

Clean technologies and the Survey of Environmental Goods and Services: A technical reference guide

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Clean technologies and the Survey of Environmental Goods and Services: A technical reference guide

Overview

This reference guide is intended for users of the Survey of Environmental Goods and Services (SEGS). The SEGS measures revenues, employment and exports from the provision of environmental and clean technology goods and services. This guide provides an overview of the goods, services, and technologies that fall within the Government of Canada clean technology priorities, as defined by the clean technology (cleantech) taxonomy, and which were used to develop content for the SEGS.

The Canadian clean technology taxonomy was developed by Natural Resources Canada in conjunction with partners at Innovation, Science and Economic Development Canada; Global Affairs Canada; Agriculture and Agri-Food Canada; Fisheries and Oceans Canada; Environment and Climate Change Canada; and Statistics Canada.

About this product

The taxonomy detailed in the following tables represents the suite of products that are considered to be clean technologies, and which are either currently included or being considered for future inclusion, in Statistics Canada's estimates of economic activity in the environmental and clean technology sector. Products that are no longer considered as clean technologies are listed in Annex 1 after the taxonomy.

The tables indicate which technologies and services were included in SEGS 2012, 2015, 2017, 2018, 2019, 2020, 2021, 2022, 2023 and 2024. As of 2024, the symbol “..” has been used to identify when products are not considered to be clean technology in that reference period. They will be updated for future survey cycles as the scope of what is considered to be an environmental or clean technology good or service evolves.

Clean technology

Clean technologies are defined as follows:

- Any good or service designed with the primary purpose of contributing to remediating or preventing any type of environmental damage;
- Any good or service that is less polluting or more resource-efficient than equivalent normal products which furnish a similar utility. Their primary use, however, is not one of environmental protection.

Table 1
Environmental protection activities

Table 1.a
Protection of air, climate and soil

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Air, environment and remediation											
Carbon management and greenhouse gases (GHG) control	Greenhouse gas (GHG) emissions control technologies	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Carbon capture technologies (e.g., point source)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Carbon transportation technologies	N	N	N	N	N	N	N	N	N	N
	Carbon storage technologies	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Methane abatement technologies	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Carbon utilization technologies	N	N	N	N	N	N	N	N	N	N
	Carbon dioxide removal - direct air capture	..	..	..	..	..	..	..	..	..	N
	Carbon dioxide removal - biomass-based methods	..	..	..	..	..	..	..	..	..	N
	Carbon dioxide removal - ocean and alkalinity-based methods	..	..	..	..	..	..	..	..	..	N
Monitoring, reporting and verification	Leak detection technologies (e.g., ultrasonic detection and measurement, gas leak detection)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Environmental and atmospheric sensing technologies (e.g., soil carbon quantification technology)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Continuous emission monitoring	..	..	..	..	..	..	..	..	..	N
	Carbon account and reporting platforms	..	..	..	..	..	..	..	..	..	N
	Artificial intelligence-enabled emission analytics and optimization systems	..	..	..	..	..	..	..	..	..	N
Air pollution (sulphur oxides [SOX], nitrogen oxides [NOX], volatile organic compounds [VOCs], carbon monoxide [CO], ammonia [NH3], ozone [O3], fine particulate matter [PM2.5], and black carbon) or flue gas or greenhouse gases management	Software	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Platform or system	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Sensors	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Other	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Physical / chemical / biological treatment of air pollution or flue gas	Filters (e.g., membrane, baghouse, granular bed), cyclones	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Electrostatic precipitator	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Scrubbers (e.g., Venturi, spray tower, mechanical, plate tower, packed tower)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Waste gas absorber, waste gas flare / incinerator	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Industrial catalytic converter	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Pollutant recovery condenser	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Adsorbers	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.a
Protection of air, climate and soil

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Air, environment and remediation											
Industrial air pollution, flue gas or greenhouse gases services Include climate market and compliance services	Emissions trading services	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Generation of compliance units, surplus allowances, emissions performance credits, offset credits	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Preparation of emissions reports and verification services	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Allowance auctioning services, exchange platform provision services	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Market monitoring services	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Offset protocol development and validation services	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Development of compliance systems, electronic emissions reporting system	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
In situ physical / chemical treatment of soil, sediment, and sludge	Chemical oxidation, fracturing, soil flushing, soil vapour extraction, solidification / stabilization Include sales of chemicals for remediation of soil, sediment and sludge	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ex situ physical / chemical treatment of soil, sediment, and sludge	Chemical extraction, chemical reduction / oxidation, dehalogenation, separation, soil washing, solidification / stabilization Include sales of chemicals for remediation of soil, sediment and sludge	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
In situ biological treatment of soil, sediment, and sludge	Bioventing, enhanced bioremediation, phytoremediation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ex situ biological treatment of soil, sediment, and sludge	Biopiles, composting, landfarming, slurry phase biological treatment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
In situ thermal treatment of soil, sediment, and sludge	Hot air injection, electrical resistance	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ex situ thermal treatment of soil, sediment, and sludge	Incineration, pyrolysis, thermal desorption	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Noise and vibration abatement	Goods and services for noise insulation in buildings	N	N	N	N	N	N	N	N	N	N
	Noise insulation works	N	N	N	N	N	N	N	N	N	N
Protection of environment	Site remediation services	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Environmental emergency response services	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Protection against radiation	Radioactive waste management, decommissioning, and site remediation	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Other environmental protection	Research and development	N	N	N	N	N	N	N	N	N	N
	Training	N	N	N	N	Y	Y	Y	Y	Y	Y
	Consulting and administrative services	N	N	N	N	Y	Y	Y	Y	Y	Y

.. not available for a specific reference period

Table 1.b
Treatment of groundwater, wastewater and municipal sewage

					SEGS						
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Water and wastewater											
Physical / chemical treatment of industrial wastewater	Tanks (including components) for dilution / equalization, decantation, neutralization, sedimentation, chemical precipitation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Oil separator / skimmer	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Ion exchange bed	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Air stripping tank / column	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Hydrocyclones	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Liquid extraction column	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Micro-porous membrane adsorber	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Biological treatment (e.g., membrane bioreactors, biofilters, activated sludge)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Equipment for advanced chemical oxidation / ultraviolet radiation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Pre-treatment filters	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Chemicals used in industrial wastewater treatment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Electrochemical treatment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Membrane technologies (e.g., nanofiltration, reverse osmosis)	..	..	..	..	..	..	..	..	..	Y
Centralized physical / chemical and biological treatment of sewage	Intake screen	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Air sparging grit chamber	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Reverse osmosis (RO) membrane	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Oil separator / skimmer	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Tanks (including components) for sedimentation, chemical precipitation / flocculation, aerobic biological treatment, aeration, clarification, disinfection	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Membrane bioreactor (MBR)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Trickling filter	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Chemicals used in municipal sewage treatment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Wastewater management system / services	Software	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Platform or system	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Sensors	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Vehicles	N	N	N	N	N	N	N	N	N	N
	Other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
In situ biological treatment of groundwater, surface water, and leachate	Enhanced bioremediation, phytoremediation, other	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ex situ biological treatment of groundwater, surface water, and leachate	Bioreaction, other	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.b
Treatment of groundwater, wastewater and municipal sewage

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Water and wastewater											
In situ physical / chemical treatment of groundwater, surface water, and leachate	Air sparging, bioslurping, chemical oxidation, directional wells, dual phase extraction, thermal treatment, hydrofracturing enhancements, in-well air stripping, passive / reactive treatment walls, other Include sales of chemicals for remediation of ground water, surface water and leachate, other	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ex situ physical / chemical treatment of groundwater, surface water, and leachate	Adsorption / absorption, advanced oxidation, air stripping, ion exchange, precipitation / flocculation / coagulation, separation, sprinkler irrigation, electrochemical treatment, other Include sales of chemicals for remediation of ground water, surface water and leachate, other	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Control, containment, and monitoring services (air, water, soil)	Landfill cap, landfill cap enhancements / alternatives, physical barriers, deep well injection, other	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Treatment of air emissions or off-gas	Oxidation, scrubbing, vapour phase, other	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Vapor treatment technologies (off-gas)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Other	Carbon adsorption, other	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Treatment of drinking water / filtration systems	Microscreening, other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Chemicals used in drinking water treatment, other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Equipment for advanced chemical oxidation / ultraviolet radiation (UV), other	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Fluoridation, other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Alkalinity adjustment for process control, other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Corrosion control - pH adjustment, other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Coagulant, other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Flocculation, other	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Tanks (including components) for dilution / equalization, neutralization, sedimentation, chemical precipitation, other	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Membrane bioreactor (MBR), other	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Air stripping tank / column, other	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Ion exchange bed, other	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Greensand and granular filtration, other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Micro / ultrafiltration, other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Electrodeionization, other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Reverse osmosis or nano filtration, other	N	N	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.b
Treatment of groundwater, wastewater and municipal sewage

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Water and wastewater											
Water efficiency	Planning and design	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Efficiency consulting	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Laboratory	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Leak detection technologies	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Piloting, validation and verification	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Training and plant operation	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Equipment to reduce water consumption	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Processes for desalinated water	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Rainwater collection	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Pipe inspection	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Measurement and control of water use	Software	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Platform or system	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Sensors	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Information and communication technologies	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Artificial intelligence-enabled water system optimization and predictive analytics	..	..	..	..	..	..	..	..	..	N
Water recycling and recovery	Gray water reuse	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Water recycling technologies	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Wastewater recycling	..	..	..	..	..	..	..	..	..	N

.. not available for a specific reference period

Table 1.c
Management of non-hazardous waste

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Waste and recycling											
Collection	Collection vehicles for non-hazardous waste, recycling and organics	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Containers for collection of recycled materials and household organics, backyard composters, yard waste bags	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Separating and sorting	Air classifier, magnetic separator, eddy current separator	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Other robotics / mechanical separators	..	..	..	..	..	..	..	..	..	N
Compaction	Balers, densifiers, compactors, shredders, granulators	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Centralized biological reprocessing	Centralized composters (e.g., turned-windrow, aerated static pile, mechanically agitated in-vessel)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Disposal	Equipment for landfill leachate collection and containment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Equipment for landfill gas management	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Equipment for thermal treatment (e.g., rotary kiln incinerator, mass burning, starved air incinerator, fluidized bed)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Waste management	Software	N	N	N	N	N	N	N	N	N	N
	Platform or system	N	N	N	N	N	N	N	N	N	N
	Sensors	N	N	N	N	N	N	N	N	N	N
	Other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Artificial intelligence-enabled waste sorting and resource recovery optimization	..	..	..	..	..	..	..	..	..	N
Recycling and advanced resource recovery	Recycling equipment and related services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Plastic and composite recycling	..	..	..	..	..	..	..	..	..	N
	Battery recycling and reuse	N	N	N	N	N	N	N	N	N	N
	Tire recycling through pyrolysis	..	..	..	..	..	..	..	..	..	N
	Electronics and solar panel recycling	..	..	..	..	..	..	..	..	..	N
	Critical mineral and rare earth recovery	..	..	..	..	..	..	..	..	..	N
	Industrial waste recovery	..	..	..	..	..	..	..	..	..	N

.. not available for a specific reference period

Table 2

Sustainable resource activities - energy

Table 2.a
Alternative fuels and bioproducts

Industry and sub-industry		Technology area / type of service		SEGS							
				2012	2015	2017	2018	2019	2020	2021	2022
Alternative fuels and bioproducts											
Biofuel production	Grain ethanol	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Cellulosic ethanol	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Corn - ethanol	N	N	N	N	N	N	Y	Y	Y	Y
	Biodiesel - other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Algae biodiesel	N	N	N	N	Y	Y	Y	Y	Y	Y
	Biobutanol	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Methanol and dimethyl ether	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Bio-syngas	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Biocrude	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Biogas	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Renewable natural gas	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Renewable gasoline	N	N	N	N	N	N	N	N	N	N
	Renewable diesel	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Pyrolysis oil	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Bionaphtha	N	N	N	N	N	N	N	N	N	N
	Sustainable aviation fuel	N	N	N	N	N	N	N	N	N	N
	Co-processed fuels	..	..	..	..	..	..	..	..	..	N
	Synthetic fuel production (e.g., carbon dioxide (CO2)-derived fuels, electricity-derived fuels, power-to-liquid)	..	..	..	..	..	..	..	..	..	Y
	Engineering services	N	N	N	N	Y	Y	Y	Y	Y	Y
Biomass feedstocks and preprocessing (formerly Bioenergy production)	Chips, cubes, briquettes, pucks, and pellets from wood residues and grasses, etc.	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Black pellets	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Other biomass	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Biochar	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Engineering services	N	N	N	N	Y	Y	Y	Y	Y	Y

Table 2.a
Alternative fuels and bioproducts

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Alternative fuels and bioproducts											
Hydrogen	Low carbon hydrogen	N	N	N	N	N	N	N	N	N	N
	Biohydrogen	..	..	..	..	..	..	..	..	..	Y
	Low-carbon ammonia	..	..	..	..	..	..	..	..	..	N
	Natural hydrogen	..	..	..	..	..	..	..	..	..	N
	Hydrogen compression equipment	..	..	..	..	..	..	..	..	..	N
	Electrolysers and related equipment and services for production of hydrogen	N	N	N	N	N	N	N	N	N	N
	Hydrogen transport infrastructure (e.g., pipelines, retrofits)	..	..	..	..	..	..	..	..	..	Y
	Hydrogen storage systems (e.g., compressed, liquid, advanced materials)	..	..	..	..	..	..	..	..	..	N
	Gasification-based hydrogen production systems	..	..	..	..	..	..	..	..	..	N
	Methane pyrolysis	..	..	..	..	..	..	..	..	..	N
Equipment for producing biofuels and bioproducts	Mixers / centrifuges	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Filtration systems	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Biofuel reactors (e.g., distillation towers, digesters)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Washers	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Dryers	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Heaters	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Storage systems	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Additives / catalysts (e.g., sodium hydroxide, potassium hydroxide)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Shredders, chippers	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Dust collectors	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Conveyors	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Other conversion equipment	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Biochemicals	Lubricants, waxes, and grease	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Resins	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Acids	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Sugars (C5, C6), cellulose esters, polyols	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Other building block chemicals	N	N	N	N	Y	Y	Y	Y	Y	Y
	Other biobased specialty chemicals	N	N	N	N	Y	Y	Y	Y	Y	Y
	Bio-catalysts and bio-enzymes	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Hemicellulose	N	N	Y	Y	Y	Y	Y	Y	Y	Y

Table 2.a
Alternative fuels and bioproducts

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Alternative fuels and bioproducts											
Biomaterials	Biocomposites and biofibres	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Advanced materials (e.g., nanomaterials, nanocomposites, nanocrystalline cellulose, silk fibres)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Cross laminated timber	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Wood composite	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Agri-based composite	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Textile	N	N	N	N	N	N	N	N	N	N
	Mats and specialty cellulose products	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Panels, cement, and other building products	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Automotive and transportation products	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Furniture and consumer goods	N	N	N	N	N	N	N	N	N	N
Bioproducts	Bioplastics	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Bio-packaging	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Biopesticides and bio-stimulants	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Biofoam (insulation) and biorubber	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Bio-oils and derivatives	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Paints, coatings, solvents, adhesives	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Lignin	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Other	Reclaimed rubber or other petro-based materials	N	N	N	N	N	N	N	N	N	N

.. not available for a specific reference period

Table 2.b
Renewable / non-emitting electricity and heat production

Industry and sub-industry	Technology area / type of service	SEGS									
		2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Renewable / non-emitting energy supply											
Wind energy	Wind turbines (including nacelles, blades, and integrated systems; excluding towers)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Wind turbine towers (excluding foundation and support structures)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Wind turbine foundations and support structures	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
	Electrical systems (e.g., switchgears, transformers)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Other wind system components (excluding turbines, towers, foundations and support structures)	..	..	..	..	..	..	..	..	..	N
	Offshore wind systems (e.g., floating platforms, subsea infrastructure)	..	..	..	..	..	..	..	..	..	N
	Engineering, installation, operations and maintenance services	N	N	Y	Y	Y	Y	Y	Y	Y	Y

Table 2.b
Renewable / non-emitting electricity and heat production

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Renewable / non-emitting energy supply											
Bioenergy	Biomass combustion systems (e.g., domestic wood stoves, biomass boilers, pellet-based systems)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Biomass-fired industrial boilers and combined heat and power (CHP) systems	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Anaerobic digestion systems (e.g., biogas production)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Biomass gasification systems	..	..	..	..	..	..	..	..	..	N
	Engineering, installation, operations and maintenance services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Geothermal energy	Geothermal power generation systems	..	..	..	..	..	..	..	..	..	N
	Ground-source heat pump systems (e.g., geothermal heating and cooling)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Enhanced geothermal systems (EGS) and related equipment	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Geothermal fluid handling systems (e.g., wells, piping, circulation systems)	..	..	..	..	..	..	..	..	..	N
	Geothermal drilling and exploration technologies	N	N	N	N	Y	Y	Y	Y	Y	Y
	Engineering, installation, operations and maintenance services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Hydro energy (freshwater)	Hydropower generation systems (e.g., turbine-based systems, including run-of-river and reservoir-based configurations)	..	..	..	..	..	..	..	..	..	N
	Hydropower civil infrastructure (e.g., dams, spillways, water conveyance systems)	..	..	..	..	..	..	..	..	..	N
	Hydropower system components (e.g., generators, valves, gates, transformers, switchgear)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Engineering, installation, operations and maintenance services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Ocean energy	Tidal energy converters (all designs including turbines)	..	..	..	..	..	..	..	..	..	N
	Wave energy converters (all designs)	..	..	..	..	..	..	..	..	..	N
	Salinity gradient energy converters (all designs)	..	..	..	..	..	..	..	..	..	N
	Ocean energy system components (e.g., mooring systems, anchors, electrical systems)	..	..	..	..	..	..	..	..	..	N
	Engineering, installation, operations and maintenance services	..	..	..	..	..	..	..	..	..	N

Table 2.b
Renewable / non-emitting electricity and heat production

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Renewable / non-emitting energy supply											
Solar energy	Active solar thermal collectors for heating and cooling (e.g., glazed, unglazed, evacuated tube)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Transpired solar thermal air collectors	..	..	..	..	..	..	..	..	..	N
	Active solar thermal power generation systems (e.g., concentrating mirrors, receivers)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Solar photovoltaic modules / panels	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Solar photovoltaic cells (including first, second, and third generation)	..	..	..	..	..	..	..	..	..	Y
	Other solar photovoltaic system components (e.g., inverters, coatings, and balance-of-system)	..	..	..	..	..	..	..	..	..	Y
	Solar tracking systems (e.g., single-axis, dual-axis)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Engineering, installation, operations and maintenance services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Waste to energy	Organic (liquid) waste to energy	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Organic (solid) waste to energy	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Refuse derived fuel (RDF) to energy	N	N	N	N	N	N	N	N	N	N
	Landfill gas to energy	N	N	N	N	Y	Y	Y	Y	Y	Y
	Engineering, installation, operations and maintenance services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Nuclear energy	Nuclear reactors, or nuclear island components (primary circuit, steam generators, primary side auxiliaries, nuclear island electrical supply and instrumentation and controls)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Nuclear fuel handling, processing, and fabrication equipment	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Balance of nuclear power plant, or conventional island components	N	N	N	N	Y	Y	Y	Y	Y	Y
	Engineering, installation, operations and maintenance services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Uranium production, refining, conversion and nuclear fuel fabrication services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Small modular reactors (SMRs)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Nuclear waste management	..	..	..	..	..	..	..	..	..	N
	Decommissioning services	..	..	..	..	..	..	..	..	..	N

.. not available for a specific reference period

Table 2.c
Smart grid and energy storage

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Smart grid and energy storage											
Demand management	Inverters	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Smart meters	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Phasor measurement units / sensors	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Management systems (e.g., communication solutions, hot water tank controllers)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Monitoring and automation software (e.g., weather forecasting software, load prediction, dispatch optimization software)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Engineering, installation, and maintenance services	N	N	N	N	Y	Y	Y	Y	Y	Y
	Artificial intelligence-enabled grid optimization and predictive grid management	..	..	..	..	..	..	..	..	..	N
Transmission and distribution	Distributed energy resources	..	..	..	..	..	..	..	..	..	N
	Virtual power plants and aggregators	..	..	..	..	..	..	..	..	..	N
	Planning and operation of electricity transmission and distribution grids	..	..	..	..	..	..	..	..	..	N
	Integrated short-duration electrical energy storage	..	..	..	..	..	..	..	..	..	N
	Microgrid solutions	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Local and district heating equipment and related services	N	N	N	N	N	N	N	N	N	N
	Other related information and communications technology (ICT) equipment	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Engineering, installation, and maintenance services	N	N	N	N	Y	Y	Y	Y	Y	Y
Mechanical energy storage	Flywheels	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Pumped hydro	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Rail cars, stacking blocks	N	N	N	N	N	N	N	N	N	N
	Compressed air	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Chemical energy storage	Hydrogen storage	..	..	..	..	..	..	..	..	..	Y
	Liquid hydrogen storage	..	..	..	..	..	..	..	..	..	N
	Gaseous hydrogen storage	..	..	..	..	..	..	..	..	..	N
	Other clean fuels (synthetic natural gas (SNG), renewable natural gas (RNG), biofuel) storage in tanks and underground facilities	..	..	..	..	..	..	..	..	..	N
Fuel cells	Fuel cells	..	..	..	..	..	..	..	..	..	Y
	Non-rechargeable metal-air batteries	..	..	..	..	..	..	..	..	..	N
Electrochemical energy storage (batteries)	Lithium-ion batteries	..	..	..	..	..	..	..	..	..	Y
	Rechargeable metal-air batteries	..	..	..	..	..	..	..	..	..	N
	Redox flow batteries	..	..	..	..	..	..	..	..	..	Y
	Solid state batteries	..	..	..	..	..	..	..	..	..	Y
	Sodium batteries	..	..	..	..	..	..	..	..	..	Y
	Metal-ion batteries	..	..	..	..	..	..	..	..	..	N

Table 2.c
Smart grid and energy storage

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Smart grid and energy storage											
Battery materials, components, and pack manufacturer and controls and end-use applications	Battery-grade and component precursor materials	..	..	..	..	..	..	..	..	..	N
	Battery components	..	..	..	..	..	..	..	..	..	Y
	Module and pack manufacturers	..	..	..	..	..	..	..	..	..	Y
	Battery energy storage systems	..	..	..	..	..	..	..	..	..	N
	Battery management systems	..	..	..	..	..	..	..	..	..	N
	Other battery powered systems and applications	..	..	..	..	..	..	..	..	..	N
Electrical storage	Double-layer and super / ultra capacitors (DLC)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Superconducting magnetic energy storage (SMES)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Thermal storage	Latent heat (e.g., phase change materials)	N	N	N	N	N	N	N	N	N	N
	Thermal storage systems (e.g., sensible heat such as rock caverns, molten salt)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hybrid storage	Hybrid storage systems	N	N	N	N	Y	Y	Y	Y	Y	Y
Energy storage services	Engineering, installation, and maintenance services	N	N	N	N	Y	Y	Y	Y	Y	Y

.. not available for a specific reference period

Table 2.d
Technologies to improve energy and resource efficiency / management

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Energy efficiency											
Energy and resource efficient modifications, improvements	In process (ancillary / own use) modifications	N	N	N	N	N	N	N	N	N	N
	Combined heat and power and cogeneration	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Enhanced solvent extraction for oil sands	N	N	N	N	N	N	N	N	N	N
	Fuel control systems	N	N	N	N	Y	Y	Y	Y	Y	Y
	Material / waste recovery and related services	N	N	N	N	Y	Y	Y	Y	Y	Y
	Energy recovery and related services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Low-energy / passive buildings and related services	N	N	N	N	N	N	N	N	N	N
	Advanced thermostats	N	N	N	N	Y	Y	Y	Y	Y	Y
	Advanced insulation activities	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Heat transfer equipment	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Collaborative consumption systems	N	N	N	N	N	N	N	N	N	N
Measurement, controls and monitoring	Energy Audit for houses, buildings, industries and fleets	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Energy efficiency certification (e.g., Energy Star for products, R-2000 for houses, Building Owners and Managers Association (BOMA) Best for buildings, International Organization for Standardization (ISO) 50001 for industry)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Energy management system services	N	N	N	N	Y	Y	Y	Y	Y	Y
	Energy monitoring services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Demand control services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Process integration services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Data analysis and modelling services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Automation and control technology	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Green building certification	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Artificial intelligence-driven predictive maintenance	..	..	..	..	..	..	..	..	..	N
	Digital twins of industrial facilities	..	..	..	..	..	..	..	..	..	N
Industrial design and related services (Efficiency design and advisory services)	Power system certification - Performance Excellence in Electricity Renewal (PEER)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Aerodynamic design	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Aerodynamic testing	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Modelling tools and services	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Energy efficiency consulting services	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Design of emission control technologies	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Circular design services	N	N	N	N	N	N	N	N	N	N

Table 2.d
Technologies to improve energy and resource efficiency / management

Industry and sub-industry	Technology area / type of service	SEGS									
		2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Energy efficiency											
Efficient equipment (commercial, industrial, residential)	High efficiency industrial heating, ventilation, air conditioning (HVAC)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Other high efficiency HVAC (e.g., commercial, residential)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	High efficiency heat pumps	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	High efficiency pumps and motors	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	High efficiency fans and compressors	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	High efficiency burners and boilers	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	High efficiency refrigeration systems	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	High efficiency lighting system	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Heat exchangers with heat transfer enhancement / waste heat recovery equipment	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Variable speed / frequency drives (VSD / VFD)	N	N	N	N	N	N	N	N	N	N
	Power factor correction devices	N	N	N	N	N	N	N	N	N	N
	Advanced pipes, pumps, valves, filters, and intersections with reduced heat loss	N	N	N	N	N	N	N	N	N	N
	High efficiency grinding systems	N	N	N	N	N	N	N	N	N	N
	High efficiency rolling equipment	N	N	N	N	N	N	N	N	N	N
	High efficiency electric appliances	N	N	N	N	N	N	N	N	N	N
	High temperature industrial heat pumps (HTIHP)	..	..	..	..	..	..	..	..	..	N
	High temperature electric furnace	..	..	..	..	..	..	..	..	..	N
	Infrared and microwave industrial heaters	..	..	..	..	..	..	..	..	..	N
	Induction heating	..	..	..	..	..	..	..	..	..	N
	Thermal storage for process heat	..	..	..	..	..	..	..	..	..	Y

.. not available for a specific reference period

Table 3
Sustainable resource activities - agriculture, forestry and biodiversity

Table 3.a
Precision agriculture, forestry, biodiversity

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Precision agriculture, forestry, biodiversity											
Agricultural efficiencies	Precision fertilizers and other inputs (e.g., smart seeds)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Technologies that reduce environmental impacts (e.g., alternative fertilizers, alternative (non-toxic) pest repellents)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Precision livestock monitoring and management technologies	N	N	N	N	N	N	N	N	N	N
Machinery, equipment and software	Variable rate / precision (global positioning system (GPS) enabled) seeders, fertilizer applicators, sprayers, etc.	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Sensors (crop canopy, yield, etc.)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Precision agriculture (PA) decision support software packages for seeding, spraying, fertilizing, irrigating	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Unmanned aerial vehicle (UAV) drones with / for agricultural platforms	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Livestock precision feeding technology (Radio-frequency identification (RFID) sensors, automated feeders)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Anaerobic digestors	N	N	N	N	N	N	N	N	N	N
	Artificial intelligence (AI)-enabled precision agriculture systems (e.g., analytics, predictive optimization, and autonomous control for input efficiency)	..	..	..	..	..	..	..	..	..	N
	Autonomous agricultural machinery and robotics	..	..	..	..	..	..	..	..	..	N
	Other	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Aquaculture	Alternative feeds (e.g., plant, algal, yeast-based proteins to replace fish meal consumption)	N	N	N	N	N	N	N	N	N	N
	Fish waste reduction / recycling (solid and liquid waste collected / filtered)	N	N	Y	Y	N	N	N	N	N	N
	Conversion to land-based culture (e.g., Recirculating Aquaculture System (RAS))	N	N	Y	Y	N	N	N	N	N	N
	Energy efficient pumps, filters, processes	N	N	Y	Y	N	N	N	N	N	N
	Organic aquaculture products and supporting services	N	N	N	N	N	N	N	N	N	N
Wild flora and fauna management	Minimization of the intake of wild flora and fauna	N	N	N	N	N	N	N	N	N	N
	Restoration activities	N	N	N	N	N	N	N	N	N	N
	Measurement, control, and laboratories for wild flora and fauna management	N	N	N	N	N	N	N	N	N	N
	Training and administrative activities related to flora and fauna management	N	N	N	N	N	N	N	N	N	N

Table 3.a
Precision agriculture, forestry, biodiversity

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Precision agriculture, forestry, biodiversity											
Sustainable forestry services and forest monitoring technologies	Management of forest areas (including restoration, replenishment, development of new forest areas, and prevention and control of fires)	N	N	N	N	Y	Y	Y	Y	Y	Y
	Wildfire detection and monitoring technologies (e.g., sensor networks, satellite monitoring, early fire detection systems)	..	..	..	..	..	..	..	..	..	N
	Wildfire prevention and suppression technologies	..	..	..	..	..	..	..	..	..	N
	Minimization of the intake of forest resources	N	N	N	N	Y	Y	Y	Y	Y	Y
	Measurement, control, and laboratories for forest management	N	N	N	N	Y	Y	Y	Y	Y	Y
	Training and administrative activities related to forest management	N	N	N	N	Y	Y	Y	Y	Y	Y
	AI-enabled wildfire prediction and risk modelling systems	..	..	..	..	..	..	..	..	..	N
	Precision sampling and data gathering technologies	N	N	N	N	N	N	N	N	N	N
UAV drones for forest monitoring	..	..	..	..	..	..	..	..	..	N	
Protein alternatives	Emerging solutions (e.g., cultured meats)	N	N	N	N	N	N	N	N	N	N

.. not available for a specific reference period

Table 4
Sustainable resource activities – minerals

Table 4.a
Mining, processing, materials manufacturing and industry

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Mining, processing, materials manufacturing and industry											
Mineral use	In-process modifications to reduce consumption of mineral resources	N	N	N	N	N	N	N	N	N	N
	Production of substitutes for minerals-based materials	N	N	N	N	N	N	N	N	N	N
	Methane leakage emission capture for coal mines	N	N	N	N	N	N	N	N	N	N
	Clinker substitution, ground limestone, and supplementary cementitious materials (SCMs)	N	N	N	N	N	N	N	N	N	N
	Carbon process replacement (e.g., hydrogen based iron reduction, inert anode for aluminium, base metal smelting process, etc.)	N	N	N	N	N	N	N	N	N	N
	Measurement / control related to the reduction of the use of minerals	N	N	N	N	N	N	N	N	N	N
	Recovery of mineral-based materials	N	N	N	N	N	N	N	N	N	N
	Machinery for metal recovery	N	N	N	N	N	N	N	N	N	N
	Mixed hydroxide precipitates	..	..	..	..	..	..	..	..	..	N
	Mixed sulfide precipitates	..	..	..	..	..	..	..	..	..	N
Sustainable mine operations and processing	In-process modification to reduce water usage, or increase energy, thermal, carbon dioxide (CO2) efficiency	N	N	N	N	N	N	N	N	N	N
	Enhanced solvent extraction	N	N	N	N	N	N	N	N	N	N
	Rock fragmentation methods	N	N	N	N	N	N	N	N	N	N
	Sustainable mineral processing	N	N	N	N	N	N	N	N	N	N
	CO2 mineralization in mine tailings	N	N	N	N	N	N	N	N	N	N
	Recovery of minerals and metals from tailings	N	N	N	N	N	N	N	N	N	N
	Recycling and reprocessing of mining waste	N	N	N	N	N	N	N	N	N	N
	Energy efficient processes and equipment for various applications	N	N	N	N	N	N	N	N	N	N
	Renewables, hydrogen, clean fuels, non-fossil fuels	N	N	N	N	N	N	N	N	N	N
	Mining ventilation systems	N	N	N	N	N	N	N	N	N	N
	Mineral processing reagents and separation chemicals	..	..	..	..	..	..	..	..	..	N
	Electrification of mineral equipment and operations	..	..	..	..	..	..	..	..	..	N
	Artificial intelligence (AI)-enabled digital twinning	..	..	..	..	..	..	..	..	..	N
	Surgical mining	..	..	..	..	..	..	..	..	..	N
	Smart mining	..	..	..	..	..	..	..	..	..	N
Reclamation and monitoring	Mine closure and environmental containment systems	N	N	N	N	N	N	N	N	N	N
	Environmental biotechnology (e.g., metagenomics, eDNA)	..	..	..	..	..	..	..	..	..	N
	Dust collectors	N	N	N	N	N	N	N	N	N	N

Table 4.a
Mining, processing, materials manufacturing and industry

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Mining, processing, materials manufacturing and industry											
Advanced and enabling materials	Products developed using additive manufacturing or low-impact processes	N	N	N	N	N	N	N	N	N	N
	Nanotechnology	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Composite materials	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Advanced packaging	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Other lightweight materials	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Cement and concrete additives as strengthening fibres	..	..	..	..	..	..	..	..	..	N
	AI-enabled material design and discovery	..	..	..	..	..	..	..	..	..	N
Low carbon industrial processes	Low carbon intensity steel and other metals	N	N	N	N	N	N	N	N	N	N
	Fuel switching equipment	N	N	N	N	N	N	N	N	N	N
	Low carbon cement / concrete	N	N	N	N	N	N	N	N	N	N
	Advanced anodes in aluminum smelting	N	N	N	N	N	N	N	N	N	N
	Advanced catalysts and membranes to reduce energy and emission intensity of chemical processes	N	N	N	N	N	N	N	N	N	N

.. not available for a specific reference period

Table 5

Adapted goods

Table 5.a
Sustainable mobility

Industry and sub-industry	Technology area / type of service	SEGS									
		2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Transportation											
Fuel efficient ground transportation equipment	Fuel efficient engines and components (including electrification and hybrids)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Electric vehicle battery	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Electric drive systems (i.e., components that convert electrical energy into vehicle motion)	..	..	..	..	..	..	..	..	..	N
	Battery electric vehicle other components	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Hydrogen fuel cell stack	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Hydrogen fuel cell vehicle other components	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Light electric mobility (e.g., e-bikes, e-scooters, micro-mobility vehicles)	..	..	..	..	..	..	..	..	..	N
	Lightweight and advanced materials / components	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Electric vehicle infrastructure (e.g., charging stations and battery swapping)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Vehicle efficiency software	..	..	..	..	..	..	..	..	..	N
	Alternative fuel (e.g., biofuels and natural gas) refueling infrastructure	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Hydrogen refueling infrastructure	N	N	N	N	N	N	N	N	N	N
	Liquefied natural gas (LNG) / compressed natural gas (CNG) engine (medium and heavy-duty vehicles (MHDV) only)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	LNG / CNG tank (MHDV only)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	LNG / CNG control system (MHDV only)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Aerodynamic device	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Auxiliary power unit (APU) (includes fuel-based APUs, low-carbon fuels, onboard batteries, and renewable electricity (e.g., solar))	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Engine control module	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Low rolling resistance tire	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Vehicle emission monitoring	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Alternative fuel retrofits	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Automatic tire inflation system	..	..	..	..	..	..	..	..	..	N

Table 5.a
Sustainable mobility

		SEGS									
Industry and sub-industry	Technology area / type of service	2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
Transportation											
Fuel efficient aerospace equipment	Efficient turbine	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Fuel efficient engines and components (including electrification, hybrids and other alternative fuels)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Additive composite	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Lightweighting technologies / components for transport decarbonization	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Powder metallurgy, coatings, polishing, anodizing for fuel efficiency	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Electric aircraft battery	N	N	N	N	N	N	N	N	N	N
	Aircraft fuel cell stack	N	N	N	N	N	N	N	N	N	N
	Electric aircraft infrastructure (charging stations)	N	N	N	N	N	N	N	N	N	N
	Novel aircraft design	..	..	..	..	..	..	..	..	..	N
	Low-carbon ground support equipment	..	..	..	..	..	..	..	..	..	N
	Alternative fuel (including hydrogen and sustainable aviation fuel) refueling infrastructure	N	N	N	N	N	N	N	N	N	N
	Alternative fuel (including hydrogen, hybrid and sustainable aviation fuel) retrofits	N	N	N	N	N	N	N	N	N	N
Fuel efficient marine equipment	Alternative power for marine transportation	N	N	N	N	N	N	N	N	N	N
	Alternative fuel engines (e.g., hydrogen)	N	N	N	N	N	N	N	N	N	N
	Alternative fuel (including hydrogen and biofuel) refueling infrastructure	N	N	N	N	N	N	N	N	N	N
	Alternative fuel (including hydrogen, hybrid, biofuel) retrofits	N	N	N	N	N	N	N	N	N	N
	Batteries for marine applications	N	N	N	N	N	N	N	N	N	N
	Marine propulsion efficiency technologies	..	..	..	..	..	..	..	..	..	N
	Shore power (cold ironing)	..	..	..	..	..	..	..	..	..	N
	Marine exhaust emission control systems	..	..	..	..	..	..	..	..	..	N
Infrastructure and traffic control	Intelligent traffic control	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Integrated traffic infrastructure	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Traffic management	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Drone monitoring	..	..	..	..	..	..	..	..	..	N
Other	Car sharing	N	N	N	N	N	N	N	N	N	N
	Electrified and high-efficiency transport equipment	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Vehicle fleet management and logistics	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	Zero-emission or low-emission mass transit vehicles (e.g., buses, trains)	N	N	N	N	N	N	N	N	N	N
	Intermodal transport information systems	..	..	..	..	..	..	..	..	..	N

.. not available for a specific reference period

Annex

Annex 1

Technologies and services no longer considered clean technologies

Year in which no longer considered clean technology	Industry	Sub-industry	Technology area / type of service	SEGS									
				2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
2024	Alternative fuels and bioproducts	Biofuel production	Drop-in synthetic fuels	N	N	Y	Y	Y	Y	Y	Y	Y	Y
2024	Alternative fuels and bioproducts	Hydrogen	Hydrogen (produced from non-fossil sources)	N	N	Y	Y	Y	Y	Y	Y	Y	Y
2024	Renewable / non-emitting energy supply	Bioenergy	Plasma torches or plasma burners to electrify heat generation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Renewable / non-emitting energy supply	Geothermal energy	Hot dry rock (HDR) equipment	N	N	Y	Y	Y	Y	Y	Y	Y	Y
2024	Renewable / non-emitting energy supply	Hydro energy (freshwater)	Turbines and components for wave / tidal energy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Renewable / non-emitting energy supply	Hydro energy (freshwater)	Turbines and components for run-of-river hydro	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Renewable / non-emitting energy supply	Hydro energy (freshwater)	Turbines (e.g., Francis, Kaplan, Pelton, propeller) and components for large hydro	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Renewable / non-emitting energy supply	Hydro energy (freshwater)	Salinity gradient power equipment	N	N	N	N	N	N	N	N	N	N
2024	Renewable / non-emitting energy supply	Solar energy	Thin film solar photovoltaic panel (nanotechnology)	N	N	N	N	N	N	N	N	N	N
2024	Smart grid and energy storage	Transmission and distribution	Transmission and distribution management	N	N	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Nickel cadmium (NiCd)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Nickel metal hydride (NiMH)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Lead acid (LA)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Lithium-ion (Li-ion)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Sodium sulphur (NaS)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Sodium nickel chloride (NaNiCl)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Hybrid flow	N	Y	Y	Y	Y	Y	Y	Y	Y	Y

Annex 1**Technologies and services no longer considered clean technologies**

Year in which no longer considered clean technology	Industry	Sub-industry	Technology area / type of service	SEGS									
				2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Redox flow	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Hydrogen storage	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Liquid hydrogen storage	N	N	N	N	N	N	N	N	N	N
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Gaseous hydrogen storage	N	N	N	N	N	N	N	N	N	N
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Fuel cells	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Synthetic natural gas	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Carbon dioxide (CO2) electroreduction	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Solid state batteries	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Lithium metal anode batteries	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Silicon anode batteries	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Metal-air batteries	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Non-Lithium intercalation batteries	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Smart grid and energy storage	Electrochemical energy storage (advanced batteries)	Conversion batteries	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
2024	Energy efficiency	Energy and resource efficient modifications, improvements	Energetic refurbishment of existing buildings and related services	N	N	N	N	Y	Y	Y	Y	Y	Y
2024	Energy efficiency	Energy and resource efficient modifications, improvements	Energy upgrading equipment	N	N	Y	Y	Y	Y	Y	Y	Y	Y
2024	Energy efficiency	Energy and resource efficient modifications, improvements	Additive manufacturing	N	N	N	N	Y	Y	Y	Y	Y	Y

Annex 1**Technologies and services no longer considered clean technologies**

Year in which no longer considered clean technology	Industry	Sub-industry	Technology area / type of service	SEGS									
				2012	2015	2017	2018	2019	2020	2021	2022	2023	2024
2024	Energy efficiency	Measurement, controls and monitoring	Uncertified green property investments	N	N	N	N	N	N	N	N	N	N
2024	Energy efficiency	Efficient industrial equipment	Batteries for portable devices	N	N	Y	Y	Y	Y	Y	Y	Y	Y
2024	Precision agriculture, forestry, biodiversity	Machinery, equipment and software	Ionophores for livestock feed	N	N	N	N	N	N	N	N	N	N
2024	Transportation	Fuel efficient ground transportation equipment	Technical inspection services related to air emissions	N	N	Y	Y	Y	Y	Y	Y	Y	Y