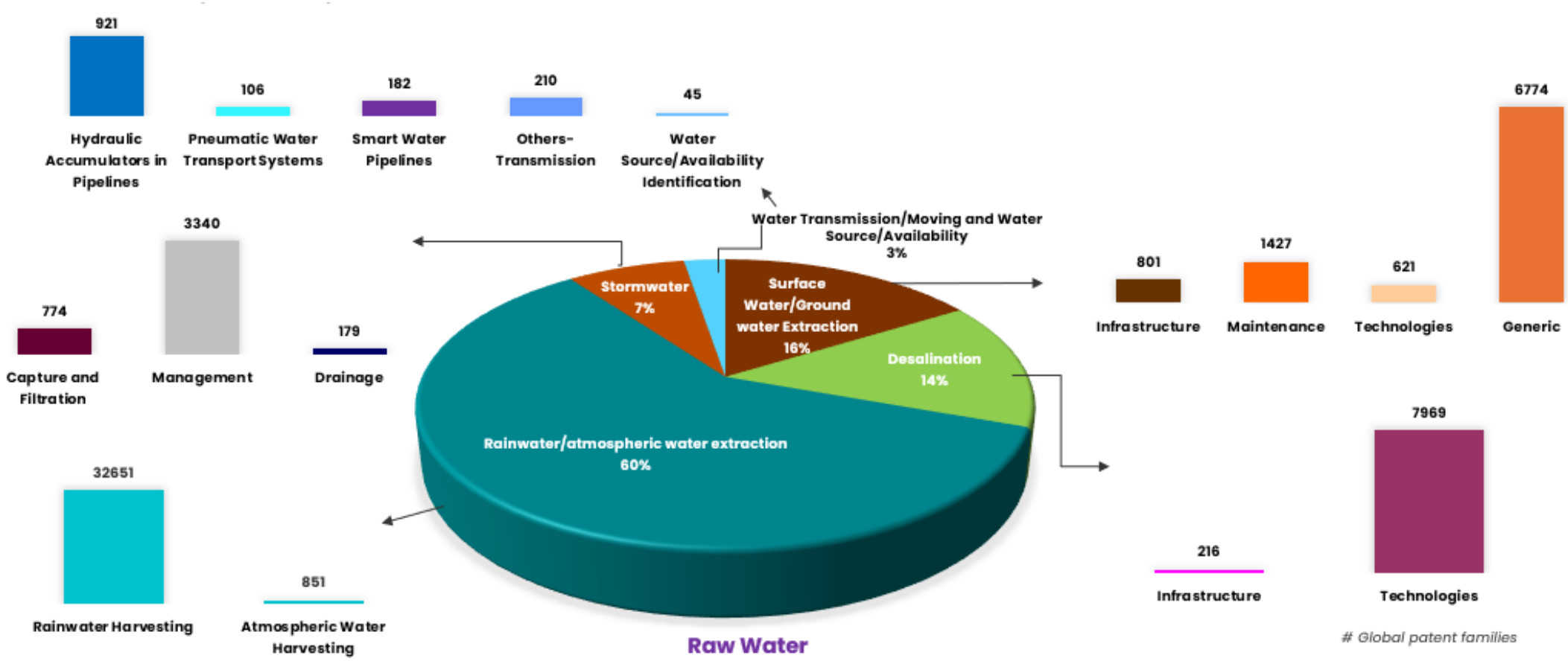
Technology Fragmentations - Global



- The pie chart shows the patent distribution among tier-1 categories. Further, the corresponding column graphs show patent distribution in respective tier-2 categories.
- Top countries for most of the tier-1 categories are China, Korea, and the United States. Brazil and Russia are top freshwater resource countries, but they have fewer filings as compared to these countries.
- Some of the top categories for patent filings are Rainwater Harvesting, Desalination Technologies, and generic patents related to Surface/Groundwater Extraction.

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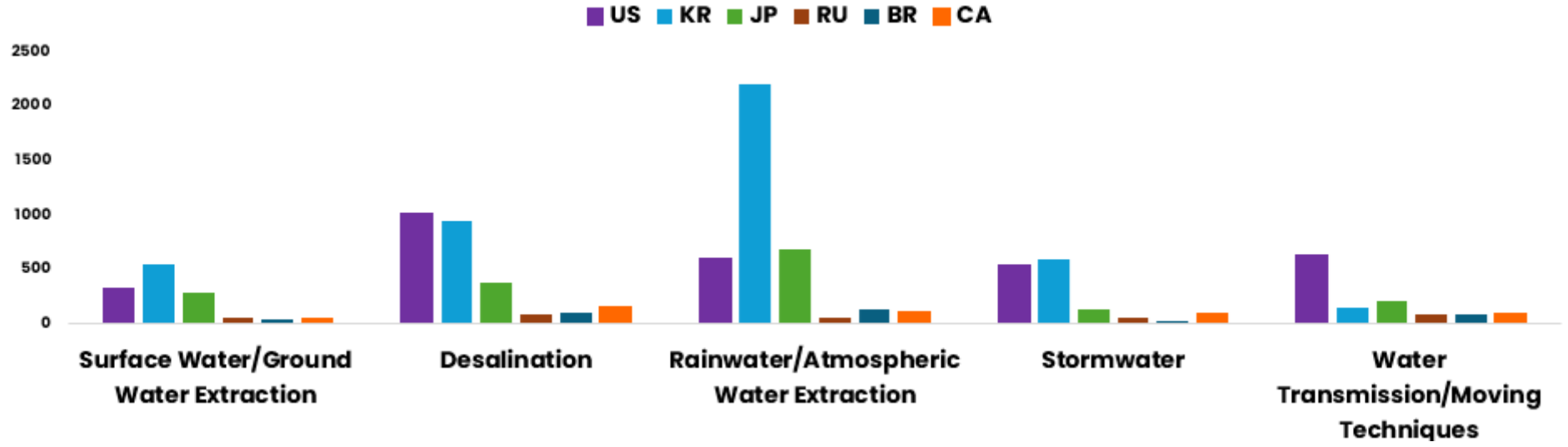
Patent Distribution by Tier-1 Categories in Key Jurisdictions (Excluding China)



 # Global active patent assets

Key Assignees				
Surface Water/Ground Water Extraction	**Desalination**	**Rainwater/Atmospheric Water Extraction**	**Stormwater**	**Water Transmission/Moving Techniques**
LG Electronics Inc. (117)	Xylem Inc. (137)	Korea Institute of Industrial Technology (132)	Advanced Drainage Systems (118)	Octopus Energy Heating Ltd. (151)
Crystal Lagoons Curacao BV (70)	BASF SE (108)	Sekisui Chemical Co. Ltd. (83)	Quikrete Holdings Inc. (71)	HYDAC International GmbH (65)
Toto Ltd. (38)	Fortera Corporation (83)	Watergen Ltd.(45)	Stormtrap LLC (47)	Baker Hughes Inc. (58)
Harwich Haven Authority (34)	Doosan Enerbility (78)	Water Harvesting Inc. (43)	SLB.com (Former Schlumberger Ltd.) (42)	Deere & Co. (49)
	Verno Holdings LLC (72)	Freshape SA (40)	Rockwool International A/S (21)	

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Patent Distribution in Key Countries (Excluding China)

Tier 1 Categories	Tier 2 categories	US	KR	EP	JP	CA
Surface Water/Ground Water Extraction	Infrastructure	20	61	5	20	2
	Maintenance	34	105	4	29	1
	Technologies	14	55	1	10	1
	Generic Patents related to Surface Water/ Ground water Extraction	219	343	107	229	31
Desalination	Infrastructure	36	26	15	15	4
	Techniques **	995	925	428	368	140
Stormwater	Capture and Filtration Infrastructure/Technologies ***	390	132	76	16	67
	Management	131	454	28	102	11
	Drainage	70	16	10	8	8
Rainwater/ Atmospheric Water Extraction	Rainwater Harvesting **	373	2166	219	635	77
	Atmospheric Water Harvesting **	222	30	59	40	26
Water Transmission/Moving Techniques	Hydraulic Accumulators in Pipelines **	581	105	373	178	77
	Pneumatic Water Transport Systems	35	20	37	22	6
	Smart Water Pipelines ***	3	14	1	1	3
	Underground Water Conveyance *	0	0	0	0	0
	Floating Pipelines *	2	5	1	2	1
	Water Transport via Smart Drones *	0	1	0	0	0

 # Global active patent assets

*** Canada is among the top five jurisdictions globally in these areas.

** These are the top areas where Canada has filed the maximum number of patents, reflecting significant focus and investment. **However, Canada is not among the top five jurisdictions globally in these areas.**

* Areas with a lower number of patent filings across all jurisdictions, indicating limited global interest. Canada is also not focusing on these areas. This presents a valuable opportunity to file patents in these niche domains.

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Canadian Insights

Module A— Raw Water

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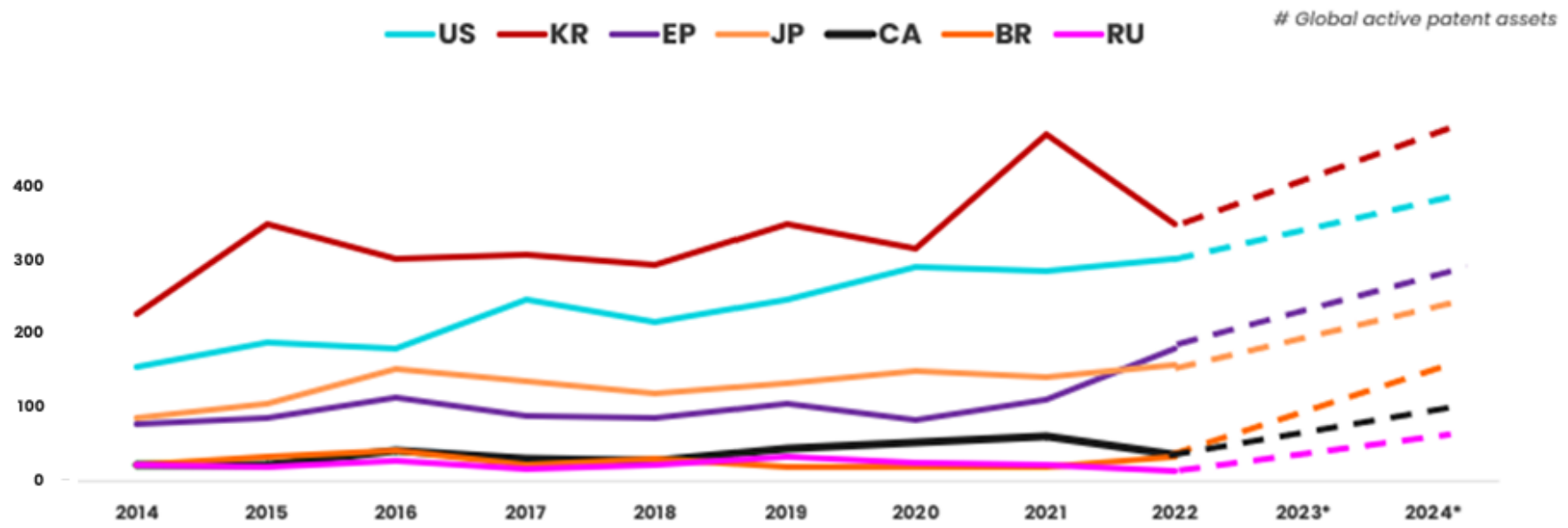
Canadian vs. International Filings – Excluding China



- The above graph shows the patent filing trend in Canada along with other key jurisdictions (excluding China).
- Though Canada ranks third globally, with nearly 6.7% of the world's freshwater resources, it has significantly fewer filings as compared to other key jurisdictions, such as Korea and the United States. Over the past five years (considering 2018-2022), the average number of filings in Canada has been approximately 38. In contrast, Korea and the United States have average filings of around 301 and 226, respectively, during the same period.
- The top three countries having the maximum freshwater resources are Brazil, Russia, and Canada. Brazil and Russia have fewer filings compared to Canada.

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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Benchmarking based on Origin Country of Assignees (Key Countries by Freshwater Resources)

The table below shows patent distribution by the assignee's country of origin, indicating where the assignees are based. For example, assignees based in Russia have filed 186 patent families. The countries are chosen based on the highest freshwater resources (i.e., countries having maximum freshwater resources).

Global Patent Insights/Country	Brazil Assignees	Russian Assignees	US Assignees	Chinese Assignees	Canadian Assignees
Patent Families	107	186	1,055	44,314	71
Expanded Dataset	136	199	3,698	45,103	260
Granted Patents	51	150	2,488	10,995	151
Pending Applications	57	11	1,203	8,262	109
Utility Models	28	38	7	25,846	0
Key Assignees	MVA Participacoes & Consultoria Ltd., Drausuisse Brasil Comercio E Locacao Uni, Drausuisse Brasil Comercio E Locacao De Unidades Hidraulicas Inteligentes SA	Rybakov Anatolij Aleksandrovich, Stroganov, Alexander Anatolyevich, Federal State Budgetary Educational, Elektroram LLC	Advanced Drainage Systems, Xylem Inc., Fortera Corporation, Verno Holdings LLC	State Grid Corp. of China, China Constr Second Eng Bureau, Chinese Academy of Science, China Mcc17 Group Co. Ltd., China Water Resources & Hydropower Res	SLB.com, Queen's University of Kingston, Omachron Intellectual Property, Intelligent Wellhead Systems Inc., Spectrafy Inc., Saltworks Technologies Inc.
Key Jurisdictions	BR, US, EP, CN	RU, UA, WO, US	US, EP, CN, CA	CN, US, WO, JP	US, CA, WO, EP

Notes:

1. *INPADOC families are considered for this report - An INPADOC patent family encompasses all patent documents that share a priority relationship, either directly or indirectly (via a third document).*
2. *Expanded dataset is the sum of granted patents, pending applications and utility models.*

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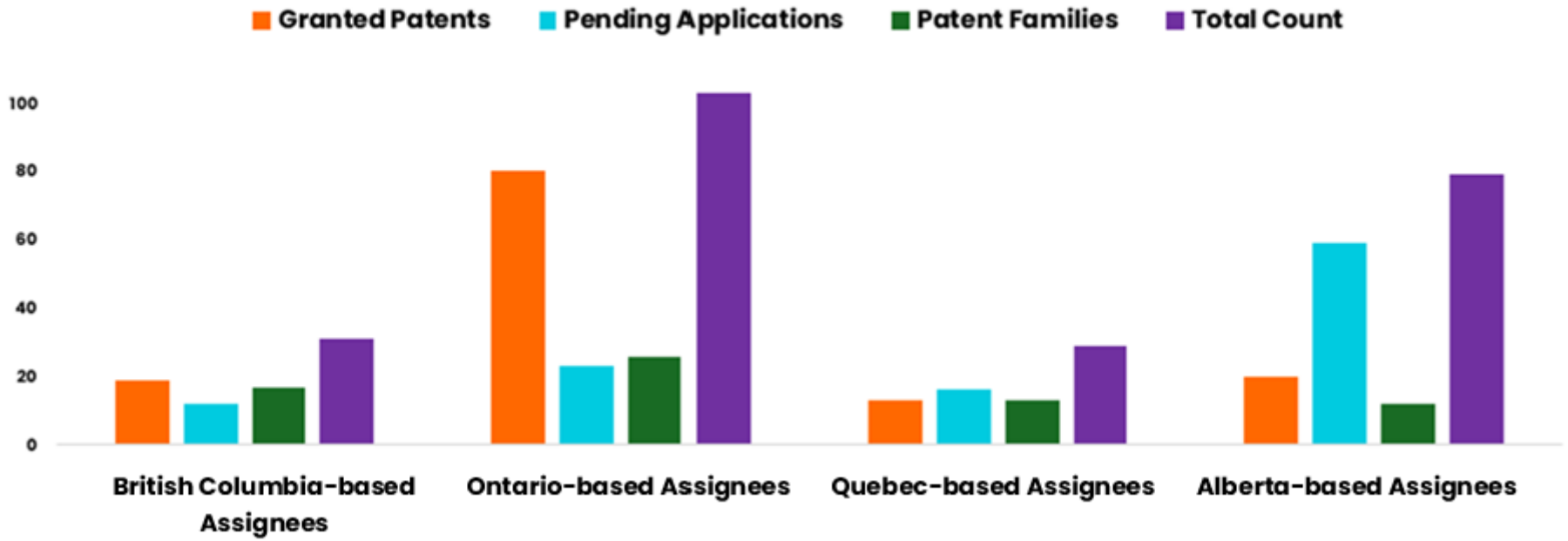
BC vs Other Provinces



- Canada's water sector companies seem to be mainly present in four provinces: British Columbia, Alberta, Ontario, and Quebec. Ontario-based companies seem to have filed more patents as compared to the other Canadian provinces.
- BC-based companies have the maximum filings in desalination, whereas Ontario-based companies have more filings in rainwater harvesting and stormwater.

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Patent Insights

Module B— Use

FORESIGHT

UnitedLex

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Filing and Geography Trends

Module B— Use

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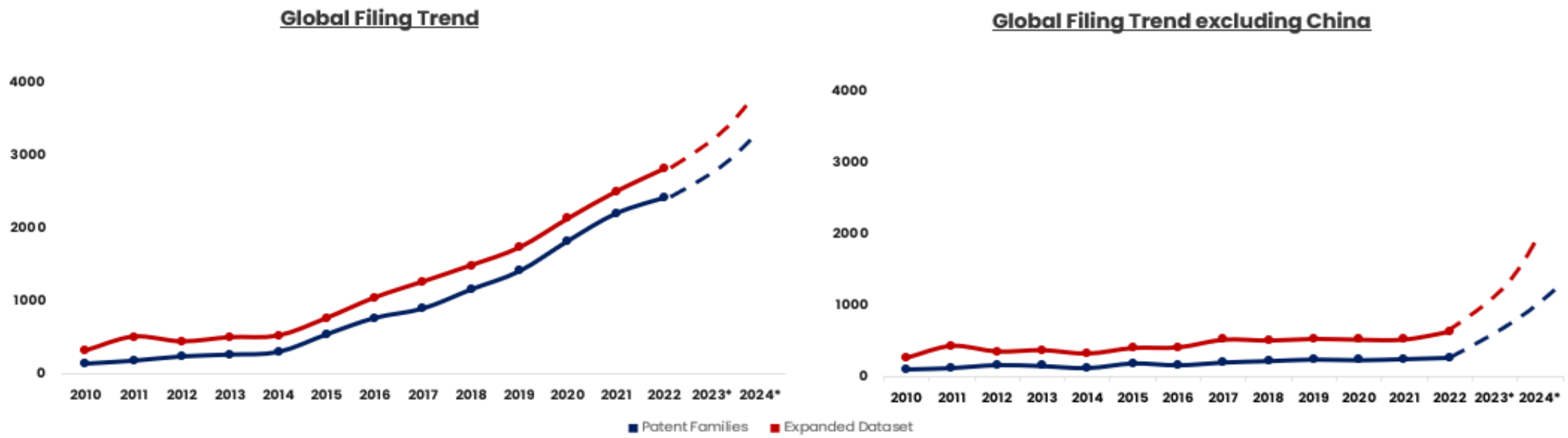
Overall Filing Trend



- The above graphs show a comparison between the global filing trend and the global filing trend excluding China.
- Including China, the total number of active patent families is ~17K, and the total active patent assets is ~22K. Excluding China, the number of filings per year has been reduced by ~66%.
- More than 65% of the total patent assets have a remaining life above 5 years.

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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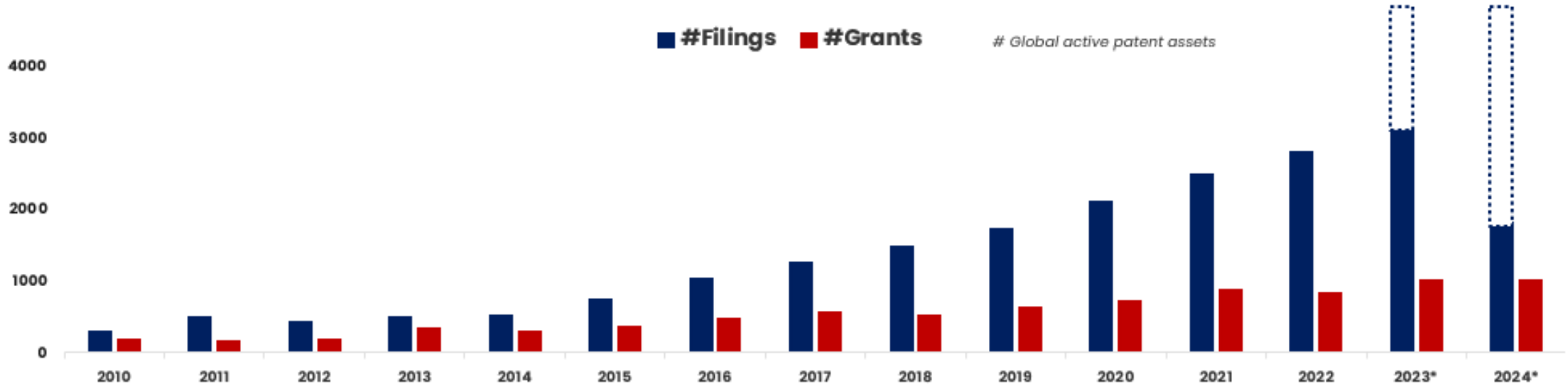
Filing Trend vs. Grant Trend



- The average number of filings per year for the last 5 years is ~2.5K, whereas the average number of grants per year for the last 5 years is ~896 (~36% of average filings per year).
- **Canada has ~109 pending applications and ~180 granted patents in this domain.**
- Companies (excluding China-based assignees) with the highest number of grants are Crystal Lagoons Curacao BV (200) > Ecolab Inc. (168) > CJ Cheil Jedang Corp. (126).
- Jurisdictions with the highest number of grants are China (3,629) > United States (1,135) > Korea (619) > Europe (454) > Russia (308).

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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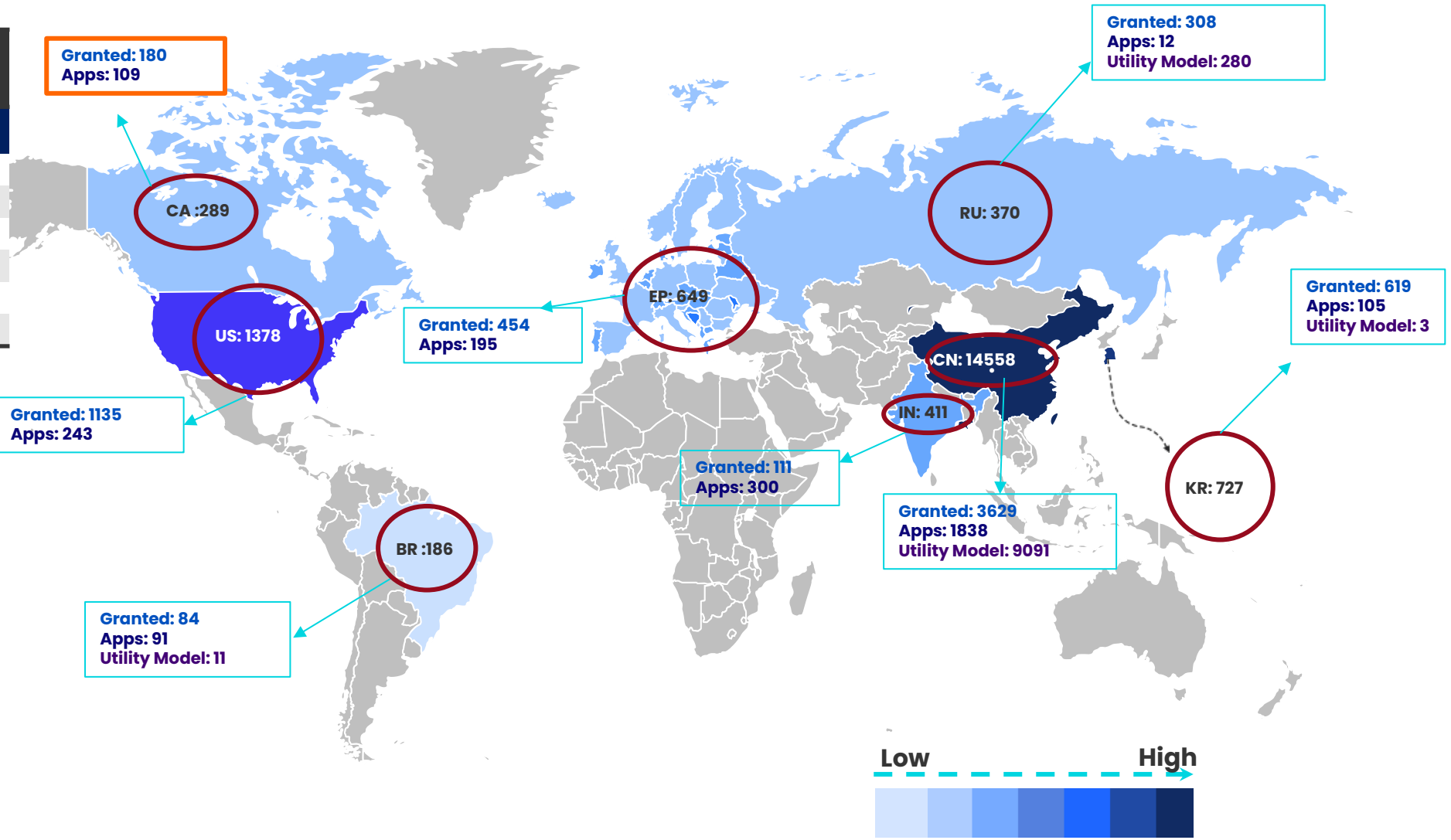
Top Jurisdictions

Top Countries by Patent Distribution	
Country	**Patent #**
China	14,558
United States	1,378
Korea	727
Europe	649
India	411
Russia	370

Top Countries with Freshwater Resources	
Country	**Patent #**
Brazil	186
Russia	370
Canada	289
United States	1,378
China	14,558

 # Global active patent assets



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Assignee-based Trends

Module B— Use

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Key Assignees in Top Countries by Patent Distribution

The table below shows patent distribution among assignees in the below countries. The countries are chosen based on the highest patent counts (i.e., the top countries having the highest number of patent assets).

CN	US	KR	EP	IN
State Grid Corp. of China (141)	Ecolab Inc. (41)	LG Electronics Inc. (42)	Octopus Energy Heating Ltd.(28)	Indian Institutes of Technology (9)
Chinese Academy of Science (126)	Deka Products LP (31)	Coway Co. Ltd. (21)	Ecolab Inc. (24)	Univ Saveetha Medical & Tech Sci Saveeth (8)
Cafs Yellow Sea Fisheries Res Inst (121)	Xylem Inc. (26)	C.J. Cheil JedangCorp. (19)	C.J. Cheil JedangCorp. (17)	Saveetha Eng College (6)
China Water Resources & Hydropower Res (82)	Rain Bird Corporation (25)	Octopus Energy Heating Ltd.(16)	Xylem Inc. (9)	Ecolab Inc. (6)
Midea Group Co. Ltd. (64)	C.J. Cheil Jedang Corp. (25)	Korea Advanced Institute for Science And Technology (16)	LG Electronics Inc. (9)	Council of Scientific And Industrial Research (6)
China Petrochemical Corp. D/B/A Sinopec Group (F/K/A China Petroleum & Chemical Corp. Inc. D/B/A Sinopec) (44)	Johnson Controls International (22)	Korea Institute of Science and Technology (12)	S.P.C.M. SA (Aka Snf Floerger) (8)	Univ Lovely Professional (5)
Univ Jiangsu (42)	Octopus Energy Heating Ltd.(21)	Ecolab Inc. (9)	Crystal Lagoons Curacao BV (8)	Xylem Inc. (4)
Inst Agric Resources & Regional Planning (39)	LG Electronics Inc. (18)		Veolia Environnement (7)	
XIAN THERMAL POWER RES INST Co. Ltd. (35)	Stoneage Inc. (16)			
Univ China Agricultural (35)	Agco Corp. (16)			
TONGWEI Co. Ltd. (31)	Hunter Industries Inc. (14)			
Harbin Institute of Technology (31)	Clorox Co. (14)			
HANGZHOU XINGYUAN FILTER Co. Ltd. (29)				

Sectors
Oil and Gas Companies
Energy/Power Sector Companies
Water Process related Companies
Water Equipment/Machinery/Chemical Manufacturing Companies
Tech Companies
Universities/Institutes

 # Global active patent assets

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Key Assignees in Top Countries by Freshwater Resources

The table below shows patent distribution among assignees in the below countries. The countries are chosen based on the highest freshwater resources (i.e., countries having maximum freshwater resources).

BR	RU	US	CN	CA
C.J. Cheil Jedang Corp. (20)	Bvt Barrier Rus Stock Co. (9)	Ecolab Inc. (41)	State Grid Corp. of China (141)	Ecolab Inc. (13)
Ecolab Inc. (11)	Federal State Budgetary Educational (7)	Deka Products LP (31)	Chinese Academy of Science (126)	AGCO Corp. (9)
ExxonMobil Corp. (6)	Ecolab Inc. (5)	Xylem Inc. (26)	Cafs Yellow Sea Fisheries Res Inst (121)	Deka Products LP (7)
S.P.C.M. SA (Aka Snf Floerger) (4)	Univ Novgorod State Yaroslav Wise (4)	Rain Bird Corporation (25)	China Water Resources & Hydropower Res (82)	Clorox Co. (7)
	Crystal Lagoons Curacao BV (4)	C.J. Cheil Jedang Corp (25)	Midea Group Co. Ltd. (64)	ExxonMobil Corp .(6)
		Johnson Controls International (22)	China Petrochemical Corp. D/B/A Sinopec Group (F/K/A China Petroleum & Chemical Corp. Inc. D/B/A Sinopec) (44)	Veolia Environnement (5)
		Octopus Energy Heating Ltd. (21)	Univ Jiangsu (42)	S.P.C.M. SA (Aka Snf Floerger) (5)
		LG Electronics Inc. (18)	Inst Agric Resources & Regional Planning (39)	
		StoneAge Inc. (16)	Xi'an Thermal Power Res Inst Co. Ltd. (35)	
		AGCO Corp. (16)	Univ China Agricultural (35)	
		Hunter Industries Inc. (14)		
		Clorox Co. (14)		

Sectors
Oil and Gas Companies
Energy/Power Sector Companies
Water Process related Companies
Water Equipment/Machinery/Chemical Manufacturing Companies
Tech Companies
Universities/Institutes

 # Global active patent assets

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Benchmarking based on Origin Country of Assignees (Key Countries by Patent Distribution)

The table below shows patent distribution by the assignee's country of origin, indicating where the assignees are based. For example, assignees based out of China have filed 14,116 patent families. The countries are chosen based on the highest patent counts (i.e., the top countries having the highest number of patent assets).

Global Patent Insights/Country	Chinese Assignees	US Assignees	Korean Assignees	EP Assignees	Indian Assignees
Patent Families	14,116	454	431	469	255
Expanded Dataset	14,343	2,080	686	1,781	258
Granted Patents	3,498	1,499	585	1,146	56
Pending Applications	1,766	571	99	597	200
Utility Models	9,079	10	2	38	2
Key Assignees	State Grid Corp. of China, Chinese Academy of Science, Cafs Yellow Sea Fisheries Res Inst, China Water Resources & Hydropower Res	Ecolab Inc., Deka Products LP, Xylem Inc., Neozyme Int Inc.	C.J. Cheil Jedang Corp., LG Electronics Inc., Coway Co. Ltd., Korea Advanced Institute for Science and Technology	Octopus Energy, S.P.C.M. SA (Aka Snf Floerger), Veolia Environnement, BASF SE	Univ Saveetha Medical & Tech Sci Saveeth, Indian Institutes of Technology, Tata Sons Ltd.; Saveetha Eng College.
Key Jurisdictions	CN, US, WO, EP	US, EP, CA, CN	KR, US, CN,, EP	EP, US, CN, CA	IN, WO, US

Notes:

1. *INPADOC families are considered for this report - An INPADOC patent family encompasses all patent documents that share a priority relationship, either directly or indirectly (via a third document).*
2. *Expanded dataset is the sum of granted patents, pending applications and utility models.*

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Technology Fragmentations

Module B— Use

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Technology Taxonomy Fragmentations (1/2)

The below representation describes the distribution of patent assets across taxonomy nodes.

Use

Industrial

Treatment Techniques

- **Boiler Feedwater Treatment** (76 | 67)
- **Cooling Water Treatment**
  - Filtration (108 | 34)
  - Clarification (16 | 16)
  - Corrosion and Scale Control Inhibitors (93 | 77)
  - pH Adjustment (19 | 9)
  - Biocides & Algaecides (35 | 7)
  - Others (125 | 57)
- **Industrial Process Water Treatment**
  - Ultra-Pure Water (UPW) Treatment (8 | 8)
  - Deionization /Demineralization/Ion Exchange (17 | 13)
  - Membrane Filtration (48 | 26)
  - Activated Carbon Filtration (113 | 17)
  - UV and Ozone disinfection (100 | 9)
  - Others (161 | 60)

Infrastructure Components

- Smart & Automated Control Valves/Dampers/Flow meters (1742 | 930)
- Remote Operated Components (1641 | 830)
- Corrosion-resistant & High-durability Components (1023 | 798)

Water Management/Analytics

- Water Usage Monitoring (1118 | 619)
- Removing Water from Other Industrial Products/Processes (13 | 7)
- Smart Industrial Water Management (5 | 5)
- Fluidic Analysis (39 | 29)

Agriculture

Treatment Techniques

- Physical Treatment Techniques (60 | 45)
- Chemical Treatment Techniques (126 | 51)
- Biological Treatment Techniques (92 | 18)
- Others (346 | 224)

Infrastructure Components

- Wireless Valve and Pump Automation (156 | 129)
- IoT-based Soil Sensors (39 | 37)
- Solar-powered Pumping System (121 | 101)

Water Management

- AI and Machine Learning for Water Allocation (135 | 104)
- Cloud-based Irrigation Monitoring (56 | 50)
- IoT-based Smart Irrigation (219 | 200)
- Climate-based Irrigation Adjustment (235 | 154)
- Irrigation Leak Detection (51 | 42)
- **Water Conservation Techniques**
  - Drip Irrigation & Micro Irrigation (903 | 809)
  - Mulching & Soil Moisture Retention (30 | 30)
  - Generic Water Conservation (5421 | 5403)

Note: Numbers in bracket (X | Y) represents (# global active expanded set | # global active patent families)

Link to Taxonomy Definitions

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Technology Taxonomy Fragmentations (2/2)

The below representation describes the distribution of patent assets across taxonomy nodes.

Use

Aquaculture

Treatment Techniques

- Ultraviolet (UV) Light (183 | 167)
- Mechanical Filtration (262 | 204)
- Sedimentation (228 | 226)
- Nitrification (92 | 47)
- Recirculating Aquaculture System (RAS) (560 | 399)
- Biological Process (108 | 105)
- Others (453 | 405)

Infrastructure Components

- IoT-enabled Sensors (175 | 171)
- Floating and Submersible Water Treatment Units (63 | 44)

Water Management

- Aeration Systems (1281 | 1217)
- pH & Salinity Control (266 | 225)
- Nutrient Management (74 | 40)

Potable

Treatment Techniques

- Membrane Filtration (1037 | 768)
- Electro-Coagulation/Oxidation (39 | 33)
- UV Disinfection (506 | 445)
- Chemical Treatment (1161 | 803)
- Biological Treatment (89 | 76)
- Others (3553 | 2467)

Infrastructure Components

- Smart Meters & Flow Regulators (38 | 36)
- Smart Distribution/Pipelines (78 | 77)

Water Management

- Mobile Application for Water Monitoring and Control (91 | 85)
- Smart Water Leak Detection & Management (183 | 157)
- Water Demand Prediction Systems (159 | 134)
- Recreational Water Treatment (484 | 273)

Link to Taxonomy Definitions

Note: Numbers in bracket (X | Y) represents (# global active expanded set | # global active patent families)

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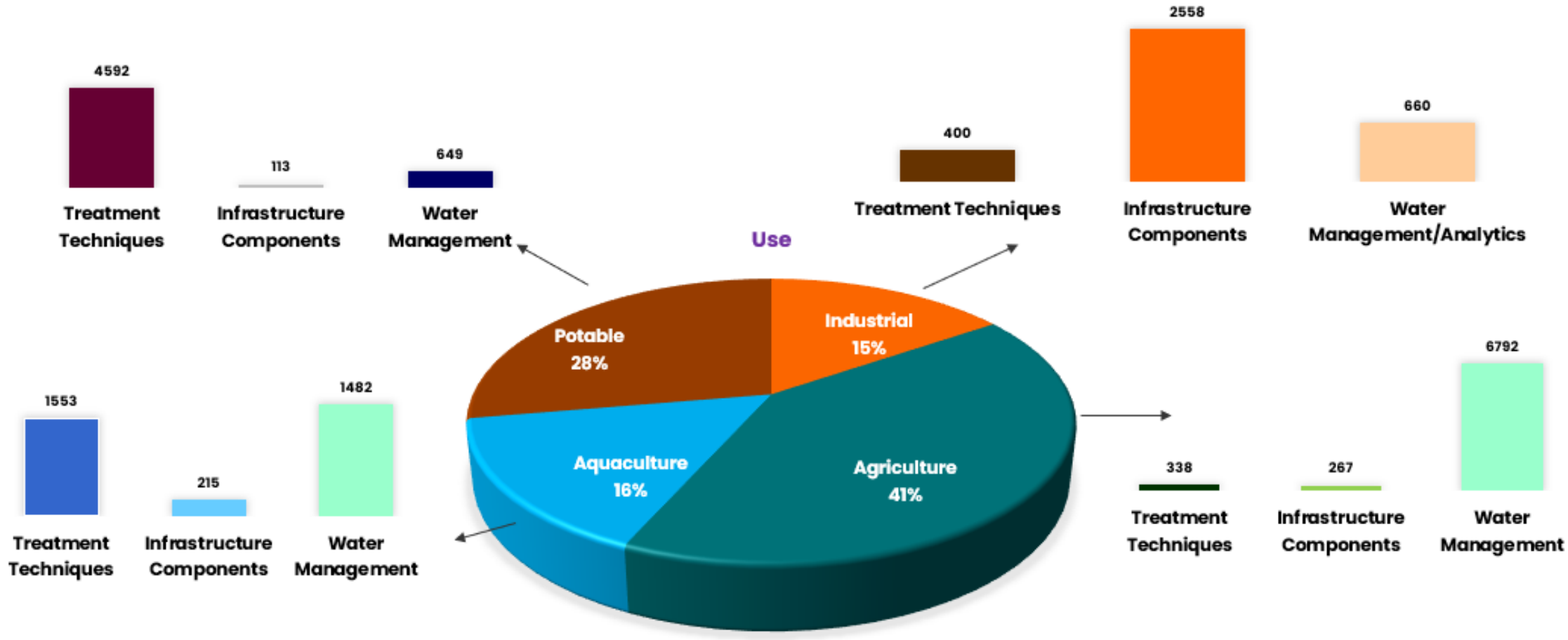
Technology Fragmentations – Global

 # Global patent families



- The pie chart shows patent distribution among tier-1 categories. Further, the corresponding column graphs show patent distribution in respective tier-2 categories.
- Top countries for most of the tier-1 categories are China, Korea, the United States, and Europe.
- Water Management (specifically, Water Conservation Techniques) in Agriculture, Treatment techniques in Potable, Water Management (specifically, Aeration Systems) in Aquaculture, and Infrastructure Components in Industrial are top categories with the maximum patent filings.

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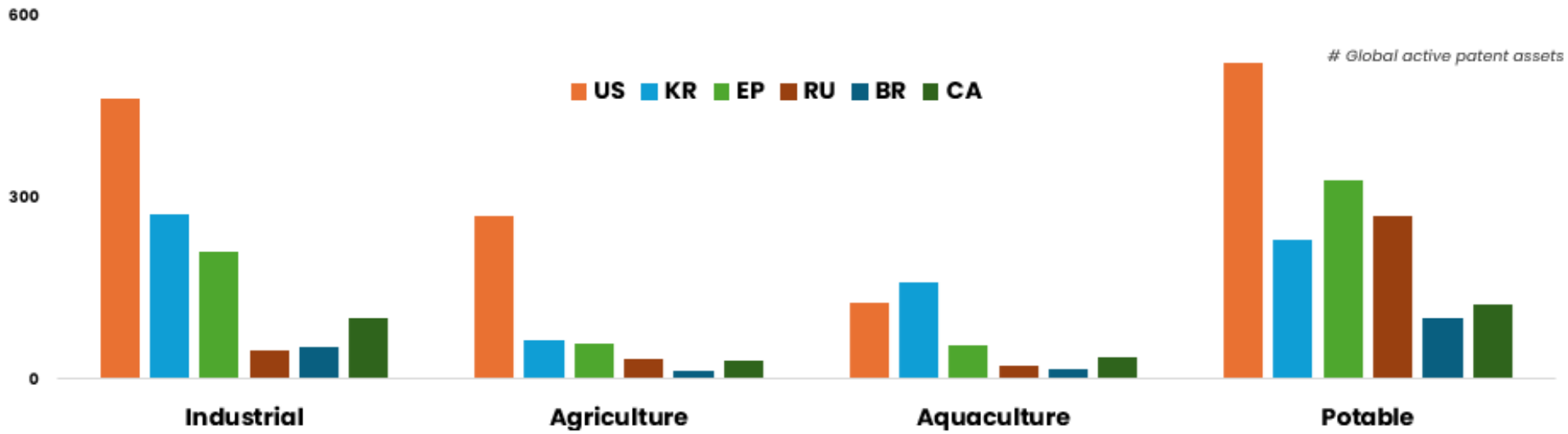
Patent Distribution by Tier-1 Categories in Key Jurisdictions (Excluding China)



Key Assignees			
Industrial	**Agriculture**	**Aquaculture**	**Potable**
Crystal Lagoons Curacao BV (171) Octopus Energy Heating Ltd.(151) Ecolab Inc. (109) Deka Products LP (78) LG Electronics Inc. (59)	Neozyme Int Inc. (55) Xylem Inc. (37) Valmont Industries Inc. (22) S.P.C.M. SA (Aka Snf Floerger) (21) Rain Bird Corporation (20) Ecovap Inc. (19)	NCH Corp. (36) Royal Caridea LLC (17) Technion - Israel Institute of Technology (14) Benchmark Genetics Iceland HF (14) Photon Eco Capture Pty Ltd.(13) Korea Advanced Institute for Science and Technology (13)	C.J. Cheil Jedang Corp. (139) Ecolab Inc. (85) Crystal Lagoons Curacao BV (64) Xylem Inc. (41)

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Patent Distribution in Key Countries (Excluding China)

Tier 1 Categories	Tier 2 Categories	US	KR	EP	IN	CA
Industrial	Treatment Techniques	65	24	40	11	16
	Infrastructure Components	142	44	66	17	26
	Water Management *	28	17	12	16	4
Agriculture	Treatment Techniques **	107	20	34	11	18
	Infrastructure Components	15	11	6	6	3
	Water Management	147	33	18	65	9
Aquaculture	Treatment Techniques ***	83	74	40	19	26
	Infrastructure Components *	6	32	1	40	2
	Water Management	47	63	17	18	9
Potable	Treatment Techniques **	446	198	276	165	107
	Infrastructure Components *	3	2	0	33	1
	Water Management	73	32	54	29	16

*** Canada is among the top five jurisdictions globally in these areas.

** These are the top areas where Canada has filed the maximum number of patents, reflecting significant focus and investment.

* Areas with a lower number of patent filings across all jurisdictions, indicating limited global interest.

 # Global active patent assets

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Canadian Insights

Module B— Use

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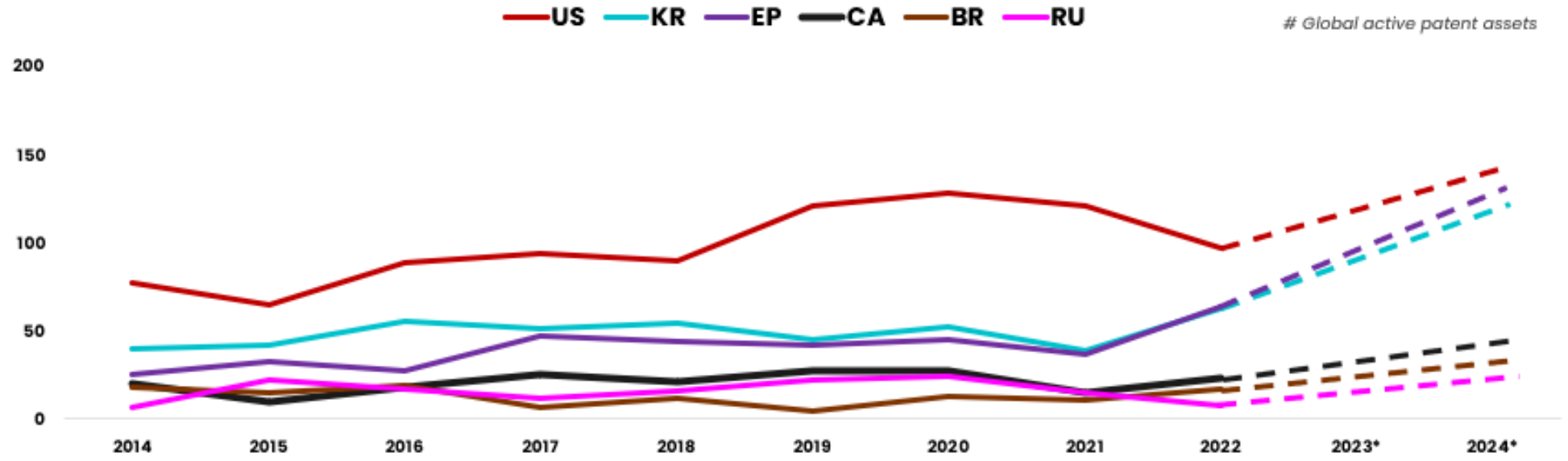
Canadian vs. International Filings – Excluding China



- The above graph shows the patent filing trend in Canada along with other key jurisdictions (excluding China).
- Canada stands in 8th position in overall filing, following China, the United States, Korea, Europe, India, Russia, and Japan.
- The top three countries having the maximum freshwater resources are Brazil, Russia, and Canada. Russia has more filings, and Brazil has fewer filings as compared to Canada.

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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Benchmarking based on Origin Country of Assignees (Key Countries by Freshwater Resources)

The table below shows patent distribution by the assignee's country of origin, indicating where the assignees are based. For example, assignees based out of Russia have filed 285 patent families. The countries are chosen based on the highest freshwater resources (i.e., countries having maximum freshwater resources).

Global Patent Insights/Country	Brazil Assignees	Russian Assignees	US Assignees	Chinese Assignees	Canadian Assignees
Patent Families	45	285	454	14,116	33
Expanded Dataset	46	291	2,080	14,343	94
Granted Patents	7	238	1,499	3,498	67
Pending Applications	29	8	571	1,766	27
Utility Models	10	45	10	9,079	0
Key Assignees	Univ Parana Tecnologica Federal, Univ Federal Campina Grande, Sabara Quimicos E Ingredientes SA	Belkina Natal'ja Viktorovna, Kvasenkov Oleg Ivanovich, Shajdullova Ol'ga Vladimirovna, Federal State Budgetary Educational	Ecolab Inc., Deka Products LP, Xylem Inc., Neozyme Int Inc.	State Grid Corp. of China, Chinese Academy of Science, Cafs Yellow Sea Fisheries Res Inst, China Water Resources & Hydropower Res	Armstrong Ltd. S A, Omachron Intellectual Property, 7142871 Canada Inc., SPI Technology Ltd.
Key Jurisdictions	BR, UY, AR	RU, EP, WO, CN	US, EP, CA, CN	CN, US, WO, EP	US, CA, EP

Notes:

1. *INPADOC families are considered for this report - An INPADOC patent family encompasses all patent documents that share a priority relationship, either directly or indirectly (via a third document).*
2. *Expanded dataset is the sum of granted patents, pending applications and utility models.*

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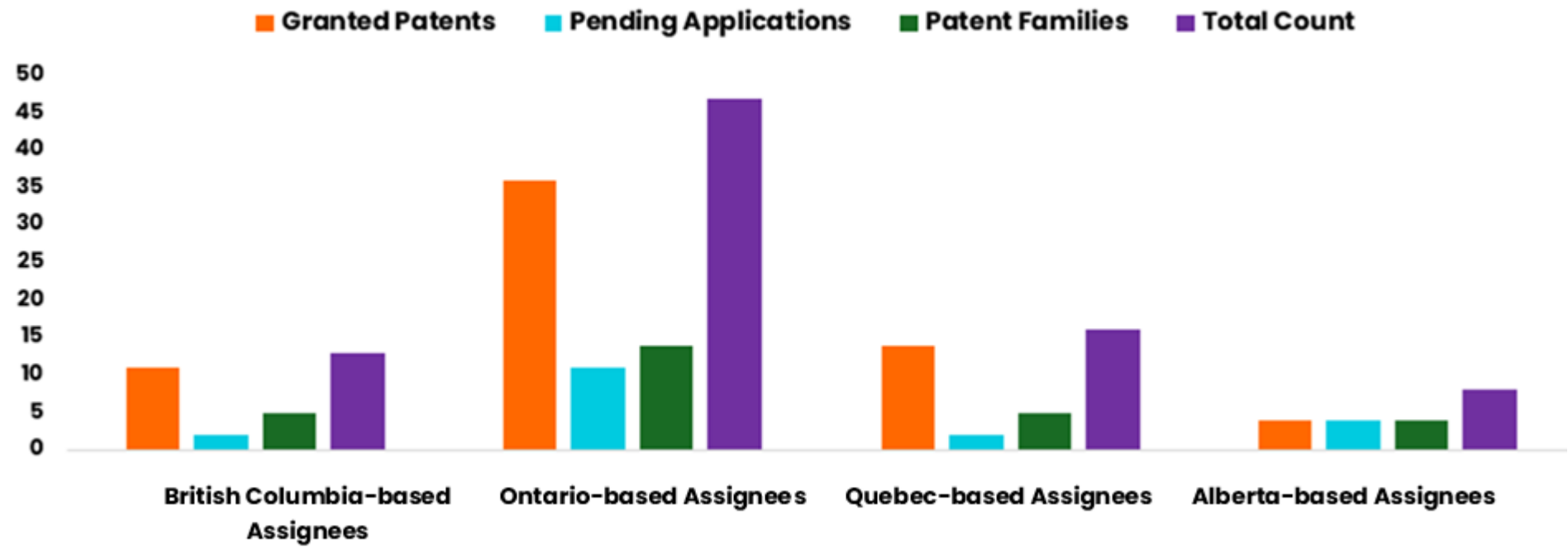
BC vs Other Provinces



- Canada's water sector companies seem to be mainly present in four provinces: British Columbia, Alberta, Ontario, and Quebec. Ontario-based companies seem to have filed more patents as compared to the other Canadian provinces.
- No significant patent filings were observed for British Columbia, Quebec, and Alberta-based companies.
- Ontario-based companies have the most filings in the treatment of water for agricultural and industrial use.

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Patent Insights

Module C— Outflows

FORESIGHT

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Filing and Geography Trends

Module C— Outflows

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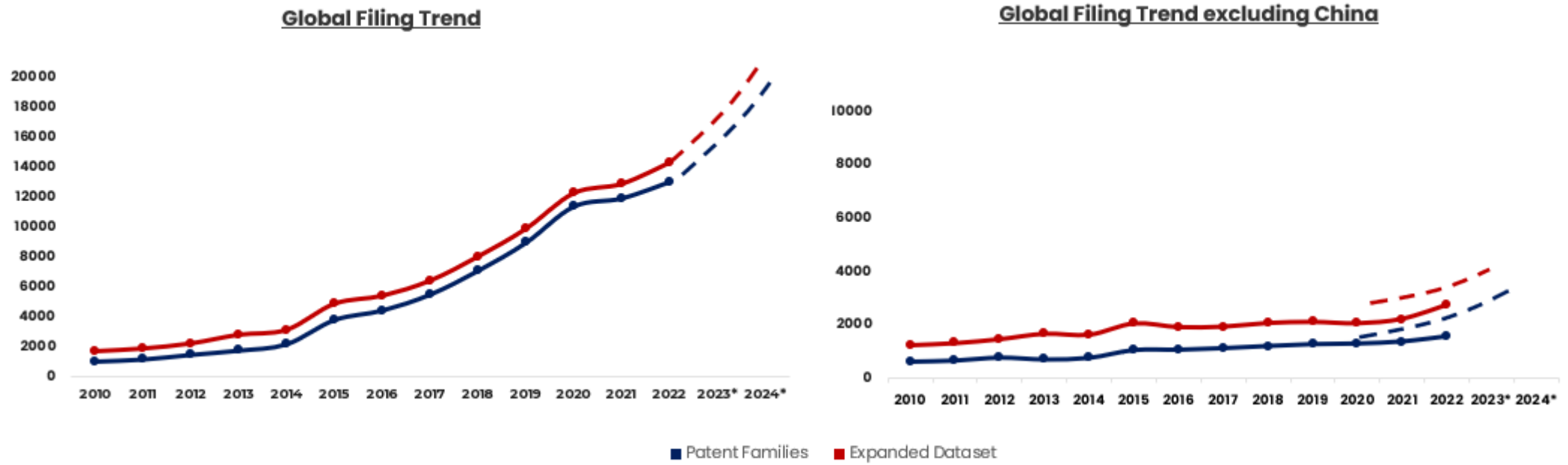
Overall Filing Trend



- The above graphs show a comparison between the global filing trend and the global filing trend excluding China, as China holds ~73% of the total patent assets.
- Including China, the total number of active patent families is ~101K, and the total active patent assets are ~116K. After excluding China, the number of active patent families is reduced to ~18K, and the total active patent assets are reduced to ~31K.
- More than 60% of the total patent assets have a remaining life above 5 years.

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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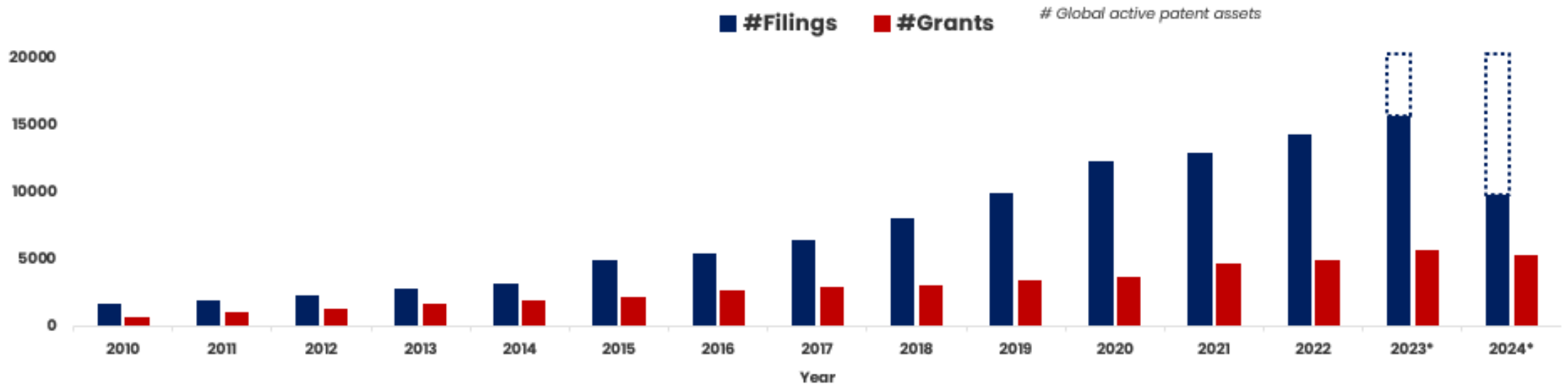
Filing Trend vs. Grant Trend



- The average number of filings per year for the last 5 years is ~13K, whereas the average number of grants per year for the last 5 years is ~4.8K (~37% of average filings per year).
- **Canada has ~456 pending applications and ~568 granted patents in this domain.**
- Companies (excluding China-based assignees) with the highest number of grants are Veolia Environnement (391) > Ecolab Inc. (324) > Xylem Inc. (299) > Kurita Water Industries Ltd. (290) > Suez Group (241).
- Jurisdictions with the highest number of grants are China (25,704) > Korea (4,588) > United States (3,171) > Japan (2,685) > Europe (1,505). Brazil and Russia have around ~229 and ~767 granted patents, respectively.

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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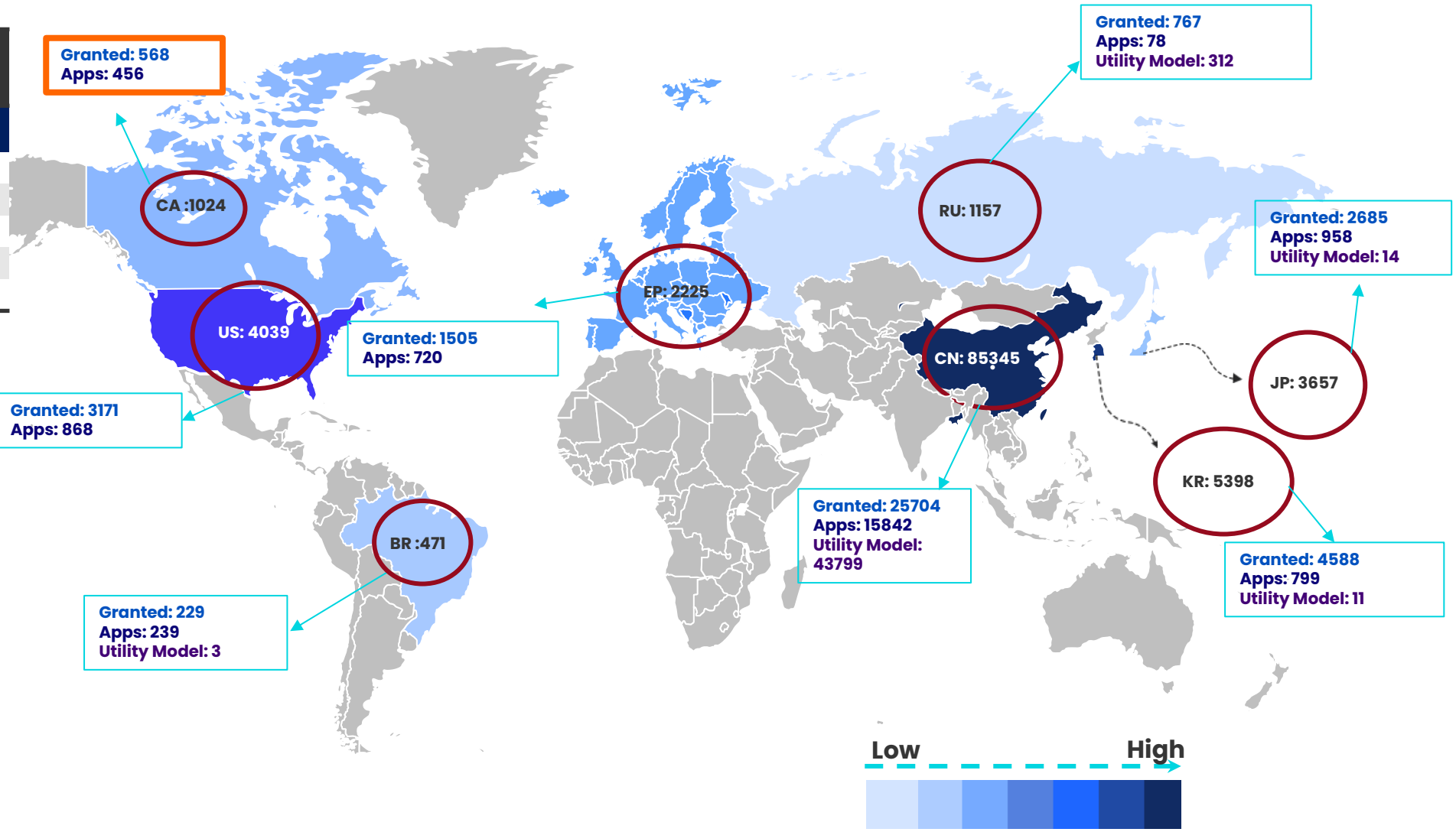
Top Jurisdictions

Top Countries by Patent Distribution	
Country	**Patent #**
China	85,345
Korea	5,398
United States	4,039
Japan	3,657
Europe	2,225

Top Countries with Freshwater Resources	
Country	**Patent #**
Brazil	471
Russia	1,157
Canada	**1,024**
United States	4,039
China	85,345

 # Global active patent assets



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Assignee-based Trends

Module C— Outflows

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Key Assignees in Top Countries by Patent Distribution

The table below shows patent distribution among assignees in the below countries. The countries are chosen based on the highest patent counts (i.e., the top countries having the highest number of patent assets).

CN	KR	US	JP	EP
China Petrochemical Corp. D/B/A Sinopec Group (F/K/A China Petroleum & Chemical Corp. Inc. D/B/A Sinopec) (1213)	Korea Institute of Industrial Technology (105)	Xylem Inc. (134)	Kurita Water Industries Ltd. (199)	Veolia Environnement (59)
Chinese Academy of Science (900)	Korea Advanced Institute for Science And Technology (65)	Immunolight LLC (90)	ACCO Brands (174)	Xylem Inc. (50)
State Grid Corp of China (638)	Seoul National University (62)	Veolia Environnement (65)	Metawater Co. Ltd. (127)	Suez Group (F/K/A Suez Environnemental Suez SA) (49)
China MCC17 Group Co. Ltd. (551)	LG Chem Ltd. (55)	Ecolab Inc. (59)	Tosoh Corp. Ltd. (123)	Kemira Oyj (43)
Nanjing University (503)	Korea Institute of Science and Technology (52)	Halliburton Co. (Holding) (57)	Mitsubishi Chemical Group Co. Ltd (F/K/A Mitsubishi Chemical Holdings Corp.) (91)	Ecolab Inc. (30)
Xi'an Thermal Power Res Inst Co. Ltd. (394)	POSCO Holdings Inc. (F/K/A POS Co. Ltd.) (51)	Duke University (54)	Mitsubishi Heavy Industries Ltd. (85)	
Tongji University (371)	Korea Atomic Energy Research Institute (50)	Suez Group (F/K/A Suez Environnemental Suez SA) (38)	Kubota Corp. (81)	
Univ Beijing Technology (342)	Samsung Electronics Co. Ltd. (47)			
Sinochem Holding (Formerly Sinochem Corp) (324)	Hyundai Motor Co. (46)			
Harbin Institute of Technology (309)	Korea Water Resources Corp. (40)			
Tsinghua University (284)				
South China University of Technology (261)				

Sectors
Oil and Gas Companies
Energy/Power Sector Companies
Water Process related Companies
Water Equipment/Machinery/Chemical Manufacturing Companies
Tech Companies
Universities/Institutes

 # Global active patent assets

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Key Assignees in Top Countries by Freshwater Resources

The table below shows patent distribution among assignees in the below countries. The countries are chosen based on the highest freshwater resources (i.e., countries having maximum freshwater resources).

BR	RU	US	CN	CA
Ecolab Inc. (15)	Univ Volg Tech (39)	Xylem Inc. (134)	China Petrochemical Corp. D/B/A Sinopec Group (F/K/A China Petroleum & Chemical Corp. Inc. D/B/A Sinopec) (1213)	Xylem Inc. (57)
Xyleco Inc. (13)	Federal State Budgetary Educational (34)	Immunolight LLC (90)	Chinese Academy of Science (900)	Veolia Environnement (42)
Suez Group (F/K/A Suez Environnemental Suez SA) (13)	Gazprom Stock Co. (16)	Veolia Environnement (65)	State Grid Corp. of China (638)	Kemira Oyj (41)
Kemira Oyj (13)	Voronezhpenosteklo LLC (14)	Ecolab Inc. (59)	China MCC17 Group Co. Ltd. (551)	Ecolab Inc. (21)
Veolia Environnement (12)		Halliburton Co. (Holding) (57)	Nanjing University (503)	Anaergia Inc. (18)
Albany International Corp. (10)		Duke University (54)	Xi'an Thermal Power Res Inst Co. Ltd. (394)	Suez Group (F/K/A Suez Environnemental Suez SA) (16)
Solenis LLC (8)		Suez Group (F/K/A Suez Environnemental Suez SA) (38)	Tongji University (371)	OVIVO Inc. (14)
			Univ Beijing Technology (342)	Axine Water Technologies Inc. (12)
			Sinochem Holding (Formerly Sinochem Corp) (324)	
			Harbin Institute of Technology (309)	
			Tsinghua University (284)	
			South China University of Technology (261)	

Sectors
Oil and Gas Companies
Energy/Power Sector Companies
Water Process related Companies
Water Equipment/Machinery/Chemical Manufacturing Companies
Tech Companies
Universities/Institutes

 # Global active patent assets

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Benchmarking based on Origin Country of Assignees (Key Countries by Patent Distribution)

The table below shows patent distribution by the assignee's country of origin, indicating where the assignees are based. For example, assignees based out of China have filed 83,716 patent families. The countries are chosen based on the highest patent counts (i.e., the top countries having the highest number of patent assets).

Global Patent Insights/Country	Chinese Assignees	Korean Assignees	US Assignees	Japanese Assignees
Patent Families	83,716	3,623	1,476	1,379
Expanded Dataset	85,230	4,210	5,170	2,723
Granted Patents	25,458	3,417	3,466	2,009
Pending Applications	15,989	777	1,698	706
Utility Models	43,783	16	6	8
Key Assignees	China Petrochemical Corp. D/B/A Sinopec Group, Chinese Academy of Science, State Grid Corp. of China, China MCC17 Group Co. Ltd., Nanjing University, Tongji University	LG Chem Ltd., Korea Institute of Industrial Technology, BKT Co. Ltd., Samsung Electronics Co. Ltd., Korea Advanced Institute for Science and Technology	Xylem Inc., Ecolab Inc., Immunolight LLC, Halliburton Co. (Holding), Tata Motor Ltd.	Kurita Water Industries Ltd., Mitsubishi Heavy Industries Ltd., Metawater Co. Ltd, Tosoh Corp. Ltd., Hitachi Ltd.
Key Jurisdictions	CN, US, WO, JP	KR, US, CN, WO	US, EP, CA, CN	JP, CN, US, KR

Notes:

1. *INPADOC families are considered for this report - An INPADOC patent family encompasses all patent documents that share a priority relationship, either directly or indirectly (via a third document).*
2. *Expanded dataset is the sum of granted patents, pending applications and utility models.*

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Technology Fragmentations

Module C — Outflows

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Technology Taxonomy Fragmentations (1/2)

The below representation describes the distribution of patent assets across taxonomy nodes.

Outflows

Wastewater Treatment and Reuse

Treatments

Physical Treatment

- Screening (2941 | 2283)
- Sedimentation (20415 | 18793)
- Skimming (254 | 157)
- Flotation (641 | 448)
- Adsorption (15884 | 13151)
- Thermal Treatment (3389 | 2720)
- Membrane-based Technology (10660 | 9054)
- Disinfection through UV Light (1447 | 1369)
- Others (101 | 88)

Chemical Treatment

- Clarification (11641 | 10276)
- Ion Exchange (3163 | 2138)
- Photolysis (140 | 137)
- Ozonation (1577 | 1395)
- Photocatalysis (2267 | 1962)
- Neutralization (3453 | 3075)
- Precipitation (1721 | 1643)
- Fenton and Photo-Fenton Process (2493 | 2452)
- Electrochemical Treatment (1852 | 1534)
- Others (2141 | 1940)

Biological Treatment

- Biofilters (454 | 389)
- Biofilm Reactors (517 | 307)
- Biological Nitrification-Denitrification (6603 | 5687)
- Bioremediation (219 | 132)
- Aerobic/Anaerobic And Facultative Treatment (3790 | 3136)
- Biosorption (50 | 40)
- Membrane Bioreactor (MBR) (1731 | 1423)
- Microbial Fuel Cells (346 | 288)
- Constructed Wetland (526 | 500)
- Others (2179 | 1793)

Other Treatments

- Zero Liquid Discharge (ZLD) (84 | 50)
- Others (29789 | 27466)

Wastewater Types

- Greywater (588 | 445)
- Industrial Wastewater (2134 | 1636)
- Agricultural Wastewater (80 | 46)
- Blackwater (454 | 398)
- Mining Wastewater (110 | 71)

Reuse Applications

- Agricultural Irrigation (584 | 355)
- Potable Water Use (638 | 290)
- Industrial Processes (943 | 730)
- Groundwater Recharge (78 | 58)
- Residential Use (687 | 484)

Note: Numbers in bracket (X | Y) represents (# global active expanded set | # global active patent families)

Link to Taxonomy Definitions

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Technology Taxonomy Fragmentations (2/2)

The below representation describes the distribution of patent assets across taxonomy nodes.

Outflows

Sludge management

Treatment

Thickening (1300 | 1107)

Stabilization & Pathogen Reduction

- Biological Treatment
  - Anaerobic Digestion (2108 | 1586)
  - Aerobic Digestion (652 | 532)
  - Composting (81 | 81)
- Chemical Treatment (341 | 291)
- Thermal Treatment (4078 | 3597)

Dewatering

- Belt Filter Press (233 | 186)
- Centrifugation (872 | 765)
- Vacuum Filtration (52 | 50)
- Automatic Filter Press (5 | 5)
- Electro-Dewatering (103 | 101)
- Hydrothermal Carbonization (20 | 9)
- Generic (7538 | 6743)

Applications

- Agricultural (as fertilizer) (529 | 421)
- Energy Generation (145 | 101)
- Building and Construction Material (227 | 165)

Wastewater Management/Monitoring

Wastewater Testing, Forecasting, and Modelling

- Peak Loads and Anomalies Related to Wastewater Transmission (275 | 264)
- Determine Water Quality (195 | 150)
- Odor Control (251 | 198)
- Meeting Discharge Compliance Standards (2203 | 2042)

Wastewater Infrastructure Inspections

- Leak Detection (10527 | 8152)
- Deformation And Corrosion Detection (24 | 23)
- Blockage Detection (363 | 329)
- Predictive Maintenance for Sewer Infrastructure (63 | 59)
- Others (162 | 148)

Resource Recovery

- Nutrient Recovery (574 | 476)
- Metals/Minerals Recovery (915 | 789)
- Heat Recovery (1305 | 1115)
- Biogas Recovery (721 | 381)
- Clean Water Recovery (312 | 153)

Link to Taxonomy Definitions

Note: Numbers in bracket (X | Y) represents (# global active expanded set | # global active patent families)

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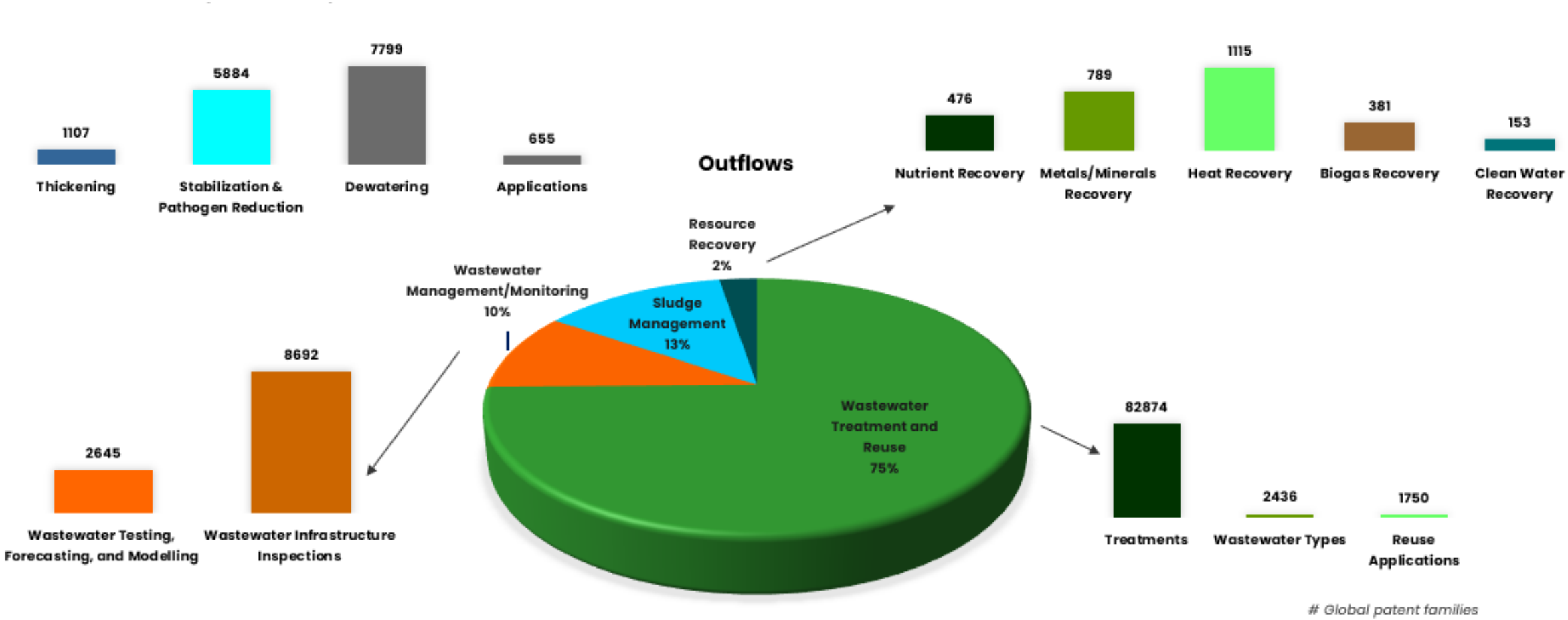
Technology Fragmentations - Global



- The pie chart shows patent distribution among tier-1 categories. Further, the corresponding column graphs show patent distribution in respective tier-2 categories.
- Top countries for most of the tier-1 categories are China, Korea, and the United States.
- Some of the top categories are Wastewater Treatments—specifically, Physical Treatment Methods, Water Infrastructure Inspections, and Sludge Dewatering techniques.

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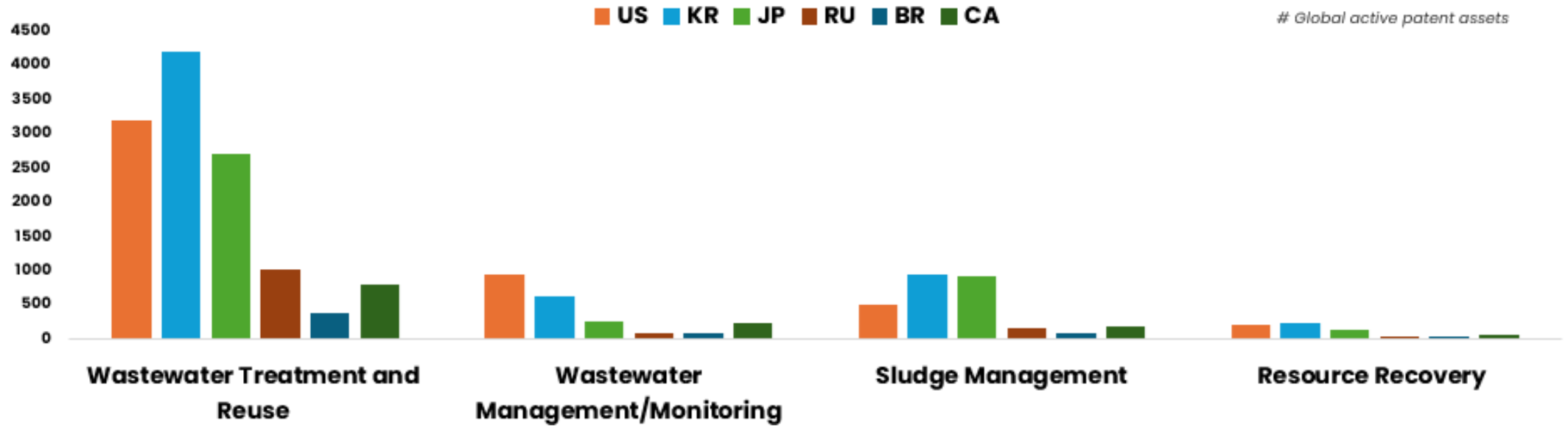
Patent Distribution by Tier-1 Categories in Key Jurisdictions (Excluding China)



Key Assignees			
Wastewater Treatment and Reuse	**Wastewater Management/Monitoring**	**Sludge Management**	**Resource Recovery**
Xylem Inc. (429) Veolia Environnement (372) Kurita Water Industries Ltd.(298) Suez Group (F/K/A Suez Environnemental Suez SA) (268) Ecolab Inc. (252)	Ecolab Inc. (165) Veolia Environnement (141) Kemira Oyj (123) Xylem Inc. (105) Dexerials Corp. (39) Kurita Water Industries Ltd. (37)	METAWATER Co. Ltd. (126) Albany International Corp. (113) Veolia Environnement (102) Kemira Oyj (101) Lanzatech Global Inc. (F/K/A Lanzatech NZ) (77) Suez Group (76)	Xyleco Inc. (134) Neozyme Int Inc. (55) Bill & Melinda Gates Found(45) Gruppo De Nora (35)

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Patent Distribution in Key Countries (Excluding China)

Tier 1 Categories	Tier 2 Categories	KR	US	JP	EP	CA
Wastewater Management/Monitoring	Wastewater Testing, Forecasting, and Modelling	180	137	63	37	21
	Wastewater Infrastructure Inspections ***	473	1024	276	509	270
Sludge Management	Thickening ***	222	69	170	37	20
	Stabilization & Pathogen Reduction ***	482	318	461	197	107
	Dewatering ***	321	275	388	179	116
	Applications	35	13	30	7	3
Resource Recovery	Nutrient Recovery ***	15	42	33	31	15
	Metals/Minerals Recovery	61	28	39	16	11
	Heat Recovery ***	75	56	30	74	22
	Biogas Recovery	88	115	66	61	33
	Clean Water Recovery ***	14	40	16	20	14
Wastewater Treatment and Reuse	Physical Treatment **	1613	1376	971	784	329
	Chemical Treatment **	1021	856	606	487	226
	Biological Treatment **	838	757	712	386	185
	Other Treatment Methods	1532	756	812	369	185
	Wastewater Types	113	221	71	134	47
	Reuse Applications	119	139	27	53	39

 # Global active patent assets

*** Canada is among the top five jurisdictions globally in these areas.

** These are the top areas where Canada has filed the maximum number of patents, reflecting significant focus and investment. **However, Canada is not among the top five jurisdictions globally in these areas.**

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Canadian Insights

Module C — Outflows

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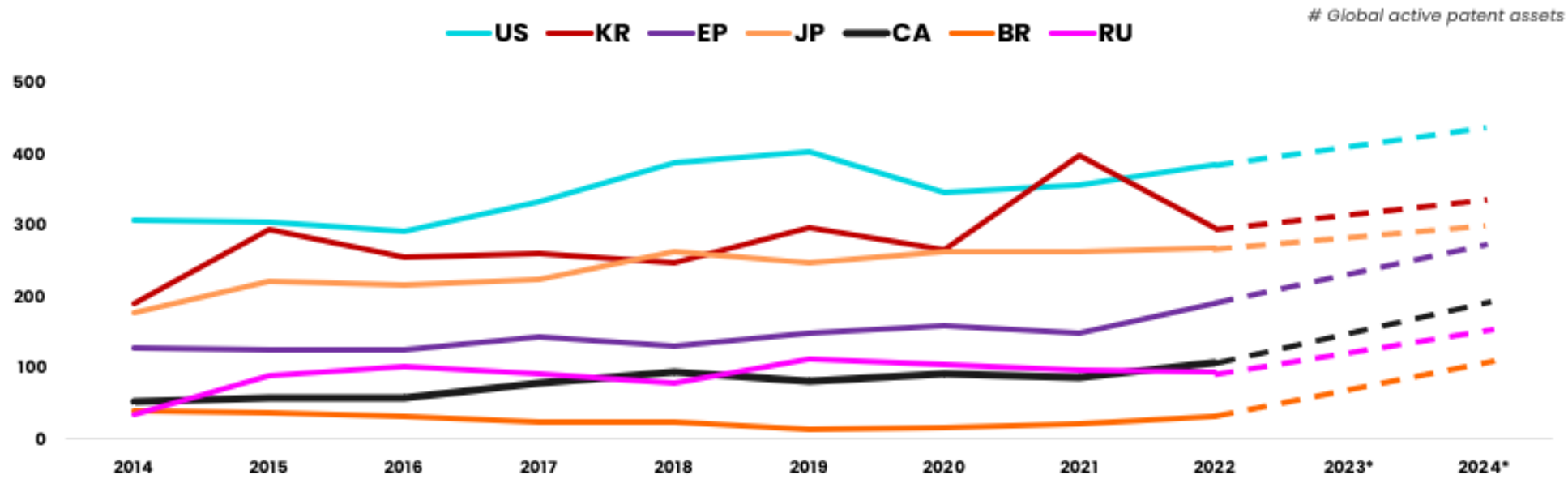
Canadian vs. International Filings – Excluding China



- The above graph shows the patent filing trend in Canada along with other key jurisdictions (excluding China).
- Over the past five years (considering 2018-2022), the average number of filings in Canada has been approximately 92. In contrast, Korea and the United States have average filings of around 376 and 314, respectively, during the same period.
- The top three countries having the maximum freshwater resources are Brazil, Russia, and Canada. Russia has more filings, and Brazil has fewer filings as compared to Canada.

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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Benchmarking based on Origin Country of Assignees (Key Countries by Freshwater Resources)

The table below shows patent distribution by the assignee's country of origin, indicating where the assignees are based. For example, assignees based out of Russia have filed 849 patent families. The countries are chosen based on the highest freshwater resources (i.e., countries having maximum freshwater resources).

Global Patent Insights/Country	Brazil Assignees	Russian Assignees	US Assignees	Chinese Assignees	Canadian Assignees
Patent Families	72	849	1,476	83,716	298
Expanded Dataset	86	889	5,170	85,230	756
Granted Patents	31	558	3,466	25,458	481
Pending Applications	52	64	1,698	15,989	275
Utility Models	3	267	6	43,783	0
Key Assignees	Universidade Federal De Minas Gerais, Universidade Estadual De Campinas, Univ Sao Paulo USP, Sparen Consultoria Ltda-me, Sparen Consultoria Ltda	Federal State Budgetary Educational, Kochetov Oleg Savel'evich, Univ Volg Tech, Gazprom Stock Co, Voronezhpenosteklo LLC	Xylem Inc., Ecolab Inc., Immunolight LLC, Halliburton Co. (Holding), Tata Motor Ltd.	China Petrochemical Corp. D/B/A Sinopec Group, Chinese Academy of Science, State Grid Corp. of China, China Mcc17 Group Co. Ltd., Nanjing University, Tongji University	Axine Water Technologies Inc., Anaergia Inc., Ovivo Inc., Queen's University of Kingston, Veolia Environnement
Key Jurisdictions	BR, US, EP, CN	RU, CN, EP, WO	US, EP, CA, CN	CN, US, WO, JP	US, CA, EP, AU

Notes:

1. *INPADOC families are considered for this report - An INPADOC patent family encompasses all patent documents that share a priority relationship, either directly or indirectly (via a third document).*
2. *Expanded dataset is the sum of granted patents, pending applications and utility models.*

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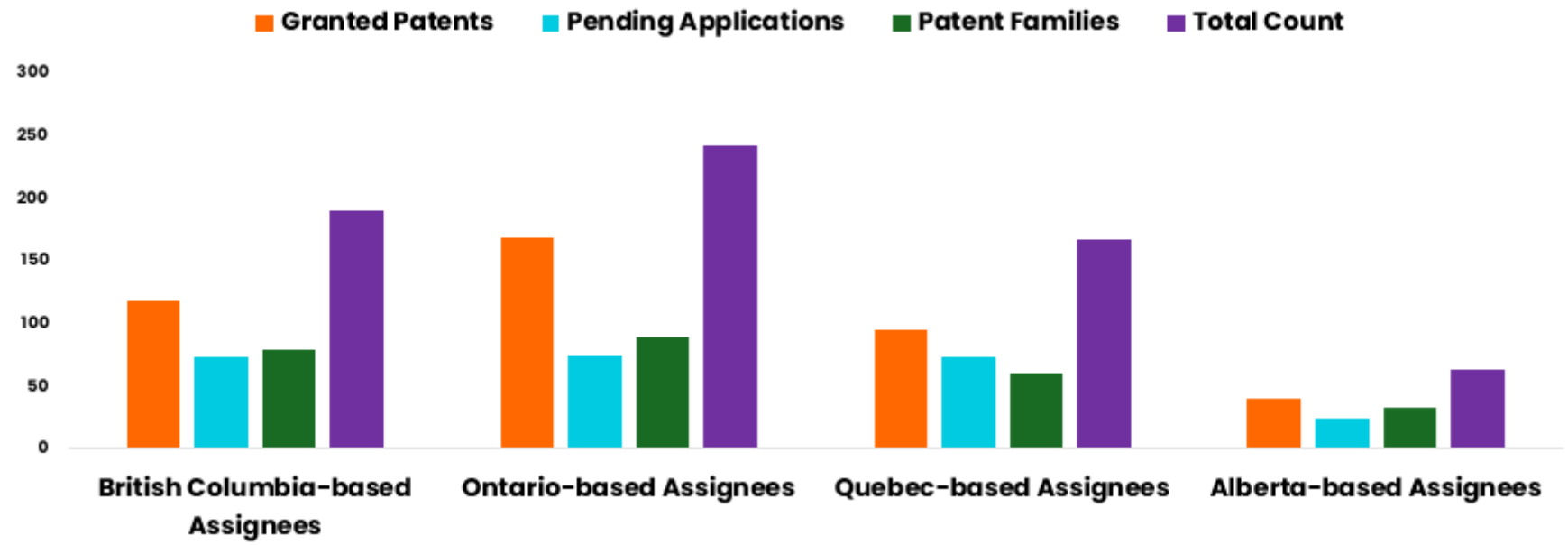
BC vs Other Provinces



- Canada's water sector companies seem to be mainly present in four provinces: British Columbia, Alberta, Ontario, and Quebec. Alberta-based companies seem to have filed fewer patents compared to the other Canadian provinces.
- BC-based, Ontario-based, Quebec-based, and Alberta-based companies have maximum filings in wastewater treatment and reuse.
- For Ontario-based assignees, Sludge Management represents the second-highest filing category, while for other provinces, it is Wastewater Management/Monitoring.

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PATENT INSIGHTS

Module D— Environmental Water Cycle

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Filing and Geography Trends

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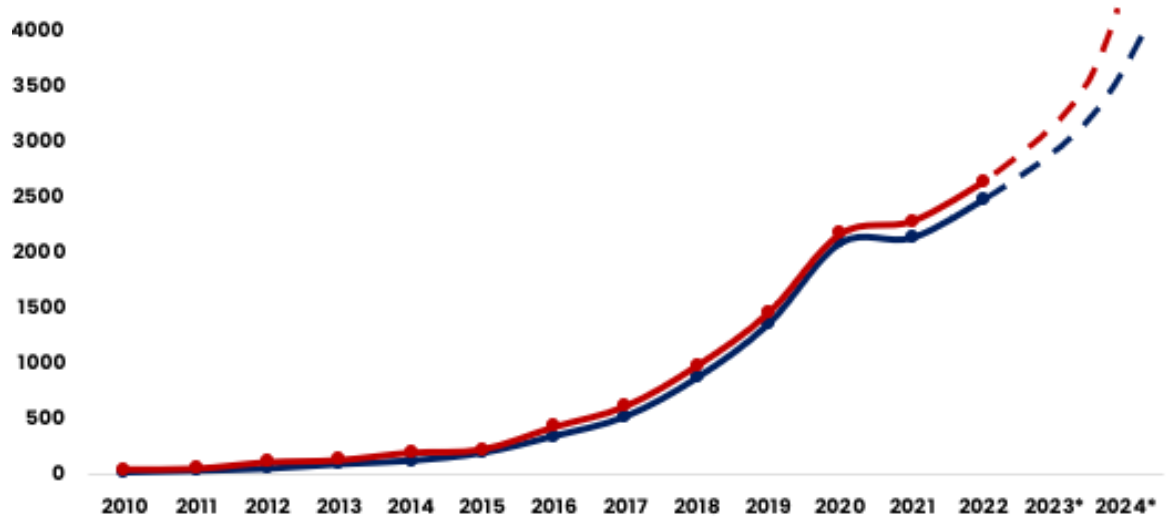
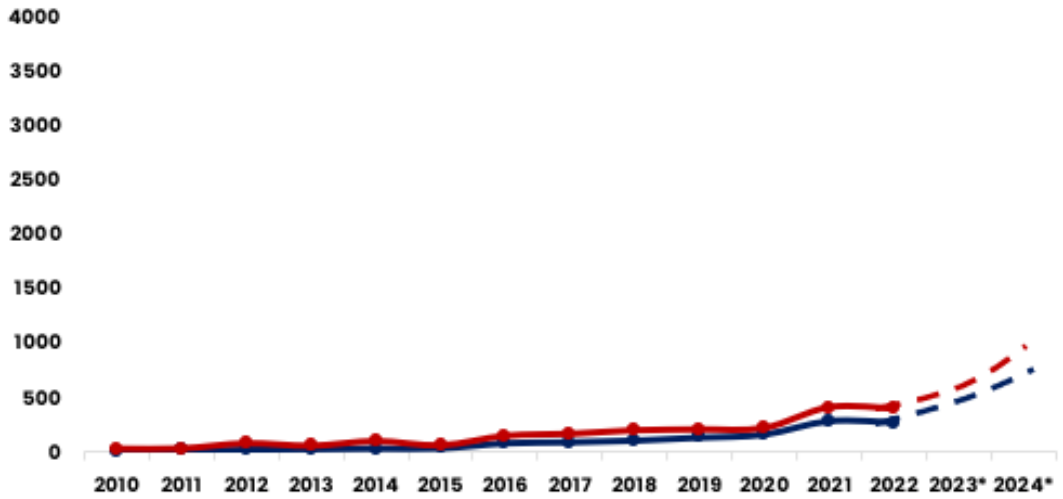
Overall Filing Trend

Global Filing Trend



Global Filing Trend excluding China



Patent Families Expanded Dataset

- The above graphs show a comparison between the global filing trend and the global filing trend excluding China, as China holds ~80% of the total patent assets.
- Including China, the total number of active patent families is ~15K, and the total active patent assets are ~17K. After excluding China, the number of active patent families is reduced to ~2K, and the total active patent assets are reduced to ~3K.
- More than 65% of the total patent assets have a remaining life above 5 years.

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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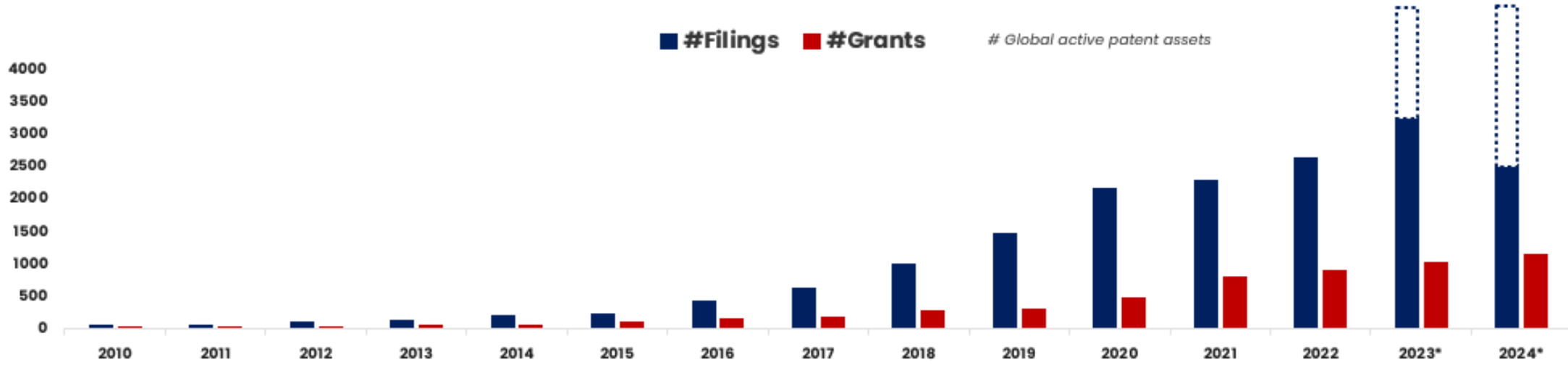
Filing Trend vs. Grant Trend



- The average number of filings per year for the last 5 years is ~2.5K, whereas the average number of grants per year for the last 5 years is ~862 (~34% of average filings per year).
- **Canada has ~45 pending applications and ~46 granted patents in this domain.**
- Companies (excluding China-based assignees) with the highest number of grants are Crystal Lagoons Curacao BV (45) > ExxonMobil Corp.(27) > Korea Institute of Industrial Technology (26).
- Jurisdictions with the highest number of grants are China (4,251) > Korea (391) > United States (363) > Japan (113) > Europe (71).

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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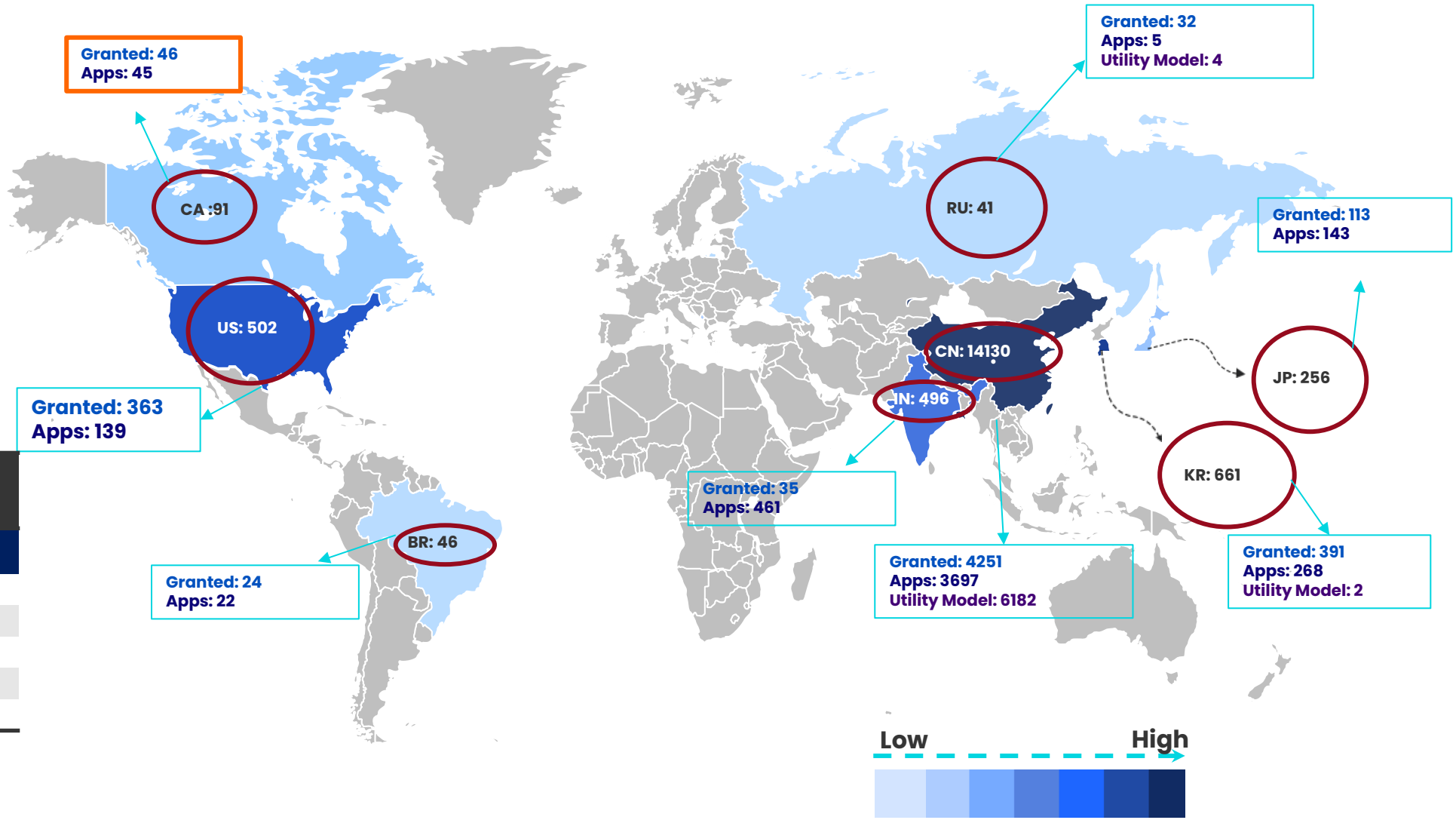
Top Jurisdictions

Top Countries by Patent Distribution	
Country	**Patent #**
China	14,130
Korea	661
United States	502
India	496
Japan	255

Top Countries with Freshwater Resources	
Country	**Patent #**
Brazil	46
Russia	41
Canada	91
United States	501
China	14,130

 # Global active patent assets



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Assignee-based Trends

Module D— Environmental Water Cycle

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Key Assignees in Top Countries by Patent Distribution

The table below shows patent distribution among assignees in the below countries. The countries are chosen based on the highest patent counts (i.e., the top countries having the highest number of patent assets).

CN	KR	US	IN	JP
Chinese Academy of Science (289)	Korea Institute of Industrial Technology (203)	Garmin Ltd. (19)	Univ Lovely Professional (17)	Nanjing Inst Environmental Sci Nat Burea (11)
State Grid Corp. of China (267)	Korea Constr Technology Inst (12)	Pentair Ltd. (11)	Univ Manipal Jaipur (9)	ACCO Brands (9)
China Petrochemical Corp. D/B/A Sinopec Group (F/K/A China Petroleum & Chemical Corp. Inc. D/B/A Sinopec) (130)	SINDAEYANG Co. Ltd. (9)	Nanjing University (9)	Saveetha Eng College (8)	Mitsubishi Heavy Industries Ltd. (8)
Nanjing Inst Environmental Sci Nat Burea (106)	Korea Institute of Geoscience & Mineral Resources (9)	Remediation Prod Inc. (8)	Univ Chandigarh (7)	Toshiba Corp. (7)
China MCC17 Group Co. Ltd. (106)	Korea Advanced Institute for Science and Technology (9)	Aquasmart Enterprises LLC (8)	Univ Reva (5)	Mitsubishi Electric Corp. (7)
Beijing Municipal Constr Group Co. Ltd. (106)	GS Eng & Constr Corp (9)	Xingmai Innovation Technology Suzhou Co. (7)		Hitachi Ltd. (7)
Nanjing University (62)	Seoul National University (7)			
Chinese Res Acad Environmental Sci (62)	Korea Institute of Science and Technology (7)			
Zhejiang University (58)	Geogrid Co. Ltd. (7)			
Yuhuan Environment Technology Co. Ltd. (58)				
China Constr Second Eng Bureau (57)				
China Water Resources & Hydropower Res (56)				
Univ Cent South (49)				

Sectors
Oil and Gas Companies
Energy/Power Sector Companies
Water Process related Companies
Water Equipment/Machinery/Chemical Manufacturing Companies
Tech Companies
Universities/Institutes

 # Global active patent assets

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Key Assignees in Top Countries by Freshwater Resources

The table below shows patent distribution among assignees in the below countries. The countries are chosen based on the highest freshwater resources (i.e., countries having maximum freshwater resources).

BR	RU	US	CN	CA
ExxonMobil Corp. (6)	Univ Kamchatka Tech (2)	Garmin Ltd. (19)	Chinese Academy of Science (289)	ExxonMobil Corp. (6)
Tevel Advanced Technologies Ltd. (4)	Gazprom Stock Co. (2)	Pentair Ltd. (11)	State Grid Corp of China (267)	IdeaCuria Inc. (5)
GO Tratch Desenvolvimentos SA (3)	ExxonMobil Corp. (2)	Nanjing University (9)	China Petrochemical Corp. D/B/A Sinopec Group (F/K/A China Petroleum & Chemical Corp. Inc. D/B/A Sinopec) (130)	Tevel Advanced Technologies Ltd. (3)
Resilience Financing Inc. (2)		Remediation Prod Inc. (8)	Nanjing Inst Environmental Sci Nat Burea (106)	William Marsh Rice University (Aka Rice University) (2)
Rag Foundation (2)		Aquasmart Enterprises LLC (8)	China MCC17 Group Co. Ltd. (106)	Resilience Financing Inc. (2)
Crystal Lagoons Curacao BV (2)		Xingmai Innovation Technology Suzhou Co. (7)	Beijing Municipal Constr Group Co. Ltd. (106)	Remediation Prod Inc. (2)
			Nanjing University (62)	Ground Effects Environmental Services Inc. (2)
			Chinese Res Acad Environmental Sci (62)	Envit Environmental Technologies & Eng (2)
			Zhejiang University (58)	Environmental Material Sci Inc. (2)

Sectors
Oil and Gas Companies
Energy/Power Sector Companies
Water Process related Companies
Water Equipment/Machinery/Chemical Manufacturing Companies
Tech Companies
Universities/Institutes

 # Global active patent assets

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Benchmarking based on Origin Country of Assignees (Key Countries by Patent Distribution)

The table below shows patent distribution by the assignee's country of origin, indicating where the assignees are based. For example, assignees based out of China have filed 13,922 patent families. The countries are chosen based on the highest patent counts (i.e., the top countries having the highest number of patent assets).

Global Patent Insights/Country	Chinese Assignees	Korean Assignees	US Assignees	Indian Assignees	Japanese Assignees
Patent Families	13,922	412	177	440	48
Expanded Dataset	14,242	671	529	452	86
Granted Patents	4,278	383	355	35	50
Pending Applications	3,780	283	174	414	36
Utility Models	6,184	5	0	3	0
Key Assignees	Chinese Academy of Science, State Grid Corp. of China, China Petrochemical Corp., Beijing Municipal Constr Group Co. Ltd.	Korea Institute of Industrial Technology, LG Chem, Korea Constr Technology Inst, Hyundai Motor Co.	ExxonMobil Corp., Garmin Ltd., Remediation Prod Inc.	Univ Lovely Professional, Univ Manipal Jaipur, Saveetha Eng College	Mitsubishi Electric Corp., Horiba Ltd., Hitachi Ltd.
Key Jurisdictions	CN, US, WO, JP	KR, US, CN, JP	US, CA, EP, WO	IN, US, EP, WO	JP, WO, US, CN

Notes:

1. *INPADOC families are considered for this report - An INPADOC patent family encompasses all patent documents that share a priority relationship, either directly or indirectly (via a third document).*
2. *Expanded dataset is the sum of granted patents, pending applications and utility models.*

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Technology Fragmentations

Module D— Environmental Water Cycle

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Technology Taxonomy Fragmentations

The below representation describes the distribution of patent assets across taxonomy nodes.

Environmental Water Cycle

Soil and Groundwater Remediation

- Bioremediation (273 | 221)
- Nanoremediation (1 | 1)
- Phytoremediation (84 | 76)
- Electrokinetic Remediation (86 | 83)
- Plasma-based Remediation (22 | 20)
- Hydrothermal Oxidation (17 | 17)
- Permeable Reactive Barriers (97 | 89)
- Soil Vapor Extraction (27 | 27)
- Air Sparging (9 | 6)
- Thermal Desorption (599 | 582)
- In-situ Chemical Oxidation/ In-situ Chemical Reduction (50 | 44)
- Generic - In-situ Remediation (262 | 254)
- Biochar Amendment (139 | 126)
- Others (9504 | 9093)

Monitoring/ Management Of Surface Water/Ground Water

Monitoring Techniques

Monitoring Techniques

- Remote Sensing & Satellite-based Monitoring (180 | 144)
- Monitoring using IoT Sensors (87 | 79)
- AI-based Forecasting (288 | 278)
- Weather and Climate Monitoring (451 | 419)

Monitoring Parameters

- Seismic Monitoring(79 | 66)
- Water Table Monitoring (538 | 508)

Water Quality Monitoring Techniques

- Autonomous Monitoring Robots (1011 | 785)
- IoT-enabled Smart Sensors (378 | 377)
- Cloud-based Water Quality Data Analytics (293 | 204)
- Unmanned Aerial Vehicles (UAVs) & Drones (2181 | 1851)
- Hyperspectral Imaging (155 | 150)
- WSN & ML (1220 | 1071)

Note: Numbers in bracket (X | Y) represents (# global active expanded set | # global active patent families)

Link to Taxonomy Definitions

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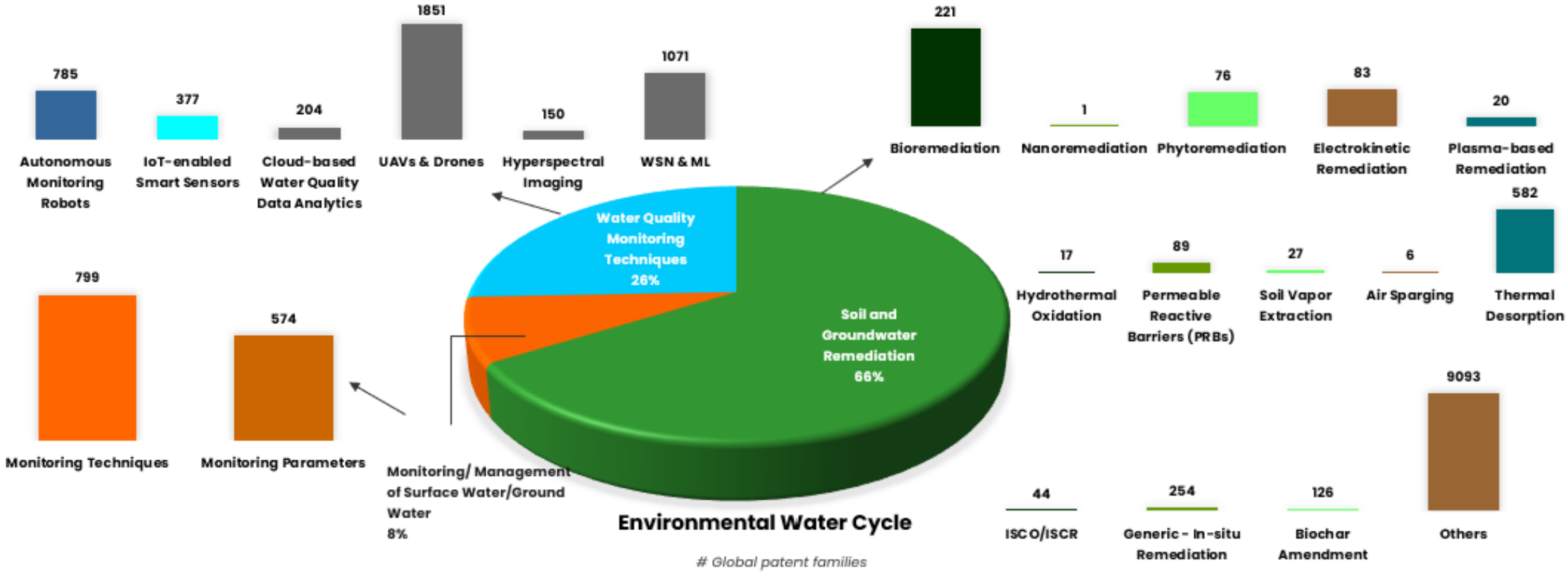
Technology Taxonomy Fragmentations - Global



- The pie chart shows patent distribution among tier-1 categories. Further, the corresponding column graphs show patent distribution in respective tier-2 categories.
- Top countries for most of the tier-1 categories are China, Korea, and the United States
- Some of the top categories are Water Quality Monitoring using UAVs & Drones, WSN & ML, and Generic - Soil and Groundwater Remediation.

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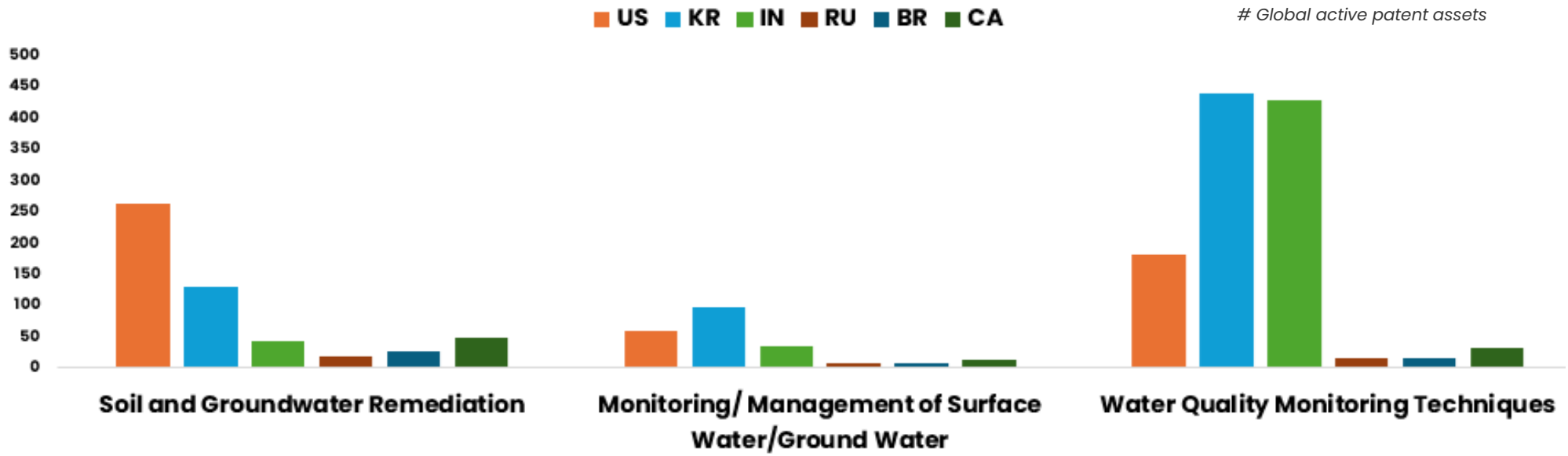
Patent Distribution by Tier-1 Categories in Key Jurisdictions (Excluding China)



Key Assignees		
Soil and Groundwater Remediation	**Monitoring/ Management of Surface Water/Ground Water**	**Water Quality Monitoring Techniques**
Advanced Potash Technologies Ltd. (27)	ExxonMobil Corp. (29)	Korea Institute of Industrial Technology (203)
Remediation Prod Inc. (20)	Garmin Ltd.(22)	Univ Andalas LPPM (60)
Lesaffre ET Compagnie (20)	Veolia Environnement (11)	Crystal Lagoons Curacao BV (59)
Nanjing Inst Environmental Sci Nat Burea (17)	Korea Institute of Geoscience & Mineral Resources (9)	Xingmai Innovation Technology Suzhou Co. (39)
	Saudi Arabian Oil Company (Saudi Aramco) (8)	Evertron Holdings PTE Ltd. (20)

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Patent Distribution in Key Countries (Excluding China) (1/2)

Tier 1 Categories	Tier 2 Categories	KR	US	IN	JP	CA
Soil and Groundwater Remediation	Bioremediation ***	0	31	3	5	7
	Nanoremediation *	0	0	0	0	0
	Phytoremediation ***	0	5	6	1	2
	Electrokinetic Remediation	5	2	0	1	0
	Plasma-based Remediation *	0	1	0	0	1
	Hydrothermal Oxidation *	1	0	0	0	0
	Permeable Reactive Barriers (PRBs) ***	3	7	0	0	2
	Soil Vapor Extraction (SVE) *	4	0	0	0	0
	Air Sparging *	2	3	1	0	0
	Thermal Desorption	12	12	2	1	1
	In-situ Chemical Oxidation (ISCO)/ In-situ Chemical Reduction (ISCR)	0	5	0	0	1
	Generic - In-situ Remediation ***	0	16	0	1	7
	Biochar Amendment	2	5	1	2	0
	Others	103	186	32	105	31

*** Canada is among the top five jurisdictions globally in these areas. However, the overall filings are on lower side.

* Areas with a lower number of patent filings across all jurisdictions, indicating limited global interest.

 # Global active patent assets

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Patent Distribution in Key Countries (Excluding China) (2/2)

Tier 1 Categories	Tier 2 Categories	KR	US	IN	JP	CA
Monitoring/ Management of Surface Water/Ground Water	Monitoring Techniques	50	39	31	16	10
	Monitoring Parameters	49	19	4	25	3
Water Quality Monitoring Techniques	Autonomous Monitoring Robots	180	40	59	10	4
	IoT-enabled Smart Sensors	28	1	91	0	0
	Cloud-based Water Quality Data Analytics	14	21	64	4	2
	Unmanned Aerial Vehicles (UAVs) & Drones	307	57	69	25	11
	Hyperspectral Imaging *	10	5	5	0	1
	WSN & ML	58	67	224	67	15

* Areas with a lower number of patent filings across all jurisdictions, indicating limited global interest.

 # Global active patent assets

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Canadian Insights

Module D—Environmental Water Cycle

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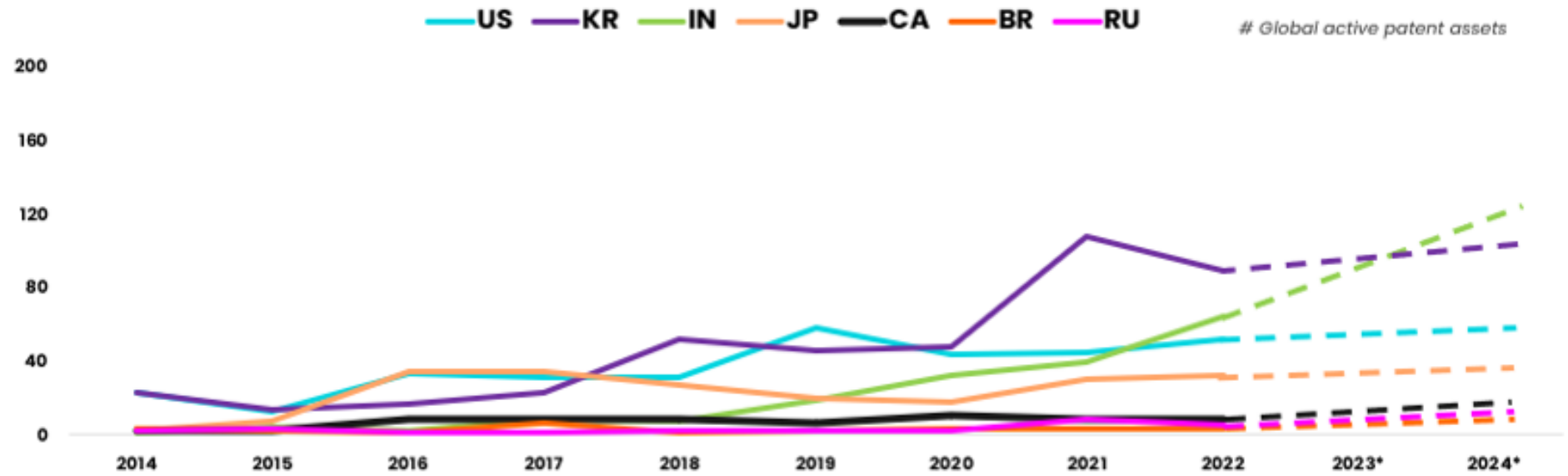
Canadian vs. International Filings – Excluding China



- The above graph shows the patent filing trend in Canada along with other key jurisdictions (excluding China).
- The top three countries having the maximum freshwater resources are Brazil, Russia, and Canada. Brazil and Russia have fewer filings compared to Canada.
- Canada has significantly fewer filings as compared to other key jurisdictions, such as Korea and the United States. Over the past five years (considering 2018-2022), the average number of filings in Canada has been approximately 8. In contrast, Korea and the United States have average filings of around 68 and 46, respectively, during the same period.

*Note: * projected numbers have been shown for the years 2023-2024, as numbers may increase as some of the applications filed during this period may not have been published yet.*

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Benchmarking based on Origin Country of Assignees (Key Countries by Freshwater Resources)

The table below shows patent distribution by the assignee's country of origin, indicating where the assignees are based. For example, assignees based out of Russia have filed 33 patent families. The countries are chosen based on the highest freshwater resources (i.e., countries having maximum freshwater resources).

Global Patent Insights/Country	Brazil Assignees	Russian Assignees	US Assignees	Chinese Assignees	Canadian Assignees
Patent Families	17	33	177	13,922	17
Expanded Dataset	27	35	529	14,242	39
Granted Patents	7	21	355	4,278	23
Pending Applications	20	10	174	3,780	16
Utility Models	0	4	0	6,184	0
Key Assignees	Univ Federal Uberlandia Ufu, Suzano SA, Go Tratch Desenvolvimentos SA, Advanced Potash Technologies Ltd.	Organic Park LLC, Smirnov Igor Leonidovich, Jagin Vasilij Petrovich, Univ Kamchatka Tech	ExxonMobil Corp., Garmin Ltd., Remediation Prod Inc.	Chinese Academy of Science, State Grid Corp. of China, China Petrochemical Corp., Beijing Municipal Constr Group Co. Ltd.	IdeaCuria Inc., SPI Technology Ltd., Environmental Material Sci Inc.
Key Jurisdictions	BR, WO	RU, WO, US	US, CA, EP, WO	CN, US, WO, JP	US, CA, WO, JP

Notes:

1. *INPADOC families are considered for this report - An INPADOC patent family encompasses all patent documents that share a priority relationship, either directly or indirectly (via a third document).*
2. *Expanded dataset is the sum of granted patents, pending applications and utility models.*

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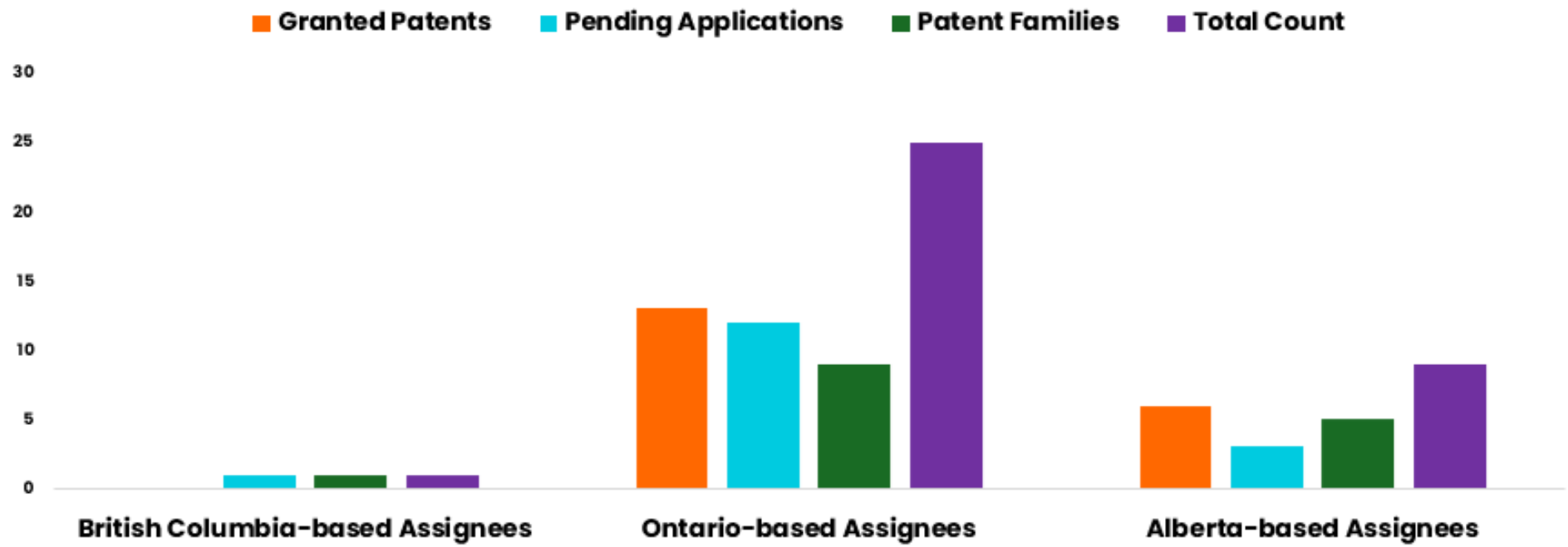
BC vs Other Provinces



- Canada's water sector companies seem to be mainly present in four provinces: British Columbia, Alberta, Ontario, and Quebec.
- Ontario-based companies and Alberta-based companies seem to have filed more patents compared to the other Canadian provinces. Ontario-based companies have the most filings in water quality monitoring, whereas Alberta-based companies have the most filings in soil and groundwater remediation.
- BC-based and Quebec-based companies have no significant filings in this area.

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Patent Litigations

This section includes major patent disputes, infringement cases, and legal trends shaping the competitive landscape.

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Patent Litigations

No significant litigations were observed in the studied technical areas. Below are exemplary patent litigations broadly related to this domain:

Plaintiff	Type of Plaintiff	Defendant	Filing Date	Patent Details	Technology	Source	Status
TaKaDu	Integrated Water Network Management, Company	Innovyze	25 /2/2021	US7920983, US8341106, US9053519, US9568392	Water Utility Network Monitoring	Source	Closed
United States Water	Water and Wastewater Services and Utility Management Company	Novozymes	06/15/2018	US8415137 US8609399	Water's Phytout Deposit Control	Source	Closed

- There have been a few litigations in the United States; however, there have been no significant litigations in Canada.
- The number of litigations does not seem to be that significant as compared to other areas (e.g., cloud computing, telecom, etc.). This may be attributed to fewer patent filings in jurisdictions such as the US, EP, etc.
- No significant litigations have been observed by NPEs (non-practicing entities).

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Market Insights

Key Players

Mergers, Acquisitions and Partnerships

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Market Forecast

This section provides an analysis of future market trends, growth projections, and key drivers influencing the industry's trajectory.

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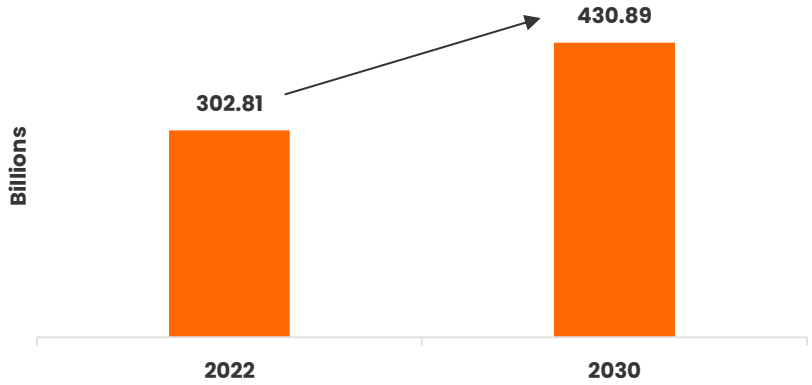
Market Forecast (1/2)

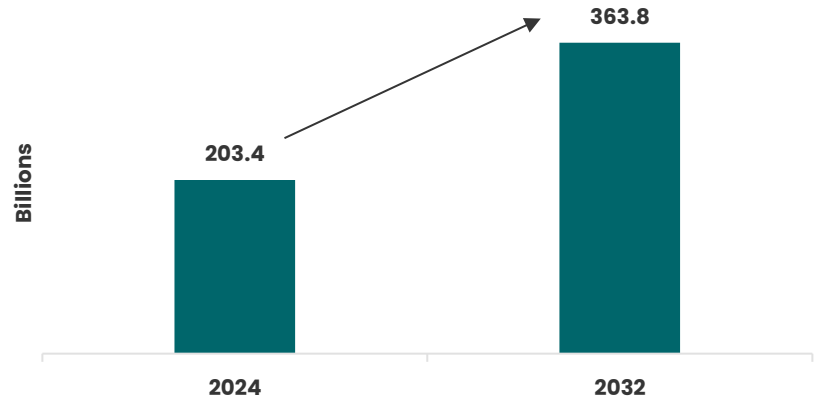
Global Water Market

The global water market size is expected to grow from USD 302.81 billion in 2022 to USD 430.89 billion by the end of 2030 at a CAGR of 4.51%. (Source)



Global Fresh Water Generator Market

The freshwater generator market was valued at $203.4 million in 2023 and is estimated to reach $363.8 million by 2032, growing at a CAGR of 6.7% from 2024 to 2032. (Source)



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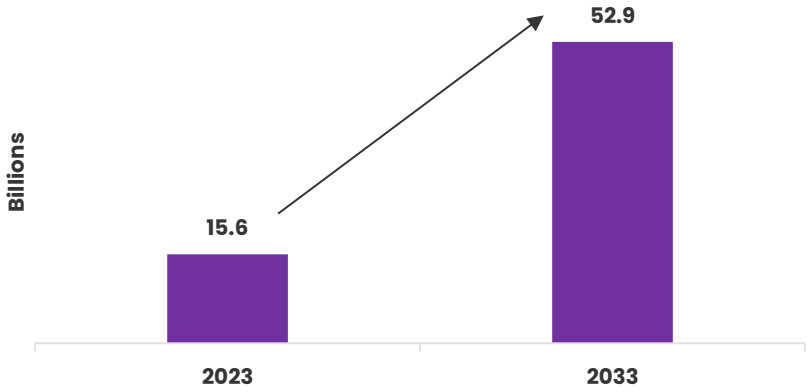
Market Forecast (2/2)

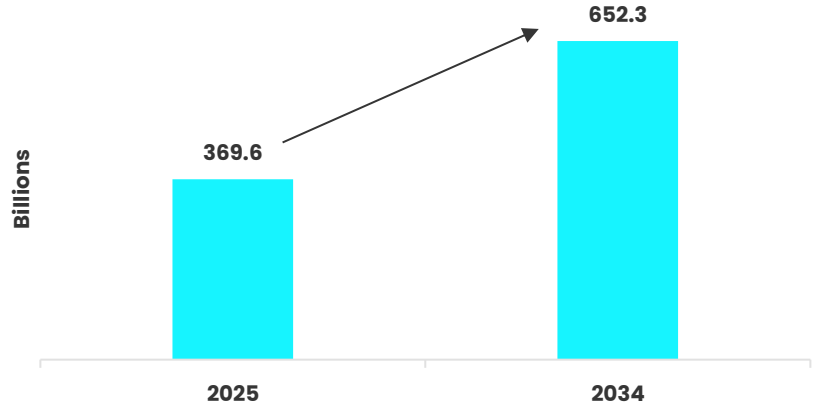
Global Water Management Systems Market

The global water management systems market size is anticipated to grow from USD 15.6 billion in 2023 to USD 52.9 billion by 2033, growing at a CAGR of 12.99% from 2023 to 2033. (Source)



Global Water and Wastewater Treatment Market

The global water and wastewater treatment market size is calculated at USD 369.60 billion in 2025 and is forecasted to reach around USD 652.30 billion by 2034, accelerating at a CAGR of 6.50% from 2025 to 2034. (Source)



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Key Players

The key players are identified based on their market presence, active patent activity, and insights from various studies. These companies or entities have a significant influence on the industry through innovation, product offerings, and strategic positioning.

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Key Players
Module A – Raw Water

The key players are identified based on their market presence (scale of operations, revenue, partnerships, and global/regional footprint), Technological Innovation (patent activity, R&D efforts, and adoption of advanced or sustainable technologies), and insights from various studies. These companies or entities have a significant influence on the industry through innovation, product offerings, and strategic positioning.

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Key Players – Module A (1/7)

The table below shows the list of key players in Module A – Raw Water:

Companies	Location	Technology Focus	Description
AOE Accumulated Ocean Energy Inc.	British Columbia, CA	Desalination	• Specializes in capturing and storing ocean wave energy as compressed air for sustainable applications like desalination, oxygenation, and electricity generation. (Source)
Aquatic Informatics	British Columbia, CA	Freshwater Extraction / Transmission, Stormwater	• Centralizes diverse environmental data sources for real-time insights and optimized operations in source water management. (Source) • Manage stormwater effectively by automating data collection, analysis, and generation of customized intensity data to assess localized street flooding and help shield the city from liability. (Source)
Saltworks	British Columbia, CA	Desalination	• Specializes in fully integrated, modular desalination systems engineered for rapid deployment, operational efficiency, and high performance. • Provide solutions to maximize water recovery, minimize waste, and support zero liquid discharge goals. (Source)
Canadian Dew Technologies	British Columbia, CA	Atmospheric Water Harvesting	• Conducts research and development of water-from-air systems (atmospheric water generators) to produce secure, independent, and environmentally safe drinking water. • Designs technologies like the WaterProducer to deliver drinking water for agri-business and water-bottling enterprise markets. (Source)

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Key Players – Module A (2/7)

The table below shows the list of key players in Module A – Raw Water:

Companies	Location	Technology Focus	Description
O'rain	British Columbia, CA	Rainwater Water Harvesting	• Specializes in harvesting rainwater to provide freshwater to coastal and remote communities. • Utilizes modular platforms that ensure minimal filtration and energy consumption. (Source)
AquaCoustic Remote Technologies	British Columbia, CA	Water Transmission	• Performs detailed surveys of river crossings and bridge abutments to ensure the stability of water transmission infrastructure. • Conducts comprehensive surveys of dams and reservoirs to assess structural integrity with tools like scanning sonar and ROVs. (Source)
Net Zero Water	Ontario, CA	Groundwater Management, Stormwater, Rainwater Harvesting	• Designs systems to recycle rainwater, stormwater, and groundwater for non-potable uses. • Provides custom water solutions for various commercial and industrial applications. (Source)
RainGrid	Ontario, CA	Rainwater Water Harvesting, Stormwater	• Designs smart systems to collect and reuse rainwater, enhancing flood and drought resilience. • Provides end-to-end stormwater management solutions, such as monitoring and maintenance of green infrastructure and digital asset management for nature-based solutions. (Source)

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Key Players – Module A (3/7)

The table below shows the list of key players in Module A – Raw Water:

Companies	Location	Technology Focus	Description
Premier Tech Water and Environment	Quebec, CA	Rainwater / Atmospheric Water Harvesting	• Offers systems for rainwater harvesting and stormwater attenuation to promote sustainable water resource management. (Source)
WSP	Montréal, Canada	Water Transmission	• Delivers various water transmission and wastewater conveyance tunnels, including drinking water supply systems, aqueducts, CSO tunnels, offshore outfalls, and deep shafts across diverse geological conditions. (Source)
SWC Canada Inc.	Ontario, Canada	Stormwater Management	• Specializes in the development, inspection, and maintenance of stormwater management systems, aiming to reduce costs, simplify processes, and protect capital investments. (Source)
Northwest Pipe Company	Washington, US	Water Transmission, Stormwater Infrastructure	• Delivers tailor-made pipelines for water transmission projects such as spiral or straight-seam steel pipe, reinforced concrete pressure pipe, etc. (Source)
ILF	Austria	Water Transmission	• Provides pressurized and gravity water transmission systems, as well as associated facilities such as water intakes, pumping stations, and storage tanks. • Designs and implements large-scale water transmission systems. (Source)

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Key Players – Module A (4/7)

The table below shows the list of key players in Module A – Raw Water:

Companies	Location	Technology Focus	Description
Veolia Water Technologies (division of Veolia group)	Aubervilliers, France	Seawater Desalination , Stormwater Management	• Desalinates water in over 108 countries. • Uses distillation, membrane desalination, and hybrid desalination. • Offers stormwater management solutions aimed at controlling, intercepting, and clarifying stormwater to mitigate environmental risks. (Source)
Suez	Paris, France	Seawater Desalination, Stormwater Management	• Have more than 260 desalination plants worldwide, providing sustainable drinking water solutions. • Offers customized, eco-friendly, and sustainable desalination units. • Provides innovative sewerage and stormwater management systems. (Source)
Xylem	Washington, DC, US	Seawater Desalination, Stormwater Handling	• Features a range of scalable, low-maintenance reverse osmosis membrane filtration systems for desalinating water. • Provides advanced pumping systems to transport stormwater to treatment facilities. • Offers retention basins to manage heavy rainfall, helping to prevent sewage system overflows. (Source)
Acciona	Municipality of Alcobendas, Spain	Seawater Desalination	• Have the largest and most advanced desalination plants. • Performs water desalination by reverse osmosis. (Source)

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Key Players – Module A (5/7)

The table below shows the list of key players in Module A – Raw Water:

Companies	Location	Technology Focus	Description
Doosan Enerbility	Changwon-si, South Korea	Seawater Desalination	• Provides seawater desalination solutions using Multi-Stage Flash (MSF), Multi-Effect Distillation (MED), and Reverse Osmosis (RO) plants. (Source)
Aquatech	Canonsburg, Pennsylvania, US	Seawater Desalination	• Uses thermal, membrane, and hybrid desalination. • Developed a low-energy membrane desalination process and AI-powered desalination optimization. (Source)
ACWA Power	Saudi Arabia	Seawater Desalination	• Operates some of the world's largest desalination plants using advanced technologies. (Source)
QED Environmental Systems	Michigan, US	Groundwater Extraction	• Specializes in groundwater extraction solutions aimed at preventing the spread of contaminants from wells to surrounding areas. (Source)
Wilo	Dortmund, Germany	Water Extraction	• Provides high-quality pumps and systems designed for various water extraction, filtration, and distribution. (Source)
Watts Water Technologies, Inc.	Massachusetts, US	Rainwater Harvesting	• Offers rainwater harvesting solutions - collect, store, pump, and treat rainwater for various uses, supporting sustainability and green building initiatives. (Source)
Graff Group GmbH	Teningen, Germany	Rainwater Treatment, Stormwater Treatment	• Designs, produces, and distributes a wide range of rainwater harvesting and stormwater solution systems, crafted for both environmental and economic efficiency. (Source)

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Key Players – Module A (6/7)

The table below shows the list of key players in Module A – Raw Water:

Companies	Location	Technology focus	Description
WISY AG	Kefenrod-Hitzkirchen, Hessen, Germany	Rainwater Treatment	• Manufactures all components of a modern rainwater harvesting system. • Offers a unique kind of filtration technology, which deflects water, automatically removes the dirt, and at the same time is low maintenance. (Source)
Kingspan Water & Energy (a division of Kingspan Group PLC)	Kingscourt, Ireland	Rainwater Harvesting	• Offers rainwater harvesting solutions to commercial, residential, and rural applications. (Source)
Watergen	Petah Tikva, Israel	Atmospheric Water Generation	• Offers a heat exchanger made from food-grade polymers to extract water from air and deliver high-quality drinking water. (Source)
Water Technologies International	Florida, United States	Atmospheric Water Generators	• Designs, manufactures, and distributes atmospheric water generators (AWGs) and related products. • Runs AWGs on solar, wind, and natural gas platforms. (Source)
REHAU	Muri, Switzerland	Stormwater Management, Plumbing & Drainage	• Provides sustainable stormwater management solutions, including drainage, storage, and treatment systems. (Source)
AquaShield (division of Komoline Company)	Chattanooga, Tennessee	Stormwater Treatment	• Provides stormwater treatment solutions to remove pollutants from runoff, safeguarding the environment and improving water quality. (Source)

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Key Players – Module A (7/7)

The table below shows the list of key players in Module A – Raw Water:

Companies	Location	Technology focus	Description
Contech Engineered Solutions	Ohio, USA	Stormwater Management	• Offers a range of stormwater management products and services, including detention and infiltration systems, hydrodynamic separation devices, filtration units, and biofiltration solutions. (Source)
Advanced Drainage Systems	Ohio, USA	Stormwater Infrastructure	• Provides high-performance thermoplastic pipes, stormwater drainage systems, and green infrastructure to a diversified set of end markets and geographies. (Source)

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Key Players
Module B – Use

The key players are identified based on their market presence (scale of operations, revenue, partnerships, and global/regional footprint), Technological Innovation (patent activity, R&D efforts, and adoption of advanced or sustainable technologies), and insights from various studies. These companies or entities have a significant influence on the industry through innovation, product offerings, and strategic positioning.

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Key Players – Module B (1/4)

The table below shows the list of key players in Module B – Use:

Companies	Location	Technology Focus	Description
Aqua Intelligent Technology	British Columbia, CA	Potable	• Uses AI-powered solutions to improve drinking water quality. • Monitors the complete water journey — from source to tap — to detect contaminants, identify operational issues, and assist in ensuring safe water. (Source)
Slimline Manufacturing	British Columbia, CA	Agriculture	• Specializes in the design and manufacturing of agricultural sprayers and industrial wastewater evaporators. • Offers Turbo-Mist sprayers to minimize drift, reduce operational costs, lessen ecological impact, and increase yield. (Source)
NOAH Water Tech	British Columbia, CA	Potable	• Develops and manufactures innovative water treatment technologies to make water healthy and useful in an environmentally responsible way. • Solutions include Dehumidification Systems (DHS) for producing potable water from any source and FOG Systems that convert fats, oils, and grease waste into biodiesel feedstock. (Source)
ThisFish	British Columbia, CA	Aquaculture	• Incorporates AI to streamline seafood processing and improve operational workflows. • ThisFish's tools assist in monitoring and refining production processes within the seafood industry. (Source)

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Key Players – Module B (2/4)

The table below shows the list of key players in Module B – Use:

Companies	Location	Technology Focus	Description
BluMetric Environmental Inc.	Ontario, CA	Potable Water	• Provides portable water purification systems for military and remote community applications. • Designs, builds, and operates water and wastewater treatment plants globally. (Source)
Farmers Edge	Manitoba, CA	Agriculture	• Utilizes advanced data analytics and AI to optimize crop management, improving yields and sustainability in farming. • Integrates real-time field data, AI models, and precision agriculture tools to streamline farm operations and supply chain traceability. (Source)
Aquamerik	Quebec, CA	Aquaculture	• Manufacturer and distributor of aquaculture and environmental equipment, offering a wide range of high-quality products for water treatment, aeration, and environmental management. (Source)
Klir	Ontario, CA	Potable Water	• Empowers utilities to deliver clean, safe water while supporting sustainability and digital transformation goals. • Offers a centralized platform that streamlines drinking water management by automating compliance tasks, enabling proactive risk identification, and ensuring operational efficiency. (Source)

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Key Players – Module B (3/4)

The table below shows the list of key players in Module B – Use:

Companies	Location	Technology Focus	Description
WesTech Engineering, Inc.	Salt Lake City, Utah	Industrial, Municipal, and Mineral Industries	• Performs various water treatment technologies to provide water to different markets. • Provides solutions for temporary mobile/rental applications. (Source)
Veolia Water Technologies (division of Veolia group)	Aubervilliers, France	Municipal, Industrial	• Ensures safe and efficient drinking water supply through its Water Network Multi-Performance solution. • Produces high-quality industrial process water from a range of feed water sources. (Source)
Pall Corporation (subsidiary of Danaher Corporation)	Port Washington, New York, US	Industrial	• Provides filtration, separation, and purification solutions across various industries, including microelectronics, aerospace, fuels, petrochemicals, chemicals, automotive, and power generation. (Source)
Aqua-Aerobic Systems, Inc. (subsidiary of METAWATER Co., Ltd)	Illinois, US	Industrial, Municipal	• Provides advanced solutions in aeration and mixing, biological processes, cloth media filtration, membranes, PFAS solutions, disinfection, and process control for serving both municipal and industrial customers. (Source)
Parkson	Kuala Lumpur, Malaysia	Industrial, Municipal	• Develops, engineers, and manufactures products featuring advanced screening, aeration, biological treatment, clarification, filtration, enhanced nutrient removal (ENR), pumping, and biosolids thickening solutions for potable water and process water. (Source)

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Key Players – Module B (4/4)

The table below shows the list of key players in Module B – Use:

Companies	Location	Technology Focus	Description
Xylem	Washington, DC, US	Municipal, Agriculture, Aquaculture, Industrial	• Provides innovative water management solutions to various markets, including agriculture, aquaculture, industrial, and municipal. (Source)
Calgon Carbon	Pittsburgh, Pennsylvania, US	Municipal, Industrial	• Provides municipal water treatment, industrial process water purification, and clean water to homes. (Source)
H2O Innovation (acquired by Ember, US)	Quebec, Canada	Potable	• Supplies systems for drinking water applications, using technologies such as RO/NF, UF/MF, conventional media filtration, UV, or chemical disinfection. (Source)

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Key Players
Module C – Outflows

The key players are identified based on their market presence (scale of operations, revenue, partnerships, and global/regional footprint), Technological Innovation (patent activity, R&D efforts, and adoption of advanced or sustainable technologies), and insights from various studies. These companies or entities have a significant influence on the industry through innovation, product offerings, and strategic positioning.

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Key Players – Module C (1/5)

The table below shows the list of key players in Module C – Outflows:

Companies	Location	Technology Focus	Description
ATD Manure Systems	British Columbia, CA	Wastewater Reuse, Resource Recovery	• Offers an efficient, environmentally friendly solution to manage livestock manure by recycling water, capturing nutrients, and reducing greenhouse gas emissions. (Source)
Boost Environmental Systems	British Columbia, CA	Sludge Management, Resource Recovery	• Uses microwave-enhanced oxidation to efficiently break down organic waste, reduce sludge volume, and boost renewable energy production. • Implements phosphorus recovery technology and methane production. (Source)
Saltworks	British Columbia, CA	Wastewater Treatment	• Offers advanced wastewater treatment solutions. • Uses crystallization for the extraction of pure salt solids from wastewater for zero liquid discharge (ZLD) applications. (Source)
Axine Water Technologies	British Columbia, CA	Wastewater Treatment	• Uses electrochemical oxidation by using advanced catalysts and AI-driven optimization to treat tough industrial wastewaters. (Source)
Trident TNZ	British Columbia, CA	Sludge Management, Resource Recovery	• Provides advanced sludge thickening and dewatering solutions, helping wastewater treatment plants boost efficiency with compact, high-capacity equipment. • Delivers circular resource recovery solutions for agriculture and industry, advancing sustainability through innovative waste and nutrient management technologies. (Source)

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Key Players – Module C (2/5)

The table below shows the list of key players in Module C – Outflows:

Companies	Location	Technology Focus	Description
Aqua Pure Technologies	Alberta, CA	Wastewater Treatment and Reuse	• Delivers reliable, turnkey water treatment solutions, helping industries and communities achieve compliance through expert guidance and innovative systems. • Assists with processes like sludge dewatering, pH balancing, solids settling and clarification, enhancing filter media performance, reducing foam, and controlling odors. (Source)
Bishop Water Technologies	Ontario, CA	Wastewater Treatment, Sludge Management	• Specializes in affordable, low-energy solutions for solids/sludge management and nutrient removal in wastewater treatment. (Source)
Anaergia	Ontario, CA	Resource Recovery, Sludge Management	• Transforms organic waste into renewable energy, clean water, and natural fertilizers through advanced anaerobic digestion and resource recovery technologies. • Recovers value from waste for municipal, industrial, and agricultural customers. (Source)
MetaFLO Technologies Inc.	Ontario, CA	Wastewater Treatment and Reuse	• Uses bio-friendly, alkaline oxidation agents to remove heavy metals and hydrocarbons from contaminated water, waste slurry, and mine tailings. • Boosts sustainability by enabling water reuse, cutting remediation time, and helping industries meet strict environmental regulations. (Source)

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Key Players – Module C (3/5)

The table below shows the list of key players in Module C – Outflows:

Companies	Location	Technology Focus	Description
H2O Innovation (acquired by Ember, US)	Quebec, Canada	Wastewater Treatment and Reuse	• Encompasses membrane filtration systems, wastewater treatment, and water reuse technologies. • Treats domestic and industrial wastewater and produces non-potable water for multiple applications, such as irrigation, farming, replenishment of aquifers, etc. (Source)
Aevitas	Ontario, Canada	Wastewater Treatment and Reuse, Sludge Treatment	• Operates one of Canada's largest industrial wastewater treatment facilities and processes nearly one million liters of wastewater daily. • Reduces solid waste by-products by 90%. (Source)
Aquatech	Canonsburg, Pennsylvania, US	Wastewater Recycling & Reuse, ZLD, Mineral Recovery	• Provides advanced water reuse technologies like ultrafiltration, clarification, reverse osmosis, and zero liquid discharge (ZLD) solutions. • Enables recovery of valuable minerals and other byproducts from wastewater. (Source)
DUPONT	Delaware, US	Wastewater Treatment, Resource Recovery	• Offers advanced technologies for wastewater treatment, such as MBR, ultrafiltration, and electro-deionization (EDI), focusing on reducing effluent discharge and enabling water reuse. • Recovers valuable by-products such as salts and other chemical compounds. (Source)

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Key Players – Module C (4/5)

The table below shows the list of key players in Module C – Outflows:

Companies	Location	Technology Focus	Description
Parkson	Kuala Lumpur, Malaysia	Wastewater Recycling & Reuse	• Provides advanced wastewater treatment and reuse solutions to enhance effluent quality and nutrient removal. (Source)
Ecolab	Minnesota, US	Wastewater Treatment, Energy Recovery	• Provides wastewater treatment solutions to remove contaminants from a wide range of waste streams. • Generates renewable energy from wastewater. (Source)
Calgon Carbon	Pittsburgh, Pennsylvania, US	Wastewater Treatment, Metal Recovery	• Provides advanced activated carbon solutions for municipal and industrial wastewater treatment, effectively removing contaminants and ensuring compliance with environmental regulations. • Performs efficient recovery of gold, precious, rare earth, and base metals from waste and reclaim streams. (Source)
Ecologix Environmental Systems	Georgia, US	Wastewater Treatment and Reuse, Sludge Treatment	• Utilizes technologies like Dissolved Air Flotation (DAF), Moving Bed Biofilm Reactor (MBBR), and Ultrafiltration to enhance water quality and enable reuse. • Offers sludge dewatering systems aimed at reducing sludge volume and disposal costs. (Source)

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Key Players – Module C (5/5)

The table below shows the list of key players in Module C – Outflows:

Companies	Location	Technology Focus	Description
Veolia Water Technologies (division of Veolia group)	Aubervilliers, France	Wastewater Treatment and Reuse, Sludge Treatment	• Provides advanced wastewater treatment and reuse solutions, such as Actiflo and Biostyr, to enhance water quality and sustainability. • Employs anaerobic digestion and thermal hydrolysis in sludge treatment to reduce waste volume and generate renewable energy. (Source)
Suez	Paris, France	Wastewater Recycling & Recovery, Sludge Reduction and Recovery	• Provides advanced wastewater treatment and reuse solutions to ensure water sustainability. • Offers solutions for recycling, destroying, and recovering sludge and treatment by-products. (Source)
Xylem	Washington, DC, US	Wastewater Recycling & Reuse, Sludge Pumping & Treatment	• Provides advanced biological treatment and disinfection technologies to enhance effluent quality, enabling safe water reuse. • Handles sludge throughout the wastewater treatment processes. (Source)

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Key Players
Module D – Environmental Water Cycle

The key players are identified based on their market presence (scale of operations, revenue, partnerships, and global/regional footprint), Technological Innovation (patent activity, R&D efforts, and adoption of advanced or sustainable technologies), and insights from various studies. These companies or entities have a significant influence on the industry through innovation, product offerings, and strategic positioning.

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Key Players – Module D (1/4)

The table below shows the list of key players in Module D – Environmental Water Cycle:

Companies	Location	Technology Focus	Description
AML Oceanographic	British Columbia, CA	Monitoring/Management of Surface Water	• Provides technologies for environmental monitoring, including instruments that measure parameters like conductivity, temperature, and depth. (Source)
Open Ocean Robotics	British Columbia, CA	Monitoring/Management of Surface Water	• Provides solar-powered uncrewed surface vehicles (USVs) that collect real-time ocean data sustainably and safely. • Their DataXplorer platform, combined with AI-driven analytics, helps industries and researchers monitor, protect, and better understand marine environments. (Source)
Ivey International	British Columbia, CA	Soil and Groundwater Remediation	• Specializes in advanced remediation technologies that remove contaminants from soil and groundwater. • Provides both in-situ remediation and ex-situ remediation. (Source)
Rockland Scientific	British Columbia, CA	Monitoring/Management of Surface Water	• Specializes in measuring turbulent flow in marine environments, offering high-precision profiling, moored, and modular systems for oceanographic and environmental research. (Source)

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Key Players – Module D (2/4)

The table below shows the list of key players in Module D – Environmental Water Cycle:

Companies	Location	Technology Focus	Description
JASCO Applied Sciences	Nova Scotia, CA	Monitoring/Management of Surface Water	• Offers scientific consulting across all phases of environmental reviews, specializing in underwater acoustic impact assessments • Helps clients balance operational goals with environmental protection, ensuring compliance through rigorous, science-based evaluations. (Source)
BioNorth Solutions	Ontario, CA	Soil and Groundwater Remediation	• Specializes in bioremediation technologies that use naturally occurring microbes to clean up contaminated water and soil. (Source)
NexGen Environmental Research	Manitoba, CA	Monitoring/Management of Surface Water	• Uses satellites, drones, and acoustic sensing to map, monitor, and assess environmental change across land, water, and ice. • Innovative technologies and real-time applications help communities and industries adapt to climate challenges and promote resilience. (Source)
In Nature Robotics	New Brunswick, CA	Water Quality	• Offers Aquatic Mini Observation System, a solar-powered robotic boat designed to autonomously collect water quality data at GPS-defined locations. (Source)

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Key Players – Module D (3/4)

The table below shows the list of key players in Module D – Environmental Water Cycle:

Companies	Location	Technology Focus	Description
Heron Instruments	Ontario, CA	Groundwater Monitoring	• Provides accurate water level meters for monitoring groundwater levels in wells and boreholes. • Measures water quality changes by temperature and conductivity fluctuations. (Source)
Regenesis	California, US	Soil and Groundwater Remediation	• Offers in-situ solutions for soil and groundwater contamination by treating pollutants such as petroleum hydrocarbons, chlorinated solvents, PFAS, and metals. • Uses advanced technologies like enhanced bioremediation, in situ chemical oxidation, and vapor intrusion mitigation. (Source)
Terra Systems	Singapore	Soil and Groundwater Remediation	• Specializes in developing biological solutions for complex remediation problems. • Holds the first United States patent for using emulsified vegetable oil substrates to remediate chlorinated solvents in groundwater. (Source)
Newterra	Pennsylvania, US	Soil and Groundwater Remediation	• Provides customized, cost-effective solutions for soil and groundwater remediation, addressing contaminants like volatile organic compounds and chlorinated solvents. (Source)

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Key Players – Module D (4/4)

The table below shows the list of key players in Module D – Environmental Water Cycle:

Companies	Location	Technology Focus	Description
GEO Remediation Company	Orange, California, US	Soil and Groundwater Remediation	• Use Gas Thermal Remediation and C3 soil vapor extraction treatment systems for soil and groundwater remediation. (Source)
CleanHarbor	Massachusetts, US	Remediation Services	• Specializes in hazardous waste management, environmental cleanup, and industrial services. • Provides mining site remediation, groundwater remediation, sediment remediation, soil solidification, and stabilization. (Source)
Envirogen Technologies, Inc.	Utah, USA	Groundwater Remediation	• Designs, installs, and supports groundwater remediation systems, utilizing technologies like fluidized bed reactors and ion exchange to treat various contaminants. (Source)

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Key Mergers And Acquisitions

This section highlights prominent mergers, acquisitions, and strategic alliances that impact market dynamics. These strategic decisions help in driving consolidation, expanding market reach, enhancing technological capabilities, and strengthening competitive positioning.

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Key Mergers And Acquisitions

This section highlights prominent mergers, acquisitions, and strategic alliances that impact market dynamics. These strategic decisions help in driving consolidation, expanding market reach, enhancing technological capabilities, and strengthening competitive positioning.

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Key Mergers and Acquisitions – Overall (1/2)

The table below shows the mergers and acquisitions between different companies to expand their position in the market:

Primary Entity	Secondary Entity	Year	Details	Source
Kurita Water Industries (Japan)	Keytech Water Management (Ontario, CA)	2021	Kurita Water Industries has acquired Ontario-based Keytech Water Management, strengthened its North American presence and expanded its customer-focused water treatment solutions.	Source
Danaher Corp. (USA)	Aquatic Informatics (British Columbia, CA)	2020	Aquatic Informatics Inc., a software solution company that addresses critical water data management, analytics, and compliance challenges for the water industry, has been acquired by Danaher's Water Quality platform from XPV Water Partners.	Source
Skion (Germany) and Ia Caisse (Quebec, CA)	Ovivo (British Columbia, CA)	2016	Ovio was acquired by SKion (Germany) and Ia Caisse (Morocco), wherein SKion held 70% and Ia Caisse held 30% stakes in the company.	Source
Tetra Tech (United States)	Piteau Associates (British Columbia, Canada)	2022	Tetra Tech acquired Piteau Associates, a Canadian consulting firm specializing in geotechnical, mining, and water resource engineering. The acquisition strengthens Tetra Tech's expertise in sustainable water management and environmental solutions.	Source
Veolia North America (a wholly owned subsidiary of Veolia Group)	Suez (France)	2022	Veolia North America (VNA), a wholly owned subsidiary of Veolia Group, integrated its businesses with Suez's assets in the United States and Canada, which primarily provides water and wastewater treatment services. Following the full acquisition of Suez, Veolia decided to retain certain segments of the company while divesting the remainder to a consortium of financial institutions comprising Meridiam, Global Infrastructure Partners, and the Caisse des Dépôts et Consignations.	Source

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Key Mergers and Acquisitions – Overall (2/2)

The table below shows the mergers and acquisitions between different companies to expand their position in the market:

Primary Entity	Secondary Entity	Year	Details	Source
Xylem (United States)	Pure Technologies (Calgary, CA)	2018	Xylem Inc. acquired Pure Technologies, Ltd. (Pure), a Canadian company specializing in smart infrastructure diagnostics and analytics for water and wastewater systems.	Source
	Evoqua (United States)	2023	Xylem acquired Evoqua Water Technologies Corp. to develop solutions for critical water challenges.	Source
	Heusser Water Solutions AG (Switzerland)	2024	Xylem acquired Heusser Water Solutions, expanding into key growth markets to provide innovative and sustainable water solutions.	Source
	Idrica (Spain)	2024	Xylem acquired a majority stake in Idrica, a water data management and analytics company, to empower water utilities with intelligent solutions.	Source

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Key Mergers And Acquisitions

Module A – Raw Water

This section highlights prominent mergers, acquisitions, and strategic alliances that impact market dynamics. These strategic decisions help in driving consolidation, expanding market reach, enhancing technological capabilities, and strengthening competitive positioning.

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Key Mergers and Acquisitions – Module A

The table below shows the mergers and acquisitions between different companies to expand their position in the market:

Primary Entity	Secondary Entity	Year	Details	Source
ACWA Power (Saudi Arabia)	Regional subsidiary of ENGIE (France)	2025	ACWA Power has acquired stakes from the regional subsidiary of French utility developer ENGIE in water desalination in Bahrain and Kuwait, adding 1.11 million cubic meters per day to its capacity.	Source
Oldcastle Infrastructure (United States)	Hydro International (United Kingdom)	2023	Oldcastle Infrastructure, a CRH Company, acquired Hydro International, which is a provider of stormwater products, wastewater treatment products, wastewater services, and data solutions.	Source
RSK Group (United Kingdom)	Richard Allitt Associates (RAA) (United Kingdom)	2022	RSK took over Richard Allitt Associates, a UK-based firm specializing in flood risk and surface water management.	Source

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Key Mergers And Acquisitions

Module B – Use

This section highlights prominent mergers, acquisitions, and strategic alliances that impact market dynamics. These strategic decisions help in driving consolidation, expanding market reach, enhancing technological capabilities, and strengthening competitive positioning.

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Key Mergers and Acquisitions – Module B

The table below shows the mergers and acquisitions between different companies to expand their position in the market:

Primary Entity	Secondary Entity	Year	Details	Source
Ember (United States)	H2O Innovation (Quebec, Canada)	2023	Ember acquired H2O Innovation Inc. to build a leading integrated water solutions company.	Source
Watersprint (Sweden)	Acuva Technologies (British Columbia, CA)	2022	Watersprint AB, a leader in innovative UVC LED water disinfection technology, has acquired the assets of Acuva Technologies.	Source
Georg Fischer (GF) (Switzerland)	Uponor (Finland)	2023	Georg Fischer (GF) acquired Uponor for sustainable water and flow solutions and a complementary portfolio for safe and clean water. The unit is now rebranded as GF Building Flow Solutions.	Source
Ecolab (United States)	Barclay Water Management (United States)	2024	Ecolab acquired Barclay Water Management to provide Barclay's water safety and digital monitoring solutions for industrial and institutional customers.	Source
Grundfos (Denmark)	Culligan (United States)	2024	Grundfos acquired the commercial & industrial business of Culligan in Italy, France, and the UK, bringing a complementary portfolio of solutions and technologies for industrial and commercial needs.	Source
EQT Group (Sweden)	AMCS (Ireland)	2024	EQT Group, a private equity and venture capital investor, acquired a majority stake in Ireland-based AMCS, which has cloud-based and AI-enabled planning, performance, safety, and sustainability-focused software.	Source

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Key Mergers And Acquisitions

Module C – Outflows

This section highlights prominent mergers, acquisitions, and strategic alliances that impact market dynamics. These strategic decisions help in driving consolidation, expanding market reach, enhancing technological capabilities, and strengthening competitive positioning.

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Key Mergers and Acquisitions – Module C (1/2)

The table below shows the mergers and acquisitions between different companies to expand their position in the market:

Primary Entity	Secondary Entity	Year	Details	Source
Ovivo Inc. (Quebec, Canada)	FilterBoxx Water (Alberta, CA)	2018	Ovivo acquired FilterBoxx and all its subsidiaries to strengthen Ovivo's footprint in North America and enhance its portfolio of water and wastewater solutions.	Source
Rochester Midland Corp. (United States)	Norkem Group (Ontario, Canada)	2024	Rochester Midland Corp. bought Norkem, a water treatment provider focused on boiler water, cooling water, and wastewater treatment in Ontario, Canada.	Source
Saur Group (France)	IWE Malaysia (Malaysia)	2024	Saur Group acquired IWE Malaysia, a specialist in industrial water treatment solutions.	Source
SUEZ (France)	Gruppo Ecosistem (Italy)	2025	SUEZ to acquire a majority stake in Gruppo Ecosistem, an independent company specializing in industrial waste processing and recovery.	Source
Lummus (United States)	Siemens Energy (Germany)	2023	Lummus acquired Siemens Energy's water and wastewater treatment technologies, including the Zimpro® wet air oxidation technology and PACT® system, as well as the associated intellectual property, lab equipment, and associated assets.	Source
Solenis (United States)	CedarChem (United States)	2023	Solenis acquired CedarChem LLC to provide chemical and wastewater treatment product and service offerings.	Source

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Key Mergers and Acquisitions – Module C (2/2)

The table below shows the mergers and acquisitions between different companies to expand their position in the market:

Primary Entity	Secondary Entity	Year	Details	Source
Ingersoll Rand (United States)	SSI Aeration (United States)	2025	Ingersoll Rand extended its capabilities in wastewater treatment by acquiring SSI Aeration and its subsidiaries. SSI designs and manufactures wastewater treatment plant equipment, including innovative and energy-efficient membrane diffusers.	Source
Axius Water (United States)	MITA Water Technologies (Italy)	2024	Axius Water, a provider of nutrient management solutions for wastewater treatment facilities, acquired MITA Water Technologies, an Italian supplier of wastewater filtration systems, to strengthen Axius Water's capabilities in wastewater treatment and filtration.	Source
	Aero-Mod (United States)	2025	Axius Water acquired Aero-Mod, a United States-based wastewater treatment systems company, to enhance Axius Water's portfolio of advanced treatment technologies.	Source

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Key Mergers And Acquisitions

Module D – Environmental Water Cycle

This section highlights prominent mergers, acquisitions, and strategic alliances that impact market dynamics. These strategic decisions help in driving consolidation, expanding market reach, enhancing technological capabilities, and strengthening competitive positioning.

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Key Mergers and Acquisitions – Module D

The table below shows the mergers and acquisitions between different companies to expand their position in the market:

Primary Entity	Secondary Entity	Year	Details	Source
EIS Holdings (United States)	**AET Group (Ontario, CA)**	2022	EIS Holdings, a key provider of essential environmental and infrastructure services for both public and private sectors, has acquired AET, a remediation and cleanup firm known for its expertise in site assessment and soil and water remediation.	Source
ERM (United States)	**NewFields (United States)**	2025	ERM acquired the Environmental Division of NewFields Companies to expand ERM's offerings in remediation and environmental services.	Source
Citadel EHS (United States)	**RMD Environmental Solutions (United States)**	2023	Citadel acquired RMD Environmental Solutions, which specializes in the assessment and remediation of soil, soil vapor, and groundwater contaminated with chlorinated solvents.	Source
Verdantas (United States)	**Groundwater Sciences Corporation (United States)**	2024	Verdantas, a consulting firm specializing in environmental and water solutions, acquired Groundwater Sciences Corporation (GSC) to enhance Verdantas' expertise in complex environmental site assessment and remediation.	Source

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Key Canadian Startups

This section includes emerging Canadian companies driving innovation and growth in the sector. They are selected based on market presence, active patent activity, technological advancements, and industry impact.

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Key Canadian Startups

This section highlights Key Canadian startup companies. The companies are shortlisted on various factors like funding (level and sources of investment indicating scalability and investor confidence), Market Potential (size and growth prospects of the target market), Technology Differentiation (uniqueness and competitiveness of the startup's technology), Industry Partnerships (collaborations that enhance credibility and market access), Commercial Growth (business traction through revenue, customer base, or expansion), *etc.*

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Key Canadian Startups – British Columbia (1/4)

Company	Industry	Company	Industry
Avantu	Agricultural / Aquaculture Water Management	Acuva Technologies (acquired by Watersprint)	Potable Water Treatment
AOE Accumulated Ocean Energy	Desalination	Canadian Dew Technologies	Rainwater / Atmospheric Water Harvesting
FuseForward Solutions Group	Distribution (Municipal Users)	Ivey International	Remediation
AquaCoustic Remote Technologies	Freshwater Extraction / Transmission	Emew Corporation	Resource Recovery
Aqua Diversities	Industrial Water Treatment	ATD Manure Systems	Reuse (Wastewater)
Mangrove Lithium Technologies	Industrial Water Use	Boost Environmental Systems	Sludge Management
AML Oceanographic	Monitoring / Management (Environmental)	Novion	Stormwater Capture And Filtration
Poseidon Ocean Systems	Agricultural / Aquaculture Water Management	Skaha Remote Sensing	Agricultural / Aquaculture Water Management
Slimline Manufacturing	Agricultural / Aquaculture Water Management	Pureleau	Desalination
Saltworks	Desalination	Kiko Water Systems	Distribution (Municipal Users)
Orka Water	Distribution (Municipal Users)	BujiBui	Industrial Water Treatment
Aquatic Informatics	Freshwater Extraction / Transmission	David Bromley Engineering	Industrial Water Treatment

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Key Canadian Startups – Ontario (2/4)

Company	Industry	Company	Industry
Blue Lion Labs	Agricultural / Aquaculture Water Management	Aquanty	Monitoring / Management (Environmental)
Bio Graphene Solutions	Desalination	Advanced Water Solutions	Potable Water Treatment
ARO Technologies	Distribution (Municipal Users)	Net Zero Water	Rainwater / Atmospheric Water Harvesting
Citylitics (formerly WatrHub)	Freshwater Extraction / Transmission	BioNorth Solutions	Remediation
Greyter Water Systems	Greywater Treatment and Reuse	Aduro Clean Technologies	Resource Recovery
ACE Manufacturing	Industrial Water Treatment	ElectroKinetic Solutions (EKS)	Sludge Management
Advanced Test and Automation (ATA)	Industrial Water Use	DECAST	Stormwater Capture And Filtration
ACG Envirocan	Industrial Water Treatment	Arjay Engineering	Industrial Water Treatment
eleven-x	Freshwater Extraction / Transmission	LiquiForce	Freshwater Extraction / Transmission
HydraTek	Distribution (Municipal Users)	Clow Canada	Distribution (Municipal Users)
BacTech	Resource Recovery	Alert Labs	Distribution (Municipal Users)
MetaFLO Technologies	Sludge Management	Golden Environmental Services	Remediation

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Key Canadian Startups – Alberta (3/4)

Company	Industry	Company	Industry
InteliRain	Agricultural / Aquaculture Water Management	AdvancedAg	Remediation
Ionic Solutions	Desalination	CVW CleanTech	Resource Recovery
Barreleye	Freshwater Extraction / Transmission	Source2Source	Stormwater Capture And Filtration
2S Water	Industrial Water Treatment	Clearflow Group	Stormwater Management And Drainage
Agar Canada Corporation	Industrial Water Use	Kayden Industries	Transmission / Management (Wastewater)
Sawback Technologies	Monitoring / Management (Environmental)	Aqua Pure Technologies	Wastewater Treatment
CEC Analytics	Potable Water Treatment	Trident Pump	Freshwater Extraction / Transmission
Delta Remediation	Remediation	E3 Metals	Industrial Water Use
Pursuit Technologies	Industrial Water Use	Rogue 7	Potable Water Treatment
Roshan Water Solutions	Potable Water Treatment	GEM Holdings	Stormwater Management And Drainage
FilterBoxx	Industrial Water Treatment	Waterworks	Industrial Water Treatment
Salacia Technologies	Desalination	Synauta	Desalination

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Key Canadian Startups – Other Provinces (4/4)

Company	Industry	Company	Industry
3D Wave Design	Monitoring / Management (Environmental)	abbaTek	Monitoring / Management (Environmental)
Aquafort AI	Agricultural / Aquaculture Water Management	Drinkable (previously What the Well)	Potable Water Treatment
H2O Innovation (acquired by Ember, US)	Desalination	Premier Tech	Rainwater / Atmospheric Water Harvesting
Aqua Data	Distribution (Municipal Users)	Typha Co.	Remediation
Infrastructure Data Solutions (IDS)	Freshwater Extraction / Transmission	Watercycles Energy Recovery	Resource Recovery
Evoqua Canada (acquired by Xylem)	Industrial Water Treatment	Fournier Industries	Sludge Management
AquaTest	Industrial Water Use	Sentry	Transmission / Management (Wastewater)
Aquatic Life	Monitoring / Management (Environmental)	Automatisation JRT	Industrial Water Treatment
BIONEST	Wastewater Treatment	C-CORE	Monitoring / Management (Environmental)
Clean Nature	Monitoring / Management (Environmental)	E2Metrix	Industrial Water Treatment
Enutech	Remediation	Geophysics GPR International	Monitoring / Management (Environmental)
Grande Water Management Systems	Stormwater Management And Drainage	Innocorps Research Corporation	Potable Water Treatment

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Key Partnerships

Strategic collaborations that drive innovation, market expansion, and competitive advantage. It includes industry alliances, R&D agreements, and supply chain partnerships.

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Key Partnerships
Module A – Raw Water

This section highlights prominent business partnerships, and strategic collaborations that drive innovation, market expansion, and competitive advantage. It includes industry alliances, R&D agreements, and supply chain partnerships.

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Key Partnerships – Module A

The table below shows the key partnerships between different companies:

Entity 1	Entity 2	Year	Description	Source
Miranda Water Technologies (subsidiary of Rainmaker Worldwide Inc) (Ontario, Canada)	Fleming College (Ontario, Canada)	2024	Rainmaker's subsidiary, Miranda Water Technologies, partnered with Fleming College to develop a SmartCell Control Module for Miranda's Miracell Rotating Biological Contactor system.	Source
Aquatech (United States)	Pani Energy (British Columbia, Canada)	2021	Aquatech International has partnered with Pani Energy to reduce the energy required for desalination by integrating Pani Energy's artificial intelligence with its LoWatt membrane process.	Source
ACWA Power (Saudi Arabia)	IC İÇTAŞ İNŞAAT SANAYİ VE TİCARET A.Ş (Turkey)	2025	ACWA Power and IC İçtaş won the bid to develop a 300,000 m^3/day SWRO desalination plant in Azerbaijan.	Source
ENGIE (France)	OCP (Morocco)	2024	Morocco's OCP and a French energy firm signed an agreement for a water desalination plant project that will be used for agricultural purposes in regions where OCP operates.	Source
Advanced Drainage SystemS (ADS) (US)	Rainwater Management Solutions (RMS) (US)	2024	Advanced Drainage Systems (ADS) has partnered with Rainwater Management Solutions (RMS), a leader in water harvesting and reuse systems, to enhance sustainable stormwater solutions across the United States and Canada.	Source

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Key Partnerships
Module B – Use

This section highlights prominent business partnerships, and strategic collaborations that drive innovation, market expansion, and competitive advantage. It includes industry alliances, R&D agreements, and supply chain partnerships.

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Key Partnerships – Module B (1/2)

The table below shows the key partnerships between different companies:

Entity 1	Entity 2	Year	Description	Source
Canadian Water Network (Canada)	GHD, ten industry partners, and a consortium of municipal water departments	2025	GHD, ten industry partners, and a consortium of municipal water departments collaborated with the Canadian Water Network to develop a roadmap for integrating greenhouse gas mitigation into long-term municipal water service planning.	Source
Greenway Water Technologies (Ontario, Canada)	ClearWater Tech LLC (United States) and Nature's Green Way (Ontario, Canada)	2013	Greenway Water Technologies (GWT), of Guelph, Ontario, announced a partnership with California's ClearWater Tech LLC and Canada's Nature's Green Way to bring residential and commercial ozone treatment systems to Canada.	Source
Innovasea (United States)	Mowi (Norway)	2024	Innovasea renewed a global framework agreement with Mowi, making Innovasea the preferred vendor for environmental monitoring equipment and software and enabling Mowi to implement Innovasea's environmental monitoring systems in Mowi's 4.0 Smart Farming initiative.	Source
Rivulis (Singapore)	Phytech (United States)	2024	Rivulis partnered with Phytech, a pioneer in digital farming solutions, to combine Rivulis' expertise in irrigation with Phytech's real-time plant health and hydraulic monitoring technology to advance sustainable agriculture practices.	Source

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Key Partnerships – Module B (2/2)

The table below shows the key partnerships between different companies:

Entity 1	Entity 2	Year	Description	Source
Netafim (Israel)	Phytech (United States)	2024	Orbia's precision agriculture business, Netafim, has partnered with Phytech to integrate Phytech's real-time plant monitoring technology into Netafim's GrowSphere irrigation system to provide farmers with enhanced insights and automation for optimized irrigation management.	Source

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Key Partnerships
Module C – Outflows

This section highlights prominent business partnerships, and strategic collaborations that drive innovation, market expansion, and competitive advantage. It includes industry alliances, R&D agreements, and supply chain partnerships.

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Key Partnerships – Module C (1/2)

The table below shows the key partnerships between different companies:

Entity 1	Entity 2	Year	Description	Source
Axine Water Technologies (British Columbia, Canada)	Nijhuis Saur Industries (Netherlands)	2025	Axine Water Technologies and Nijhuis Saur Industries have partnered to eliminate PFAS contaminants in water using PFAS-Destruct, powered by Axine's electraCLEAR solution.	Source
	Global Pharmaceutical Company	2020	Axine Water Technologies signed a multimillion-dollar, multiyear agreement with a global pharmaceutical company to treat antimicrobial wastewater at a United States plant using its advanced electrochemical oxidation technology.	Source
Baymag Inc. (Alberta, Canada)	PMAP Mine Water Corporation (British Columbia, Canada)	2024	Baymag Inc., a Calgary-based magnesium producer, has partnered with Vancouver's PMAP Mine Water Corporation to revolutionize mining wastewater treatment.	Source
Schneider Electric Canada (Canada)	Delco Automation (Saskatchewan, Canada)	2022	Schneider Electric Canada announced Delco Automation as a Water Wastewater Preferred Alliance Partner to focus on implementing advanced water and wastewater treatment technologies across municipalities.	Source
Catapult Environmental Inc. (Alberta, Canada)	Crew Energy Inc (Alberta, Canada)	2017	Catapult Environmental partnered with Crew Energy to design and build a water management facility in northeast British Columbia to treat and reuse flowback and produced water for oil and gas operations.	Source
Greatario (Ontario, Canada)	EBARA HG (Ontario, Canada)	2025	Greatario and EBARA HG have formed a strategic alliance to enhance wastewater and biogas storage and mixing systems.	Source

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Key Partnerships – Module C (2/2)

The table below shows the key partnerships between different companies:

Entity 1	Entity 2	Year	Description	Source
MattenPlant (Singapore)	Royal HaskoningDHV (Netherlands)	2024	MattenPlant, a Singapore-based water and wastewater treatment specialist, entered into a Memorandum of Understanding (MoU) with Royal HaskoningDHV for implementing the Ephyra sludge digestion technology to reduce sludge retention time while maintaining stability.	Source
	Schneider Electric (France)	2024	MattenPlant entered into a partnership with Schneider Electric for the joint development of innovative technologies tailored to address wastewater treatment challenges in tropical climates.	Source
	bNovate Technologies (Switzerland)	2024	MattenPlant's partnership with bNovate to introduce the BactoSense analyzer, a real-time online water monitoring solution to enable rapid detection of potential contamination.	Source
Ovivo Inc. (United States)	Evocra (Australia)	2024	Ovivo Inc., a global water and wastewater treatment company, has signed an exclusive deal through its United States branch with Australian company Evocra to use and offer Evocra's ozone foam technology in the United States This technology helps remove harmful "forever chemicals" (PFAS) from water.	Source
Orbital Biocarbon (United States)	PYREG (Germany)	2024	Orbital Biocarbon and PYREG partnered to transform wastewater sludge disposal into salable biochar, a commercial-grade fertilizer or durable building material additive.	Source

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Key Partnerships

Module D – Environmental Water Cycle

This section highlights prominent business partnerships, and strategic collaborations that drive innovation, market expansion, and competitive advantage. It includes industry alliances, R&D agreements, and supply chain partnerships.

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Key Partnerships – Module D

The table below shows the key partnerships between different companies:

Entity 1	Entity 2	Year	Description	Source
Maven Water and Environment (Saskatchewan, Canada)	Integrated Sustainability (Calgary, Canada)	2025	Maven Water and Environment partnered with Integrated Sustainability to enhance innovation in sustainable water management for mining projects, combining Maven's biological treatment technologies with Integrated's multidisciplinary expertise. The collaboration aims to deliver advanced, low-carbon water solutions while scaling their impact across industries.	Source
GreenSoil (Belgium)	Georem International (South Africa)	2024	GreenSoil Group partnered with Georem International to undertake future biological and sustainable environmental remediation projects in Africa, such as treatment of organic and inorganic contaminants in soil, groundwater, and surface water environments.	Source
Petrochem Performance Chemicals (PPC) (Abu Dhabi)	Arva Greentech Remediation AG (Switzerland)	2024	Petrochem Performance Chemicals (PPC), a division of Mazrui Energy Services, has entered a strategic partnership with Arva Greentech Remediation AG, a Swiss-German firm known for its patented sustainable remediation technologies, to tackle issues like treating oil-contaminated soil and oil-based drill cuttings.	Source

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Key Investments and Funding Programs

Prominent funding activities, venture capital infusions, and strategic investments shaping market growth and innovation.

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Key Investments And Funding Programs

This section highlights prominent funding activities, venture capital infusions, and strategic investments shaping the market growth and innovation.

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Key Investments and Funding Programs – Canadian Companies (1/2)

The following are a few exemplary investments/fundings provided to Canadian companies in the water market:

Companies	Description	Year	Source
Aqua Pure Technologies	Aqua Pure Technologies secured $724,000 from the Alberta Government through the Emissions Reduction Alberta program for water management and remediation.	2024	Source
Eximius Environmental Solutions	Eximius Environmental Solutions is advancing the development of a filtration system, the VelRay X system, with a $750,000 investment through the Emissions Reduction Alberta program.	2024	Source
Oneka Technologies	Oneka Technologies secured CA$12.5 million in Series A funding from the Hoffecker Family and other prominent investors to advance its wave-powered desalination solutions. Additionally, Oneka secured CA$20 million in grants from organizations including the Ocean Supercluster (OSC), Sustainable Development Technology Canada (SDTC), and the United States Department of Energy (DOE), bringing their total funding to CA$32.5 million.	2023	Source
SENTRY Water Monitoring	SENTRY Water Monitoring received an investment of $1.9 million from Sustainable Development Technology Canada (SDTC) to support the enhancement of their wastewater treatment optimization technology and protect the aquatic environment.	2021	Source
RainStick Shower	RainStick Shower closed $2.6 million CAD in seed-plus financing to advance its water-saving shower system. The round was led by Raven Indigenous Capital Partners, with participation from BDC's Thrive Lab, BuildTech VC, and angel investors.	2024	Source

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Key Investments and Funding Programs– Canadian Companies (2/2)

Companies	Description	Year	Source
Axine Water Technologies	Veralto Corporation invested approximately $15 million for a minority stake in Axine Water Technologies to expand the reach of Axine's electrochemical oxidation technology for destroying persistent organic contaminants like PFAS in industrial and municipal wastewater.	2024	Source
Pani Energy	Pani Energy raised $8M to scale its AI-powered water treatment platform globally, helping facilities optimize operations and cut emissions. The raise was led by Blue Bear Capital and Blue Coast, with participation from Mazarine Ventures, Humanitas, Sustainable Development Technology Canada (SDTC), and other undisclosed government entities.	2021	Source

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Global Key Investments (1/2)

The following are a few exemplary investments observed in the water market :

Companies/ Organizations	Description	Year	Source
Xylem (Headquarter – US)	Xylem announced expansion of its corporate venture capital investments by committing an additional $50 million to support emerging companies and water service providers addressing critical challenges such as water scarcity, quality, and decarbonization.	2023	Source
Perenfra (Headquarter – US)	Perenfra, an infrastructure developer and operator, raises $125 million through its Perennial Infrastructure Fund to support the development of new water mains and treatment facilities, addressing the increasing demand for water infrastructure in the United States	2025	Source
Five WRC member companies – Starbucks, Ecolab, Gap Inc., Reckitt, and DuPont	United States companies, including Starbucks, Ecolab, Gap Inc., Reckitt, and DuPont, collectively invested nearly $140 million into the WaterEquity Global Access Fund IV to focus on enhancing water access and resilience in underserved communities worldwide.	2023	Source
Ofwat Innovation Fund	Ofwat announced the expansion of its Innovation Fund to £400 million over the next five years, aiming to support projects that could transform the water sector and address its many challenges.	2025	Source
United States Environmental Protection Agency (EPA)	EPA allocated $3.6 billion under the Bipartisan Infrastructure Law to upgrade water infrastructure, ensuring safe wastewater management and protecting drinking water sources.	2024	Source

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Global Key Investments (2/2)

Companies/ Organizations	Description	Year	Source
United States Environmental Protection Agency (EPA)	EPA announced the availability of $7.5 billion in WIFIA funding to support long-term loans for critical water infrastructure projects across the nation.	2024	Source
Algeria Government	Algeria invested $3 billion in the second phase of its desalination expansion project, aiming to construct six new plants by 2030.	2024	Source

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Emerging Technologies

Innovative advancements shaping the industry's future, driving efficiency, sustainability, and market evolution.

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Emerging Technologies (1/2)

Technology	Functionality & Use Cases	Sustainability Impact	Market Outlook
MOF-based Atmospheric Water Harvesters	Utilizes Metal-Organic Frameworks (e.g., MOF-303) to extract water from air at low humidity levels; ideal for arid regions, remote housing, and military bases.	Enables water access in arid zones, off-grid deployment; supports SDG 6 (Clean Water), reduces groundwater overuse.	The metal-organic frameworks market is expected to grow at a CAGR of 40% between 2025 and 2035. (Source)
AI-directed Fog Meshes	AI-optimized fog nets adjust mesh orientation and location in real-time to maximize water collection; suitable for coastal and mountainous regions.	Enhances water availability in regions without traditional water infrastructure, promoting water equity and resilience.	Market growth is driven by increasing demand for sustainable water solutions in fog-prone areas.
Graphene-infused Solar Membranes	Solar-powered membranes incorporating graphene oxide for efficient water purification; applicable in remote villages and mobile units.	Reduces dependency on bottled water, lowers carbon footprint, and supports SDG 13 (Climate Action).	Market expansion is anticipated as demand for off-grid water purification solutions rises.
Smart Water ATMs (IoT-enabled)	IoT-enabled kiosks offering safe, affordable water distribution; ideal for low-income and rural areas.	Promotes water access equity, reduces waste, and supports sustainable urban development.	Market growth is projected as digital infrastructure expands in underserved regions.

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Emerging Technologies (2/2)

Technology	Functionality & Use Cases	Sustainability Impact	Market Outlook
Digital Twin Rainwater Harvesting Systems	Combines satellite data and AI to design efficient urban rainwater harvesting systems.	Enhances urban water resilience, reduces flood risk, and supports SDG 11 (Sustainable Cities and Communities).	Market expansion as cities adopt smart infrastructure solutions.
Floating Solar-powered Desal Pods	Modular desalination units powered by solar energy, suitable for islands and coastal communities.	Provides clean water using renewable energy, reducing environmental impact and supporting SDG 14 (Life Below Water).	Market growth is driven by increasing demand for sustainable desalination technologies.
Eco-Machines for Water Purification	Nature-inspired systems that use diverse local pond life to naturally purify contaminated water. Proven to transform polluted water into drinkable water within ten days.	Enhances water quality without chemicals, supports biodiversity, and offers scalable solutions for wastewater treatment.	Adoption is growing, particularly in areas seeking sustainable and low-energy water treatment solutions.
Nanobubble Water Treatment Systems	Employs nanobubbles to rehabilitate contaminated environments, treat wastewater, and purify food. Demonstrated to increase crop yields using sustainable technology.	Improves water quality, reduces chemical usage, and enhances agricultural productivity sustainably.	The market for nanobubble technology is expanding as industries seek efficient and eco-friendly water treatment methods.

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Relevant Standards and Standard Essential Patents

This section includes key industry standards and SEPs that define compliance, interoperability, and innovation in the sector.

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Role of Standard Essential Patents

Standard Essential Patent

A Standard Essential Patent (SEP) is a patent granted for a technological invention that is essential for the implementation and working of a standard. Patents that are essential to a standard and have been adopted by a Standard Setting Organization (SSO) are known as SEPs.

Risks associated with SEPs

- Multiple products/services may infringe on SEPs if those products/services use relevant standards (generally, such technology standards are mandatory or important for relevant products/technologies; therefore, the risk of infringement is high in case relevant SEPs exist in a domain).

- ISO, WHO, CSA, and NSF/ANSI water standards specify performance outcomes (e.g., microbial removal rate, turbidity), but don't mandate a specific technology or method.

- Many companies develop and patent technologies (like filters, membranes, and UV systems) that are used to comply with water standards, making their products certified under water standards.

- However, there is no centralized SEP declaration framework (like ETSI has for telecom) in water-focused standards organizations.

- In conclusion, there are no significant SEPs related to relevant standards in the water sector. Therefore, there seems to be no significant risk associated with SEPs.

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Relevant Standards

There seem to be a few related standards to this domain. A few relevant standards have been provided below:

Standard / Framework	Issuing Body	Focus Area	Description
ISO 24512:2024	ISO	Drinking Water Services	Guidelines for managing water supply services and evaluating performance indicators.
ISO 24511:2024	ISO	Wastewater Services	Guidelines for the management and performance of wastewater utilities and related infrastructure.
ISO 14046:2014	ISO	Water Footprint	Specifies principles, requirements, and guidelines for conducting and reporting water footprint assessments.
ISO 16075 (1–4) ISO 16075-1:2020 , ISO 16075-2:2020 , ISO 16075-3:2021 , ISO 16075-4:2021	ISO	Water Reuse in Irrigation	Guidelines for the use of treated wastewater in agriculture, covering planning, monitoring, and health protection.
ISO 5667 Series	ISO	Water Sampling	Standardized methods for sampling from rivers, lakes, wastewater, and drinking water sources.
CSA B128.1:06	CSA (Canada)	Non-Potable Water System Design	Technical requirements for the design and installation of non-potable water reuse systems.
CSA B128.2:06	CSA (Canada)	Non-Potable Water System Maintenance	Guidelines for testing, inspection, and maintenance of non-potable water systems in buildings.
CSA B128.3:12	CSA (Canada)	Non-Potable Water System Performance	Performance evaluation and certification methods for non-potable water reuse systems.
NSF/ANSI 350	NSF International	Onsite Water Reuse	Certification standard for residential and commercial greywater and blackwater reuse treatment systems.

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Relevant Standards

Standard / Framework	Issuing Body	Focus Area	Description
WHO Drinking Water Guidelines	WHO	Drinking Water Quality	Global health-based standards for safe drinking water, including microbial, chemical, and radiological criteria.
EU Water Framework Directive (WFD)	European Commission	Integrated Water Management	Legal framework for achieving good ecological and chemical status of all water bodies in the EU.
EU Urban Wastewater Treatment Directive (UWWTD)	European Commission	Wastewater Treatment	Sets minimum standards for the collection, treatment, and discharge of urban wastewater.
FAO AQUASTAT Guidelines	FAO	Agricultural Water Use	Global information system on water and agriculture, including standards for irrigation data collection.

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British Columbia-based Insights

This section includes market trends, key players, investments, and policy impacts specific to British Columbia.

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British Columbia-based Patent Insights

This section highlights patent trends, key players, and key inventors related insights specific to British Columbia.

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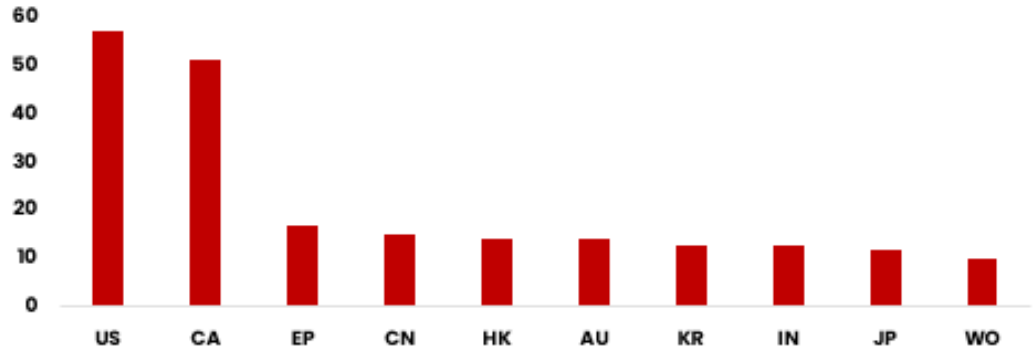
British Columbia based Assignees – Patent Trends – All Modules



Key Assignees in British Columbia	#Patents
Axine Water Technologies Inc.	96
Saltworks Technologies Inc.	14
Ostara Nutrient Recovery Technologies Inc.	14
Viridis Res Inc.	7
University of British Columbia	6
Provectus Engineered Materials Ltd.	6
Biovac Solutions Inc.	6
Muddy River Technologies Inc.	5

The above graphs show patent trends for BC-based companies:

- BC-based assignees have filed ~16 patents/year in the last few years.
- BC-based assignees have mostly filed in the United States, followed by Canada and Europe.
- Axine Water Technology has the highest filings among BC-based assignees, followed by Saltworks and Ostara Nutrient Recovery.
- BC-based assignees have **~101 INPADOC patent families** and **~235 patent assets.**
- BC-based assignees have **~148 granted patents** and **~87 pending applications.**

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British Columbia-based Assignees Patent Insights- Module A (1/2)

The table below shows benchmarking for British Columbia-based assignees against assignees based in other top provinces such as Ontario, Alberta and Quebec.

	British Columbia-based Assignees	Ontario-based Assignees	Quebec-based Assignees	Alberta-based Assignees
Patent Families	17	26	13	12
Expanded Dataset	31	103	29	79
Granted Patents	19	80	13	20
Pending Applications	12	23	16	59
Top Assignees	Saltworks Technologies Inc. Forefront Energy Ltd.	Queen's University of Kingston, Omachron Intellectual Property, Quikrete Holdings Inc.	Ovivo Inc., Oneka Technologies, Axelys (F/K/A Polyvalor L P)	SLB.Com, Intelligent Wellhead Systems Inc., Ionic Solutions Ltd.
Top Jurisdictions	US, CA, CN	US, CA, EP	CA, US, EP	US, WO, CA
Top Categories	Desalination	Rainwater Harvesting, Stormwater, Desalination	Desalination, Stormwater, Atmospheric Water Harvesting	Desalination, Stormwater, Water transmission

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British Columbia-based Inventor Patent Insights- Module A (2/2)

The table below shows benchmarking for British Columbia-based inventors against inventors based in other top provinces such as Ontario, Alberta and Quebec.

	British Columbia-based Inventors	Ontario-based Inventors	Quebec-based Inventors	Alberta-based Inventors
Patent Families	7	23	8	5
Expanded Dataset	12	78	27	8
Granted Patents	7	61	18	1
Pending Applications	5	17	9	7
Top Assignees	Forefront Energy Ltd., Everest Water Ltd.	Omachron Intellectual Property, Excelsior Inc., Stormwell Inc.	Oneka Technologies, Axelys (F/K/A Polyvalor L P)	Nautilus Ventures IPCO Inc.
Top Jurisdictions	US, CA, WO	US, CA, EP	US, CA, WO, EP	US, CA, WO
Top Categories	Surface/Groundwater Extraction, Water Transmission	Rainwater Harvesting, Stormwater	Desalination, Atmospheric Water Harvesting	Stormwater

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British Columbia-based Assignees Patent Insights- Module B (1/2)

The table below shows benchmarking for British Columbia-based assignees against assignees based in other top provinces such as Ontario, Alberta and Quebec.

	British Columbia-based Assignees	Ontario-based Assignees	Quebec-based Assignees	Alberta-based Assignees
Patent Families	5	14	5	4
Expanded Dataset	13	47	16	8
Granted Patents	11	36	14	4
Pending Applications	2	11	2	4
Top Assignees	Revolution Resource Recovery Inc., IdeaCuria Inc	Armstrong Ltd. S A, Omachron Intellectual Property, SPI Technology Ltd., Univ Guelph	7142871 Canada Inc., Universite De Montreal, Eau Matelo Inc.	SLB.com, 683107 Alberta Ltd.
Top Jurisdictions	US, CA, MX	US, CA, EP	US, CA, EP	CA, WO, US
Top Categories	Potable	Industrial, Agriculture, Potable	Potable	Aquaculture, Industrial

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British Columbia-based Inventors Patent Insights- Module B (2/2)

The table below shows benchmarking for British Columbia-based inventors against inventors based in other top provinces such as Ontario, Alberta and Quebec.

	British Columbia-based Inventors	Ontario-based Inventors	Quebec-based Inventors	Alberta-based Inventors
Patent Families	3	12	8	4
Expanded Dataset	9	40	26	5
Granted Patents	8	22	22	1
Pending Applications	1	18	4	4
Top Assignees	Revolution Resource Recovery Inc.	Tata Motor Ltd., Armstrong Ltd. S A, Univ Guelph	7142871 Canada Inc., Suez Group, Johnson Controls International	683107 ALBERTA Ltd.
Top Jurisdictions	US, CA, MX	US, CA, EP, CN	US, CA, EP	CA, WO, EP
Top Categories	Potable	Industrial, Agriculture, Potable	Potable, Industrial	Aquaculture

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British Columbia-based Assignees Patent Insights- Module C (1/2)

The table below shows benchmarking for British Columbia-based assignees against assignees based in other top provinces such as Ontario, Alberta and Quebec.

	British Columbia-based Assignees	Ontario-based Assignees	Quebec-based Assignees	Alberta-based Assignees
Patent Families	78	88	59	32
Expanded Dataset	190	242	167	63
Granted Patents	118	168	95	39
Pending Applications	72	74	72	24
Top Assignees	Axine Water Technologies Inc., Ostara Nutrient Recovery Technologies Inc., Viridis Res Inc.	Anaergia Inc., Queen's University Of Kingston, Danaher Corp.	Ovivo Inc., Veolia Environnement, 11814192 Canada Inc.	Suncor Energy Inc., Clearflow Group Inc., University of Alberta
Top Jurisdictions	US, CA, MX	US, CA, EP	US, CA, EP	CA, US, WO
Top Categories	Wastewater Treatment, Resource Recovery	Wastewater Treatment, Sludge Management	Wastewater Treatment	Wastewater Treatment, Wastewater Management

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British Columbia-based Inventors Patent Insights- Module C (2/2)

The table below shows benchmarking for British Columbia-based inventors against inventors based in other top provinces such as Ontario, Alberta and Quebec.

	British Columbia-based Inventors	Ontario-based Inventors	Quebec-based Inventors	Alberta-based Inventors
Patent Families	11	15	9	7
Expanded Dataset	34	59	54	22
Granted Patents	15	49	28	14
Pending Applications	19	10	26	8
Top Assignees	Axine Water Technologies Inc., Ostara Nutrient Recovery Technologies Inc., Univ Athabasca	Queen's University of Kingston, Tata Motor Ltd., Greencentre Canada .	Veolia Environnement, Axine Water Technologies Inc., Kemira OYJ	Suncor Energy Inc., CEC Analytics Ltd., University of Alberta
Top Jurisdictions	US, CA, WO	US, CA, EP	US, CA, EP	CA, US, WO
Top Categories	Wastewater Treatment, Resource Recovery	Wastewater Treatment	Wastewater Treatment, Sludge Management	Wastewater Treatment, Sludge Management

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British Columbia-based Assignees/Inventors Patent Insights- Module D

- Ontario-based companies/inventors and Alberta-based companies/inventors seem to have filed more patents as compared to the other Canadian provinces. Ontario-based companies have the most filings in water quality monitoring as well as soil and groundwater remediation, whereas Alberta-based companies have the most filings only in soil and groundwater remediation.
- **However, BC-based** and Quebec-based companies/inventors have no significant filings in this area.

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British Columbia-based Market Insights

This section highlights market trends, key players, investments, and policy impacts specific to British Columbia.

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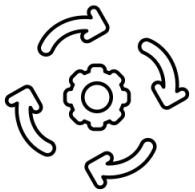
British Columbia Market Insights - Overview

- British Columbia has **27,000 kilometers of coastline and a mainland crisscrossed by rivers, creeks, and lakes** and is **rich in both surface and groundwater resources**. (Source)
- **Cleantech companies in B.C. within the water and wastewater sector make up 7.9%** of the province's environment and clean technology (ECT) industry. (Source)
- More than **70% of B.C.'s dedicated cleantech companies** are based **in Metro Vancouver**, while most of the **remaining firms** are primarily located **in Victoria and Kelowna**. (Source)

Williston Lake, formed by the W.A.C. Bennett Dam on the Peace River, is **B.C.'s largest freshwater body.** (Source)



Resource recovery is a **particular strength of B.C.'s water tech sector**. (Source)

Metro Vancouver supplies approximately **one billion liters of drinking water** daily to its member jurisdictions. (Source)

Engineers and Geoscientists BC received the **Drinking Water award** in the **2024 Water Canada Awards** for developing guidelines on One Water System Risk Management Plans. (Source)

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British Columbia Market Insights - Key Players

Below are exemplary B.C.-based key players across different sectors of water:

Raw Water

- Accumulated Ocean Energy
- Flowlink Environmental
- Aquatic Informatics
- infinitii ai — make your data smarter
- Novion
- Saltworks
- ROMEX® Hardscapes
- Pureleau
- Quest Water Global Inc. — Securing Access to Clean Water

Use

- Ionmr Innovations
- orca
- AWC
- Aqua Intelligent
- BI Pure Water
- Muddy River
- Waterworth
- BujiBui
- CarboNet
- DIACHEM
- Slimline Manufacturing
- Mangrove Lithium — Unlocking a battery-powered future
- verdi
- McCue — Engineering Contractors — Est. 2000
- Acuva by watersprint

Outflows

- pani
- SHARC Energy
- axine
- Valence Water
- waterStrider Treatment
- Acti-Zyme
- Viridis
- pmp
- NORAM
- NANOSentinel™
- BQE Water
- ATD's H_2O
- Eagleridge Innovations Corporation
- andor
- Ostara
- BioMaxx Environmental
- boost Environmental Systems

Environmental Water Cycle

- AML Oceanographic
- Ocean Diagnostics
- ASL Environmental Sciences
- Cellula Robotics
- Tersa
- Fathom Scientific Ltd.
- Foundry Spatial
- IVEY
- ISE — International Submarine Engineering Ltd.

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British Columbia Market Insights - Key Organizations/Initiatives (1/2)

Key B.C. Organizations/Initiatives Supporting Sustainable Water Solutions in British Columbia:

Organization/Initiative	Details
Partnership for Water Sustainability in British Columbia (Waterbucket)	The Partnership for Water Sustainability in British Columbia serves as a central hub for delivering the Water Sustainability Action Plan program through partnerships and collaboration. The Partnership develops tools, resources, and strategies to support local governments and communities in implementing the water balance approach.
BC Water & Waste Association (BCWWA)	The B.C. Water and Wastewater Association connects and supports water professionals through training, resources, and advocacy to ensure safe, sustainable water and wastewater systems.
Working for Watersheds	Working for the Watersheds initiative fosters collaboration among industry, government, Indigenous communities, and non-profits to protect and restore healthy watersheds across BC, supporting nearly 47,900 jobs and contributing $5 billion to the province's GDP.
Environmental Operators Certification Program (EOCP)	The Environmental Operators Certification Program (EOCP) certifies water and wastewater professionals in B.C. and Yukon to ensure public health and environmental protection.
BC Net Zero Innovation Network (BCNZIN)	The BC Net Zero Innovation Network (BCNZIN), launched by Foresight Canada in 2023, is an initiative aimed at accelerating the development and adoption of clean technologies to help British Columbia achieve its net-zero emissions goals.
Engineers and Geoscientists British Columbia	Engineers and Geoscientists BC is dedicated to safeguarding the public by regulating the engineering and geoscience professions in British Columbia, ensuring that only licensed individuals and firms undertake such projects.
Cowichan Watershed Board	The Cowichan Watershed Board is a partnership between the Cowichan Tribe First Nation and the Cowichan Valley Regional District, working collaboratively to protect the Cowichan and Koksilah watersheds. Guided by Indigenous teachings, it promotes sustainable water governance and community stewardship.

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British Columbia Market Insights - Key Organizations/Initiatives (2/2)

Key B.C. Organizations/Initiatives Supporting Sustainable Water Solutions in British Columbia:

Government Initiative	Details
Okanagan Basin Water Board (OBWB)	The Okanagan Basin Water Board (OBWB) addresses critical water issues across the Okanagan Basin in British Columbia. It operates as a valley-wide partnership, bringing together representatives from the three Okanagan regional districts.
Water Supply Association of BC (WSABC)	The Water Supply Association of BC (WSABC) represents water suppliers across B.C.'s interior, promoting sustainable water use and resource management. Originally known as the Association of B.C. Irrigation Districts, the WSABC was founded in 1923 to advocate for the interests of domestic and irrigation water suppliers in British Columbia.
Sustainable Infrastructure Society (WaterBC.ca)	WaterBC.ca is a resource platform developed by the Sustainable Infrastructure Society (SIS) to support community water suppliers and contractors in British Columbia and Western Canada. It offers programs and services such as affordable insurance, management support, and best practices to promote safe and sustainable water systems.
Water Research Foundation	The Water Research Foundation (WRF) is a research organization advancing water science through applied research on drinking water, wastewater, reuse, and stormwater to ensure water quality and improve water services to the public.
BC Research Inc.	BC Research Inc. (BCRI) is an R&D incubator focusing on the commercialization of clean technologies, including water-related innovations. As part of the NORAM Group, it supports clients from lab-scale research to full-scale industrial implementation.

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British Columbia Market Insights - Key Government Investments (1/2)

Key Government Investments in Water Infrastructure of B.C.:

Project	Location	Investment	Year	Details
Sunshine Coast conservation upgrades	Sunshine Coast	More than $117 million from the federal government.	2025	Involves upgrading the existing water treatment plant and constructing two large-scale water storage reservoirs.
B.C. communities' water infrastructure upgrades	Richmond, Hope, Harrison Hot Springs, and the Alberni-Clayoquot Regional District	Over $7.6 million from the federal, provincial, and municipal governments.	2024	Building a stormwater detention pond, enhancing pathway links within Minoru Lakes Park in Richmond, constructing a booster station in Hope, upgrading the stormwater system in Harrison Hot Springs, and replacing a submarine water main in the Alberni-Clayoquot Regional District.
Holland Lake expansion and water infrastructure improvements	Holland Lake in Ladysmith and other communities	More than $98 million from the federal and provincial governments and local partners.	2024	Includes improvement of drinking water supply by expanding storage capacity of the lake and construction and upgrading of wastewater infrastructure.
Lonsdale Energy Sewer Heat Recovery	North Vancouver	Part of $89 million in clean economy infrastructure projects across BC.	2024	A new energy plant to extract heat from raw sewage, reducing greenhouse gas emissions by up to 40% and heating over 15,600 residents.

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British Columbia Market Insights - Key Government Investments (2/2)

Project	Location	Investment	Year	Details
Williams Lake Water Treatment Plant	Williams Lake	Over $24.3 million from the Government of Canada, the Government of British Columbia, and Williams Lake.	2023	A new facility to reduce manganese levels in drinking water, enhancing community health and resilience.
Burns Lake, Fraser Lake, and District of Mackenzie Upgrades	Burns Lake, Fraser Lake, and the District of Mackenzie	Over $10 million from the governments of Canada and British Columbia and the municipalities of Burns Lake, Fraser Lake, and the District of Mackenzie.	2023	Includes phosphorus treatment system replacement, UV disinfection, reservoir upgrades, and construction of a water treatment system to improve water and wastewater services.
Infrastructure improvements in southern B.C.	Greenwood, Keremeos	More than $4.5 million from the federal and provincial governments, along with the City of Greenwood and the Village of Keremeos.	2023	In Greenwood, upgrade of the water system with a new reservoir, treatment facility, and pump station, while improving sewage infrastructure in Keremeos by replacing manholes and sewer pipes to reduce groundwater infiltration.
Whistler Water Infrastructure Projects	Whistler	More than $16.1 million for multiple water infrastructure projects across B.C. by the Canadian and British Columbia governments.	2023	Includes a new water treatment plant, well pump replacements, and water main construction to ensure proper wastewater treatment and improve system connections.

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British Columbia-based Market Insights - Water Plan Updates in B.C.

Major water plan updates to enhance water management, address environmental challenges, and ensure sustainable water use in B.C. -

Date	Key Policy Development	Impact on B.C.
Feb 2025	**Vancouver City Council approved the Healthy Waters Plan -** A comprehensive strategy aimed at modernizing the city's sewage and rainwater management systems by accelerating sewer separation to eliminate combined sewer overflows (CSOs) and expanding green rainwater infrastructure (GRI).	Improves water quality and mitigates climate change impacts such as flooding. (Source)
Aug 2024	**Elk Valley Water Quality Plan Update in Progress –** The initiative involves collaboration with the Ktunaxa First Nations and aims to incorporate current scientific knowledge and ecological considerations to protect the environment and public health.	Manages the effects of mining on water quality. (Source)
2024	**Metro Vancouver's Updating Drinking Water Management Plan –** The Drinking Water Management Plan serves as the overarching framework for regional drinking water initiatives. Goals include providing high-quality drinking water, ensuring efficient supply, and promoting sustainable water use.	Addresses emerging challenges such as climate change impacts, population growth, and seismic events. (Source)

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British Columbia-based Market Insights – Challenges

Challenges/Issues in B.C. related to the water sector -

Issue	Key Developments	Impact on B.C.
United States Pauses Columbia River Water-sharing Negotiations With Canada	In early 2025, Canada and the United States reached an Agreement-in-Principle (AIP) to update this critical transboundary water management agreement, originally ratified in 1964. The AIP aims to enhance flood-risk management, hydropower coordination, and ecosystem health while also recognizing Indigenous rights and values. However, in March 2025, the United States paused negotiations, citing a broad review of the treaty. This pause has raised concerns in British Columbia, as the Columbia River is vital for hydroelectric power and water supply in the region.	Concerns over hydroelectric power, water supply issues, and flooding. (Source)
Worst Drought Conditions in B.C.	Nearly 20% of B.C., mainly in the Peace and Fort Nelson districts, is now experiencing high to extreme drought, with rivers in Fort St. John and Dawson Creek at record low flows for almost two years, marking conditions unprecedented in a century of climate records.	Hydroelectric reservoirs are strained. Struggles for farmers: cattle feed shortages, wildfires. (Source)

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Conclusions & Recommendations

Technology Whitespaces Actionable Insights - Potential Risks and Opportunities

This section includes meaningful insights, strategic guidance, technology whitespaces, and potential risks and opportunities. It highlights innovation gaps, market challenges, and growth prospects to support informed decision-making.

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Technology Whitespaces

This section highlights opportunity areas, having low patenting activities with good future potential, therefore, can be considered for further research.

The indicators—**High**, **Medium**, and **Low**—are assessed across three key aspects: Patent Activity, Products & Services, and Market Scope.

A **High** rating in patent activity indicates frequent filings and strong innovation, while **Medium** suggests steady activity and **Low** reflects limited R&D or a mature market.

For Products & Services, **High** points to diverse offerings and active competition, **Medium** implies moderate presence, and **Low** indicates a niche or emerging segment.

In terms of Market Scope, a **High** rating denotes a large and growing market with strong demand, **Medium** reflects stability or moderate growth, and **Low** suggests limited or declining interest.

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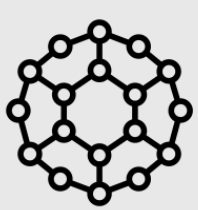
Water Technology – Technology Whitespaces (1/3)

Technology Whitespace 1 – Nanoremediation for Soil and Groundwater			
  **Nanoremediation for Soil and Groundwater utilizing Engineered Nanomaterials, such as zero-valent iron (nZVI), carbon nanotubes (CNTs), and metal oxides (e.g., TiO_2, Fe_3O_4), to degrade, immobilize, or adsorb pollutants like heavy metals, chlorinated solvents, and emerging contaminants.**	 **Patent Activity**	**Low**	• There appears to be limited patent activity in the field of nanoremediation for soil and groundwater, particularly concerning the use of advanced nanomaterials for large-scale environmental cleanup. While some patents focus on specific nanomaterial applications, such as zero-valent iron and carbon-based nanomaterials, their use in complex groundwater and soil remediation systems remains underexplored.
	 **Products & Services**	**Medium**	• There is a moderate number of research papers disclosing nano remediation for soil and groundwater. (Source) • One of the articles discloses the use of recent advances in nanoremediation technologies for soil and groundwater remediation (Source).
	 **Market Scope**	**High**	• The advanced nanomaterials market for environmental detection and remediation was valued at approximately USD 1.4 billion in 2022 and is projected to reach USD 4.9 billion by 2031, growing at a CAGR of 15.5%. (Source).

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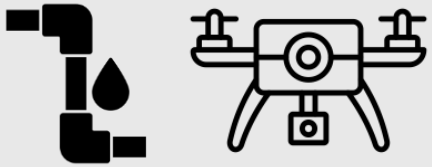
Water Technology – Technology Whitespaces (2/3)

Technology Whitespace 2 – Water Transport via Smart Drones			
 **Water Transport via Smart Drones is an emerging segment combining unmanned aerial and surface vehicles for logistics, environmental monitoring, and offshore applications.** While global interest is growing, especially in cargo drone systems and unmanned marine vessels, the Canadian market remains nascent but promising, particularly for remote area access and coastal operations.	 **Patent Activity**	**Low**	• There appears to be a growing number of patent applications related to drone-based logistics and unmanned transport systems (example: CN114644235A). However, the specific use of smart drones for water transport, particularly for cargo delivery across water bodies or remote maritime routes, seems to be less explored.
	 **Products & Services**	**Low**	• There are a few research papers disclosing the use of drones for aerial water transportation. (Source).
	 **Market Scope**	**High**	• In Canada, the marine drone market had a valuation of USD 221.48 million in 2024 and is expected to grow at a CAGR of 15.2% during the forecast period. This growth is driven by advancements in drone technology and the increasing adoption of unmanned aerial vehicles (UAVs) in various sectors. (Source)

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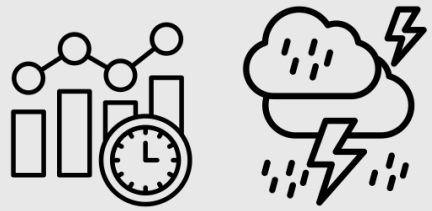
Water Technology – Technology Whitespaces (3/3)

Technology Whitespace 3 – Real-time Adaptive Stormwater Drainage Systems



Real-time Stormwater Drainage Systems that utilize sensors, IoT, and predictive controls for dynamic flow management appear to be sparsely represented in current patent literature. This suggests a potential whitespace in smart urban drainage infrastructure.

Patent Activity

Low

- While conventional stormwater drainage systems (like ponds or tanks) are well established, there is limited patent and technical activity specifically addressing real-time, sensor-driven drainage systems that can dynamically adjust outflow based on real-time rainfall data, forecasted precipitation, downstream hydraulic load, and urban flood risk prediction.

Products & Services

Medium

- There are several recent research papers evaluating real-time control (RTC) of stormwater drainage network and green stormwater infrastructure (GSI) to enhance flooding resilience under future rainfall projections. One such article is "Evaluating real-time control of stormwater drainage network and green stormwater infrastructure for enhancing flooding resilience under future rainfall projections." (Source)

Market Scope

High

- Valued at approximately USD 17.83 billion in 2024, the global stormwater management market is projected to reach USD 29.99 billion by 2030, growing at a CAGR of 9.05%. (Source)

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Actionable Insights

This section highlights meaningful insights on emerging opportunities, potential risks, and strategic directions to drive informed decision-making and market growth.

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Actionable Insights – Potential Risks and Opportunities

Based on the patent landscape study and market study, potential risks and opportunities have been recommended for Canadian companies:

- **Potential Opportunities** – These include recommendations on what actions can be taken by Canadian companies to strengthen their position in terms of valuable IP assets or in terms of the value of products/services offered in comparison to their competitors.
- **Potential Risks** – These include indicators for potential risks that Canadian companies might face if proper measures are not taken at the right time.

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Actionable Insights – Potential Opportunities (1/3)

INSIGHTS

- The water sector has **high** future potential with significant revenue growth – market size is expected to grow from USD 302.81 billion in 2022 to USD 430.89 billion by the end of 2030 at a CAGR of 4.51%. (Source)
- New technologies are emerging in sustainability and clean technology sectors, such as MOF-based Atmospheric Water Harvesters, Floating Solar-powered Desal Pods, and others.
- Canadian Assignees have demonstrated a moderate level of patent activity (~1100 patent assets) compared to leading global filers.

Upcoming/Emerging Technology Focused IP Protection

ACTIONABLES

Canadian companies should focus on:

- Building a defensive patent portfolio by filing patents in the suggested technology areas to gain a competitive edge in the Canadian and global markets and alleviate infringement risks.
- Expanding jurisdictional coverage to key global markets, including CA, US, JP, KR, EP, BR, and RU, to future-proof IP assets and enhance monetization potential across broader markets.
- Research on identified whitespace areas for invention harvesting to attract venture capital funding.

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Actionable Insights – Potential Opportunities (2/3)

INSIGHTS

- ~ 15-18k patents filed by universities and academic institutions globally, spread across various modules.
- Canadian universities such as Queen's University at Kingston, Lakehead University, University of Guelph, University of Calgary, University of Manitoba, Université de Montréal, University of Alberta, and the University of British Columbia have filed patents in this domain, mainly covering innovations related to wastewater treatment.
- Few Canadian companies have established co-innovation partnerships with water-related companies such as **Forward Water Technologies- Queen's University**, and **St. Lawrence College (SLC) Applied Research and Queen's University - Purafy Clean Technologies Inc**.

Industry-Academia Collaboration

ACTIONABLES

Canadian companies should consider:

- Collaborating with universities for co-innovation by establishing joint R&D programs to secure early-stage inventions for patent filings and access government/industry innovation grants.
- Getting licenses or purchasing patents filed by universities to leverage research done by universities to enhance the company's technology portfolio and save R&D time and cost.
- Building a structured industry-academia innovation ecosystem by sponsoring research chairs and technology incubators at leading universities, offering internships, PhD funding, or entrepreneurship programs aligned with the company's technology focus areas.

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Actionable Insights – Potential Opportunities (3/3)

INSIGHTS

- Several companies and organizations are actively seeking partnerships in the water sector, particularly with innovative startups such as **Xylem Partnerships Accelerator**, **Imagine H2O Accelerator and Imagine H2O Asia**, **Aquapreneur Innovation Initiative**, **WaterStart**, and **Va Tech Wabag's Blue Seed Initiative**.
- Patent filings are observed by Canadian companies, including British Columbia-based companies, in the related technology areas. Filings by B.C. companies reached their **highest point** in 2018, although the overall trend has been inconsistent.

Participation in Global Initiatives

ACTIONABLES

Canadian companies/startups should consider:

- Collaborating with these global initiatives to pilot new technologies and secure strategic partnerships by focusing on technologies aligned with their innovation themes: smart water, PFAS removal, and decentralized systems.
- Ensuring that new patent filings address global issues such as water scarcity, pollution, ESG compliance, and climate resilience — areas receiving the most partnership and funding attention.
- Developing bundled offerings where patent-backed innovations are demonstrated in real-world pilots through partners like WaterStart or Aquapreneur, increasing valuation and acquisition attractiveness.

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Actionable Insights – Potential Risks (1/2)

INSIGHTS

- Multiple big players operating in Europe and the US, such as Xylem, Veolia, and Suez, in this domain, primarily in wastewater treatment. (Source)
- The water startup ecosystem is worth more than $25 billion, with 75% of its value coming from companies founded after 2010, highlighting its relatively young nature and significant potential for growth. (Source)
- Start-ups in the water sector are mainly from Israel and the USA. Approximately 1,500 start-ups were founded in the past three years on water conservation techniques for end-user cases of aquaculture, blue biotech, and algae cultivation. (Source: Apricum)

Competitive Market Outside Canada

ACTIONABLES

Canadian companies should focus on:

- Exploring unique/differentiated features in products/services with proper IP protection in multiple countries, such as nanotechnology, decentralized systems, AI-driven water optimization, PFAS removal, and green hydrogen from wastewater.
- Strategizing business decisions based on upcoming trends to get funding.
- Leveraging PCT filings early to cover key global markets — North America, Europe, the Middle East, and Southeast Asia — where water sector partnerships are expanding rapidly.

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Actionable Insights – Potential Risks (2/2)

INSIGHTS

- Many critical materials used extensively in water/wastewater infrastructure are sourced from the United States, Europe, or China — disruptions or tariffs could impact business, such as the recent United States imposition of across-the-board tariffs of 25% on all steel and aluminum imports (used in constructing water pipelines, storage tanks, and wastewater treatment facilities) from all countries, including Canada. (Source)
- Project delays and elevated material costs for water infrastructure projects are observed. (Source)
- Negotiations paused for the Columbia River Treaty (CRT) (cornerstone of United States-Canada water cooperation, covering flood control and hydropower generation along the Columbia River). (Source)

Geopolitical Dependence and Supply Chain Risks

ACTIONABLES

Canadian companies should focus on:

- Securing Canadian or North American supply chains where possible by identifying and partnering with domestic or North American suppliers to reduce dependence on overseas materials.
- Investing in R&D for alternative materials (e.g., composites, coated carbon steel, high-strength polymers) that can replace tariff-affected metals without compromising structural integrity or compliance.
- Expanding domestic production capabilities by developing patented designs or modular systems that rely on local manufacturing technologies, boosting sovereignty and competitiveness.

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Appendix

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Appendix A - Taxonomy Definitions (1/27)

S. No.	Taxonomy Nodes	Definition
1	Raw Water	This category would include patent publications related to infrastructure and supporting technologies for extracting and moving raw water from the source.
1.1	Surface Water/Ground Water Extraction	This category would include patent publications disclosing infrastructure and supporting technologies for extracting and moving freshwater from the surface/ground.
1.1.1	Infrastructure	This category would include patent publications disclosing the infrastructure applied in transmitting or collecting raw groundwater or surface water for various uses.
1.1.1.1	Smart Water Intake Structures	This category would include patent publications disclosing intelligent water intake systems that utilize sensors, automation, and adaptive controls to optimize freshwater extraction from natural or artificial sources. These systems dynamically adjust intake parameters based on flow rate, real-time water quality, environmental conditions, and demand, enhancing efficiency and sustainability.
1.1.1.1.1	Floating Intake Structures	This category would include patent publications disclosing floating intake structures designed for extracting freshwater from surface water sources. These systems incorporate buoyant platforms, adjustable intake mechanisms, and filtration technologies to optimize water collection while adapting to changing water levels.
1.1.1.1.2	Self-cleaning Intake Screens	This category would include patent publications disclosing self-cleaning intake screens designed to prevent debris, sediments, and biological contaminants from entering water intake systems. These screens utilize automated cleaning mechanisms, such as backwashing, mechanical brushing, or ultrasonic technology, to maintain optimal flow and reduce maintenance.
1.1.1.1.3	Generic	This category would include patent publications disclosing smart water intake structures in general, such that they do not fall under the defined subcategories.
1.1.1.2	Solar-powered Pumps	This category would include patent publications disclosing solar-powered pumps that utilize photovoltaic energy to operate for extracting and transporting freshwater.
1.1.1.3	Gravity-fed Water Systems	This category would include patent publications disclosing gravity-fed water systems that utilize elevation differences to transport and distribute freshwater without the need for external power sources.
1.1.2	Maintenance	This category pertains to patent publications disclosing technologies and methods for maintaining infrastructure used in surface and groundwater extraction. These innovations focus on ensuring system efficiency, longevity, and operational reliability through preventive and corrective measures.

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Appendix A - Taxonomy Definitions (2/27)

S. No.	Taxonomy Nodes	Definition
1.1.2.1	Leak Prevention/ Inspection	This category would include patent publications disclosing technologies for detecting, preventing, and mitigating leaks in water extraction and distribution systems. It covers methods such as pressure monitoring, acoustic sensing, smart leak detection systems, and automated sealing technologies to reduce water loss and enhance system integrity.
1.1.2.2	Corrosion Prevention/ Inspection	This category would include patent publications disclosing technologies for monitoring, preventing, and mitigating corrosion in pipelines, pumps, and other water extraction infrastructure. It includes protective coatings, cathodic protection, corrosion-resistant materials, and real-time monitoring systems to extend equipment lifespan and maintain water quality.
1.1.2.2	Equipment Repair and Replacement	This category would include patent publications related to methods and technologies for repairing or replacing components of water extraction systems. It covers predictive maintenance tools, automated diagnostics, modular component designs, and advanced repair techniques to minimize downtime and improve operational efficiency.
1.1.2.3	Others	This category would include patent publications disclosing the use of other maintaining infrastructure for extracting groundwater or surface water that do not fall under the defined subcategories.
1.1.3	Technologies	This category would include patent publications disclosing innovative technologies used in surface and groundwater extraction, treatment, and management. These technologies enhance efficiency, sustainability, and water quality through advanced materials, automation, and smart monitoring systems.
1.1.3.1	Nanotechnology In Groundwater Remediation	This category would include patent publications disclosing the use of nanomaterials and nanotechnology-based processes for treating contaminated groundwater. It covers applications such as nano-adsorbents, nanofiltration membranes, and reactive nanoparticles for removing heavy metals, organic pollutants, and microbial contaminants.
1.1.3.2	Smart Aquifer Recharge Systems	This category would include patent publications disclosing advanced systems for artificial groundwater recharge. These systems incorporate smart monitoring, automated control, and data-driven optimization to enhance recharge efficiency, prevent over-extraction, and maintain aquifer sustainability.
1.1.4	Generic Patents related to Surface Water/Ground Water Extraction	This category would include patent publications disclosing methods, systems, and equipment for extracting surface and groundwater without focusing on specialized or emerging technologies.

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Appendix A - Taxonomy Definitions (3/27)

S. No.	Taxonomy Nodes	Definition
1.2	Desalination	This category would include patent publications disclosing infrastructure and technologies for treating saltwater (seawater or brackish water) to produce freshwater. It covers innovations in materials, system designs, and treatment processes to enhance efficiency, sustainability, and cost-effectiveness.
1.2.1	Infrastructure	This category would include patent publications disclosing physical structures and supporting components for desalination systems, including facility design, deployment, and integration with water distribution networks.
1.2.1.1	Bio-graphene & Nanomaterial Membranes	This category would include patent publications disclosing desalination membranes made from bio-graphene, nanomaterials, and advanced composites. These membranes enhance filtration efficiency, reduce fouling, and improve energy efficiency in desalination processes.
1.2.1.2	Floating/Submerged Desalination Plants	This category would include patent publications disclosing mobile, offshore, and submerged desalination systems for seawater desalination. These plants leverage renewable energy sources and modular designs for flexible, scalable water production.
1.2.2	Technologies	This category would include patent publications disclosing specific desalination processes and treatment technologies to remove salt and impurities from seawater or brackish water.
1.2.2.1	Membrane Desalination	This category would include patent publications disclosing desalination methods using semi-permeable membranes, such as reverse osmosis (RO) and forward osmosis (FO), to separate salts and contaminants from water.
1.2.2.2	Thermal Desalination	This category would include patent publications disclosing desalination techniques that use heat-based processes, such as multi-stage flash (MSF) and multi-effect distillation (MED), to evaporate and condense freshwater.
1.2.2.3	Solar Desalination	This category would include patent publications disclosing desalination technologies that utilize solar energy for water purification. It includes direct and indirect solar desalination methods, such as solar stills and solar-powered reverse osmosis.
1.2.2.4	Membrane Distillation	This category would include patent publications disclosing desalination processes that use hydrophobic membranes to separate freshwater from saline water through vaporization and condensation, often driven by temperature gradients.
1.2.2.5	Capacitive Deionization (CDI)/ Electro-Deionization (EDI)	This category would include patent publications disclosing electrochemical desalination techniques that use electrically charged electrodes or ion exchange membranes to remove dissolved salts and ions from water.

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Appendix A - Taxonomy Definitions (4/27)

S. No.	Taxonomy Nodes	Definition
1.2.2.6	Generic Desalination	This category would include patent publications disclosing desalination in general, such that it does not fall under the defined subcategories.
1.3	Rainwater/Atmospheric water extraction	This category would include patent publications disclosing infrastructure and technologies for harvesting and collecting freshwater from rainwater and atmospheric sources. These innovations aim to enhance water availability through efficient collection, storage, and treatment methods.
1.3.1	Rainwater Harvesting	This category would include patent publications related to the systems and techniques for collecting, storing, and utilizing rainwater for potable and non-potable applications.
1.3.1.1	Rainwater Collection Systems	This category would include patent publications related to rainwater harvesting systems incorporating storage and distribution mechanisms to optimize water collection and usage.
1.3.1.2	Groundwater Recharge Techniques	This category would include patent publications disclosing methods for directing harvested rainwater into aquifers to replenish groundwater levels, including percolation pits, infiltration basins, and recharge wells.
1.3.1.3	Drainage Systems	This category would include patent publications disclosing systems and techniques for managing rainwater and preventing waterlogging through proper channeling, storage, or disposal of excess rainwater.
1.3.1.4	Rainwater Treatment	This category would include patent publications disclosing technologies and processes for treating collected rainwater to improve its quality for potable or specific non-potable uses.
1.3.2	Atmospheric Water Harvesting	This category would include patent publications disclosing technologies that extract water directly from the atmosphere through condensation or sorption-based processes.
1.3.2.1	Fog and Dew harvesting	This category would include patent publications disclosing passive and active systems for collecting water from fog and dew, utilizing mesh-based collectors, surface coatings, and hydrophilic materials.
1.3.2.2	Cooling Condensation-based Atmospheric Water Generator (AWGs)	This category would include patent publications disclosing AWG systems that use cooling-based condensation to extract moisture from the air, often powered by electricity or renewable energy sources.
1.3.2.3	Desiccant-based AWGs	This category would include patent publications disclosing AWG technologies that use hygroscopic materials (desiccants) to absorb atmospheric moisture, followed by thermal or chemical processes to release and collect the extracted water.
1.3.2.4	Solar-driven Atmospheric Water Extraction (SAWE)	This category would include patent publications disclosing atmospheric water harvesting technologies powered by solar energy, enhancing sustainability and off-grid water accessibility.

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Appendix A - Taxonomy Definitions (5/27)

S. No.	Taxonomy Nodes	Definition
1.3.2.5	Generic	This category would include patent publications disclosing atmospheric water harvesting technologies in general, such that it does not fall under the defined subcategories.
1.4	Stormwater	This category would include patent publications disclosing infrastructure and technologies that collect, transmit, and manage stormwater for any use.
1.4.1	Capture and Filtration Infrastructure/ Technologies	This category would include patent publications disclosing infrastructure and technologies for capturing, managing, and treating stormwater. These innovations integrate natural and engineered solutions to optimize stormwater collection, filtration, and absorption.
1.4.1.1	Green Infrastructure (Rain Gardens, Bioswales, etc.)	This category would include patent publications disclosing nature-based solutions for stormwater management, such as rain gardens, bioswales, permeable pavements, and constructed wetlands. These systems use vegetation and soil to filter pollutants, enhance infiltration, and reduce runoff.
1.4.1.2	Gray Infrastructure - Detention & Retention Systems	This category would include patent publications disclosing engineered stormwater management systems, including detention basins, retention ponds, underground storage tanks, and conveyance structures. These systems regulate water flow, mitigate urban flooding, and support controlled water release.
1.4.1.3	Filtration/Treatment/ Absorption Technologies	This category would include patent publications disclosing advanced treatment methods for stormwater purification. It covers filtration systems, absorbent materials, sediment separation technologies, and chemical/biological treatment processes to remove contaminants and improve water quality.
1.4.1.4	Others	This category would include patent publications disclosing additional stormwater capture and filtration innovations that do not fall under the defined subcategories.
1.4.2	Management	This category would include patent publications disclosing infrastructure, systems, and technologies designed to manage stormwater runoff, control water accumulation, and mitigate the impact of excessive rainfall on urban and natural environments.
1.4.2.1	Overflow and Flood Management	This category would include patent publications disclosing infrastructure, predictive technologies, and engineering solutions aimed at preventing stormwater overflows and mitigating flooding through advanced drainage, retention, and control mechanisms.

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Appendix A - Taxonomy Definitions (6/27)

S. No.	Taxonomy Nodes	Definition
1.4.2.1.1	Predictive Technologies for Flood Prevention and Stormwater Modelling	This category would include patent publications disclosing predictive and analytical technologies used to forecast flooding, optimize stormwater management, and enhance decision-making. These innovations leverage data-driven models, real-time monitoring, and advanced simulations to mitigate flood risks and improve water resource planning.
1.4.2.1.1.1	AI and Machine Learning	This category would include patent publications disclosing the application of artificial intelligence (AI) and machine learning algorithms for stormwater modeling, flood prediction, and adaptive water management. These technologies analyze historical and real-time data to optimize stormwater infrastructure and response strategies.
1.4.2.1.1.2	IoT Devices for Real-time Monitoring	This category would include patent publications disclosing Internet of Things (IoT)-enabled sensors and smart devices for continuous monitoring of stormwater levels, flow rates, water quality, and weather conditions. These systems provide real-time alerts and data-driven insights for flood prevention and water resource optimization.
1.4.2.1.1.3	Hydrologic and Hydraulic Models	This category would include patent publications disclosing computational models that simulate the movement, distribution, and impact of stormwater. These models assist in flood forecasting, drainage design, and watershed management by analyzing rainfall, infiltration, runoff, and channel flow dynamics.
1.4.2.1.1.4	Remote Sensing and GIS-based Models	This category would include patent publications disclosing the use of remote sensing technologies and Geographic Information Systems (GIS) for stormwater analysis, flood risk mapping, and land-use planning. These models integrate satellite imagery, topographic data, and hydrological parameters to enhance predictive accuracy and decision-making.
1.4.2.1.1.5	Others	This category would include patent publications disclosing additional predictive technologies for flood prevention and stormwater modelling that do not fall under the defined subcategories.
1.4.2.1.2	Combined Sewer Overflow (CSO)	This category would include patent publications disclosing systems and methods for managing combined sewer overflows (CSOs), including technologies for real-time monitoring, overflow regulation, and pollution control.
1.4.2.1.2.1	Real-time Monitoring and Prevention Systems	This category would include patent publications disclosing sensor-based and automated systems that detect, predict, warn, and manage combined sewer overflows in real time to minimize environmental impact.
1.4.2.1.2.3	Screening/Filtration/Treatment Systems	This category would include patent publications disclosing technologies for screening, filtering, and treating combined sewer overflows to remove pollutants and improve water quality before discharge.
1.4.2.1.2.4	Overflow Regulators and Storage Basins	This category would include patent publications disclosing flow regulation devices, retention basins, and underground storage solutions designed to temporarily store excess stormwater and prevent overflow events.

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Appendix A - Taxonomy Definitions (7/27)

S. No.	Taxonomy Nodes	Definition
1.4.2.1.2.5	Others	This category would include patent publications disclosing any additional CSO-related technologies not covered by the defined subcategories.
1.4.2.3	Stormwater Quality Monitoring	This category would include patent publications disclosing systems and technologies for assessing and analyzing the physical, chemical, and biological characteristics of stormwater. These innovations involve real-time sensors, automated sampling, and data analytics to detect contaminants, monitor water quality parameters, and ensure compliance with environmental regulations.
1.4.3	Drainage	This category would include patent publications disclosing drainage infrastructure, systems, and methods for managing surface and subsurface water flow to prevent water accumulation, soil erosion, and flooding.
1.5	Water Transmission/Moving Techniques	This category would include patent publications disclosing infrastructure and technologies for transporting water efficiently across various terrains and distances. These innovations enhance water distribution systems by optimizing flow, reducing energy consumption, and improving adaptability in diverse environments.
1.5.1	Hydraulic Accumulators in Pipelines	This category would include patent publications disclosing the use of hydraulic accumulators to regulate pressure, store energy, and optimize water flow within pipeline systems, improving efficiency and reducing water hammer effects.
1.5.2	Pneumatic Water Transport Systems	This category would include patent publications disclosing water conveyance methods that use compressed air or vacuum-based mechanisms to transport water through pipelines, enhancing efficiency in specific industrial and municipal applications.
1.5.3	Underground Water Conveyance	This category would include patent publications disclosing subterranean pipeline networks, tunnels, and aqueducts designed to transport water while minimizing evaporation, contamination, and environmental disruption.
1.5.4	Floating Pipelines	This category would include patent publications disclosing flexible and buoyant pipeline systems used for water transportation across water bodies, remote areas, or temporary emergency applications.
1.5.5	Water Transport via Smart Drones	This category would include patent publications disclosing the use of autonomous or remotely operated drones equipped to carry and deliver water, primarily for emergency relief, remote irrigation, or targeted water distribution.
1.6	Water Source/Availability Identification	This category would include patent publications disclosing technologies and methods for detecting, mapping, and assessing water sources, including surface water, groundwater, and atmospheric moisture. These innovations leverage advanced sensing, predictive modeling, and data analytics to optimize water resource management and planning.

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Appendix A - Taxonomy Definitions (8/27)

S. No.	Taxonomy Nodes	Definition
1.6.1	Remote Sensing/Satellite Imaging	This category would include patent publications disclosing the use of satellite imagery, aerial drones, and remote sensing technologies to identify water bodies, monitor water levels, and assess hydrological changes over time.
1.6.2	AI Prediction Techniques	This category would include patent publications disclosing artificial intelligence and machine learning-based models for predicting water availability, analyzing climate patterns, and forecasting drought conditions to support sustainable water management.

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Appendix A - Taxonomy Definitions (9/27)

S. No.	Taxonomy Nodes	Definition
2	Use	This category would include patent publications disclosing technologies, systems, and processes for utilizing water in various sectors, including industrial, agricultural, aquaculture, and potable water applications. These innovations focus on optimizing water treatment, conservation, and sustainable management practices.
2.1	Industrial	This category would include patent publications disclosing technologies, treatment techniques, infrastructure, and management systems to treat or support the process of treating raw water to make it suitable for industrial usage. These innovations focus on optimizing water quality, efficiency, and sustainability in industrial processes, including boiler feedwater treatment, cooling water systems, and process water purification.
2.1.1	Treatment Techniques	This category would include patent publications disclosing methods for treating and conditioning water used in industrial applications to ensure optimal performance, prevent equipment damage, and comply with environmental regulations.
2.1.1.1	Boiler Feedwater Treatment	This category would include patent publications disclosing technologies and processes for treating water used in industrial boilers to prevent scaling, corrosion, and operational inefficiencies. These innovations ensure optimal boiler performance, extend equipment lifespan, and improve energy efficiency.
2.1.1.2	Cooling Water Treatment	This category would include patent publications disclosing technologies and processes for maintaining the quality of cooling water used in industrial heat exchange systems. These innovations focus on preventing scaling, corrosion, and biological fouling to improve cooling efficiency and reduce maintenance costs.
2.1.1.2.1	Filtration	This category would include patent publications disclosing filtration methods to remove suspended solids, biofouling agents, and contaminants from cooling water.
2.1.1.2.2	Corrosion and Scale Control Inhibitors	This category would include patent publications disclosing chemical and electrochemical treatments to prevent corrosion and scale buildup in cooling systems.
2.1.1.2.3	Clarification	This category would include patent publications disclosing processes that remove suspended solids and improve water clarity using sedimentation, coagulation, or flotation techniques.
2.1.1.2.4	Biocides & Algaecides	This category would include patent publications disclosing chemical and biological agents used to control microbial growth, algae, and biofouling in cooling systems.
2.1.1.2.5	pH Adjustment	This category would include patent publications disclosing pH regulation techniques to maintain optimal water chemistry for industrial cooling applications.
2.1.1.2.6	Others	This category would include patent publications disclosing additional cooling water treatment techniques that do not fall under the defined subcategories.

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Appendix A - Taxonomy Definitions (10/27)

S. No.	Taxonomy Nodes	Definition
2.1.1.3	Industrial Process Water Treatment	This category would include patent publications disclosing technologies for purifying and conditioning water used in industrial processes to meet specific quality standards. These innovations focus on removing contaminants, improving water reusability, and enhancing process efficiency.
2.1.1.3.1	Ultra-Pure Water (UPW) Treatment	This category would include patent publications disclosing advanced purification processes for producing ultra-pure water for industries such as semiconductor manufacturing, pharmaceuticals, and power generation.
2.1.1.3.2	Deionization /Demineralization/Ion exchange	This category would include patent publications disclosing ion exchange technologies for removing dissolved ions from water to achieve high-purity standards.
2.1.1.3.3	UV and Ozone Disinfection	This category would include patent publications disclosing ultraviolet and ozone-based disinfection techniques to eliminate bacteria, viruses, and organic contaminants from process water.
2.1.1.3.4	Membrane Filtration	This category would include patent publications disclosing membrane-based separation technologies for removing particulates, microbes, and dissolved substances from industrial water.
2.1.1.3.5	Activated Carbon Filtration	This category would include patent publications disclosing the use of activated carbon to remove organic contaminants, chlorine, and volatile compounds from process water.
2.1.1.3.6	Others	This category would include patent publications disclosing additional industrial process water treatment techniques that do not fall under the defined subcategories.
2.1.2	Infrastructure Components	This category would include patent publications disclosing physical and digital infrastructure used in industrial water systems to enhance monitoring, efficiency, and operational safety.
2.1.2.1	Smart & Automated Control Valves/Dampers/Flow meters	This category would include patent publications disclosing intelligent control systems that regulate water flow, pressure, and distribution in industrial processes.
2.1.2.2	Remote Operated Components	This category would include patent publications disclosing remotely controlled valves, pumps, and monitoring devices for automated water management in industrial facilities.
2.1.2.3	Corrosion-resistant & High-durability Components	This category would include patent publications disclosing advanced materials and coatings used in industrial water infrastructure to enhance durability and resist corrosion.

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Appendix A - Taxonomy Definitions (11/27)

S. No.	Taxonomy Nodes	Definition
2.1.3	Water Management/Analytics	This category would include patent publications disclosing digital and analytical solutions for optimizing water usage, improving efficiency, and ensuring regulatory compliance in industrial settings.
2.1.3.1	Water Usage Monitoring	This category would include patent publications disclosing systems for tracking water consumption, flow rates, and efficiency in industrial facilities.
2.1.3.2	Removing Water from other Industrial Products/Processes	This category would include patent publications disclosing methods for removing, extracting, and reusing water from industrial products or industrial processes.
2.1.3.3	Smart Industrial Water Management	This category would include patent publications disclosing intelligent water management systems that use IoT sensors, AI algorithms, and automated processes to optimize industrial water use and prevent waste.
2.1.3.4	Fluidic Analysis	This category would include patent publications disclosing analytical techniques for assessing fluid dynamics, chemical composition, and quality of industrial water.
2.2	Agriculture	This category would include patent publications disclosing technologies, systems, and infrastructure for treating, distributing, and managing water in agricultural applications. These innovations aim to enhance water efficiency, ensure water quality, and optimize irrigation practices for sustainable farming.
2.2.1	Treatment Techniques	This category would include patent publications disclosing methods for treating agricultural water to remove contaminants, improve quality, and ensure suitability for irrigation and livestock use.
2.2.1.1	Physical Treatment Techniques	This category would include patent publications disclosing filtration, sedimentation, UV sterilization, membrane-based treatment techniques, and other mechanical processes used to remove suspended solids, debris, and impurities from agricultural water.
2.2.1.2	Chemical Treatment Techniques	This category would include patent publications disclosing chemical-based water treatment methods, including pH adjustment, disinfection, and nutrient balancing, to improve water quality for agricultural applications.
2.2.1.3	Biological Treatment Techniques	This category would include patent publications disclosing bioremediation, microbial filtration, and natural treatment processes to remove organic contaminants and enhance water quality for irrigation and livestock.
2.2.1.4	Others	This category would include patent publications disclosing additional agricultural water treatment methods that do not fall under the defined subcategories.

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Appendix A - Taxonomy Definitions (12/27)

S. No.	Taxonomy Nodes	Definition
2.2.2	Infrastructure Components	This category would include patent publications disclosing physical and digital infrastructure used to control, monitor, and optimize agricultural water usage.
2.2.2.1	Wireless Valve & Pump Automation	This category would include patent publications disclosing remotely controlled and automated valve and pump systems that regulate water distribution for irrigation based on real-time data and pre-programmed settings.
2.2.2.2	IoT-based Soil Sensors	This category would include patent publications disclosing sensor-based systems that monitor soil moisture, salinity, and nutrient levels to optimize irrigation and reduce water wastage.
2.2.2.3	Solar-powered Pumping Systems	This category would include patent publications disclosing solar-driven water pumping technologies designed for irrigation and agricultural water distribution, reducing reliance on conventional energy sources.
2.2.3	Water Management	This category would include patent publications disclosing advanced technologies and systems for efficient water distribution, conservation, and allocation in agriculture.
2.2.3.1	AI & Machine Learning for Water Allocation	This category would include patent publications disclosing artificial intelligence and machine learning-based models that analyze environmental factors and crop needs to optimize water distribution.
2.2.3.2	Cloud-based Irrigation Monitoring	This category would include patent publications disclosing cloud-enabled systems for real-time tracking and remote control of irrigation processes, ensuring optimal water usage.
2.2.3.3	IoT-based Smart Irrigation	This category would include patent publications disclosing smart irrigation systems that use IoT sensors and automated controls to dynamically adjust water supply based on weather conditions, soil moisture, and crop requirements.
2.2.3.4	Climate-based Irrigation Adjustment	This category would include patent publications disclosing irrigation technologies that adjust water distribution based on real-time climate data, such as temperature, humidity, and precipitation forecasts.
2.2.3.5	Irrigation Leak Detection	This category would include patent publications disclosing automated monitoring systems designed to detect and prevent leaks in irrigation networks, reducing water wastage and improving efficiency.
2.2.3.6	Water Conservation Techniques	This category would include patent publications disclosing techniques and technologies aimed at minimizing water wastage and improving irrigation efficiency to support sustainable agricultural practices.
2.2.3.6.1	Drip Irrigation & Micro Irrigation	This category would include patent publications disclosing precision irrigation systems that deliver water directly to plant roots through controlled drippers, emitters, and micro-sprinklers, reducing evaporation and runoff while optimizing water usage.

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Appendix A - Taxonomy Definitions (13/27)

S. No.	Taxonomy Nodes	Definition
2.2.3.6.2	Mulching & Soil Moisture Retention	This category would include patent publications disclosing the use of organic and inorganic mulch materials to cover soil surfaces, reducing evaporation, maintaining soil temperature, and enhancing moisture retention for improved plant growth.
2.2.3.6.3	Generic	This category would include patent publications disclosing additional water conservation techniques in general in agriculture that do not fall under the defined subcategories.
2.3	Aquaculture	This category would include patent publications disclosing technologies, infrastructure, and management systems for maintaining water quality in aquaculture environments.
2.3.1	Treatment Techniques	This category would include patent publications disclosing methods for treating and maintaining water quality in aquaculture systems to ensure a healthy aquatic environment.
2.3.1.1	Ultraviolet (UV) light	This category would include patent publications disclosing UV-based water treatment technologies used for disinfection, pathogen control, and reducing microbial contamination in aquaculture facilities.
2.3.1.2	Mechanical Filtration	This category would include patent publications disclosing filtration techniques that remove suspended solids, organic matter, and debris from water using mesh, screens, or other physical filtration systems.
2.3.1.3	Sedimentation	This category would include patent publications disclosing sedimentation-based water treatment methods designed to separate and remove particulate matter by allowing solids to settle naturally or through enhanced sedimentation techniques.
2.3.1.4	Nitrification	This category would include patent publications disclosing biological treatment processes that convert toxic ammonia into nitrate, promoting water quality and maintaining a balanced nitrogen cycle in aquaculture systems.
2.3.1.5	Recirculatory Aquaculture System (RAS)	This category would include patent publications disclosing water treatment techniques used in closed-loop aquaculture systems that continuously filter and recycle water, reducing water usage and improving environmental sustainability.
2.3.1.6	Biological Process	This category would include patent publications disclosing biological methods for improving water quality in aquaculture systems, including the use of beneficial microorganisms to manage waste and maintain ecological balance.
2.3.1.7	Others	This category would include patent publications disclosing additional water treatment methods in aquaculture that do not fall under the defined subcategories.
2.3.2	Infrastructure Components	This category would include patent publications disclosing physical and digital infrastructure for monitoring, controlling, and optimizing aquaculture water quality.

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Appendix A - Taxonomy Definitions (14/27)

S. No.	Taxonomy Nodes	Definition
2.3.2.1	IoT-enabled Sensors	This category would include patent publications disclosing sensor-based systems that monitor key water quality parameters, such as temperature, dissolved oxygen, pH, and salinity, providing real-time data for efficient aquaculture management.
2.3.2.2	Floating & Submersible Water Treatment Units	This category would include patent publications disclosing autonomous and deployable water treatment units that operate on or beneath the water surface to filter, oxygenate, and maintain optimal aquatic conditions.
2.3.3	Water Management	This category would include patent publications disclosing systems and techniques for optimizing water conditions, ensuring proper nutrient balance, and maintaining overall aquaculture ecosystem health.
2.3.3.1	Aeration Systems	This category would include patent publications disclosing technologies that enhance dissolved oxygen levels in aquaculture environments using aerators, diffusers, or oxygen injection methods to support aquatic life.
2.3.3.2	pH & Salinity Control	This category would include patent publications disclosing methods and systems for regulating pH and salinity levels in aquaculture water to maintain ideal conditions for fish and shellfish farming.
2.3.3.3	Nutrient Management	This category would include patent publications disclosing technologies that control and optimize nutrient levels and imbalances in water chemistry.
2.4	Potable Water	This category would include patent publications disclosing technologies, infrastructure, and management systems for treating, distributing, and monitoring potable water to ensure safety, quality, and efficient consumption. These innovations focus on advanced purification methods, smart distribution systems, and data-driven water management.
2.4.1	Treatment Techniques	This category would include patent publications disclosing methods for purifying water to meet drinking water standards by removing contaminants, pathogens, and impurities.
2.4.1.1	Membrane Filtration	This category would include patent publications disclosing membrane-based filtration technologies that remove particles, bacteria, viruses, and dissolved substances from water at varying levels of filtration precision.

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Appendix A - Taxonomy Definitions (15/27)

S. No.	Taxonomy Nodes	Definition
2.4.1.2	Electro-Coagulation/Oxidation	This category would include patent publications disclosing electrochemical water treatment processes that use electric currents to destabilize and remove contaminants, heavy metals, and organic pollutants.
2.4.1.3	UV Disinfection	This category would include patent publications disclosing ultraviolet (UV) light-based water treatment systems that inactivate bacteria, viruses, and other microorganisms without the use of chemicals.
2.4.1.4	Chemical Treatment	This category would include patent publications disclosing chemical-based water purification techniques, such as chlorination and ozone treatment, to eliminate contaminants and improve water quality.
2.4.1.5	Biological Treatment	This category would include patent publications disclosing biological methods for treating water by using microorganisms to degrade organic contaminants and improve overall water quality.
2.4.1.6	Others	This category would include patent publications disclosing additional potable water treatment techniques that do not fall under the defined subcategories.
2.4.2	Infrastructure Components	This category would include patent publications disclosing physical and digital infrastructure for potable water distribution, monitoring, and optimization.
2.4.2.1	Smart Meters & Flow Regulators	This category would include patent publications disclosing intelligent water metering systems and flow control devices that enable real-time tracking of water consumption, leak detection, and pressure regulation.
2.4.2.2	Smart Distribution/Pipelines	This category would include patent publications disclosing advanced water distribution systems that incorporate IoT-enabled sensors and automated control valves.
2.4.3	Water Management	This category would include patent publications disclosing digital and analytical solutions for monitoring, optimizing, and managing potable water supply and consumption.
2.4.3.1	Mobile Application for Water Monitoring and Control	This category would include patent publications disclosing smartphone-based platforms that enable users to track water quality, consumption, and system performance remotely.

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Appendix A - Taxonomy Definitions (16/27)

S. No.	Taxonomy Nodes	Definition
2.4.3.2	Smart Water Leak Detection & Management	This category would include patent publications disclosing automated systems for identifying, analyzing, and mitigating leaks in water distribution networks to reduce water loss and enhance efficiency.
2.4.3.3	Water Demand Prediction Systems	This category would include patent publications disclosing AI-driven and data analytics-based models for forecasting water demand based on usage patterns, climate conditions, and population growth.
2.4.3.4	Recreational Water Treatment	This category would include patent publications disclosing water treatment solutions specifically designed for swimming pools, spas, and other recreational water facilities to maintain safety and hygiene.

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Appendix A - Taxonomy Definitions (17/27)

S. No.	Taxonomy Nodes	Definition
3	Outflows	This category would include patent publications disclosing processes, technologies, and systems related to the final stages of water treatment, sludge handling, water reuse, and resource recovery.
3.1	Wastewater Treatment and Reuse	This category would include patent publications disclosing technologies, systems, and processes for treating wastewater to remove contaminants, improve water quality, and enable its safe reuse for industrial, agricultural, or potable applications.
3.1.1	Treatments	This category would include patent publications disclosing technologies, processes, and infrastructure for treating wastewater. These innovations encompass physical, chemical, and biological treatment methods to enhance efficiency and sustainability in wastewater management.
3.1.1.1	Physical Treatments	This category would include patent publications disclosing mechanical and physical processes for separating solid and liquid components in wastewater treatment.
3.1.1.1.1	Screening	This category would include patent publications disclosing methods for removing large debris, solids, and suspended particles from wastewater using mesh screens, grates, or sieves.
3.1.1.1.2	Sedimentation	This category would include patent publications disclosing gravity-based settling techniques that allow heavier solids to settle at the bottom for separation from wastewater.
3.1.1.1.3	Skimming	This category would include patent publications disclosing processes for removing floating substances such as oil, grease, and scum from wastewater surfaces.
3.1.1.1.4	Flotation	This category would include patent publications disclosing methods that use air bubbles to lift suspended solids and contaminants to the surface for removal.
3.1.1.1.5	Adsorption	This category would include patent publications disclosing techniques that use porous materials (e.g., activated carbon) to absorb pollutants, organic matter, and toxins from wastewater.
3.1.1.1.6	Thermal Treatment	This category would include patent publications disclosing heat-based methods such as evaporation, incineration, and pasteurization to treat wastewater and remove contaminants.
3.1.1.1.7	Membrane-based Technology	This category would include patent publications disclosing filtration techniques that use membranes (e.g., microfiltration, ultrafiltration, nanofiltration, and reverse osmosis) to separate contaminants from wastewater.
3.1.1.1.9	Disinfection through UV Light	This category would include patent publications disclosing ultraviolet (UV) radiation-based disinfection methods for inactivating bacteria, viruses, and pathogens in treated wastewater.
3.1.1.1.10	Others	This category would include patent publications disclosing additional physical wastewater treatment techniques that do not fall under the defined subcategories.

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Appendix A - Taxonomy Definitions (18/27)

S. No.	Taxonomy Nodes	Definition
3.1.1.2	Chemical Treatment	This category would include patent publications disclosing chemical processes used to neutralize, remove, or break down contaminants in wastewater.
3.1.1.2.1	Clarification	This category would include patent publications disclosing chemical coagulation and flocculation techniques that enhance the settling and removal of suspended solids.
3.1.1.2.2	Ion Exchange	This category would include patent publications disclosing methods that use ion exchange resins to remove dissolved ions such as heavy metals, nitrates, and ammonia from wastewater.
3.1.1.2.3	Photolysis	This category would include patent publications disclosing chemical treatment methods that use light energy to break down pollutants and organic contaminants in wastewater.
3.1.1.2.4	Ozonation	This category would include patent publications disclosing ozone-based oxidation processes for breaking down organic pollutants, disinfecting wastewater, and removing color and odor.
3.1.1.2.5	Photocatalysis	This category would include patent publications disclosing chemical treatment methods that use photocatalysts (e.g., titanium dioxide) and light to degrade organic pollutants and eliminate contaminants.
3.1.1.2.6	Neutralization	This category would include patent publications disclosing techniques for adjusting wastewater pH levels using acids, bases, or buffering agents to achieve a balanced composition.
3.1.1.2.7	Precipitation	This category would include patent publications disclosing chemical methods for converting dissolved contaminants into solid precipitates that can be easily removed from wastewater.
3.1.1.2.8	Fenton and Photo-Fenton Process	This category would include patent publications disclosing advanced oxidation processes that use hydrogen peroxide and iron catalysts (Fenton reagents) to degrade organic pollutants in wastewater.
3.1.1.2.9	Electrochemical Treatment	This category would include patent publications disclosing electrochemical methods such as electrocoagulation, electrooxidation, and electroflotation for removing contaminants from wastewater.
3.1.1.2.10	Others	This category would include patent publications disclosing additional chemical wastewater treatment techniques that do not fall under the defined subcategories.
3.1.1.3	Biological Treatment	This category would include patent publications disclosing biological processes that use microorganisms, enzymes, and natural systems to degrade organic pollutants and improve wastewater quality.
3.1.1.3.1	Biofilters	This category would include patent publications disclosing filtration systems that use microorganisms to break down organic contaminants in wastewater.
3.1.1.3.2	Biofilm Reactors	This category would include patent publications disclosing treatment systems where microorganisms grow as biofilms on surfaces, enhancing the breakdown of organic pollutants.

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Appendix A - Taxonomy Definitions (19/27)

S. No.	Taxonomy Nodes	Definition
3.1.1.3.3	Biological Nitrification-Denitrification	This category would include patent publications disclosing microbial processes that convert ammonia to nitrate (nitrification) and further reduce it to nitrogen gas (denitrification) for wastewater treatment.
3.1.1.3.4	Bioremediation	This category would include patent publications disclosing natural or engineered microbial processes for degrading pollutants and restoring water quality.
3.1.1.3.5	Aerobic/Anaerobic and Facultative Treatment	This category would include patent publications disclosing biological treatment systems that operate under aerobic (oxygen-rich), anaerobic (oxygen-free), or facultative (both conditions) environments to break down organic matter in wastewater.
3.1.1.3.6	Biosorption	This category would include patent publications disclosing methods that use biological materials (e.g., algae, fungi, or bacteria) to absorb heavy metals and pollutants from wastewater.
3.1.1.3.7	Membrane Bioreactor (MBR)	This category would include patent publications disclosing hybrid biological treatment systems that combine membrane filtration with microbial degradation for highly efficient wastewater purification.
3.1.1.3.8	Microbial Fuel cells	This category would include patent publications disclosing bio-electrochemical systems that use microorganisms to generate electricity while treating wastewater.
3.1.1.3.9	Constructed Wetland	This category would include patent publications disclosing engineered wetland systems that use natural vegetation and microbial activity to filter and purify wastewater.
3.1.1.3.10	Others	This category would include patent publications disclosing additional biological wastewater treatment techniques that do not fall under the defined subcategories.
3.1.1.4	Other Treatment Methods	This category would include patent publications disclosing alternative or advanced water treatment technologies designed to enhance water purification, resource recovery, and environmental sustainability beyond conventional treatment methods.
3.1.1.4.1	Zero Liquid Discharge (ZLD)	This category would include patent publications disclosing wastewater treatment processes that eliminate liquid waste by recovering and recycling all water, often through advanced filtration, evaporation, and crystallization techniques.
3.1.2	Wastewater Types	This category would include several related types of wastewater based on their sources or characteristics. It provides a high-level grouping to organize and manage various wastewater types for treatment, reuse, or disposal.
3.1.2.1	Greywater	This category would include patent publications focused on wastewater from domestic activities like bathing, laundry, and dishwashing.

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Appendix A - Taxonomy Definitions (20/27)

S. No.	Taxonomy Nodes	Definition
3.1.2.2	Industrial Wastewater	This category would cover patents related to wastewater from industrial processes, which may contain oils, chemicals, and heavy metals.
3.1.2.3	Agricultural Wastewater	This category would include patent publications related to wastewater generated from agricultural activities, such as runoff from irrigation systems, livestock operations, and crop production.
3.1.2.4	Blackwater	This category would include patent publications related to wastewater that comes from toilets and contains human waste.
3.1.2.5	Mining Wastewater	This category would include patent publications related to wastewater generated from mining operations, which may contain heavy metals, chemicals, sediments, and other pollutants.
3.1.3	Reuse Applications	This category would include patent publications disclosing specific applications where treated wastewater is repurposed/reused, reducing freshwater consumption and enhancing resource efficiency.
3.1.3.1	Industrial Processes	This category would include patent publications disclosing the use of reclaimed water in industrial applications such as cooling systems, boiler feedwater, equipment cleaning, and manufacturing processes, reducing dependency on freshwater sources.
3.1.3.2	Agricultural Irrigation	This category would include patent publications disclosing wastewater treatment and reuse technologies for irrigation in agriculture, ensuring a safe and nutrient-rich water supply for crops while preventing contamination.
3.1.3.3	Groundwater Recharge	This category would include patent publications disclosing methods for reintroducing treated wastewater into aquifers through direct or indirect recharge techniques to prevent groundwater depletion and maintain water table levels.
3.1.3.4	Potable Water Use	This category would include patent publications disclosing advanced water treatment technologies that purify reclaimed wastewater to meet drinking water standards using methods such as filtration, reverse osmosis, UV disinfection, and advanced oxidation processes.
3.1.3.5	Residential Use	This category would include patent publications disclosing greywater and wastewater reuse systems for homes, including treated water for toilet flushing, laundry, landscaping, and other non-potable applications.
3.2	Wastewater Management	This category would include patent publications disclosing technologies, infrastructure, and methodologies for handling, monitoring, and optimizing wastewater collection, treatment, and disposal. These innovations focus on efficient wastewater transport, quality assessment, sludge management, and regulatory compliance.

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Appendix A - Taxonomy Definitions (21/27)

S. No.	Taxonomy Nodes	Definition
3.2.1	Wastewater Testing, Forecasting, and Modelling	This category would include patent publications disclosing systems and technologies for analyzing and predicting wastewater conditions, ensuring efficient system operation, and maintaining regulatory compliance.
3.2.1.1	Peak Loads and Anomalies related to Wastewater Transmission	This category would include patent publications disclosing monitoring and control technologies for identifying sudden changes in wastewater flow, preventing system overloads, and optimizing wastewater transmission during peak demand periods.
3.2.1.2	Determine Water Quality	This category would include patent publications disclosing methods and sensor-based systems for assessing wastewater quality by analyzing parameters such as pH, turbidity, biological oxygen demand (BOD), chemical oxygen demand (COD), and microbial contaminants.
3.2.1.3	Odor Control	This category would include patent publications disclosing technologies for detecting, neutralizing, and preventing odors in wastewater treatment facilities, including biofilters, activated carbon systems, and chemical scrubbing techniques.
3.2.1.4	Meeting Discharge Compliance Standards	This category would include patent publications disclosing technologies and processes that ensure wastewater treatment facilities meet regulatory discharge limits, including automated compliance monitoring and advanced treatment solutions.
3.2.2	Wastewater Infrastructure Inspections	This category would include patent publications disclosing technologies, systems, and methods for assessing the condition, performance, and integrity of wastewater infrastructure, including pipelines, treatment plants, and sewer systems, to ensure efficient operation and prevent failures.
3.2.2.1	Leak Detection	This category would include patent publications disclosing technologies for identifying and locating leaks in wastewater pipelines and treatment systems, including acoustic sensors, pressure monitoring, and tracer gas methods.
3.2.2.2	Deformation and Corrosion Detection	This category would include patent publications disclosing methods and systems for detecting structural deformations, material degradation, and corrosion in wastewater infrastructure using techniques such as ultrasonic testing, laser profiling, and ground-penetrating radar.
3.2.2.3	Blockage Detection	This category would include patent publications disclosing systems for identifying obstructions, sediment buildup, and flow restrictions in wastewater pipelines and sewer networks through CCTV inspections, sonar imaging, and smart sensor technology.

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Appendix A - Taxonomy Definitions (22/27)

S. No.	Taxonomy Nodes	Definition
3.2.2.4	Predictive Maintenance for Sewer Infrastructure	This category would include patent publications disclosing AI-driven and IoT-enabled predictive maintenance solutions that analyze real-time data from wastewater infrastructure to anticipate failures, optimize maintenance schedules, and extend asset lifespan.
3.2.2.5	Others	This category would include patent publications disclosing additional wastewater infrastructure inspection technologies and methods that do not fall under the defined subcategories.
3.3	Sludge Management	This category would include patent publications disclosing technologies and methods for the treatment, handling, separating, storage, and disposal of sludge generated from wastewater treatment processes. These innovations focus on reducing sludge volume, stabilizing organic matter, and enhancing resource recovery for sustainable waste management.
3.3.1	Treatment	This category would include patent publications disclosing methods for processing sludge to reduce its volume, eliminate pathogens, and improve its usability or disposal.
3.3.1.1	Thickening	This category would include patent publications disclosing thickening of sludge by removing excess water, increasing solid content before further treatment or disposal.
3.3.1.2	Stabilization & Pathogen Reduction	This category would include patent publications disclosing processes that reduce odor, pathogens, and biodegradable material in sludge to improve safety and usability.
3.3.1.2.1	Biological Treatment	This category would include patent publications disclosing biological processes for treating sludge generated from wastewater treatment. These methods utilize microorganisms to break down organic matter, reduce sludge volume, and stabilize waste while minimizing environmental impact.
3.3.1.2.1.1	Anaerobic Digestion	This category would include patent publications disclosing microbial processes that break down organic matter in sludge without oxygen, producing biogas as a byproduct.
3.3.1.2.1.2	Aerobic Digestion	This category would include patent publications disclosing sludge treatment techniques that use oxygen to promote microbial degradation of organic material, reducing sludge volume and odor.
3.3.1.2.1.2	Composting	This category would include patent publications disclosing methods for converting sludge into nutrient-rich compost using microbial decomposition under controlled conditions.
3.3.1.3	Chemical Treatment	This category would include patent publications disclosing chemical-based sludge stabilization techniques, such as lime stabilization, oxidation, and chemical conditioning, to reduce pathogens and improve sludge handling.
3.3.1.4	Thermal Treatment	This category would include patent publications disclosing heat-based processes, such as incineration, pyrolysis, and gasification, for reducing sludge volume and recovering energy.

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Appendix A - Taxonomy Definitions (23/27)

S. No.	Taxonomy Nodes	Definition
3.3.1.5	Dewatering	This category would include patent publications disclosing methods for reducing water content in sludge to facilitate handling, transportation, and disposal.
3.3.1.5.1	Belt Filter Press	This category would include patent publications disclosing mechanical dewatering techniques using a continuous belt system to squeeze water from sludge.
3.3.1.5.2	Centrifugation	This category would include patent publications disclosing the use of centrifugal force to separate water from sludge solids.
3.3.1.5.3	Vacuum Filtration	This category would include patent publications disclosing vacuum-assisted filtration systems that remove water from sludge using negative pressure.
3.3.1.5.4	Automatic Filter Press	This category would include patent publications disclosing automated filtration systems that use high-pressure plates to separate water from sludge.
3.3.1.5.5	Electro-Dewatering	This category would include patent publications disclosing electrically assisted dewatering techniques that use electrokinetic forces to enhance water removal from sludge.
3.3.1.5.6	Hydrothermal Carbonization	This category would include patent publications disclosing high-temperature, high-pressure treatment processes that convert sludge into biochar-like materials for energy recovery and soil applications.
3.3.1.5.7	Others	This category would include patent publications disclosing additional sludge dewatering techniques that do not fall under the defined subcategories.
3.3.2	Applications	This category would include patent publications disclosing the reuse and repurposing of treated sludge for various applications, promoting sustainability and resource recovery. These innovations focus on converting sludge into valuable byproducts for the agriculture, energy, and construction industries.
3.3.2.1	Agricultural (as fertilizer)	This category would include patent publications disclosing the use of treated sludge as a soil amendment or fertilizer, providing nutrients such as nitrogen and phosphorus for crop growth while ensuring pathogen and heavy metal reduction.
3.3.2.2	Energy Generation	This category would include patent publications disclosing technologies that utilize sludge for bioenergy production, including biogas generation through anaerobic digestion, sludge incineration for electricity, and biofuel production.
3.3.2.3	Building and Construction Material	This category would include patent publications disclosing the incorporation of treated sludge into construction materials, such as bricks, cement, and concrete additives, enhancing sustainability in the building sector.

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Appendix A - Taxonomy Definitions (24/27)

S. No.	Taxonomy Nodes	Definition
3.4	Resource Recovery	This category would include patent publications disclosing the extraction of valuable resources from wastewater, sludge, and other water treatment byproducts. These innovations promote sustainability by converting waste into reusable materials, energy, and nutrients, supporting circular economy practices.
3.4.1	Nutrient Recovery	This category would include patent publications disclosing the recovery of essential nutrients such as phosphorus and nitrogen from wastewater and sludge. These recovered nutrients can be used as fertilizers or in other agricultural applications.
3.4.2	Metals/Minerals recovery	This category would include patent publications disclosing the extraction of valuable metals and minerals, such as copper, lead, lithium, and rare earth elements, from industrial wastewater and sludge.
3.4.3	Heat Recovery	This category would include patent publications disclosing capturing and reusing thermal energy from wastewater and sludge treatment processes, improving energy efficiency in treatment facilities.
3.4.4	Biogas Recovery	This category would include patent publications disclosing biogas generation from organic waste in wastewater and sludge, providing a renewable energy source.
3.4.5	Clean Water Recovery	This category would include patent publications disclosing extracting and purifying clean water from wastewater, sludge, and other water treatment byproducts.
4	Environmental Water Cycle	This category would include patent publications disclosing technologies and systems related to the natural and managed movement, storage, monitoring, and treatment of water within the environment.
4.1	Soil and Groundwater Remediation	This category would include patent publications disclosing technologies and methods for treating soil and groundwater by removing or neutralizing contaminants.
4.1.1	Bioremediation	This category would include patent publications disclosing the use of microorganisms and biological processes to degrade or neutralize contaminants in soil and groundwater, including bacterial, fungal, and enzymatic remediation techniques.
4.1.2	Nanoremediation	This category would include patent publications disclosing the use of nanoparticles (e.g., zero-valent iron, carbon-based nanomaterials) to break down or immobilize contaminants in soil and groundwater, enhancing treatment efficiency.
4.1.3	Phytoremediation	This category would include patent publications disclosing the use of plants to absorb, accumulate, or break down pollutants from contaminated soil and water through mechanisms such as rhizofiltration, phytoextraction, and phytostabilization.

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Appendix A - Taxonomy Definitions (25/27)

S. No.	Taxonomy Nodes	Definition
4.1.4	Electrokinetic Remediation	This category would include patent publications disclosing the application of low-intensity electrical currents to mobilize heavy metals, organic contaminants, and other pollutants in soil and groundwater for easier extraction or degradation.
4.1.5	Plasma-based Remediation	This category would include patent publications disclosing the use of plasma technologies to degrade persistent organic pollutants and hazardous substances in contaminated soil and water.
4.1.6	Hydrothermal Oxidation	This category would include patent publications disclosing high-temperature and high-pressure water-based oxidation processes that break down organic contaminants in soil and groundwater.
4.1.7	Permeable Reactive Barriers (PRBs)	This category would include patent publications disclosing subsurface barriers filled with reactive materials to filter and neutralize contaminants in groundwater as it flows through.
4.1.8	Soil Vapor Extraction (SVE)	This category would include patent publications disclosing technologies that use vacuum extraction to remove volatile organic compounds (VOCs) from contaminated soil by inducing vaporization and collection.
4.1.9	Air Sparging	This category would include patent publications disclosing in-situ remediation techniques that inject air or oxygen into groundwater to volatilize and degrade contaminants such as petroleum hydrocarbons and VOCs.
4.1.10	Thermal Desorption	This category would include patent publications disclosing heat-based methods for extracting and destroying organic contaminants from soil by increasing their volatility.
4.1.11	In-situ Chemical Oxidation (ISCO)/ In-situ Chemical Reduction (ISCR)	This category would include patent publications disclosing chemical injection techniques that introduce oxidants or reductants to break down contaminants in soil and groundwater.
4.1.12	Generic - In-situ Remediation	This category would include patent publications disclosing general in-situ remediation methods for soil and groundwater that are not specific to a particular chemical or thermal process.

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Appendix A - Taxonomy Definitions (26/27)

S. No.	Taxonomy Nodes	Definition
4.1.13	Biochar Amendment	This category would include patent publications disclosing the use of biochar (carbon-rich material from biomass pyrolysis) to absorb and immobilize contaminants in soil, improving remediation efficiency.
4.1.14	Others	This category would include patent publications disclosing additional soil and groundwater remediation technologies that do not fall under the defined subcategories.
4.2	Monitoring/ Management of Surface Water/Ground water	This category would include patent publications disclosing technologies and systems for monitoring, analyzing, and managing surface water and groundwater resources. These innovations focus on real-time data collection, predictive modeling, and advanced sensing techniques to ensure sustainable water use and environmental protection.
4.2.1	Monitoring Techniques	This category would include patent publications disclosing methods and technologies for tracking and assessing surface and groundwater conditions using remote sensing, IoT, and AI-based analytics.
4.2.1.1	Remote Sensing & Satellite-based Monitoring	This category would include patent publications disclosing satellite imaging, aerial drones, and remote sensing technologies used to detect changes in water bodies and assess water availability.
4.2.1.2	Monitoring using IoT Sensors	This category would include patent publications disclosing the use of Internet of Things (IoT)-enabled sensors for real-time tracking of water levels, quality, and flow dynamics in surface water and groundwater systems.
4.2.1.3	AI- based Forecasting	This category would include patent publications disclosing artificial intelligence and machine learning-based predictive models for assessing water availability based on historical and real-time data.
4.2.1.4	Weather and Climate Monitoring	This category would include patent publications disclosing integrated climate and weather monitoring systems that analyze meteorological data to predict water resource fluctuations and extreme weather events affecting surface and groundwater.
4.2.2	Monitoring Parameters	This category would include patent publications disclosing specific parameters and measurement techniques for assessing groundwater and surface water conditions.
4.2.2.1	Seismic Monitoring	This category would include patent publications disclosing methods for detecting and analyzing seismic activity and subsurface changes that may affect groundwater movement, aquifer stability, and water resource availability.
4.2.2.2	Water Table Monitoring	This category would include patent publications disclosing technologies for tracking fluctuations in groundwater levels using piezometers, automated data loggers, and other hydrological monitoring tools.

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Appendix A - Taxonomy Definitions (27/27)

S. No.	Taxonomy Nodes	Definition
4.3	Water Quality Monitoring Techniques	This category would include patent publications disclosing technologies and systems for assessing and analyzing water quality in real-time. These innovations leverage automation, IoT, remote sensing, and data analytics to detect contaminants, track water parameters, and ensure compliance with environmental standards.
4.3.1	Autonomous Monitoring Robots	This category would include patent publications disclosing robotic systems designed to autonomously navigate and collect water samples, analyze water quality parameters, and detect pollutants in surface and groundwater sources.
4.3.2	IoT-enabled Smart Sensors	This category would include patent publications disclosing Internet of Things (IoT)-based water quality monitoring systems that use networked sensors to measure parameters such as pH, dissolved oxygen, turbidity, conductivity, and contaminant levels in real time.
4.3.3	Cloud-based Water Quality Data Analytics	This category would include patent publications disclosing cloud-based platforms that aggregate, analyze, and visualize water quality data from multiple sources, enabling remote monitoring and predictive insights.
4.3.4	Hyperspectral Imaging	This category would include patent publications disclosing the use of hyperspectral imaging techniques for detecting and analyzing water quality by capturing spectral signatures of contaminants, algae blooms, and chemical compositions.
4.3.5	Unmanned Aerial Vehicles (UAVs) & Drones	This category would include patent publications disclosing the use of UAVs and drones equipped with water quality sensors and imaging systems to conduct aerial surveillance, collect water samples, and monitor pollution levels in water bodies.
4.3.6	Wireless Sensor Network (WSN) and Machine Learning (ML) Techniques Based Water Quality Monitoring	This category would include patent publications disclosing the integration of wireless sensor networks (WSN) with machine learning algorithms to analyze large-scale water quality data, detect anomalies, and optimize water management.
4.3.7	Others	This category would include patent publications disclosing additional water quality monitoring techniques that do not fall under the defined subcategories.

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Appendix B - Country Codes

Country Code	Country Name
CN	China
KR	Korea
US	United States
IN	India
EP	Europe
RU	Russia
AR	Argentina
BY	Belarus
ID	Indonesia
MX	Mexico
WO	WIPO
JP	Japan
BR	Brazil

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Appendix C - Canadian Startups' List

Company	Industry	Company	Industry
2S Water	Industrial Water Treatment	AGSI	Transmission / Management (Wastewater)
3D Wave Design	Monitoring / Management (Environmental)	Aldex Chemical Company	Industrial Water Treatment
A.U.G. Signals	Stormwater Management And Drainage	Aqua Data	Distribution (Municipal Users)
ABBA Pump Parts & Service	Potable Water Treatment	Amb.AI	Transmission / Management (Wastewater)
abbaTek	Monitoring / Management (Environmental)	Amitis	Potable Water Treatment
ACE Manufacturing	Industrial Water Treatment	AML Oceanographic	Monitoring / Management (Environmental)
ACG Envirocan	Industrial Water Treatment	Amplytica	Wastewater Treatment
Aclarus Ozone Water Systems	Stormwater Management And Drainage	Anaergia	Wastewater Treatment
ACME Engineering Products	Industrial Water Treatment	Andion North America	Wastewater Treatment
Acti-Zyme Products	Wastewater Treatment	AOE Accumulated Ocean Energy	Desalination
Acuva Technologies	Potable Water Treatment	APG Neuros	Wastewater Treatment
Aduro Clean Technologies	Resource Recovery	Aqua Intelligent Technology	Potable Water Treatment
Advanced Test and Automation (ATA)	Industrial Water Use	Aqua Diversities	Industrial Water Treatment
Advanced Water Solutions	Potable Water Treatment	ARO Technologies	Distribution (Municipal Users)
AdvancedAg	Remediation	Aqua Pure Technologies	Wastewater Treatment
Agar Canada Corporation	Industrial Water Use	AQUA Treatment Technologies	Wastewater Treatment

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Company	Industry	Company	Industry
Aqua-Guard Spill Response	Wastewater Treatment	Ascend EcoTech	Wastewater Treatment
AquaCoustic Remote Technologies	Freshwater Extraction / Transmission	ASDR Industries	Industrial Water Treatment
Aquafort AI	Agricultural / Aquaculture Water Management	ASL Environmental	Monitoring / Management (Environmental)
Aquamerik	Agricultural / Aquaculture Water Management	Aslan Technologies	Wastewater Treatment
Aquanty	Monitoring / Management (Environmental)	ATD Manure Systems	Reuse (Wastewater)
Aquartis	Greywater Treatment And Reuse	Automatisation JRT	Industrial Water Treatment
CANN Forecast	Distribution (Municipal Users)	Avantu	Agricultural / Aquaculture Water Management
AquaSignum	Wastewater Treatment	Axine Water	Wastewater Treatment
AquaSwift	Monitoring / Management (Environmental)	BacTech	Resource Recovery
AquaTest	Industrial Water Use	Baleen International	Wastewater Treatment
Aquatic Informatics (acquired by Danaher Corp.)	Freshwater Extraction / Transmission	Barreleye	Freshwater Extraction / Transmission
Aquatic Life	Monitoring / Management (Environmental)	Bello Solutions	Potable Water Treatment
Arjay Engineering	Industrial Water Treatment	Bergmann North America	Wastewater Treatment
Citylitics (formerly WatrHub)	Freshwater Extraction / Transmission	BI Pure Water	Industrial Water Treatment
Armtec	Stormwater Management And Drainage	Bio Graphene Solutions	Desalination
eleven-x	Freshwater Extraction / Transmission	BioAlert Solutions	Industrial Water Treatment

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Company	Industry	Company	Industry
BioCAST Systems	Potable Water Treatment	BNW Valve Manufacturing	Distribution (Municipal Users)
BIODISK Corporation	Wastewater Treatment	Boost Environmental Systems	Sludge Management
BioLargo Water	Industrial Water Treatment	Boss Technologie	Wastewater Treatment
Biomaxx	Wastewater Treatment	BQE Water	Wastewater Treatment
BIONEST	Wastewater Treatment	BujiBui	Industrial Water Treatment
Bionetix International	Wastewater Treatment	Burcam	Freshwater Extraction / Transmission
BioNorth Solutions	Remediation	C-CORE	Monitoring / Management (Environmental)
Biopolynet	Wastewater Treatment	C&M Environmental Technologies	Industrial Water Treatment
Biorem Technologies	Wastewater Treatment	CalAgua Innovations	Wastewater Treatment
BioSec Enviro	Sludge Management	Can-Am Chains	Wastewater Treatment
Bishop Water Technologies	Wastewater Treatment	Canadian Dew Technologies	Rainwater / Atmospheric Water Harvesting
Blue Eden CleanTech Solutions	Industrial Water Treatment	Canadian Infrastructure Products	Stormwater Management And Drainage
Blue Lion Labs	Agricultural / Aquaculture Water Management	Canadian Pond	Industrial Water Treatment
Blue Planet Environmental	Potable Water Treatment	Canature Water Group	Potable Water Treatment
BluMetric Environmental	Potable Water Treatment	FuseForward Solutions Group	Distribution (Municipal Users)
BMS North America	Wastewater Treatment	CarboNet Nanotechnologies	Industrial Water Treatment

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Company	Industry	Company	Industry
CB Shield	Stormwater Management And Drainage	Clearflow Group	Stormwater Management And Drainage
CEC Analytics	Potable Water Treatment	Clearpath Robotics	Monitoring / Management (Environmental)
Cellula Robotics	Monitoring / Management (Environmental)	ClearTech	Industrial Water Treatment
CHAR Technologies	Resource Recovery	Clow Canada	Distribution (Municipal Users)
Chemtrade	Industrial Water Treatment	Combustion & Energy Systems	Resource Recovery
Chrystal Biotechnologie	Wastewater Treatment	Compliance365	Industrial Water Treatment
HydraTek	Distribution (Municipal Users)	CON-V-AIR	Industrial Water Treatment
Civica Infrastructure	Stormwater Management And Drainage	Concord Screen	Freshwater Extraction / Transmission
Claro Environmental Technologies	Wastewater Treatment	Conductive Energy	Industrial Water Use
inField Solutions	Distribution (Municipal Users)	Continental Carbon Group	Industrial Water Treatment
Clean Nature	Monitoring / Management (Environmental)	Controlchem Canada	Industrial Water Treatment
Clean Valley CIC	Agricultural / Aquaculture Water Management	Copperstone Technologies	Industrial Water Use
Cleanflo Water Technologies	Rainwater / Atmospheric Water Harvesting	Infrastructure Data Solutions (IDS)	Freshwater Extraction / Transmission
Cleantek Industries	Wastewater Treatment	Crystalflow	Potable Water Treatment
Clear Pod	Wastewater Treatment	Current Water Technologies	Industrial Water Treatment
ClearBakk Water Solutions	Potable Water Treatment	CUT Membrane Technologies	Industrial Water Treatment

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Company	Industry	Company	Industry
CVW CleanTech	Resource Recovery	E2Metrix	Industrial Water Treatment
Dartmouth Ocean Technologies	Monitoring / Management (Environmental)	E3 Metals	Industrial Water Use
Datifex	Industrial Water Treatment	Eagleridge Innovations Corporation	Sludge Management
David Bromley Engineering	Industrial Water Treatment	Waterlix	Distribution (Municipal Users)
DBO Expert	Wastewater Treatment	Easily Moved Equipment	Industrial Water Treatment
DECAST	Stormwater Capture And Filtration	Echelon Environmental	Stormwater Management And Drainage
KenWave Solutions	Distribution (Municipal Users)	Waterworth	Potable Water Treatment
Delco Water	Industrial Water Treatment	Ecochem International	Industrial Water Treatment
Delta Remediation	Remediation	Ecodrain	Resource Recovery
Diachem	Industrial Water Treatment	Ecodyne Water	Industrial Water Treatment
Klir	Potable Water Treatment	ECOfluid Systems	Wastewater Treatment
Dimachem	Industrial Water Use	EcoInnovation Technologies	Resource Recovery
Drinkable (previously What the Well)	Potable Water Treatment	Ecoli Sense	Potable Water Treatment
DRYCAKE Vanderbeken Enterprises	Sludge Management	Ecolo Odor Control Technologies	Wastewater Treatment
Dundee Sustainable Technologies	Industrial Water Use	Ecometrix	Monitoring / Management (Environmental)
Durpro	Industrial Water Treatment	Econse Water Purification Systems	Industrial Water Treatment
Mangrove Lithium Technologies	Industrial Water Use	Mirapakon	Agricultural / Aquaculture Water Management

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Company	Industry	Company	Industry
Ecotime	Rainwater / Atmospheric Water Harvesting	Environmental Biodetection Products (EBPI)	Potable Water Treatment
Alert Labs	Distribution (Municipal Users)	Environmental Material Science	Remediation
ElectroKinetic Solutions (EKS)	Sludge Management	Environmental Remediation Equipment (ERE)	Remediation
AquaSensing	Distribution (Municipal Users)	EnviroPod	Stormwater Management And Drainage
Elite Valve	Industrial Water Treatment	EnviroSim Associates	Wastewater Treatment
emew Corporation	Resource Recovery	Equator	Monitoring / Management (Environmental)
EMO3	Industrial Water Treatment	Equipump	Sludge Management
EnBiorganic Technologies	Wastewater Treatment	Eramosa Engineering	Potable Water Treatment
Enereau	Wastewater Treatment	ESIL Water Treatment	Potable Water Treatment
Enervac Corporation	Industrial Water Use	Evercloak	Desalination
Enutech	Remediation	Evoqua Canada	Industrial Water Treatment
EnviCore	Resource Recovery	ExactBlue (previously Genemis)	Industrial Water Treatment
EnviroApps	Industrial Water Use	Excalibur Water Systems	Potable Water Treatment
Envirogard Products (Rainfresh)	Industrial Water Treatment	Farmer's Edge	Agricultural / Aquaculture Water Management
Envirologics Engineering	Distribution (Municipal Users)	Fathom Scientific	Monitoring / Management (Environmental)
Environmental & Power Solutions	Industrial Water Treatment	Federal Screen Products	Industrial Water Treatment

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Company	Industry	Company	Industry
FER-PAL Infrastructure	Distribution (Municipal Users)	Deep Trekker	Stormwater Management And Drainage
FibraCast Canada	Wastewater Treatment	G.E.T. Industries	Wastewater Treatment
Fil-Trek	Industrial Water Treatment	Galatea Technologies	Industrial Water Use
FilterBoxx	Industrial Water Treatment	GALAXIA Mission Systems	Monitoring / Management (Environmental)
FilterPro Services Canada	Industrial Water Treatment	GAP EnviroMicrobial Services	Industrial Water Treatment
Filtervac International	Industrial Water Use	GEM Holdings	Stormwater Management And Drainage
Filtrexx Canada	Stormwater Management And Drainage	Genomadix (previously Spartan)	Industrial Water Treatment
Fixed Earth	Remediation	Geomorphix	Monitoring / Management (Environmental)
FloNergia	Transmission / Management (Wastewater)	Geophysics GPR International	Monitoring / Management (Environmental)
Flowlink Environmental	Stormwater Management And Drainage	Geosapiens	Stormwater Management And Drainage
Foraction	Distribution (Municipal Users)	GeoSpectrum Technologies	Monitoring / Management (Environmental)
Fortress Control	Wastewater Treatment	Glen Chemicals	Potable Water Treatment
Forward Water Technologies	Industrial Water Use	Global Remediation Technology	Resource Recovery
Foundry Spatial	Monitoring / Management (Environmental)	GlobeOwl Solutions	Industrial Water Treatment
Fournier Industries	Sludge Management	Golden Environmental Services	Remediation
FREDsense Technologies	Potable Water Treatment	Grande Water Management Systems	Stormwater Management And Drainage

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Company	Industry	Company	Industry
Green Turtle (Zurn)	Distribution (Municipal Users)	Hannah Environmental Equipment	Industrial Water Treatment
Greenland International	Monitoring / Management (Environmental)	Hayward Gordon Group	Wastewater Treatment
Greenoil Solutions	Remediation	Heat-Line	Distribution (Municipal Users)
Greyter Water Systems	Greywater Treatment And Reuse	Heron Instruments	Monitoring / Management (Environmental)
Ground Effects Environmental Services	Wastewater Treatment	Hortau	Agricultural / Aquaculture Water Management
Ground Force Environmental	Wastewater Treatment	EAIGLE	Industrial Water Use
Groundwater Environmental Management Services	Monitoring / Management (Environmental)	HydroFlow Canada	Industrial Water Treatment
Groupe HELIOS	Industrial Water Treatment	Hydromantis Environmental Software Solutions	Potable Water Treatment
GT Water Machines	Wastewater Treatment	Idralink	Potable Water Treatment
GTR Chemical Solutions	Industrial Water Treatment	Imbrium Systems	Stormwater Management And Drainage
H2Flow Equipment	Industrial Water Treatment	In Nature Robotics	Monitoring / Management (Environmental)
H2nanO	Industrial Water Treatment	inCTRL Solutions	Wastewater Treatment
H2O Geomatics	Monitoring / Management (Environmental)	Industrial Filter Manufacturing	Industrial Water Treatment
H2O Innovation	Desalination	Echologics	Freshwater Extraction / Transmission
Haetch2Oh Group	Reuse (Wastewater)	Infinitii	Stormwater Management And Drainage
Hamilton Kent	Stormwater Management And Drainage	Maid Labs Technologies	Distribution (Municipal Users)

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Company	Industry	Company	Industry
Innocorps Research Corporation	Potable Water Treatment	Kanatan Water	Potable Water Treatment
Innovasea Systems	Agricultural / Aquaculture Water Management	Kavacha	Agricultural / Aquaculture Water Management
IntegraSEE Research	Monitoring / Management (Environmental)	Kayden Industries	Transmission / Management (Wastewater)
InteliRain	Agricultural / Aquaculture Water Management	Pipe Trekker	Distribution (Municipal Users)
International Submarine Engineering	Monitoring / Management (Environmental)	Keytech Water Management (acquired by Kurita Water)	Industrial Water Treatment
International Water Guard Industries (IWG)	Potable Water Treatment	Kiko Water Systems	Distribution (Municipal Users)
Interpump	Industrial Water Treatment	Rinno Vision	Distribution (Municipal Users)
Intuitive Water Systems	Industrial Water Treatment	Koenders Water Solutions	Potable Water Treatment
Ionic Solutions	Desalination	Kontek Ecology Systems	Industrial Water Treatment
Ionomr Innovations	Industrial Water Treatment	Kraken Robotics	Monitoring / Management (Environmental)
IPEX	Distribution (Municipal Users)	Kraken Sense	Industrial Water Treatment
Ironbrook UV	Wastewater Treatment	Layfield Canada	Stormwater Management And Drainage
Island Water Technologies	Wastewater Treatment	Legacy Watercare Innovations	Wastewater Treatment
Ivey International	Remediation	Link-Pipe	Distribution (Municipal Users)
JASCO Applied Sciences	Monitoring / Management (Environmental)	LiquiForce	Freshwater Extraction / Transmission
KAM Biotechnology	Potable Water Treatment	Lithium ONE Environmental	Industrial Water Use

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Company	Industry	Company	Industry
Litus	Industrial Water Use	Mantech	Industrial Water Treatment
Livestock Water Recycling	Resource Recovery	Marecomms	Agricultural / Aquaculture Water Management
Logiball	Distribution (Municipal Users)	Marine Thinking	Monitoring / Management (Environmental)
Logistec	Distribution (Municipal Users)	Maven Water and Environment	Industrial Water Treatment
Lotek Wireless	Monitoring / Management (Environmental)	McCue Engineering Contractors	Industrial Water Treatment
Lotic Technologies	Wastewater Treatment	McKay Creek Technologies	Wastewater Treatment
LUMINOR Environmental	Potable Water Treatment	Membranes FR Liners	Stormwater Management And Drainage
LuminUltra Technologies	Industrial Water Treatment	Memprotec	Industrial Water Treatment
Lystek International	Resource Recovery	Meritech Engineering	Stormwater Management And Drainage
M2Ocean	Monitoring / Management (Environmental)	Metafix	Resource Recovery
Mabarex	Industrial Water Treatment	MetaFLO Technologies	Sludge Management
MacArtney Underwater Technology	Monitoring / Management (Environmental)	Methanol Recovery Technologies	Resource Recovery
MAGNA Engineering Services	Wastewater Treatment	MetOcean Telematics	Monitoring / Management (Environmental)
Magnus Chemicals	Industrial Water Treatment	Meunier Technologies	Industrial Water Treatment
Syrinix	Freshwater Extraction / Transmission	Milne Technologies	Monitoring / Management (Environmental)

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Company	Industry	Company	Industry
MixAnox Systems	Wastewater Treatment	Nordikeau	Potable Water Treatment
MLM Conveying Systems	Sludge Management	Nova Filtration Technologies	Industrial Water Treatment
Momentum Materials Solutions	Desalination	Novinfra	Industrial Water Use
Mosaic Sensors	Potable Water Treatment	Novion	Stormwater Capture And Filtration
Muddy River Technologies	Industrial Water Treatment	NPower Cleantech	Resource Recovery
Municipal Water Savings Corporation	Potable Water Treatment	NuFlow Technology	Freshwater Extraction / Transmission
Nanometrics	Monitoring / Management (Environmental)	Nuvac	Industrial Water Treatment
NANOSentinel	Industrial Water Treatment	O'land Stations	Distribution (Municipal Users)
Napier Reid	Industrial Water Treatment	Ocean Diagnostics	Monitoring / Management (Environmental)
Net Zero Water	Rainwater / Atmospheric Water Harvesting	Ocean Sonics	Monitoring / Management (Environmental)
Newterra	Industrial Water Treatment	Ocion Water Sciences	Potable Water Treatment
NexGen Environmental Research	Monitoring / Management (Environmental)	Octo-M Technologies	Monitoring / Management (Environmental)
Nexom	Industrial Water Treatment	OENano	Wastewater Treatment
Next Level Stormwater Management	Stormwater Capture And Filtration	One Eye Industries	Industrial Water Treatment
NOAH Water Technologies	Agricultural / Aquaculture Water Management	One-Eighty Remediation	Wastewater Treatment
NORAM Engineering and Constructors	Wastewater Treatment	Oneka Technologies	Desalination

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Company	Industry	Company	Industry
Opalux	Potable Water Treatment	PhosphoSens	Wastewater Treatment
Open Ocean Robotics	Monitoring / Management (Environmental)	Pi2 Technologies	Wastewater Treatment
Ora Graphene Audio	Desalination	Z3 Controls	Distribution (Municipal Users)
Orain	Rainwater / Atmospheric Water Harvesting	Corrpro Canada	Distribution (Municipal Users)
Orbinox Canada	Industrial Water Treatment	Planetary Hydrogen	Resource Recovery
Orca Water	Potable Water Treatment	Point 3	Resource Recovery
Orka Water	Distribution (Municipal Users)	PolyGone Technologies	Industrial Water Treatment
Ostara Nutrient Recovery Technologies	Resource Recovery	Pompaction	Distribution (Municipal Users)
Ovivo Canada (acquired by SKion and la Caisse)	Industrial Water Treatment	Poseidon Ocean Systems	Agricultural / Aquaculture Water Management
Ozero Solutions	Remediation	Premier Tech	Rainwater / Atmospheric Water Harvesting
Ozocan	Industrial Water Treatment	Primodal	Wastewater Treatment
Pani Energy	Industrial Water Treatment	Pro-Oceanus	Agricultural / Aquaculture Water Management
Pattern Discovery Technologies	Potable Water Treatment	Probiosphere	Agricultural / Aquaculture Water Management
Permalution	Rainwater / Atmospheric Water Harvesting	PROCECO	Industrial Water Use
Petro Barrier Systems	Stormwater Management And Drainage	Prongineer Research and Development	Resource Recovery
Petro Sep Membrane Technologies	Wastewater Treatment	Protectolite Composites	Industrial Water Treatment

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Company	Industry	Company	Industry
Proteus Waters	Potable Water Treatment	Recion Technologies	Resource Recovery
Pulsenics	Industrial Water Treatment	Recyc PHP	Stormwater Management And Drainage
Purafy	Potable Water Treatment	ReelData A.I.	Agricultural / Aquaculture Water Management
Pureleau	Desalination	Regeneau	Resource Recovery
Purifics ES	Industrial Water Treatment	RenewABILITY Energy	Resource Recovery
Pursuit Technologies	Industrial Water Use	Renewage Canada	Stormwater Management And Drainage
Pipeline Inspection and Condition Analysis Corporation (PICA)	Freshwater Extraction / Transmission	RENIX	Resource Recovery
QuantWave Technologies	Potable Water Treatment	REVEAU	Desalination
Quench Water Canada	Potable Water Treatment	RG2S Solutions	Freshwater Extraction / Transmission
Quest Water Solutions	Freshwater Extraction / Transmission	RH2O North America	Rainwater / Atmospheric Water Harvesting
RainGrid	Stormwater Capture And Filtration	Armstrong Fluid Technology	Distribution (Municipal Users)
Rainmaker Worldwide	Rainwater / Atmospheric Water Harvesting	Riptide Tek	Transmission / Management (Wastewater)
RainSource	Rainwater / Atmospheric Water Harvesting	RJ Enviro Tech	Resource Recovery
RainStick	Greywater Treatment And Reuse	RM Products	Industrial Water Treatment
RBR	Monitoring / Management (Environmental)	Rockland Scientific	Monitoring / Management (Environmental)
Real Tech	Industrial Water Treatment	Rogue 7	Potable Water Treatment

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Appendix C - Canadian Startups' List

Company	Industry	Company	Industry
Rokval Valves	Freshwater Extraction / Transmission	Seppure	Industrial water use
ROMEX Canada	Stormwater Management And Drainage	SewerVUE Technology	Transmission / management (wastewater)
Roshan Water Solutions	Potable Water Treatment	Sewllkwe Book	Industrial water treatment
SafeSump	Stormwater Management And Drainage	SHARC Energy Systems	Resource recovery
Salacia Technologies	Desalination	Shepherdess Ecotech	Resource recovery
Saltworks	Desalination	Simran Canada	Industrial water treatment
SanEcoTec	Potable Water Treatment	SiREM	Wastewater treatment
Sanexen Environmental Services	Distribution (Municipal Users)	Skaha Remote Sensing	Agricultural / aquaculture water management
Santevia	Potable Water Treatment	Slimline Manufacturing	Agricultural / aquaculture water management
Savron	Wastewater Treatment	Smart City Water	Stormwater management and drainage
Sawback Technologies	Monitoring / Management (Environmental)	SmartICE Sea Ice Monitoring and Information	Monitoring / management (environmental)
SCG Process	Freshwater Extraction / Transmission	Smartrek Technologies	Industrial water use
SciCorp International	Wastewater Treatment	Soleno	Stormwater management and drainage
Sedna Technologies	Agricultural / Aquaculture Water Management	Solinst Canada	Monitoring / management (environmental)
Sensor Technology	Agricultural / Aquaculture Water Management	Solmax	Freshwater extraction / transmission
Sentry	Transmission / Management (Wastewater)	SolutionsH2Eau	Industrial water treatment

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Appendix C - Canadian Startups' List

Company	Industry	Company	Industry
SolvAqua	Wastewater Treatment	Clean Cut Enery	Distribution (Municipal Users)
Source2Source	Stormwater Capture And Filtration	Technologies ECOFIXE	Wastewater Treatment
Spaans Babcock	Industrial Water Treatment	Technosub	Freshwater Extraction / Transmission
Spartan Controls	Industrial Water Treatment	TechSolutions RJ	Industrial Water Treatment
SPIRALENGINEERING	Sludge Management	Tecosol	Remediation
Spiri Robotics	Monitoring / Management (Environmental)	TECTA-PDS	Potable Water Treatment
Steeper Energy	Resource Recovery	Terrafix Geosynthetics	Stormwater Management And Drainage
Storm Pal	Stormwater Management And Drainage	Terragon Technologies	Resource Recovery
Strategic Systems Engineering	Monitoring / Management (Environmental)	Tersa Earth	Resource Recovery
SubC Imaging	Agricultural / Aquaculture Water Management	Tesera	Monitoring / Management (Environmental)
Suez Water Technologies Canada	Wastewater Treatment	Texel Matériaux Techniques	Stormwater Management And Drainage
Summit Nanotech	Industrial Water Use	TGWT	Industrial Water Treatment
SunAct Systems	Rainwater / Atmospheric Water Harvesting	ThisFish	Agricultural / Aquaculture Water Management
Swirltex	Wastewater Treatment	Thordon Bearings	Wastewater Treatment
Symbiotic EnviroTek	Wastewater Treatment	Tradeworks	Wastewater Treatment
Synauta	Desalination	Triangle Fluid Controls	Industrial Water Use

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Appendix C - Canadian Startups' List

Company	Industry	Company	Industry
Trident Pump	Freshwater Extraction / Transmission	Viridis Research	Industrial Water Treatment
Trident TNZ	Sludge Management	Vivreau	Potable Water Treatment
Trihedral Engineering	Industrial Water Treatment	Voyis	Monitoring / Management (Environmental)
Trojan Technologies	Industrial Water Treatment	Water Energy Technologies	Industrial Water Treatment
Turbulent Research	Monitoring / Management (Environmental)	Water Life Systems	Potable Water Treatment
Typha Co.	Remediation	Water Matrix	Distribution (Municipal Users)
Universal Fan & Blower	Wastewater Treatment	Water Rangers	Monitoring / Management (Environmental)
Uponor Infra	Distribution (Municipal Users)	Water Secure	Monitoring / Management (Environmental)
USP Technologies	Industrial Water Treatment	WATERAX	Freshwater Extraction / Transmission
UV Dynamics	Industrial Water Treatment	Watercare Company	Potable Water Treatment
UV Pure Technologies	Potable Water Treatment	Watercycles Energy Recovery	Resource Recovery
V-Fold	Sludge Management	Digital Water Solutions	Distribution (Municipal Users)
Vahn-Tech International	Industrial Water Use	Waterloo Biofilter Systems	Wastewater Treatment
Vector Process Equipment	Industrial Water Treatment	WaterPuris	Industrial Water Treatment
Veolia Canada	Industrial Water Treatment	WaterShed Monitoring	Monitoring / Management (Environmental)
Verdi Expeditions	Agricultural / Aquaculture Water Management	Eddy Smart Home Solutions	Distribution (Municipal Users)

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Appendix D - Key Canadian Government Policies and Initiatives (1/2)

Canada is recognized as a global leader in freshwater resources, possessing one of the largest supplies of renewable freshwater in the world. In response to growing challenges such as climate change, aging infrastructure, and the need for reconciliation with Indigenous communities, the Canadian government has been implementing a range of policies and initiatives to ensure the sustainable management and protection of its water resources. Below are some recent developments and strategic actions aimed at strengthening sustainable water management across the country:

Canada Water Agency (CWA)

Announced in 2020, it aims to improve freshwater management through coordination among federal, provincial, and Indigenous governments. Source

Freshwater Action Plan

The Government of Canada invested $650 million over 10 years in the Freshwater Action Plan to protect and restore water quality and ecosystem health in major watersheds across the country. Source

Clean Water and Wastewater Fund (CWWF)

The Clean Water and Wastewater Fund (CWWF) provided $2 billion in funding for projects to enable the rehabilitation of water treatment and distribution infrastructure. Source

EcoAction Community Funding Program

Managed by the Canada Water Agency, the EcoAction Community Funding Program supports community-based projects aimed at improving water quality and protecting freshwater ecosystems by funding initiatives across the country that contribute to the restoration and conservation of freshwater resources. Source

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Appendix D - Key Canadian Government Policies and Initiatives (2/2)

Modernization of the Canada Water Act

The Government of Canada is modernizing the Canada Water Act to better align with current freshwater challenges, including the impacts of climate change and the recognition of Indigenous rights. Source

Federal Contaminated Sites Action Plan (FCSAP)

Established in 2005 and extended to March 31, 2035, with funding currently approved until March 31, 2025, FCSAP is a program aimed at reducing environmental and human health risks from known federal contaminated sites in Canada. Source

Ended long-term drinking water advisories

The Government of Canada collaborated with First Nations to end long-term drinking water advisories and improve water and wastewater systems on reserves. Source

Green Municipal Fund (GMF)

Offers funding and capacity building to accelerate the transformation to resilient, net-zero communities and supports sustainability projects, including those focused on wastewater and drinking water treatment. Source

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Appendix D - Key Global Organizations and Initiatives (1/2)

Below are a few policies and initiatives undertaken by different global organizations:

Initiative / Organization	Focus Area	Description	Link
UNEP Global Wastewater Initiative (GWI)	Wastewater Reuse & Resource Recovery	Promotes sustainable wastewater management, reuse, and nutrient recovery	Source
International Water Association (IWA)	Wastewater Reuse & Resource Recovery	Advances water reuse and circular economy in utilities and industry	Source
OECD Water Governance Initiative	Water Governance	Provides principles and indicators to improve governance, transparency, and efficiency	Source
Global Water Partnership (GWP)	Water Governance	Promotes Integrated Water Resources Management (IWRM) and water security	Source
WHO WASH Program	Sanitation & Hygiene	Global guidelines and programs on safe drinking water, sanitation, and hygiene	Source
Sanitation and Water for All (SWA)	Sanitation & Hygiene	Global platform for political prioritization and accountability in the WASH sectors	Source
SDG 6 – UN Sustainable Development Goal	Integrated Water Management	Holistic framework covering water use, access, governance, treatment, and sustainability	Source
UN-Water SDG 6 Monitoring Initiative	Monitoring & Data	Coordinates global reporting and data tools like the SDG 6 Data Portal	Source
UNESCO IHP	Monitoring & Data	Supports water research, education, and international data sharing	Source

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Appendix D - Key Global Organizations and Initiatives (2/2)

Initiative / Organization	Focus Area	Description	Link
Blue Peace Initiative	Transboundary Water Cooperation	Supports peacebuilding and collaboration over shared water resources	Source
UNESCO IHP – Groundwater Resources Governance in Transboundary Aquifers (GGRETA) project	Transboundary Water Cooperation	Focuses on cooperation and governance of shared underground water resources	Source
World Bank Water Global Practice	Climate Resilience	Climate-resilient water infrastructure, flood and drought management	Source
2030 Water Resources Group (2030 WRG)	Climate Resilience	Public-private collaboration on water stress in the face of climate change	Source
Water Action Agenda (UN 2023 Water Conference)	Climate Resilience	Mobilizes global climate-aligned water protection commitments	Source

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Appendix D - Key Global Government-led Policies and Initiatives

Below are few policies and initiatives undertaken by different government bodies globally across countries:

The **Australian Government** provides a National Water Grid to improve water security and reliability in regional, remote, and First Nations communities across Australia. (Source). It also supports integrated water management through the Murray–Darling Basin Plan, which includes caps on water extraction and restoration of environmental flows. (Source)

The **United States Environmental Protection Agency (EPA)** allocated $3.6 billion under the Bipartisan Infrastructure Law to improve water systems, including PFAS removal, wastewater upgrades, and climate resilience. (Source)

The **European Union** revised its Urban Wastewater Treatment Directive in 2024, requiring advanced nutrient and micropollutant removal, and promoting sludge-to-energy recovery in wastewater treatment. (Source)

Barbados completed a $125 million debt-for-climate swap in 2024, unlocking funds for water security projects including aquifer recharge, sewage system upgrades, and resilient drainage. (Source)

Chinese financial institutions, under the Belt and Road Initiative, have funded water infrastructure such as hydropower dams in over 30 developing countries**.** (Source)

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Appendix E - Inclusions and Exclusions

Inclusions

- Value-chain nodes as mentioned in the paper Canada's VENTURES TO VALUE CHAINS – WATER TECHNOLOGY
- Sustainable or clean processes/methodologies in each of the nodes.
- For Module C, the water used for the analysis is wastewater outputted from Module B.

Exclusions

- Concepts not falling within the scope of the categories defined in the taxonomies.
- Traditional infrastructure related to water transmission is not considered.
- For Module B, the wastewater treatment of water used in various sectors is not included, and similarly, for Module C, the water utilized in Module B is not included.

Assumptions

- The number of patents/ published applications filed in 2023/2024/2025 may be more than this document shows, as some of the applications filed during this period may not have been published yet.
- All alive patents/publications are considered for the analysis. Alive/Dead is considered based on data provided by Derwent Innovation.
- The analysis is primarily done on the Title, Abstract, and Claims. Support is taken from the description for some taxonomy nodes.

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