Thought Starter Paper on Highly Hazardous Pesticides and the Strategic Approach to International Chemicals Management (SAICM)

Pesticides Action Network (PAN) and IPEN
August 2013

Executive Summary
Highly Hazardous Pesticides (HHPs) are a threat to human health and the environment with significant impacts on developing and transition countries. At ICCM3, a large number of countries from all UN regions supported actions on HHPs, including developing a priority list of substances for a progressive ban and substitution with safer alternatives. Delegates supported intercessional work on HHPs, but there was insufficient time at ICCM3 to develop concrete proposals. We believe that there are several key activities that could advance chemical safety and the SAICM goal with very modest resource requirements. Proposed activities include:

1) An FAO paper on alternatives to HHPs;
2) Surveys of HHP registrations, uses, bans and restrictions;
3) Collection of success stories on HHP phase-out including information on alternatives
4) Clearinghouse of HHP registrations, uses, restrictions, and prohibitions

The results of these intercessional activities should provide a basis for robust discussion of HHPs at OEWG2 and a forwarding of the issue to ICCM4. At ICCM4, agreement on global actions to address HHPs could provide a more elevated and concerted effort to address HHPs in the intercessional period between ICCM4 and ICCM5.

Background
Agricultural chemicals, including pesticides, are among some of the largest volume uses of chemicals worldwide and were among the first synthetic chemicals to be actively exported to developing countries.[1] Pesticides are designed to kill biota and are deliberately released into the environment, mostly in a broad-scale approach that results in only a small proportion of the chemical reaching its intended target organism.[2] [3] Adverse effects of pesticides include acute and chronic impacts on

[1] UNEP. 2012. Global Chemicals Outlook: Towards Sound Management of Chemicals. http://www.unep.org/hazardoussubstances/Portals/9/Mainstreaming/CostOfInaction/Report_Cost_of_Inaction_Feb2013.pdf
[2] Pimentel D. 1995. Amounts of pesticides reaching target pests; environmental impacts and ethics. *J Agric Environ Ethics* 8(1):17-29.

human health, livestock, wildlife, pollinators, beneficial insects such as biological controls, and other invertebrates and microbes both terrestrial and aquatic that are essential for the proper functioning of a stable and healthy ecosystem.[4] There is now global contamination of environmental media including soil, surface and groundwater, air, rain, fog, snow, and biota with pesticides.

Pesticides in developing and transition countries have significant impacts on human health and economics. An authoritative study[5] estimated that there are possibly one million cases of serious unintentional pesticide poisonings each year, and an additional two million cases of people hospitalized for suicide attempts with pesticides. The author notes that this necessarily reflects only a fraction of the real problem and estimates that there could be as many as 25 million agricultural workers in the developing world suffering some form of occupational pesticide poisoning each year, though most incidents are not recorded and most patients do not seek medical attention. One of the conclusions this author reaches is that acute pesticide poisoning may in some developing countries be as serious a public health concern as are communicable diseases.[6] These health outcomes have economic impacts. A recent UNEP report noted that the cost of inaction related to pesticide use in Africa is greater than the total Official Development Assistance to general health care in Africa, excluding HIV/AIDs.[7]

The adverse effects of pesticides are sometimes very evident, some times invisible but non-the-less concerning, especially in developing countries where agriculture is often the largest economic sector and pesticides account for the most significant chemical releases. In highly industrial countries, agriculture generally occupies less than 5% of the employed workforce. However in Latin America, the Middle East and the countries of the former Soviet Union, nearly one-fifth (20%) of employed workers are in agriculture. In North Africa and East Asia the number rises to more than one-third. In South and Southeast Asia, nearly half the workforce is in agriculture. In Sub-Saharan Africa, two-thirds of all employed workers engage in agricultural activities.[8]

Approaches to the regulation of pesticides often assume that conditions of work and regulatory capabilities in developing and transition countries are similar to those in highly industrial countries, but this frequently is not the case. In many developing countries, there is no system for tracking quantities of pesticides imported and used.

---

[3] Pimentel D. 2005. Environmental and economic costs of the application of pesticides primarily in the United States. *Environ Dev Sustain* 7:229-52.
[4] Ibid.
[5] *Acute Pesticide Poisoning: A Major Global Health Problem*, J. Jeyaratnam, World Health Statistics Quarterly, Vol. 43, No. 3, 1990, pages 139-44, http://www.communityipm.org/toxictrail/Documents/Jeryaratnam-WHO1990.pdf
[6] Ibid.
[7] UNEP. 2013. Costs of Inaction on the Sound Management of Chemicals.
[8] *Employment by sector*, ILO 2007; http://www.ilo.org/public/english/employment/strat/kilm/download/kilm04.pdf

Once a hazardous pesticide is imported, it is often difficult or impossible for the national authorities to effectively enforce laws and regulations that would ensure the pesticide will be used only in accordance with the regulatory guidelines. The International Code on Pesticide Management states that "pesticides whose handling and application require the use of personal protective equipment that is uncomfortable, expensive or not readily available should be avoided, especially in the case of small-scale users and farm workers in hot climates."[9] In such countries, the responsible regulatory approach should be to prohibit the import and use of HHPs and to help farmers identify effective, less-hazardous alternatives. However, countries are often unaware of safer alternatives or even which HHPs should be prioritized for prohibition and substitution. For further discussion on the rationale for actions on HHPs please see Annex 1.

Resolution on Highly Hazardous Pesticides at ICCM3

HHPs emerged as a topic of great concern by many countries at the Third International Conference on Chemicals Management (ICCM3) in September 2012. Kenya, on behalf of a number of countries and organisations,[10] introduced a resolution on Highly Hazardous Pesticides (HHPs) that called for the Conference to:

1. Support the progressive ban of Highly Hazardous Pesticides and their substitution with safer alternatives;

2. Support the inclusion of the progressive ban of Highly Hazardous Pesticides in the International Code of Conduct on the Distribution and Use of pesticides as a means of reducing risk;

3. Invite FAO, WHO, UNEP and other relevant institutions to develop a priority list of highly hazardous pesticides that require such progressive ban;

4. Invite FAO, WHO, UNEP and other relevant institutions to report on this matter to the conference at its fourth session.

The resolution was supported in plenary by more than 65 countries. A small number of countries stated that they had not had sufficient time to consider the resolution, but supported intercessional work on the issue, and concerns about HHPs were documented in the meeting report of the Conference. The rationale for the resolution is described in Annex 1.

Activities on HHPs in the intercessional period between ICCM3 and ICCM4

---

[9] International Code of Conduct on Pesticide Management, article 3.6. http://www.fao.org/agriculture/crops/core-themes/theme/pests/code/en/

[10] Antigua & Barbuda, Armenia, Bhutan, Dominican Republic, Egypt, Guyana, International Trade Union Congress, IPEN, Iraq, Kenya, Kiribati, Kyrgyzstan, Libya, Mongolia, Nepal, Nigeria, Peru, Pesticide Action Network, Republic of Moldova, St Lucia, Tanzania, Tunisia and Zambia.

Many countries supported the idea of actions on HHPs in the intercessional period due to the concerns expressed at ICCM3. However, there was insufficient time at ICCM3 to develop concrete proposals. We believe that there are several key activities that could advance chemical safety and the SAICM goal in this area with very modest resource requirements. These activities could be rapidly implemented in the intercessional period and then reported on by regions at ICCM4. Intercessional HHP activities could include:

1. FAO paper on alternatives to HHPs
Safer alternatives, particularly ecosystem-based approaches to pest management, are a key part of phasing-out HHPs. Countries would benefit a great deal from an information paper on replacing HHPs, prepared by FAO. At the very least, the paper should include HHPs used in the highest volumes, or that are otherwise a priority for replacement. One source of information for ecosystem-based alternatives has already been approved by the Stockholm Convention COP6 for work on alternatives to endosulfan.[11]

2. Surveys of HHP registrations, uses, restrictions, and prohibitions
Tackling HHPs requires knowledge of which ones are used in the country. A simple survey would help identify HHPs among current registration lists and/or patterns of pesticide use in the country, and those which countries have decided are too hazardous for use under their conditions. Interestingly, government delegates from a variety of countries and organisations have approached both PAN and IPEN seeking this type of information. The regional coordination group could develop a simple questionnaire which would be sent to all national SAICM focal points in the region. National SAICM focal points could work with personnel from the Ministry of Agriculture to examine pesticide registration lists to determine which potential HHPs are present and which pesticides have been banned in the country. If no registration information exists, then information on pesticide use could substitute.

Since FAO has not yet produced a list of HHPs, several options exist. Firstly, countries could start with the indicative list provided in Annex 2 based on the JMPM criteria. Countries could consider also adding to this list those pesticides that are endocrine disruptors, given the concern about these pesticides raised by the WHO/UNEP paper on endocrine disruption.[12] Secondly, IOMC organizations could take on the task of developing an agreed list of HHPs, as requested by the resolution at ICCM3. Thirdly, countries could individually determine which substances are likely to be HHPs by applying the criteria as agreed by the FAO/WHO Joint Meeting on Pesticide Management (JMPM) in 2008.[13] Fourthly countries could consider action on pesticides highly toxic to bees, and these can be found in the Pesticide

---

[11] UNEP/POPS/POPRC.8/INF/14/Rev.1;
http://synergies.pops.int/2013COPsExCOPs/Documents/tabid/2915/language/en-US/Default.aspx
[12] WHO, UNEP. 2012. State of the Science of Endocrine Disrupting Chemicals 2012.
http://www.who.int/ceh/publications/endocrine/en/
[13] http://www.fao.org/agriculture/crops/core-themes/theme/pests/code/hhp/en/

Action Network list of HHPs.[14] Note that a significant number of substances on the Rotterdam Annex III and Stockholm Convention lists are HHPs and these might be prioritized for action. Please see Annex 2 for more information.

3. Collection of success stories on HHP phase-outs
Countries can benefit a great deal from the experience of other countries. A successful HHP phase-out could provide useful information on substitutes and processes for phase-out in the region. For example, Stockholm Convention Parties will be obligated to phase-out endosulfan, an HHP. Experiences with this process could be collected by the regional focal point and then re-distributed to national focal points and personnel from Ministries of Agriculture to permit more efficient actions in the substitution process. These success stories could also be added to the clearinghouse described above.

4. Clearinghouse of HHP registration, bans, and restrictions from surveys
It would very helpful to countries if the results of the surveys could be organized and available on-line. Regulators would benefit from knowing which substances have been banned in other countries, particularly neighbouring countries or countries growing the same crops. More importantly, the clearinghouse would help define future activities on HHPs by outlining country experiences. For example, the need to define alternatives for certain crops might be informed by clearinghouse information that indicates widespread registration or use of a substance. Overall, the clearinghouse would provide a sensible one-stop location for the survey results and pave the way for further solutions.

Further actions on HHPs in the SAICM process
HHPs should be discussed at each regional SAICM regional in 2013 – 2014. If intercessional activities on HHPs can begin promptly then their results should provide a basis for robust discussion of HHPs at OEWG2 and a forwarding of the issue to ICCM4. At ICCM4, agreement on global actions to address HHPs could provide a more elevated and concerted effort to address HHPs in the intercessional period between ICCM4 and ICCM5.

[14] http://www.pan-germany.org/download/PAN_HHP-List_1306.pdf. PAN's list of HHPs differs from that provided in Annex 2 ,because in addition to the JMPM criteria it used criteria for endocrine disruption, possible carcinogenicity, bee toxicity, bioaccumulation and persistence in the environment.,

Annex 1 Rationale for actions on HHPs

1. The progressive ban of HHPs

In November 2006, the FAO Council endorsed SAICM, and suggested that the activities FAO could carry out to support it could include risk reduction, including the progressive ban of HHPs.[15] Since then, the idea of a progressive ban of HHPs has taken root globally, culminating in the widespread support at ICCM 3 referred to above.

HHPs continue to cause widespread human and environmental harm. Pesticides have been poisoning farm workers, their families and communities, and animals for over 60 years. International efforts to reduce the problem, including the Rotterdam and Stockholm Conventions, the World Health Organization's Classification of Pesticides, and the International Code of Conduct on Distribution and Use of Pesticides, are all efforts to address the deep-seated problems with pesticides. UN agency programmes, NGO activities, and country registration processes also contribute substantially to addressing the problems. But despite all these efforts, and despite considerable improvement in the situation, a serious problem remains.

Some harm results from negligence and shortage of resources – for example the death of 23 school children in India recently when their free midday meal was cooked with oil contaminated by monocrotophos, thought to be as a result of storing the oil in an empty monocrotophos container. It is reported that WHO advised India in 2009 to consider banning monocrotophos.[16]

Some harm results from the pervasiveness of pesticides in air, drinking water and food, and there is particular concern about the exposure of the unborn foetus or newly born child to neurotoxins such as organophosphate insecticides (OPs), resulting in neurodevelopmental deficits. Numerous studies on animals have shown that *in utero* or neonate exposure to OPs, such as chlorpyrifos, adversely affects neurodevelopment (Eskenazi et al 1999, 2007).[17] Some studies show that inhibition of chlolinesterase can interfere with brain development leading to permanent brain damage (London et al 2012).[18] OP metabolites have been found in the urine of 94%

---

[15] FAO. Report of the Hundred and Thirty-first Session of the Council. Rome, 20-25 November 2006.

[16] Reuters. 2013.World Health Organisation had asked India to ban toxin that killed school children. July 22, 2013. http://www.ndtv.com/article/india/world-health-organisation-had-asked-india-to-ban-toxin-that-killed-school-children-395630; http://tvnz.co.nz/world-news/asked-india-ban-toxin-23-killed-children-5516941

[17] e.g. Qiao D, Seidler FJ, Padilla S, Slotkin TA. 2002. Developmental neurotoxicity of chlorpyrifos: what is the vulnerable period? *Environ Health Perspect* 110(11):1097-103. Qiao D, Seidler FJ, Tate CA, Cousins MM, Slotkin TA. 2003. Fetal chlorpyrifos exposure: adverse effects on brain cell development and cholinergic biomarkers emerge postnatally and continue into adolescence and adulthood. *Environ Health Perspect* 111(4):536-44. Flaskos J. 2012. The developmental neurotoxicity of organophosphorus insecticides: A direct role for the oxon metabolites. *Toxicol Lett* 209(1):86-93.

[18] e.g. London L, Beseler C, Bouchard MF, Bellinger DC, Colosio C, Grandjean P, Harari R, Kootbodien T, Kromhout H, Little F, Meijster T, Moretto A, Rohlman DS, Stallones L. 2012. Neurobehavioural and neurodevelopmental effects of pesticide exposures. *Neurotoxicology* 33(4):887-96.

of farm and non-farm children in the Bang Rieng agricultural community in Thailand.[19] One US study found that as little as 4.6 picograms of chlorpyrifos per gram of cord blood during gestation resulted in a drop of 1.4% of a child's IQ and 2.8% of its working memory.[20] There are significant societal effects and costs as a result of such exposures: Dr David Bellinger of the USA's Children's Hospital Boston concluded that the impact of OPs on children is responsible for a significant lowering of IQ across the whole US population.[21]

Some harm results from ordinary occupational use. Community monitoring by PAN partner organisations in 13 countries resulted in the publication by PAN in 2010 of "Communities in Peril: Global report on health impacts of pesticide use in agriculture".[22] The report identified a high rate of adverse effects from occupational pesticide exposure – up to 59 % of respondents affected – and widespread use of HHPs: 82 out of 150 active ingredients being used by surveyed farmers, and 7 of the 10 most used pesticides.[23] More recent reports confirm that pesticide poisoning continues: 24.7% acute occupational pesticide poisoning amongst young male Korean farmers;[24] health impacts in 44.8% of pesticide users in a survey in northeast Brazil; [25] and adverse effects in 94.4% of pesticide sprayers surveyed in the state of Punjab, India.[26]

Apart from the obvious devastation such poisoning causes at a personal level, the costs to society are enormous. The UNEP Cost of Inaction Report notes:[27]

- WHO reported 186,000 deaths, and 4.4 million Disability-Adjusted Life Years (DALYs), from self-poisoning with pesticides in 2011 (this does not include occupational or accidental poisonings).
- A conservative future risk scenario analysis suggests that accumulated health costs of injury to smallholder pesticide users in sub-Saharan Africa will increase to approximately USD 97 billion by 2020, from USD 4.4 billion in 2004.

---

[19] Panuwet P, Siriwong W, Prapamontol T, Ryan B, Fiedler N, Robson MG, Barr DB. 2012. Agricultural pesticide management in Thailand: status and population health risk. *Environ Sci Pol* 17:72-81.

[20] Rauh VA, Arunajadai S, Horton M, Perera F, Hoepner L, Barr DB, Whyatt R. 2011. Seven-year neurodevelopmental scores and prenatal exposure to chlorpyrifos, a common agricultural pesticide. *Environ Health Perspect* 119(8):1196-201.

[21] Bellinger D. 2012. A strategy for comparing the contributions of environmental chemicals and other risk factors to children's neurodevelopment. *Environ Health Perspect* 120(4):501-7.

[22] http://www.pan-germany.org/download/PAN-I_CBM-Global-Report_1006-final.pdf

[23] Based on the PAN criteria for HHPs – refer next section.

[24] Lee WJ, Cha ES, ParkJ, KoY, Kim HJ, Kim J. 2012. Incidence of acute occupational pesticide poisoning among male farmers in South Korea. *Am J Ind Med* 55(9):799-807.

[25] Preza DLC, Augusto LGS. 2012. Vulnerabilidades de trabalhadores rurais frente ao uso de agrotóxicos na produção de hortaliças em região do Nordeste do Brasil. *Rev Bras Saúde Ocup* 37(125).

[26] Singh A, Kaur MI. A health surveillance of pesticide sprayers in Talwandi Sabo area of Punjab, north-west India. *J Hum Ecol* 37(2):133-7.

[27] UNEP. 2013. Costs of Inaction on the Sound Management of Chemicals.

- In 2009, the conservatively projected costs of inaction related to current pesticide use alone is greater than the total Official Development Assistance to general healthcare in Africa, excluding that for HIV/AIDS.
- Health costs resulting from pesticides were estimated to be USD 230 million in Uganda in 2005.
- In Europe, there is an estimated monetized value of USD 15 million per year for hospitalisations, and USD 3.9 million from lost work resulting from pesticide poisonings.
- In the USA, acute poisonings, fatalities, cancer and other chronic effects are estimated to have a monetized value of USD 787 million annually.
- The "major economic and environmental losses due to the application of pesticides in the USA", as reported in 2005 amounted to: USD 1.1 billion per year in public health costs; USD 1.5 billion per year in pesticide resistance; USD 1.4 billion per year in crop losses; USD 2.2 billion per year in bird losses; and USD 2.0 billion per year in groundwater contamination. This totals USD 10 billion per year.
- The disappearance of bees and other pollinators would cost the UK economy up to £440 million per year and amount to 13% of the country's income from farming. Although there is no single factor that explains pollinator decline, the factors involved include pesticides.

The progressive ban of the HHPs could dramatically reduce these costs, without reducing the production or income from agriculture, especially if they are replaced with ecosystem-based approaches to pest management such as agrocecology.

2. The development of a priority list of HHPs

In October 2007, the FAO/WHO Joint Meeting on Pesticide Management (JMPM) recommended that FAO and WHO, as a first step, should prepare a list of HHPs based on the criteria identified by the JMPM, and update it periodically in cooperation with UNEP.[28] Delegates from 65 countries at ICCM3 reiterated this request because it simply provides a clear basis for countries to proceed.

In the absence of a UN list, PAN developed one for its own use, and this has become widely used by other stakeholders such as supply chain companies, fair trade organisations and others.[29]

Optimally, FAO and WHO could begin work to prepare a list of HHPs based on the criteria identified by the FAO/WHO Panel of Experts on Pesticide Management Panel with consideration given to updated science on chronic health effects and the

---

[28] The minutes of the panel of experts meeting October 2007 are available at: http://www.fao.org/agriculture/crops/core-themes/theme/pests/code/panelcode/en/

[29] In 2010, PAN developed a list based on the FAO/WHO Panel of Experts criteria, with the addition of criteria for endocrine disruption, inhalation toxicity and some environmental criteria such as bee toxicity, persistence and bioaccumulation; the list has been updated again in 2013. It is available at http://www.pan-germany.org/download/PAN_HHP-List_1306.pdf

recent WHO – UNEP report on the State of the Science of Endocrine Disrupting Chemicals.[30]

3. Priority for ecosystem-based approaches to pest management

The ecosystem-based approach to pest management, including agroecology, is now well established at the UN level:

- At the Conference of the Parties to the Stockholm Convention in May 2013, Parties agreed unanimously to give priority to ecosystem-based approaches to pest control to replace the insecticide endosulfan listed under the Convention for global phase out.[31]

The Stockholm Convention decision was based on the guidance document on nonchemical alternatives to endosulfan developed by the POPs Review Committee (POPRC),[32] which included the following information:

- FAO promotes a paradigm of sustainable crop production intensification (SCPI) that conserves and enhances natural resources, and develops a healthy agroecosystem as the first line of defence against crop pests. It is based on an ecosystem approach: inputs of land, water, seed and fertiliser compliment natural processes that support plant growth, pollination, natural predation for pest control, and soil biota that enhance plant access to nutrients. It draws on nature's contribution to crop growth, and applies appropriate external inputs as needed. SCPI involves a major shift from the current homogenous model of crop production to one of knowledge-intensive, location-specific, farming systems, based on conservation practices, good seed of high-yielding adapted varieties, integrated pest management, plant nutrition based on healthy soils, efficient water management, and the integration of crops, pastures, trees and livestock.
- The UN Special Rapporteur on the right to food, Oliver de Schutter, delivered a report to the 16th Session of the UN Human Rights Council in 2011, based on an extensive review of recent scientific literature. The report demonstrated that, if sufficiently supported, agroecology could double food production in entire regions within 10 years, at the same time mitigating climate change and alleviating rural poverty. It can increase farm productivity and food security, improve incomes and rural livelihoods, and reverse the trend towards species loss and genetic erosion. The report states that agroecology is supported by the FAO, UNEP and Biodiversity International, as well as gaining ground in countries such as the United States, Brazil, Germany and France.

---

30 http://www.who.int/ceh/publications/endocrine/en/index.html

31 Report of the Conference of the Parties to the Stockholm Convention on Persistent Organic Pollutants on the work of its sixth meeting. SC-6/8:Work programme on endosulfan, point 2. P46. http://chm.pops.int/Convention/ConferenceofthePartiesCOP)/ReportsandDecisions/tabid/208/Default.aspx

32 UNEP-POPS-POPRC.8-INF-14-Rev.1

- The FAO Guidance on Pest and Pesticide Management Policy Development (2010), a guideline based on the framework of the International Code of Conduct on the Use and Distribution of Pesticides, promotes the adoption of Integrated Pest Management (IPM) based on an ecosystem approach. It describes this approach as using knowledge about the life cycles and ecology of pests and their natural enemies to minimize pest damage through agronomic interventions or other non-chemical techniques that suppress the development of the pest or disease. Pesticides are only used where there are no effective or economically viable alternatives.
- In 2009, the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) concluded it is necessary to shift from current farming practices to sustainable agriculture systems capable of providing both significant productivity increases and enhanced ecosystem services. It noted that sustainable development can be promoted through reduced agrochemical inputs and use of agroecological management approaches.

The POPRC document contains a number of examples of reduced costs of production, increased income, increased food security and other social and environmental benefits from replacing HHPs with ecosystem-based approaches. Additionally, the UNEP Cost of Inaction Report notes that:

- In Bangladesh, by using IPM, farmers can increase rice output and thus increase profits, on average, by approximately 17%.
- In Indonesia, from 1991 to 1999, an IPM programme helped farmers reduce the use of pesticides by approximately 56% and increase yields by approximately 10%.
- The total estimated GDP gain from implementing its national IPM programme from 2001 to 2020 is equivalent to 3.65% of Indonesia's GDP in 2000, while the increase in household incomes is 1.5-4.8%.
- In the Philippines, the aggregate value of environmental benefits for the five villages in the Central Luzon, where an IPM research program was centred, was estimated at USD 150,000 for the 4600 local residents.

Ecosystem-based approaches to pest management are the clearly the way forward for replacing HHPs, well supported by UN agencies and by studies showing that farmers benefit financially, sociologically and in terms of their own health. It remains now for UN agencies and others to support countries to assist their farmers to implement these approaches. The POPRC guidance document on nonchemical alternatives to endosulfan states that there will be a need for farmer training and institutional support in order to help farmers successfully change to ecosystem approaches to pest management.

Annex 2. Highly hazardous pesticides using the criteria of the FAO/WHO Joint Meeting on Pesticide Management (JMPM) in 2008[33] [34]

			Acute Toxicity		Severe/ adverse effects human	Long term effects							Treaties		
	CAS number	**Pesticide**	WHO Ia	WHO Ib		EPA carc	IARC carc	EU GHS carc (1A, 1B)	EPA prob likely carc	IARC prob carc	EU GHS muta (1A, 1B)	EU GHS repro (1A ,1B)	Montreal Protocol	Rotterdam Convention	Stockholm Convention
0			**26**	**49**	**1**	**1**	**3**	**8**	**76**	**33**	**4**	**22**	**1**	**29**	**14**
1	542-75-6	1,3-dichloropropene							1	1					
2	93-76-5	2,4,5-T (2,4,5-trichloro phenoxy acetic acid)								1				1	
3	93-80-1	2,4,5-T, butyric acid								1					
4	95-95-4	2,4,5-trichlorophenol								1					
5	94-75-7	2,4-D								1					
6	94-82-6	2,4-DB								1					
7	28631-35-8	2,4-DP, isooctyl ester								1					

[33] http://www.fao.org/agriculture/crops/core-themes/theme/pests/code/hhp/en/

[34] PAN's list of HHPs included the following additional criteria: EU H330 (fatal if inhaled), EPA possible carcinogenicity, IARC possible carcinogenicity, EU cancer 2, EU GHS carcinogenicity (2), bioaccumulative, very persistent in water or sediment, high toxicity to bees.

8	101-10-0	3-CPA								1					
9	107-02-8	Acrolein		1											
10	116-06-3	Aldicarb	1											1	
11	309-00-2	Aldrin							1					1	1
12	319-84-6	alpha-BHC; alpha-HCH								1					1
13	96-24-2	Alpha-chlorohydrin		1											
14	90640-80-5	Anthracene oil						1							
15	7778-39-4	Arsenic and ist compounds				1	1								
16	68049-83-2	Azafenidin										1			
17	2642-71-9	Azinphos-ethyl		1											
18	86-50-0	Azinphos-methyl		1											
19	17804-35-2	Benomyl									1	1		1	
20	177406-68-7	Benthiavalicarb-isopropyl							1						
21	68359-37-5	Beta-cyfluthrin; Cyfluthrin		1											
22	319-85-7	beta-HCH; beta-BCH													1
23	485-31-4	Binapacryl										1		1	
24	2079-00-7	Blasticidin-S		1											
25	1303-96-4	Borax; disodium tetraborate decahydrate										1			
26	10043-	Boric acid										1			

	35-3														
27	56073-10-0	Brodifacoum	1												
28	28772-56-7	Bromadiolone	1												
29	63333-35-7	Bromethalin	1												
30	23184-66-9	Butachlor							1						
31	34681-23-7	Butoxycarboxim		1											
32	95465-99-9	Cadusafos		1											
33	2425-06-1	Captafol	1					1	1					1	
34	63-25-2	Carbaryl							1						
35	10605-21-7	Carbendazim									1	1			
36	1563-66-2	Carbofuran		1										1	
37	2439-01-2	Chinomethionat; Oxythioquinox							1						
38	57-74-9	Chlordane							1	1				1	1
39	143-50-0	Chlordecone													1
40	6164-98-3	Chlordimeform							1					1	
41	54593-83-8	Chlorethoxyphos	1												
42	470-90-6	Chlorfenvinphos		1											
43	24934-91-6	Chlormephos	1												
44	510-15-6	Chlorobenzilate												1	
45	67-66-3	Chloroform							1	1					

46	3691-35-8	Chlorophacinone	1												
47	1897-45-6	Chlorothalonil							1	1					
48	56-72-4	Coumaphos		1											
49	5836-29-3	Coumatetralyl		1											
50	8001-58-9	Creosote						1	1						
51	180409-60-3	Cyflufenamid							1						
52	68359-37-5	Cyfluthrin		1											
53	1596-84-5	Daminozide							1						
54	50-29-3	DDT							1	1				1	1
55	919-86-8	Demeton-S-methyl		1											
56	97-23-4	Dichlorophene								1					
57	15165-67-0	Dichlorprop-P								1					
58	62-73-7	Dichlorvos; DDVP		1						1					
59	51338-27-3	Diclofop-methyl							1						
60	141-66-2	Dicrotophos		1											
61	60-57-1	Dieldrin							1					1	1
62	56073-07-5	Difenacoum	1												
63	104653-34-1	Difethialone	1												
64	39300-45-3	Dinocap										1			
65	88-85-7	Dinoseb and ist salts										1		1	
66	1420-07-1	Dinoterb		1								1			

67	82-66-6	Diphacinone	1												
68	298-04-4	Disulfoton	1												
69	330-54-1	Diuron							1						
70	534-52-1	DNOC		1										1	
71	17109-49-8	Edifenphos		1											
72	115-29-7	Endosulfan													1
73	72-20-8	Endrin													1
74	297-99-4	E-Phosphamidon	1												
75	106-89-8	Epichlorohydrin						1	1						
76	2104-64-5	EPN	1												
77	133855-98-8	Epoxiconazole							1						
78	29973-13-5	Ethiofencarb		1											
79	13194-48-4	Ethoprophos; Ethoprop	1						1						
80	106-93-4	Ethylene dibromide; 1,2-dibromoethane						1	1					1	
81	107-06-2	Ethylene dichloride							1	1				1	
82	75-21-8	Ethylene oxide					1	1			1			1	
83	96-45-7	Ethylene thiourea							1			1			
84	52-85-7	Famphur		1											
85	22224-92-6	Fenamiphos		1											
86	72490-01-8	Fenoxycarb							1						

87	76-87-9	Fentin hydroxide; Triphenyltin hydroxide							1						
88	90035-08-8	Flocoumafen	1												
89	69806-50-4	Fluazifop-butyl										1			
90	70124-77-5	Flucythrinate		1											
91	103361-09-7	Flumioxazin										1			
92	658066-35-4	Fluopyram							1						
93	640-19-7	Fluoroacetamide		1										1	
94	85509-19-9	Flusilazole										1			
95	117337-19-6	Fluthiacet-methyl							1						
96	133-07-3	Folpet							1						
97	50-00-0	Formaldehyde					1		1						
98	22259-30-9	Formetanate		1											
99	65907-30-4	Furathiocarb		1											
100	121776-33-8	Furilazole							1						
101	77182-82-2	Glufosinate-ammonium										1			
102	69806-40-2	Haloxyfop-methyl (unstated stereochemistry)							1						
103	76-44-8	Heptachlor							1	1				1	1
104	23560-59-0	Heptenophos		1											
105	118-74-	Hexachlorobenzene	1					1	1	1				1	1

	1														
106	67-72-1	Hexachloroethane								1					
107	608-73-1	Hexchlorocyclohexane							1	1				1	
108	78587-05-0	Hexythiazox							1						
109	35554-44-0	Imazalil							1						
110	36734-19-7	Iprodione							1						
111	140923-17-7	Iprovalicarb							1						
112	881685-58-1	Isopyrazam							1						
113	141112-29-0	Isoxaflutole							1						
114	18854-01-8	Isoxathion		1											
115	65277-42-1	Ketoconazole										1			
116	143390-89-0	Kresoxim-methyl							1						
117	58-89-9	Lindane								1				1	1
118	330-55-2	Linuron										1			
119	8018-01-7	Mancozeb							1						
120	12427-38-2	Maneb							1						
121	94-74-6	MCPA								1					
122	94-81-5	MCPB								1					
123	7085-19-0	MCPP								1					
124	2595-54-2	Mecarbam		1											
125	16484-	Mecoprop-P								1					

	77-8														
126	110235-47-7	Mepanipyrim							1						
127	7439-97-6	Mercury and its compounds												1	
128	137-41-7	Metam-potassium							1						
129	137-42-8	Metam-sodium							1						
130	10265-92-6	Methamidophos		1										1	
131	950-37-8	Methidathion		1											
132	2032-65-7	Methiocarb		1											
133	16752-77-5	Methomyl		1											
134	74-83-9	Methyl bromide											1		
135	556-61-6	Methyl isothiocyanate							1						
136	9006-42-2	Metiram							1						
137	443-48-1	Metronidazole								1					
138	7786-34-7	Mevinphos	1												
139	136-45-8	MGK 326							1						
140	2385-85-5	Mirex								1					1
141	71526-07-3	MON 4660							1						
142	6923-22-4	Monocrotophos		1										1	
143	54-11-5	Nicotine		1											
144	1929-	Nitrapyrin							1						

	82-4														
145	98-95-3	Nitrobenzene								1					
146	1113-02-6	Omethoate		1											
147	19044-88-3	Oryzalin							1						
148	39807-15-3	Oxadiargyl										1			
149	23135-22-0	Oxamyl		1											
150	301-12-2	Oxydemeton-methyl		1											
151	106-46-7	Para-dichlorobenzene								1					
152	64741-88-4	Paraffin oils; mineral oils						1							
153	1910-42-5	Paraquat			1										
154	56-38-2	Parathion	1												
155	298-00-0	Parathion-methyl	1											1	
156	87-86-5	PCP		1					1	1				1	
157	52645-53-1	Permethrin							1						
158	298-02-2	Phorate	1												
159	13171-21-6	Phosphamidon	1											1	
160	23103-98-2	Pirimicarb							1						
161	32809-16-8	Procymidone							1						
162	1918-16-7	Propachlor							1						
163	2312-35-8	Propargite							1						

164	31218-83-4	Propetamphos		1											
165	114-26-1	Propoxur							1						
166	75-56-9	Propylene oxide							1		1				
167	23950-58-5	Propyzamide							1						
168	123312-89-0	Pymetrozine							1						
169	129630-19-9	Pyraflufen-ethyl							1						
170	119738-06-6	Quizalofop-p-tefuryl										1			
171	10453-86-8	Resmethrin							1						
172	874967-67-6	Sedaxane							1						
173	105024-66-6	Silafluofen										1			
174	128-04-1	Sodium dimethyl dithio carbamate							1						
175	62-74-8	Sodium fluoroacetate (1080)	1												
176	148477-71-8	Spirodiclofen							1						
177	57-24-9	Strychnine		1											
178	3689-24-5	Sulfotep	1												
179	96182-53-5	Tebupirimifos	1												
180	79538-32-2	Tefluthrin		1											
181	13071-79-9	Terbufos	1												
182	2593-15-9	Terrazole; Etridiazole							1						

183	22248-79-9	Tetrachlorvinphos							1						
184	112281-77-3	Tetraconazole							1						
185	111988-49-9	Thiacloprid							1						
186	59669-26-0	Thiodicarb							1						
187	39196-18-4	Thiofanox		1											
188	640-15-3	Thiometon		1											
189	23564-05-8	Thiophanate-methyl							1						
190	731-27-1	Tolylfluanid							1						
191	8001-35-2	Toxaphene							1	1				1	1
192	24017-47-8	Triazophos		1											
193	3380-34-5	Triclosan								1					
194	81412-43-3	Tridemorph										1			
195	2275-23-2	Vamidothion		1											
196	50471-44-8	Vinclozolin										1			
197	81-81-2	Warfarin		1								1			
198	52315-07-8	zeta-Cypermethrin		1											
199	1314-84-7	Zinc phosphide		1											
200	23783-98-4	Z-Phosphamidon	1												