Annex 1 To Destruction Technologies. Summary their Availability, Efficiency and Capacity.

Technology (Availability)	Application	Pesticides POPs	PCB	ODS	HBB/ HBCD/ HCBD	PCDDs/ PCDFs	Reported DE%/DRE %	Residue POPs Release	Capacity of destruction technologies	Input materials needed for processing 1 tonne of waste	State of Commercialization/ Adaption
1.Base-catalyzed decompositi on (BCD) (The technology is now in reverse because very low capacity, complicated chemical procedure and not well controlled the chemical process. Previously used in several cases in Asia and Japan).	PCBs, POPs pesticides, PCDD in soil, solid, sludge and liquids	Yes, for certain pesticides: chlordane, HCH, DDT, HCB	Yes	ND*	ND	Yes	99.99- 99.9999 / >99.9999	• <2 mg/kg HCB/lindane in soil • <3 mg/kg PCCD in soil • <60 mg/kg PCCD in demolition waste	Modular, mobile and fixed facilities have been built	• Power requirements : 100-125 kWh/h • Water requirements: cooling water 10-15 m^3/h • Fuel volumes: Fuel gas 40 m^3/h • Reagents volumes: - hydrogen donor oil, such as No. 6 fuel oil or Sun Par oils No. LW-104, LW-106 and LW-110;150-200 t/year - alkali or alkali earth metal carbonate, bicarbonate or hydroxide, such as sodium bicarbonate. The amount of alkali required is dependent on the concentration of the halogenated contaminant contained in the medium - proprietary catalyst amounting to 1 % by volume of the hydrogen donor oil (approx. 0.5 t/year)	• Commercially available through established technology vendor/ licensee arrangements. • Several facilities operating worldwide. • Suitable for establishment in many countries provided volumes justify supporting high capital cost infrastructure. • Moderate to high complexity.
2.Gas Phase Chemical Reduction (GPCR) (The technology is currently used very rarely, due to its complicated structure, previously in several cases in China and Australia).	PCBs, POPs pesticides, PCDD in spoil, solid, sludge and liquids.	Yes for all pesticides	Yes	Yes	Yes	Yes	>99.9999 / >99.9999	• No residual POPs content or releases noted.	Fixed and mobile configurations available	• Power requirement : 2.5 MWh • Water requirements: - Steam: 1,500 kg - Cooling water: 500 m^3 • Gas volumes : natural gas: 600 m^3 • Reagents volumes: - Nitrogen: 75 m^3 - Carbon Dioxide: 20 kg - Caustic: 1.4 t - Hydrogen: 1,000 m^3	• Demonstrated in pilot and small commercial facilities in developed countries. • Require secure infrastructure, trained technical staff, laboratory support, utilities and re-agent supply. • High level of complexity including safe handling of hydrogen.
3.Plasma Arc	PCBs, POPs	Yes, for most	Yes	Yes	ND	ND	>99.9999 / n/a	• <0.5 mg/l	Fixed and	• Power requirements : 180 kW	• Commercially available

(Technology has been invented to destroy chemical and biological weapons, mainly used in the military purposes, very expensive, because required full energy voltage, used in Canada, USA, Mexico)	pesticides, PCDD in soil, solid, sludge and liquids	pesticides, including chlordane, chlordecone, DDT, endosulfan, heptaclor						POPs liquid in effluent • <1 ng/ m3 POPs in air • <0.1 ng PCDD TEQ/Nm3 • Solidified residuals generally meet leachate limits	mobile configurations available	• Water requirements: Both cooling and deionised water are continuously reused, total water consumption - 1.4m³/h. • Reagents volumes: - Argon: 15 m3/hr - Caustic: 1.4 tonnes (Caustic is directly proportional to waste concentration i.e. chlorine content) - Oxygen 0.8 tonnes of concentrated waste.(Oxygen use varies with chemical composition of waste and hydrocarbon - solvents mixtures).	technology with a number of operating facilities in developed countries. • Technology vendors with stable licensee arrangements capable of competitive tendering worldwide. • Require secure infrastructure, trained technical staff, laboratory support and utilities and reagent supply. • High level of complexity
4.Pyrolysis/ Gasification (Technology not complicated, but only in order to destroy not very high hazardous waste, otherwise problem with emission limits, cheap, good for contaminated materials).	PCBs, POPs pesticides, PCDD in soil, solid, sludge and liquids (in principle)	Yes	Yes	ND	ND	Yes	99.974 / 99.9999	Claimed to meet US/EU emission and disposal limits	Fixed and mobile facilities potentially available.	Moderate power consumption with reliable water and electrical supply	• Commercial units from a number of technology vendors but limited application to POPs wastes. • Subject to demonstration of stable licensee arrangements should be capable of competitive tendering worldwide. • Require secure infrastructure, trained technical staff, laboratory support and utilities and re-agent supply. • High level of complexity.
5.GeoMelt™ (The technology is now in reverse, previously used in several cases in Asia and Japan, very difficult to control the process, high power	PCBs, POPs pesticides, PCDD contaminated soils or granulated solids	Yes	Yes	Yes, for HCB	ND	Yes	90 to 99.99 / 99.99- 99.9999 (with off gas treatment)	• Negligible air emission claimed. • Solidified residuals generally meet leachate limits	Depending upon the composition and configuration of the waste matrix, a typical 800 tonnes large scale in situ melt requires approximately 10 to 14 days of operation	High power consumption.	• Commercial operating facilities in a number of developed countries. • Require secure infrastructure, trained technical staff, laboratory support and utilities and reagent supply. • Technology vendor with stable licensee arrangements capable of competitive tendering worldwide. • High level of complexity.

consumption and water. It used to be implemented only in the experimental and laboratory stage).											
6.Supercritical water oxidation (SCWO). (Not complicated, no emission technology, could be also set up as a mobile unit, the input material must be specially prepared as paste). Used already in commercial phase in few countries: USA, Canada, France, UK and Germany).	• PCBs, Chlordane, PCDD, PCDF. • Liquid and slurries with <20% organic content, and particle size under 200um • Vendor reports capability for 100% organic content	Yes, for certain pesticides: chlordane and DDT	Yes	ND	ND	Yes, for PCDDs	98.7-99.8 Vendor reports higher DE potential / >99.9999	Requires assessment	• Mobile plant in shipping containers available. • A full-scale SWCO commercial facility with the capacity to treat 2 tonnes of waste per day	• Energy requirements are expected to be relatively high because of the combinations of high temperatures and pressures • Material requirements: reaction vessels must be constructed of materials capable of resisting corrosion caused by halogen ions.	• Specialized commercial plants operating in a number of developed countries. • Remains under evaluation and demonstration for more general POPs applications. • Technology vendor with stable licensee arrangements that should be capable of competitive tendering worldwide. • High level of complexity
7.Cement Kiln Co-disposal (Cement plants network is well known, this is a big advantage, high temperature in the cylinders, the waste must be specially prepared, special attention	PCBs and POPs pesticide wastes in liquid and solid form	Yes, for all pesticides	Yes	Yes	Yes	Yes	<99.9999 / <99.9999	Air emissions <0.1 ng PCDD-l/m3	Cement kilns are fixed constructions. Cement kilns run in principle always without waste as their objective is to produce cement and it has to be investigate if they are suitable to treat certain hazardous wastes	The cement kiln has to be investigated further because raw material conditions, technology, chemistry etc will be site specific.	• Commercial application in developed countries and demonstrations in developing countries. • Generally limited to relatively modern rotary kiln units with overall BAT/BEP environmental performance equipped with appropriate POPs waste handling/ injection infrastructure as well as monitoring capacity. • Application requires case by case assessment and performance demonstration.

must be paid for emission limits, no every plant has a monitoring system and suitable filters).											
8. Hazardous waste incineration (the best well known technology, used already from 1950 in Europe, expensive , very good filtration in nowadays allow to dispose a wide range of the different waste).	All POPs wastes in any physical form	Yes, for all pesticides	Yes	Yes	Yes	Yes	99.88- 99.999 / 99.9999	• Air emissions <0.1 ng PCDD-l/m3 • Low discharges to water effluent. • 1,500 ng PCDD TEQ/ kg for APC residues. • 50 ng PCDD TEQ/kg ash.	Mobile/semi-mobile 2-5,000 t/year capacity available	• Power requirements: 170 KWh/t. • Fuel volumes: 4.4 kg/t combustion • Water requirements: 1.7 m^3/t/year • Reagents volumes: 40 kg/t of 50 % NaOH is used for the neutralisation of acid gases in the wet scrubber, the exact amount is very much dependent on the halogen and sulfur content of the wastes; • Activated carbon/chalk mixture is 1.5 kg/t	• Extensive commercial application on developed countries. • High capital and operating costs. • Sophisticated emission controls and monitoring required. • Economies of scale >30,000 t/ year generally required for development with broad application to hazardous organic wastes generally.

* ND stands for “not determined” and indicates that information is not available to confirm the use of the technology for certain POPs.