PRECURSOR CONTROL

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A. INTRODUCTION

A number of strategies have been developed by Member States and the international community over the years to address the world drug problem in a comprehensive way, including demand reduction programmes (prevention, treatment), supply reduction interventions (drug interdiction, dismantlement of drug trafficking organizations, alternative development programmes, eradication) and efforts to control illicit financial flows. A further key intervention in supply reduction has gained importance since the adoption of the United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988: the control of precursor chemicals, that is, the control of chemicals used to manufacture plant-based and synthetic drugs. As early as the 1990s, the Chemical Action Task Force pointed out that "the procurement of chemicals necessary to manufacture drugs is one of the few points where ... drug trafficking intersects with legitimate commerce. Regulation of legitimate commerce to deny traffickers the chemicals they need is one of our most valuable tools in the battle against drug criminals."[1] This has become even more relevant over time, as a growing proportion of the illicit drugs found on the market nowadays are synthetic drugs for which traditional supply-control measures applied to plant-based substances, such as alternative development or eradication, cannot be used.

Progress has been made with regard to precursor control.[2] Such progress has been strengthened through resolutions of the Economic and Social Council and the Commission on Narcotic Drugs, as well as the Political Declaration adopted by the General Assembly at its twentieth special session, in 1998, and the Political Declaration on International Cooperation towards an Integrated and Balanced Strategy to Counter the World Drug Problem, adopted by the Assembly in 2009, and their related action plans and the work done by the International Narcotics Control Board in assisting Member States in monitoring licit trade and preventing diversion.[3]

Nonetheless, chemicals are still available for the illicit manufacture of drugs. Precursor control is a complex area involving a large number of substances which have widespread legitimate uses and which can be easily substituted. It involves many players and multiple links between the licit and illicit sectors.

The present chapter will start with a review of the evolution of licit production and trade in chemicals, the degree of international interdependence and the development of the regulatory framework. It will then analyse the effect of precursor control on the supply of illicit drugs and new challenges, such as the growing role of the Internet, the emergence of substitute precursors, pre-precursors and new psychoactive substances, to which the current controls at the international level do not apply. The pages ahead will present an analysis of the various aspects of precursor control, covering both the licit and the illicit side of this sector while keeping an underlying focus on drug control.

B. WHAT ARE PRECURSOR CHEMICALS?

The term "precursor chemicals" broadly refers to chemicals that are employed in the manufacture of drugs. From a scientific point of view "precursor chemicals" are defined as the chemical substances that become incorporated, at the molecular level, into a narcotic drug or psychotropic substance during the manufacturing process.[4] They can be distinguished from other chemicals used in the manufacturing process, such as "reagents" and "solvents".[5]

This scientific distinction does not entail legal consequences, however. Article 12 of the 1988 Convention, the legal basis for precursor control at the international level, does not make any such distinction and speaks only of "substances frequently used in the illicit manufacture of narcotic drugs or psychotropic substances".

In the Political Declaration adopted by the General Assembly at its twentieth special session, in June 1998, and the related measures to enhance international cooperation to counter the world drug problem,[6] the term "precursors" was broadened to encompass all chemicals that are controlled under the 1988 Convention.

1 Chemical Action Task Force, *Status Report for the 1992 Economic Summit* (Washington, D.C., June 1992), p. 11.

2 Progress made in precursor control was highlighted in the March 2014 joint ministerial statement of the high-level review by the Commission on Narcotic Drugs on the implementation by Member States of the Political Declaration and Plan of Action on International Cooperation towards an Integrated and Balanced Strategy to Counter the World Drug Problem.

3 The International Narcotics Control Board is given the prime responsibility for precursor control at the international level under article 12 of the 1988 Convention.

4 United Nations, *Commentary on the United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances 1988* (New York, 1998).

5 "Reagents" are chemicals that react with, or take part in the reaction of another substance during the manufacture of a drug. They do not become part of the molecular structure of the end product. "Solvents" are liquid chemical substances used to dissolve or disperse one or more substances. They do not "react" with other substances and are not incorporated into the molecular structure of the end product. They are typically used to purify the end product.

6 General Assembly resolutions S-20/4 A-E.

C. THE POTENTIAL VULNERABILITY OF THE CHEMICAL INDUSTRY TO THE DIVERSION OF PRECURSOR CHEMICALS

1. Trends and patterns in the production of chemicals

Over the past century, the chemical industry has been one of the main economic growth sectors, and it continues to grow strongly, both in volume and in geographical terms, involving an ever larger number of players. Asia has become the new centre for manufacture, and the increasing number of intermediaries provides greater opportunities for diversion.

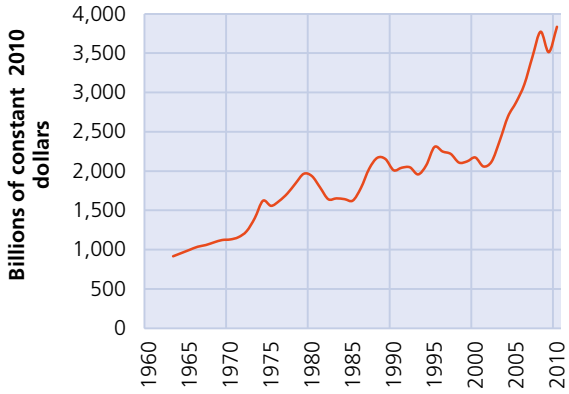
The total number of "establishments" in the chemical sector rose worldwide from approximately 61,000 in 1981 to 67,000 in 1990, 83,000 in 2000 and close to 97,000 in 2010.[7] This reflects an expansion of the production base of chemicals and thus potentially expands the possibilities for the diversion of chemicals. This is exacerbated by a growing number of "chemical operators" who are also involved in the trade of such substances.[8]

Data from the United Nations Industrial Development Organization (UNIDO) suggest that chemicals are now being manufactured in most countries.[9] Of the 148 Governments that reported manufacturing output data to UNIDO over the 1990-2010 period, 142 also declared production of chemicals.

The rapid expansion of the chemical sector can also be observed in terms of output. The production output of the chemical industry, expressed in constant United States dollars, almost doubled between 1990 and 2010, and rose more than fourfold between 1960 and 2010 to approximately $3,800 billion (see figure 1).

The "value added"[10] of the global chemical industry, which can be directly compared with the notion of gross domestic product (GDP), shows an increase in constant 2010 dollars from $620 billion in 1990 to about $1,110 billion in 2010.[11] This growth was larger than the growth of the entire manufacturing sector and global GDP (see figure 2). As a result, the proportion represented by the chemical sector in the overall value added of manufacturing increased from less than 11 per cent in 1990 to close to 13 per cent by 2010. Expressed as a percentage of global GDP, the value added of the chemical industry accounts for about 2 per cent, which is comparable to the value added of agriculture, which accounts for 3 per cent of global GDP.

Fig. 1. Output of the global chemical industry, 1963-2010



Source: UNODC estimates based on UNIDO INDSTAT 2 database.

The observed stronger growth of output (5.8 per cent annually during the 2000-2010 period) as compared with value added[12] (3.5 per cent) in the chemical industry (see figure 3) suggests a trend of companies redefining their core products and spinning off non-core production and services to new companies. This can be explained by a reduced vertical integration of the chemical industry, mainly as a consequence of the emergence of new production sites in developing countries. One side effect of this has been increased intra-industry trade in chemicals between continents, which increases the risk of diversion of chemicals used in the clandestine manufacture of drugs.

While the chemical sector has been growing over the past few decades, it is still characterized by some geographical concentration and by significant shifts in production,

7 UNODC estimates, based on data contained in the 2013 edition of the UNIDO INDSTAT 2 database at the two-digit level of International Standard Industrial Classification (ISIC) Revision 3.

8 International Narcotics Control Board, *Precursors and Chemicals Frequently Used in the Illicit Manufacture of Narcotic Drugs and Psychotropic Substances: 2012* (New York, 2013), paras. 45-49.

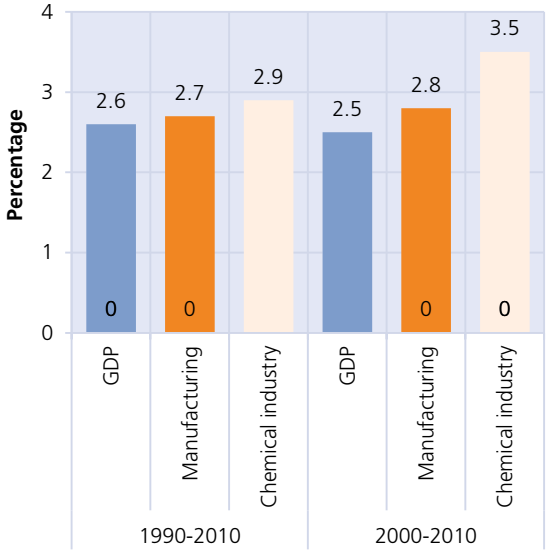
9 Information from the INDSTAT 2 database, which has entries regarding the chemical industry of 158 countries and areas over the 1963-2010 period. Data are missing mainly from a few island countries and, in recent years, from countries affected by serious conflict in Africa.

10 The value added of the manufacture of chemicals is defined as the sum of gross output less the value of intermediate inputs used in the production for industries classified under International Standard Industrial Classification (ISIC) major division 3 by UNIDO as chemical industries. This comprises ISIC groups 351 (manufacture of industrial chemicals) and 352 (manufacture of other chemical products). The ISIC groups 353 (petroleum refineries), 354 (miscellaneous products of petroleum and coal), 355 (rubber products) and 356 (plastic products) are not included.

11 The data presented here are UNODC estimates based on country data provided by the World Bank (for the value added of manufacturing in United States dollars) and by the UNIDO INDSTAT 2 database (for the proportion of the manufacturing sector comprised by the chemical sector), as reported by the World Bank. For missing years within a time series for a particular country, an interpolation was applied. For missing data at the beginning or end of a time series, the assumption was made that results remained unchanged from the first (or last) reporting year.

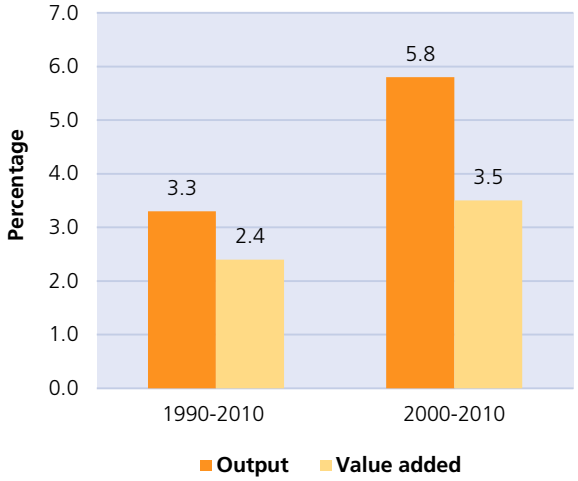
12 The concepts of value added and output are different economic measures of overall production. Value added measures the value of the final product regardless of the number of companies involved in the intermediate production steps, while output measures the value of the products produced during all production steps. Countries with higher levels of output and similar levels of value added may reflect an overall lower degree of vertical integration.

Fig. 2. Average annual growth of the value added of the global economy, manufacturing and the chemical industry



Source: UNODC estimates based on World Bank indicators on "Manufacturing, value added (in constant 2005 dollars)" and "Chemicals (percentage of value added in manufacturing)" (accessed in August 2013 at http://data.worldbank.org/indicator).

Fig. 3. Average annual growth of the output and the value added for the chemical industry

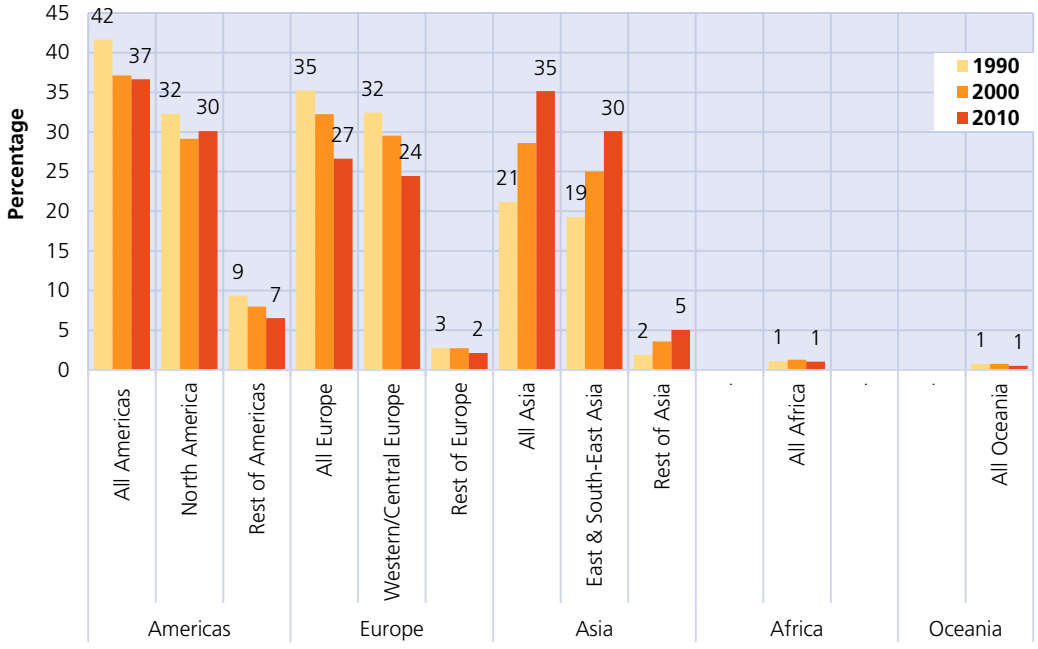


Source: UNODC estimates based on the UNIDO INDSTAT 2 database and World Bank indicators (http://data.worldbank.org/indicator).

which has implications for precursor control. Traditionally, most chemicals have been produced in Europe and in North America (United States of America, Germany, France and the United Kingdom of Great Britain and Northern Ireland) and — after World War II — the former Union of Soviet Socialist Republics. Initially, only one Asian country — Japan — was included among major chemical producers.

Over the past few decades, however, a number of countries in Asia (notably in East, South and South-East Asia) have gained market share at the expense of North America and Europe (see figure 4). By 2010, Asia accounted for 35 per cent of the global value added of manufacture of chemicals, up from 21 per cent in 1990. China advanced from generating the eighth-largest value added of chemicals in 1990

Fig. 4. Regional distribution of the value added of the chemical industry, 1990-2010

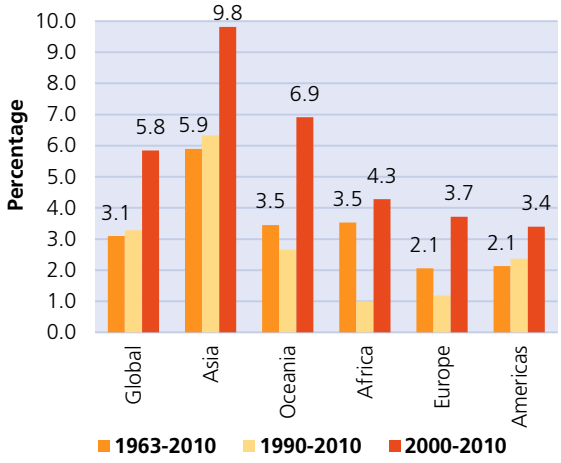


Source: UNODC estimates based on World Bank indicators on "Manufacturing, value added (in constant 2005 dollars) and "Chemicals (percentage of value added in manufacturing) (accessed in August 2013 at http://data.worldbank.org/indicator).

to second place (following the United States and ahead of Japan) in 2010. India progressed from fourteenth place in 1990 to fifth place by 2010, following Germany and ahead of Brazil and Mexico.

An analysis of long-term output trends for the chemical sector reveals similar patterns (see figure 5). Above-average growth rates were reported in particular in Asia, notably in East, South and South-East Asia, and output growth accelerated further during the 2000-2010 period. By 2010, China reported the world's largest chemical industry output, ahead of the United States, Japan, Germany, France, Brazil, the Republic of Korea, Italy, India, the Netherlands, the United Kingdom, the Russian Federation and Switzerland (in that order).[13] The production output of these 13 countries accounted for more than three quarters (78 per cent) of the global output of the chemical industry.

Fig. 5. Average annual growth in the output of the chemical industry, globally and by region

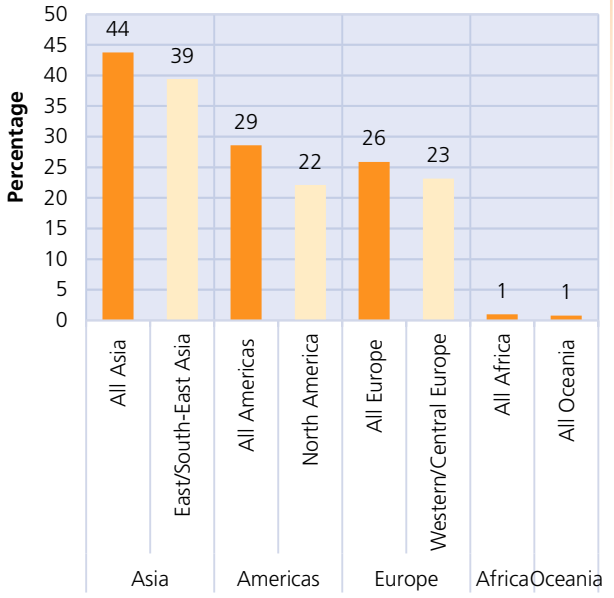


Source: UNODC estimates based on the UNIDO INDSTAT 2 database.

The importance of Asia's chemical industry as measured in terms of output (44 per cent, see figure 6) exceeds its importance in terms of value added (35 per cent, see figure 4). The opposite is true for the Americas and Europe. This suggests that chemical mass products are increasingly being produced in Asia, while there is still a concentration of some value-added intensive production of chemicals in North America and in Western and Central Europe.

Data on the sales of the chemical industry for 2011 (€2,744 billion, or $3,822 billion) suggest that by that year 52 per cent of global turnover was credited to companies in Asia (see figure 7). Taken together, Asia, Europe and North America accounted for 92.5 per cent of world chemical sales in 2011.[14] The largest sales were reported by compa-

Fig. 6. Regional distribution of output of the chemical industry, 2010



Source: UNODC estimates based on the UNIDO INDSTAT 2 database.

nies in China (27 per cent), followed by the European Union (20 per cent), the United States (15 per cent) and Japan (6 per cent). The single largest European producer was Germany (5.7 per cent of global sales). The largest producer in Latin America was Brazil (3.2 per cent), although its sales still lagged behind Asia's third largest producer, the Republic of Korea (4.3 per cent). Other important producers included France (3.0 per cent of global sales), Taiwan Province of China (2.2 per cent),[15] the Russian Federation (2.1 per cent) and the Netherlands (1.9 per cent).[16]

All of these production shifts have potential implications for the control of precursor chemicals. A chemical industry concentrated among big companies facilitates the control of chemicals that can be diverted for the illicit manufacture of drugs, while a more scattered production system increases the number of trade lines and, ultimately, the risk of diversion. Control systems were initially developed mostly in North America and in Europe, where the chemical industry was dominated by large, vertically integrated companies. This facilitated national controls, including through voluntary cooperation with the authorities. The emerging chemical industry in Asia, in contrast, is charac-

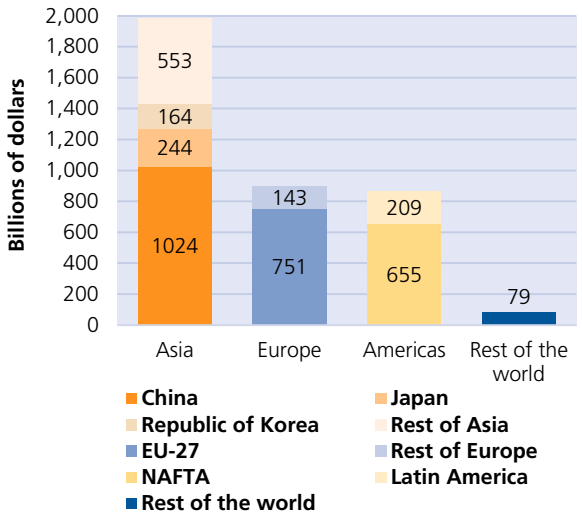
13 This ranking is based on UNIDO data for 2010 or the latest year available (adjusted for inflation).

14 Companies and Markets, "Global Chemicals Market" (11 July 2013). Available from www.companiesandmarkets.com.

15 Despite its sizable chemical industry, Taiwan Province of China does not participate in international precursor control. The International Narcotics Control Board encouraged the Government of China to work with Taiwan Province of China to devise practical ways and means of addressing the issue, notably in the areas of pre-export notifications, suspicious shipments and diversions of precursors involving Taiwan Province of China (see *Precursors Report*, 2013, para. 33).

16 European Chemical Industry Council, "Chemicals sales by country: top 30" (2012). Available from www.cefic.org.

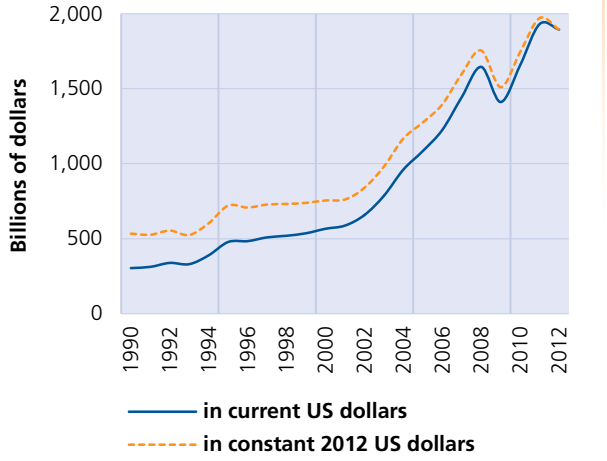
Fig. 7. Regional distribution of sales of the chemical industry, 2011



Note: NAFTA means North American Free Trade Agreement countries. EU-27 means the States Members of the European Union as of 2011.

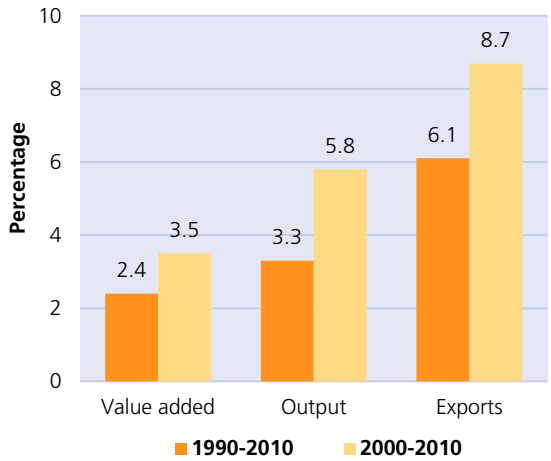
Sources: European Chemical Industry Council Chemdata International, "World chemicals sales: geographic breakdown" and OANDA (for conversion of euros into United States dollars).

Fig. 8. Global exports of the chemical industry, 1990-2012



Source: UNODC estimates based on the United Nations Commodity Trade Statistics database (UN COMTRADE), Standard International Trade Classification Revision 3.

Fig. 9. Average annual growth in chemical exports, output and value added of the chemical industry (in constant dollars)



Source: UNODC estimates based on World Bank indicators, INDSTAT 2 and UN COMTRADE.

terized by a much greater number of smaller enterprises,[17] thus posing a bigger challenge to the authorities.

2. Trends and patterns in international trade in chemicals

Growth in international trade in chemicals outstripped growth in the global production of chemicals. While output doubled between 1990 and 2010, chemical exports, expressed in constant 2012 United States dollars, grew to more than three-and-a-half times the size (see figure 8).

This pattern became even more pronounced during the 2000-2010 period (see figure 9).

As a consequence, global chemical exports rose from representing 25 per cent of the global output of the chemical industry in 1990 to 33 per cent in 2000 and 43 per cent in 2010. With ever more chemicals being traded among an increasing number of countries, the possibility of diversion of chemicals has increased.

The chemical industry is widely seen as one of the most globalized of all manufacturing industries, and this globalization is still in progress,[18] facilitated by reduced import duties as a consequence of several rounds of the General Agreement on Tariffs and Trade and the subsequent work of the World Trade Organization. Although the value added generated by the chemical industry accounted for "just" 1.9 per cent of global GDP in 2010, the proportion that chemicals comprise of global exports is almost six times as high — and rising (see figure 10).

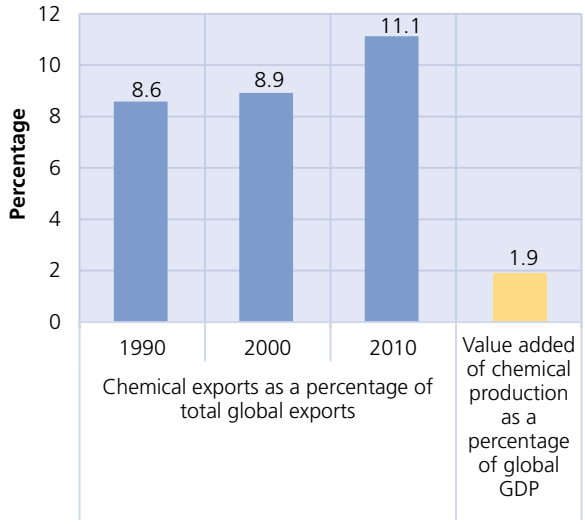
The relationship between the production and trade of chemicals is not linear. Countries with high levels of production are not always the biggest exporters of chemicals, and almost a quarter of countries have larger chemical exports than domestic production.[19] A more linear cor-

17 The average output per "establishment" of the chemical industry during the 2007-2009 period amounted to $81 million in the Netherlands, $64 million in Belgium and $59 million in Germany. This was more than three times the average output per establishment in China ($18 million), more than eight times the average output per establishment in India ($7 million), 15 times the average in Hong Kong, China, or Viet Nam ($4 million) and more than 40 times the average in Thailand ($1.25 million in 2006) (INDSTAT 2 database).

18 MBendi Information Services, "World chemicals: global chemical industry overview". Available from www.mbendi.com.

19 This applies to 34 out of 146 countries and areas for which both export and domestic production data were available. Adding countries and areas which exported chemicals but did not report production of chemicals, the overall proportion of countries and areas where exports exceeded domestic production would rise to above 40 per cent (80 out of 192).

Fig. 10. Proportion of the chemical industry in global GDP and of chemical exports in global merchandise exports



Source: UNODC estimates based on World Bank indicators and UN COMTRADE.

relation is observed between the levels of exports and imports of chemicals (see figure 11), which underlines the importance of re-exports[20] and the fact that trade flows are not always directly from producing to consuming countries, but instead involve an increasing number of brokers and other intermediaries in the supply chain. Not only does this provide more opportunities for diversion, it makes the effective application of the "know your customer" principle[21] more difficult to achieve.

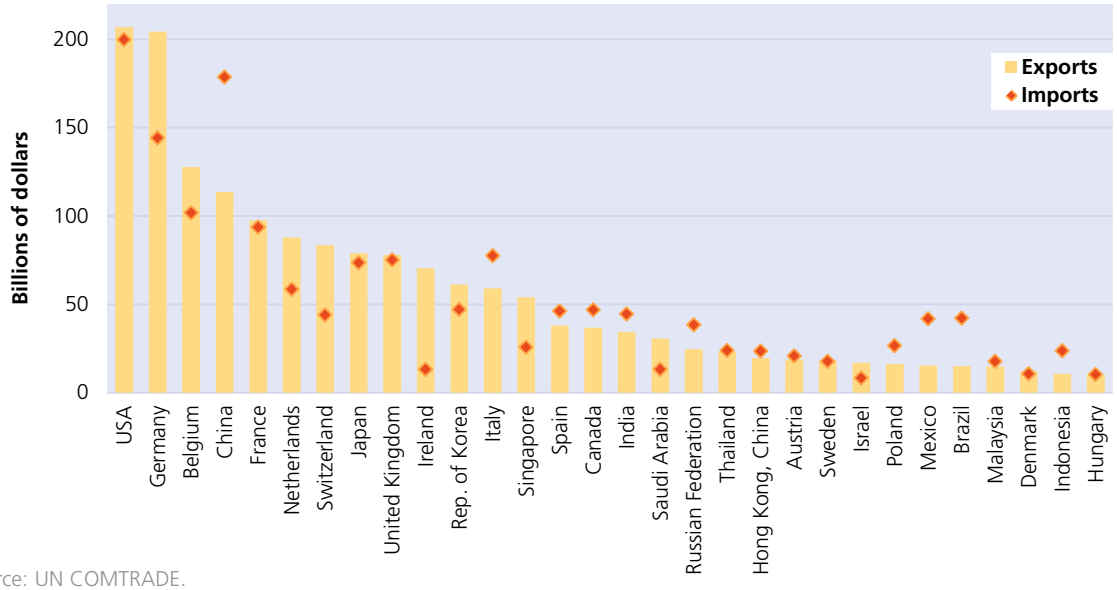
D. RESPONSE OF THE INTERNATIONAL COMMUNITY

The idea of controlling precursors as one of the strategies for controlling the overall manufacture of drugs and thus their consumption (for non-medical purposes) dates back to the early 1930s. It was only in the late 1980s, however, that an effective international precursor control system was devised. That system was further strengthened over the following decades.

1. Conventions concluded under the auspices of the League of Nations

The basic idea of precursor control was already present in the Convention for Limiting the Manufacture and Regulating the Distribution of Narcotic Drugs of 1931, which had provisions for the international control of a limited number of "convertible substances",[22] i.e. substances that could be converted into a product capable of producing addiction.[23]

Fig. 11. International trade in chemicals, 2012 or latest year available (30 largest exporting countries and territories)



Source: UN COMTRADE.

20 Data on 127 countries and areas for the year 2012 show a correlation coefficient of $r = 0.93$ between imports and exports.

21 The "know your customer" principle, for those who manufacture or market chemicals, is set out in the Political Declaration adopted by the General Assembly at its twentieth special session and the measures to enhance international cooperation to counter the world drug problem (General Assembly resolutions S-20/4 A-E).

22 Any product obtained from any of the phenanthrene alkaloids of opium or from the ecgonine alkaloids of the coca leaf.

23 Article 11 of the 1931 Convention made it clear that no manufacture or trade in such products should be allowed "unless and until it has been ascertained to the satisfaction of the Government concerned that the product in question is of medical or scientific value".

Another reference to the need for precursor control can be found in the Convention for the Suppression of the Illicit Traffic in Dangerous Drugs of 1936. That Convention introduced an obligation to seize such precursors and contained penal provisions for the manufacture, conversion, extraction and preparation of drugs,[24] which also had an impact on the handling of precursor chemicals. Both Conventions were superseded by the Single Convention on Narcotic Drugs of 1961.

2. Single Convention on Narcotic Drugs of 1961

A general reference to precursor control, asking for the "supervision"[25] of such substances, is also found in the Single Convention on Narcotic Drugs of 1961 as amended by the 1972 Protocol, which is still in force today. In addition, it allowed substances "convertible into a drug" to be scheduled.[26] The 1961 Convention also obliged parties to seize precursor chemicals and to introduce penal provisions for the illegal manufacture, extraction and preparation of such drugs.[27]

24 In article 2 of the 1936 Convention, each of the High Contracting Parties agreed "to make the necessary legislative provisions for severely punishing, particularly by imprisonment or other penalties of deprivation of liberty … the manufacture, conversion, extraction, preparation … of narcotic drugs, contrary to the provisions of the … conventions". Article 10 of the Convention states that "any narcotic drugs as well as any substances and instruments intended for the commission of any of the offences referred to in article 2 shall be liable to seizure and confiscation". This was the first international obligation relating to precursor control. Nonetheless, the practical importance of this obligation remained limited, as only 13 countries (Belgium, Brazil, Canada, China, Colombia, Egypt, France, Greece, Guatemala, Haiti, India, Romania and Turkey) signed and ratified the Convention (Thomas Pietschmann, "A century of international drug control", *Bulletin on Narcotics*, vol. LIX, Nos. 1 and 2 (2007).

25 Article 2, paragraph 8, of the 1961 Convention states that "the Parties shall use their best endeavours to apply to substances which do not fall under this Convention, but which may be used in the illicit manufacture of drugs, such measures of supervision as may be practicable". This definition of a "substance" was left very broad on purpose, as the authors admitted that they could not foresee what kind of substances would be employed in the illicit manufacture of drugs in the future. Article 2 is important because it lays down a general obligation for the control of precursors used in the manufacture of narcotic drugs. In the discussion of the plenipotentiary conference that adopted the 1961 Convention, acetic anhydride, used in the conversion of morphine into heroin, was explicitly mentioned as a substance to which paragraph 8 would apply (*Commentary on the Single Convention on Narcotic Drugs, 1961* (New York, 1962)).

26 Article 3, paragraph 3 (iii), of the 1961 Convention enables the scope of controlled substances to be extended to any substance "convertible into a drug". Thus, one finds ecgonine, an alkaloid of the of coca plant which itself is not addictive but which can be converted into cocaine, in Schedule I of the 1961 Convention.

27 The specific provisions for precursor control of the 1936 Convention entered the 1961 Convention in article 37: "Any drug, substances and equipment used in or intended for the commission of any of the offences, referred to in article 36, shall be liable to seizure and confiscation." Article 36 states that each Party shall "adopt such measures as will ensure that … production, manufacture, extraction, preparation … of drugs contrary to the provisions of this Convention … shall be punishable offences when committed intentionally".

3. Convention on Psychotropic Substances of 1971

The requirements relating to the introduction of precursor control were broadened in the Convention on Psychotropic Substances of 1971 to include chemicals used in the manufacture of psychotropic substances.[28] Precursors were thus in principle under international control, with provisions for such substances to be seized and confiscated. There was a general obligation for taking "measures of supervision" regarding such substances, though much was left to the discretion of Member States. Thus, only a few countries introduced a comprehensive control regime. Moreover, the 1971 Convention did not include a provision for the scheduling of specific substances that were convertible into a psychotropic substance.[29] This changed only with the 1988 Convention.

4. United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988

(a) The basic control system

The United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988 enjoys nearly universal adherence[30].

The basic idea of the Convention is to regulate the trade of a number of chemicals which can be used for the manufacture of drugs by allowing their trade for licit purposes and prevent their diversion for illicit manufacture of drugs. The 1988 Convention establishes a legal basis for the control of precursors and calls for the establishment of an appropriate administrative framework, working mechanism and standard operating procedures to prevent the diversion of such substances. There are hundreds of chemicals that are or could be used in the manufacture of illicit drugs. Of those, a total of 23 chemicals were internationally controlled under the 1988 Convention as of January 2014: 15 substances under the stricter rules foreseen for substances in Table I (for which pre-export notifications are foreseen) and 8 under the less stringent rules for substances in Table II.[31] This list is regularly updated. The

28 Article 2 states that "the Parties shall use their best endeavours to apply to substances which do not fall under this Convention, but which may be used in the illicit manufacture of psychotropic substances, such measures of supervision as may be practicable". Subsequently, article 22 also follows closely the wording of the Single Convention, laying down in its paragraph 3 that "any psychotropic substance or other substance, as well as any equipment, used in or intended for the commission of any of the offences referred to … shall be liable to seizure and confiscation".

29 Thus lysergic acid, for instance, which is easily convertible into lysergic acid diethylamide (LSD), could not be scheduled under the 1971 Convention.

30 The Convention has been ratified by or acceded to by 187 countries and areas (plus the European Union).

31 Substances listed in Table I are specifically required in the manufacture of narcotic drugs or psychotropic substances. Substances listed in Table II are mostly solvents, cleaning agents and chemical reagents.

total number of controlled chemical substances in Table I and II nearly doubled from 12 in 1988 to 23 by 2013. The increase over the past two decades has been most noticeable for substances in Table I, rising from 6 in 1988 to 16 following the decision of the Commission on Narcotic Drugs in March 2014 to add *alpha*-phenylacetoacetonitrile (APAAN) to Table I.

Substances controlled under the 1988 Convention (as of January 2014)

Table I	Table II
Acetic anhydride	Acetone
N-acetylanthranilic acid	Anthranilic acid
Ephedrine	Ethyl ether
Ergometrine	Hydrochloric acid
Ergotamine	Methyl ethyl ketone
Isosafrole	Piperidine
Lysergic acid	Sulphuric acid
3,4-Methylenedioxyphenyl-2-propanone	Toluene
Norephedrine	
Phenylacetic acid	
1-Phenyl-2-propanone	
Piperonal	
Potassium permanganate	
Pseudoephedrine	

Paragraph 1 of article 3 of the 1988 Convention requires parties to establish as criminal offences the manufacture, transport and distribution of the listed precursor chemicals in the knowledge that they are to be used in or for the illegal cultivation, production or manufacture of drugs.

As in the 1961 and 1971 Conventions, the 1988 Convention requires States parties to take appropriate measures to prevent the diversion of precursor chemicals.[32]

Article 12 lays down more specific control measures for the manufacture and distribution (e.g. licensing, prevention of the accumulation of large stocks)[33] and international trade in precursor chemicals (e.g. notification of suspicious shipments, seizures, proper labelling and documentation, establishment of a comprehensive monitoring system,[34] including pre-export notifications for substances in Table I)[35] while guaranteeing Member States a high degree of confidentiality[36] and limiting controls (e.g. exclusion of pharmaceutical preparations from controls).[37]

(b) Role of the International Narcotics Control Board

The 1988 Convention also clarified the roles of the various actors. The primary role of precursor control lies with the individual Member States;[38] the International Narcotics Control Board was given the prime responsibility for precursor control at the international level.

The Board is responsible, along with States parties, for recommending to the Commission on Narcotic Drugs the scheduling or rescheduling of chemical substances to be controlled at the international level. While the World Health Organization (WHO) plays a key role in the scheduling of narcotic drugs and psychotropic substances under the 1961 and 1971 Conventions, the Board was given this role for precursor chemicals.[39] It also collects statistics relating to precursors, reports on progress made in precur-

32 Article 12, paragraph 1, contains a general statement that "the Parties shall take the measures they deem appropriate to prevent diversion of substances in Table I and Table II used for the purpose of illicit manufacture of narcotic drugs or psychotropic substances, and shall cooperate with one another to this end".

33 Article 12, paragraph 8 (a), states that "the Parties shall take the measures they deem appropriate to monitor the manufacture and distribution of substances in Table I and Table II which are carried out within their territory". Paragraph 8 (b) proposes the following concrete measures that parties may take to that end:
(i) Control all persons and enterprises engaged in the manufacture and distribution of such substances;
(ii) Control under licence the establishment and premises in which such manufacture or distribution may take place;
(iii) Require that licensees obtain a permit for conducting the aforesaid operations;
(iv) Prevent the accumulation of such substances in the possession of manufacturers and distributors, in excess of the quantities required for the normal conduct of business and the prevailing market conditions.

34 Article 12, paragraph 9, lists the following measures that each party shall take with regard to international trade in substances in Table I and Table II:
(a) Establish and maintain a system to monitor international trade in such substances in order to facilitate the identification of suspicious transactions;
(b) Provide for the seizure of any such substance if there is sufficient evidence that it is for use in the illicit manufacture of a narcotic drug or psychotropic substance;
(c) Notify, as soon as possible, the competent authorities and services of the parties concerned if there is reason to believe that the import, export or transit of such a substance is destined for the illicit manufacture of narcotic drugs or psychotropic substances;
(d) Require that imports and exports be properly labelled and documented;
(e) Ensure that documents referred to in subparagraph (d) above are maintained for a period of not less than two years and may be made available for inspection by the competent authorities.

35 Article 12, paragraph 10, contains the core principle of international precursor control: the obligation of an exporting country, if asked by an importing country, to issue a "pre-export notification" for substances listed in Table I. This then entails some form of a clearance or permission to be granted from the competent authorities of the importing country. Importing countries can adopt stricter measures and request a pre-export notification not only for substances in Table I but also for some or all of the substances in Table II. A number of countries have made use of this provision.

36 See article 12, paragraph 11.

37 Article 12, paragraph 14, for example, excludes pharmaceutical preparations from precursor controls if such substances cannot be easily used in the manufacture of drugs: "The provisions of this article shall not apply to pharmaceutical preparations, nor to other preparations containing substances in Table I or Table II that are compounded in such a way that such substances cannot be easily used or recovered by readily applicable means".

38 In the case of States members of the European Union, the prime responsibility is with the European Union, not the individual member States.

39 See article 12, paragraphs 2-7.

sor control[40] and reports annually to the Commission on the implementation of article 12.[41]

Moreover, the Board has been given a special role in monitoring the implementation of precursor control measures by Member States in accordance with the requirements of the 1988 Convention.[42] The potential sanctions of the Board are limited, however, to bringing an issue to the attention of the parties, the Economic and Social Council and the Commission on Narcotic Drugs; it is then up to these bodies to deal with the issue. This is in contrast to the broader powers given to the Board (e.g. recommending an "import ban") in cases of non-compliance with the other drug conventions.[43]

In addition to collecting data and preparing reports to alert policymakers about new trends, the Board also engages in operational activities. It assists Member States in conducting joint law enforcement operations under the banner of Project Cohesion (with regard to chemicals used in the manufacture of plant-based drugs) and Project Prism (with regard to chemicals used in the manufacture of synthetic drugs) to detect unlawful precursor shipments. In response to various action plans and resolutions, the Board established and maintains a limited international special surveillance list of non-scheduled substances for the identification of substitute chemicals used in the illicit manufacture of drugs.[44] It has also issued the Guidelines for a Voluntary Code of Practice for the Chemical Industry, and established the Pre-Export Notification Online (PEN Online) system, as well as the Precursors Incident Communication System (PICS), a secure online tool to enhance real-time communication and information sharing between national authorities.[45]

5. Resolutions passed by the General Assembly, the Economic and Social Council and the Commission on Narcotic Drugs

Following the adoption of the 1988 Convention, a total of 36 resolutions relevant to precursor control were passed by the General Assembly, the Economic and Social Council and the Commission on Narcotic Drugs during the 1991-2013 period. While some of those resolutions were geared towards simply raising awareness, others were very focused, dealing with specific aspects of precursor control.[46]

6. Political Declaration and Action Plan adopted by the General Assembly at its twentieth special session

Precursor control received a new impetus from the Political Declaration adopted by the General Assembly at its twentieth special session, in 1998,[47] and the related measures to enhance international cooperation to counter the world drug problem,[48] which contained separate resolutions on the Action Plan against Illicit Manufacture, Trafficking and Abuse of Amphetamine-type Stimulants and their Precursors and on the control of precursors.

In its resolution S-20/4 B, on control of precursors, the General Assembly asked Member States to implement many of the proposals made under the 1988 Convention. Member States were requested to adopt and implement the "proposals" of article 12 of the 1988 Convention, including the establishment of a system of control and licensing of the enterprises and persons engaged in the manufacture and distribution of substances listed in Tables I and II of the 1988 Convention. Similarly, exporting States were requested to issue pre-export notifications for substances in Table I to the competent authorities in importing countries (irrespective of whether an importing country had requested such a notification). In addition, information exchange (from data on licit manufacture to imports and exports) was highlighted as being crucial for precursor control, as was strengthened cooperation with associations of the chemical trade and industry which could be achieved by issuing guidelines and/or a code of conduct.[49]

Most importantly, the principle of "know your customer"[50] was introduced at the international level. It obliges the seller of precursor chemicals to investigate the credentials of the purchaser and, if in doubt, to involve the authorities.

40 Ibid., para. 12.

41 Ibid., para. 13.

42 Article 22 sets forth action that the Board may take if it has reason to believe that the aims of the Convention in matters related to its competence are not being met.

43 See article 14, paragraph 2, of the 1961 Convention and article 19, para. 2, of the 1971 Convention.

44 That list contained more than 50 substances in 2012.

45 For more information, see http://incb.org/incb/en/precursors/precursors/tools_and_kits.html.

46 Topics addressed included the following: controls for non-scheduled substances, the Precursors Incident Communication System, the strengthening of monitoring and control systems at the points of entry of precursors (airports, ports, customs ports), the real-time exchange of information, backtracking investigations, the promotion of participation in Project Prism and Project Cohesion, chemical profiling, training in precursor control, the provision to International Narcotics Control Board of annual estimates of legitimate requirements for precursors of amphetamine-type stimulants, trafficking via the Internet, the development of joint actions with the national chemical industry, the promotion of a voluntary code of conduct for the chemical industry, the smuggling of precursors to and within Afghanistan, use of the Pre-Export Notification Online system for precursors and pharmaceutical preparations containing ephedrine and pseudoephedrine, treatment of safrole-rich oils, ephedra, PMK (=3,4-methylenedioxyphenyl-2-propanone (3,4-MDP-2-P)), norephedrine and potassium permanganate. A comprehensive summary of the resolutions relevant to precursor control is available from http://incb.org/incb/en/precursors/resolutions.html.

47 General Assembly resolution S-20/2.

48 General Assembly resolutions S-20/4 A-E.

49 See General Assembly resolution S-20/4 B, paras. 4, 7 (a) (i) and 9 (b).

50 Ibid., para. 9 (c). In addition, the "know your customer" principle is found in several resolutions of the Economic and Social Council and the Commission on Narcotic Drugs.

In addition, the document highlighted the challenges arising from the use of "substitute chemicals". In that context, it proposed to prepare a limited international special surveillance list of substances currently not in Tables I and II of the 1988 Convention. This was subsequently implemented by the Board. Moreover, States were asked to apply monitoring measures, in cooperation with the chemical industry, so as to prevent the diversion of substances included on the special surveillance list. In addition, States were asked to "consider punishing, as a criminal offence … the diversion of non-scheduled chemical substances with the knowledge that they are intended for use in the illicit manufacture of narcotic drugs or psychotropic substances".[51]

7. Political Declaration and Plan of Action of 2009

Precursor control also played a role in the 2009 Political Declaration and Plan of Action on International Cooperation towards an Integrated and Balanced Strategy to Counter the World Drug Problem. The Plan of Action underlined the need for "a global approach in order to … prevent the diversion of synthetic drugs and their precursors into illicit channels in all manufacturing, transit and consumer countries" and, in the Political Declaration, States Members of the United Nations decided to establish 2019 as a target date for States "to eliminate or reduce significantly … the diversion of and illicit trafficking in precursors".[52]

The 2009 Plan of Action shows how the precursor market had changed over time. It recognized that pharmaceutical preparations and chemicals not under international control were being substituted for controlled precursors.[53] To respond to these new challenges, the Plan of Action invited Member States to expand the use of pre-export notifications to non-scheduled substances and pharmaceutical preparations. Furthermore, Member States were asked to "develop systems (for example, shared online recording systems) to prevent precursor chemicals from being diverted into illicit channels from community pharmacies".[54]

While acknowledging that regulatory controls helped to prevent the diversion of precursor chemicals from international trade, the Plan of Action identified the new problem of precursors being diverted "from domestic distribution channels" in countries where they were manufactured or imported.[55]

Responding to this new challenge, the Plan of Action asked Member States to "increase efforts, beyond international trade controls, to prevent the diversion of precursors, and pharmaceutical preparations containing the precursors ephedrine and pseudoephedrine, from domestic channels to be smuggled across borders."[56]

Another new element is the invitation to Member States to "consider 'marking' certain chemical shipments for possible future use if scientific advances ensure the appropriate use of such tools, taking into account the potential burden this would place on authorities and industry".[57]

E. PATTERNS AND TRENDS IN PRODUCTION OF, AND TRADE AND TRAFFICKING IN PRECURSOR CHEMICALS

1. Licit activities

(a) Production and trade patterns of substances in Table I and Table II

Detailed information on global production of all 23 chemicals under international control is not available. There is, however, some information on the geographical spread of the licit manufacture of precursor chemicals, suggesting that such production is a global phenomenon.

Twenty Governments officially reported production of substances in Table I during the 2010-2012 period. Combining this information with trade statistics (Governments reporting more exports than imports of Table I precursor chemicals during the 2010-2012 period) suggests that production of Table I precursors is probably taking place in 47 countries and areas. The manufacture of Table I and Table II precursors may occur in 77 countries and areas, representing about half of the 163 countries and areas for which information is available (see map 1).[58] The com-

51 General Assembly resolution S-20/4 B, para. 14 (b).

52 See *Official Records of the Economic and Social Council, 2009, Supplement No. 8* (E/2009/28), chap. I, sect. C, Plan of Action, para. 33; and Political Declaration, para. 36.

53 Ibid., Plan of Action, paras. 35 and 39. While the 1988 Convention excluded pharmaceutical preparations from the control efforts (para. 14), the 2009 Plan of Action, as a consequence of the changed situation, stated in its paragraph 36 (c) that Member States should "strengthen controls, including through the Pre-Export Notification Online system, where required, for the import and export of preparations containing precursor chemicals, such as ephedrine and pseudoephedrine, which could be used in the manufacture of amphetamine-type stimulants".

54 Ibid., paras. 41 (k) and (r).

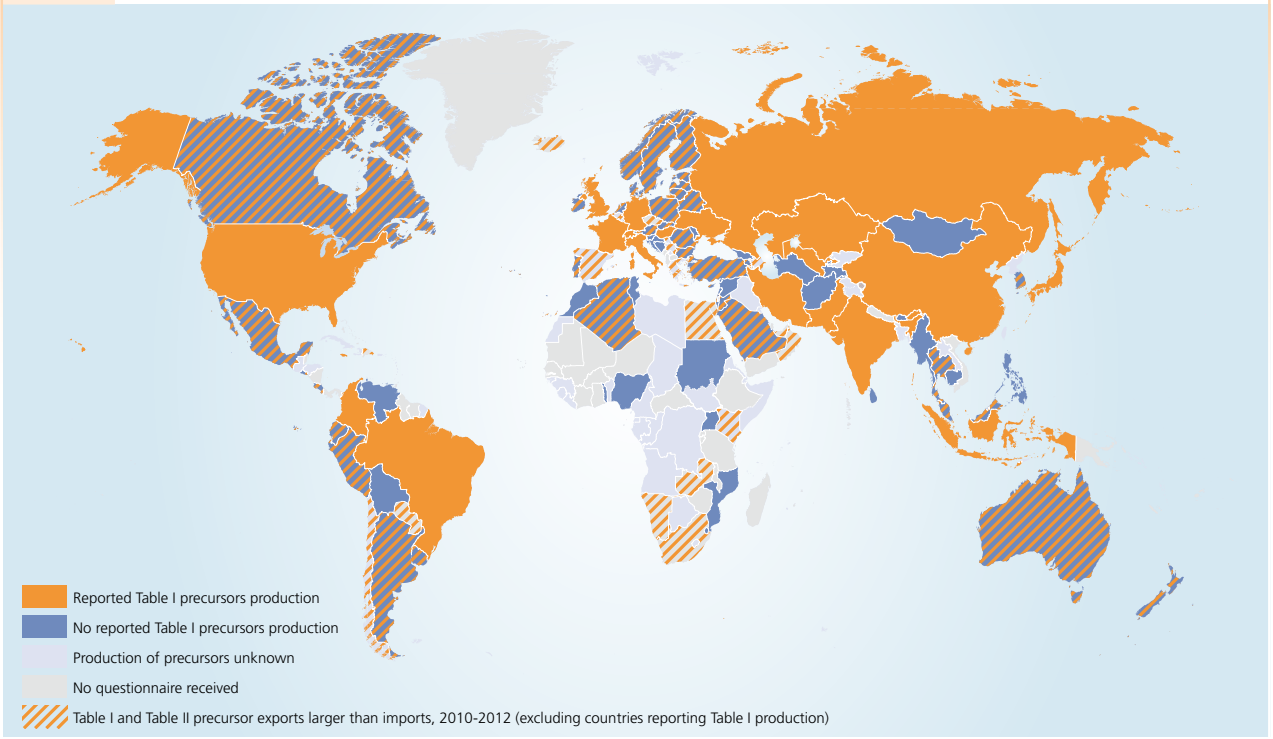
55 Ibid., para. 39.

56 Ibid., para. 41 (s).

57 Ibid., para. 41 (u). That provision has not been widely used so far. While that could represent a major leap forward in strengthening and improving backtracking investigations, there are concerns about the costs involved and its actual value added. In addition, the "marking" involved in the provision could be potentially problematic if applied to chemicals used in the manufacture of pharmaceutical products, entailing expensive litigation if patients claim that such pharmaceuticals have been contaminated.

58 Twenty Governments reported licit manufacture of any of the 15 Table I precursor chemicals during the 2010-2012 period, out of a total of 104 Governments reporting to UNODC in part I of the annual reports questionnaire. According to UN COMTRADE, 73 countries exported Table I precursor chemicals during the 2010-2012 period, i.e. almost half of the countries contained in that database.

Map 1. Potential manufacture of precursor chemicals (Table I and Table II), 2010-2012



Sources: Annual reports questionnaire of UNODC and UN COMTRADE.

Note: The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations. Dashed lines represent undetermined boundaries. The dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. The final boundary between the Sudan and South Sudan has not yet been determined.

bined population of the area concerned accounts for about 77 per cent of the world's population.

The largest proportion of licit exports of the 23 internationally controlled chemical precursors during the 2010-2012 period were from countries in Asia (41 per cent of the total in value terms), followed by countries in Europe and the Americas (see table 1).

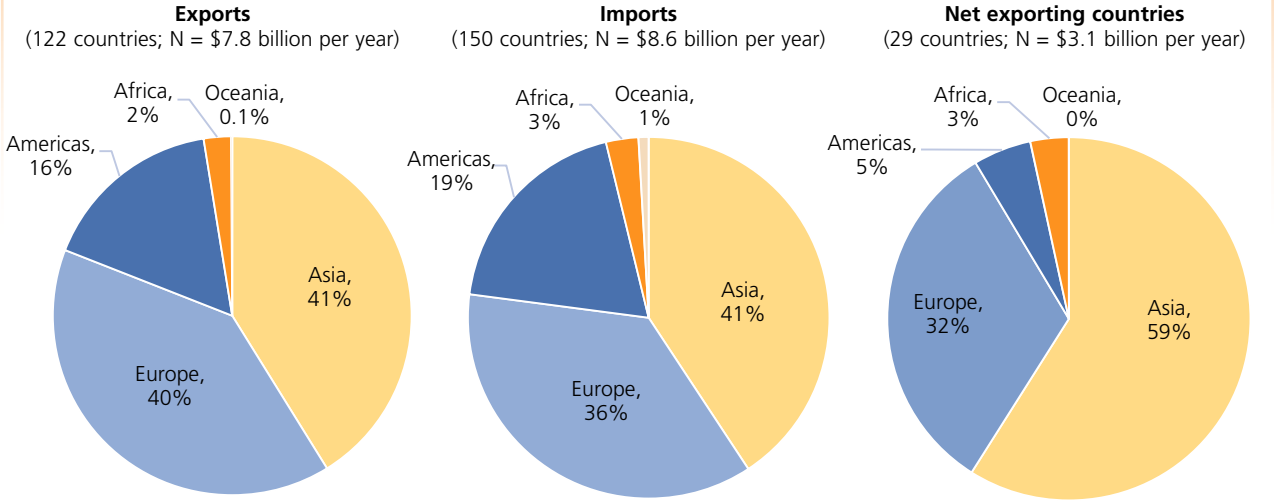
The largest proportion of such exports in Asia during that period were made by the Republic of Korea, followed by Japan, Singapore, Thailand, China and India. The largest exporter in Europe was Belgium, followed by Germany, the Netherlands and Spain. In the Americas, the list was topped by the United States, followed by Canada, Mexico and Brazil. The main exporter in Africa was South Africa, followed by Zambia, Nigeria, Egypt and Kenya. The largest exporter in the Oceania region was Australia, followed by New Zealand. The role of different countries in the licit trade of controlled precursors can be a function of multiple elements: the size of their chemical industry, the domestic demand for chemicals and the trade sector, which may also be influenced by the existence of large seaports. The correlation between exports and imports of precursor chemicals during the 2010-2012 period was weaker than for chemicals in general, suggesting that re-exports, though common, occurred less frequently for precursor chemicals than for chemicals in general.

If only the "net exports" of precursors are considered (i.e. the difference between precursor exports and precursor imports), which may be a better reflection of underlying production, data show an even stronger concentration of such "net exports" of precursors from countries in Asia (59 per cent of the total).

If the analysis is restricted to Table I precursor chemicals, the largest proportion of licit exports during the 2010-2012 period were reported, in descending order, by Belgium, China, Mexico, the United States, India, Germany, the Netherlands and Switzerland. Aggregated to the regional level, the largest proportion of exports and imports of substances listed in Table I were accounted for by Europe (44 per cent of exports and 65 per cent of imports), Asia (29 per cent and 18 per cent, respectively) and the Americas (27 per cent and 14 per cent, respectively). In terms of net exports, Asia accounts for 50 per cent of the global total (mainly China, followed by India) and the Americas for 38 per cent (mainly Mexico, followed by the United

Thirty-eight countries reported higher exports of Table I precursors than imports during the 2010-2012 period. If exports exceed imports in a country over a period of time, local manufacture is probably taking place. Combining information from the annual reports questionnaire and UN COMTRADE, the number of "potential" Table I manufacturing countries could rise to 47. Extending the analysis to all substances controlled in Table I and Table II, UN COMTRADE data show exports of internationally controlled precursors by 122 countries and imports by 150 countries. If one includes countries reporting domestic precursor production, the potential number of countries involved in the manufacture of precursor chemicals rises to 77.

Table 1. Regional distribution of trade in internationally controlled precursors (Table I and Table II), 2010-2012



Source: Data from UN COMTRADE (based on HS07 classification).

States), while Europe accounts for "just" 12 per cent, reflecting the fact that a significant proportion of European precursor chemical exports are nowadays "re-exports" of imported substances.

(b) Economic importance of substances listed in Table I and Table II

Data from UN COMTRADE indicate that precursor chemicals account for a very small share of the overall market for chemicals. Total international trade[59] in precursor chemicals amounted to approximately $9 billion in 2012,[60] which is equivalent to just 0.5 per cent of total international trade in chemicals.

Although there were 15 substances listed in Table I and only 8 in Table II, the latter substances accounted for 93 per cent of the international trade in precursor chemicals, based on 2012 data (see table 2). The largest (licit) international trade amounts were reported for toluene (40 per cent of total exports in 2012), a chemical used as a solvent (paint thinner) and as an octane booster in gasoline fuels, although it is also used in the processing of cocaine. The second-largest amounts were reported for acetone (22 per cent), a widely used solvent and a chemical used in cocaine and heroin processing, followed by sulphuric acid (14 per cent), a chemical used in the manufacture of cocaine, and amphetamine-sulphate, which in the licit market is required, inter alia, in the production of fertilizers, detergents, pharmaceuticals, insecticides, anti-freezes, explosives, textiles and lubricants.

The economic importance of international trade in substances listed in Table I is far lower. Table I precursors, which are under tighter control, account for only 7 per cent of international trade in precursors. Expressed as a proportion of total exports, substances in Table I comprise a mere 0.04 per cent of all chemicals traded at the global level. The most important substance in Table I is acetic anhydride, which is employed, inter alia, in the manufacture of heroin. It accounts for global international licit trade of some $0.4 billion, or about 4 per cent of global exports in precursor chemicals. The next most important Table I precursors are potassium permanganate, involved in the manufacture of cocaine (exports of $70 million, or 0.8 per cent of global exports of precursor chemicals) and pseudoephedrine ($63 million, or 0.7 per cent), which is used in the manufacture of methamphetamine, followed by piperonal ($44 million, or 0.5 per cent) part of the manufacture of 3,4-methylenedioxy-*N*-methylamphetamine (MDMA), commonly known as "ecstasy".

(c) Trends in the licit trade of Table I and Table II precursors

Expressed in constant United States dollars, global exports of precursor chemicals rose almost fivefold during the 1996-2012 period.[61] Even accounting for inflation, such exports still rose threefold over this period.

There was, however, a marked difference between Table I

59 International trade is defined here, in line with the definition used by the Board, as the total levels of exports or imports, whichever is greater. Global exports should, in theory, largely equal global imports, except for minor differences. Owing to a lack of consistent reporting, however, there are important data discrepancies, i.e. some countries report exports, but not all of their trading partners report the corresponding imports, and vice versa.

60 October 2013 data from UN COMTRADE, based on HS07 classification for precursor chemicals and Standard International Trade Classification Revision 3 for global imports and exports of chemicals.

61 The subsequent analysis of international trade will be based, unless otherwise indicated, on information contained in UN COMTRADE. Those data have the advantage of being readily available and, in contrast to trade data submitted by Member States to the Board, not being subject to any confidentiality clauses.

Table 2. International trade in precursor chemicals, 2012

Used in manufacture of	Chemical substance	Schedule	Licit exports (in millions of dollars)	As a percentage of global precursor exports	Licit imports (in millions of dollars)	As a percentage of global precursor imports
Cocaine	Potassium permanganate	Table I	70.3	0.8	56.7	0.7
Heroin, conversion of phenylacetic acid to P-2-P and conversion of anthranilic acid to N-acetylanthranilic acid	Acetic anhydride	Table I	361.8	4.49	415.4	4.8
Amphetamines (methamphetamine/ amphetamine) and methcathinone	Ephedrine	Table I	10.0	0.1	7.5	0.1
	Pseudoephedrine	Table I	63.3	0.8	51.2	0.6
	P-2-P	Table I	2.9	0.04	2.8	0.03
	Phenylacetic acid	Table I	11.3	0.1	28.4	0.3
	Norephedrine	Table I	2.2	0.03	1.2	0.01
MDMA ("ecstasy")	3,4-MDP-2-P	Table I	0.3	0.00	0.3	0.00
	Piperonal	Table I	44.1	0.5	42.7	0.5
	Safrole	Table I	0.06	0.0	0.05	0.0
	Isosafrole	Table I	3.8	0.05	2.8	0.03
Lysergic acid diethylamide (LSD)	Lysergic acid	Table I	0.6	0.01	0.8	0.01
	Ergotamine	Table I	3.6	0.04	5.7	0.07
	Ergometrine	Table I	0.7	0.01	1.0	0.01
Methaqualone	N-acetylanthranilic acid	Table I	1.3	0.02	0.8	0.01
	Anthranilic acid	Table II	12.1	0.1	5.2	0.1
Phencyclidine	Piperidine	Table II	432.6	5.2	420.0	4.8
Cocaine	Toluene	Table II	3,273.3	39.5	3,208.4	36.8
	Methyl ethyl ketone	Table II	711.5	8.6	768.4	8.8
Cocaine and heroin	Acetone	Table II	1,794.4	21.7	1,881.0	21.6
	Ethyl ether	Table II	27.1	0.3	28.7	0.3
Cocaine and amphetamine sulphate	Sulphuric acid	Table II	1,144.9	13.8	1,455.1	16.7
Cocaine, heroin, methamphetamine, "ecstasy" and phencyclidine	Hydrochloric acid	Table II	308.0	3.7	330.1	3.8
Internationally controlled precursors		Table I	574.0		616.0	7.1
		Table II	7,703.9		8,096.7	92.9
		Table I and Table II	8,280.0		8,713.9	100.0
All chemicals			1,764 429		1,764 429	
Precursors as a percentage of international trade in chemicals			0.5		0.5	

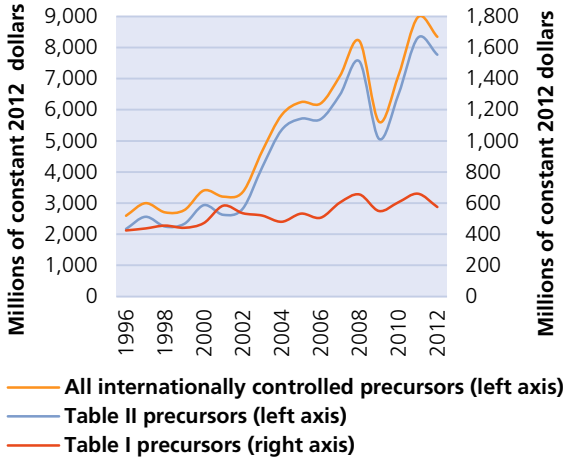
Source: October 2013 data from UN COMTRADE (based on HS07 classification for precursor chemicals and Standard International Trade Classification Revision 3 for global chemicals imports and exports).

and Table II precursors. While Table II precursor chemicals rose three-and-a-half times in constant dollars over the 1996-2012 period, the increase in the more strictly controlled substances in Table I amounted to 35 per cent (see figure 12).

2. Trafficking in Table I and Table II substances

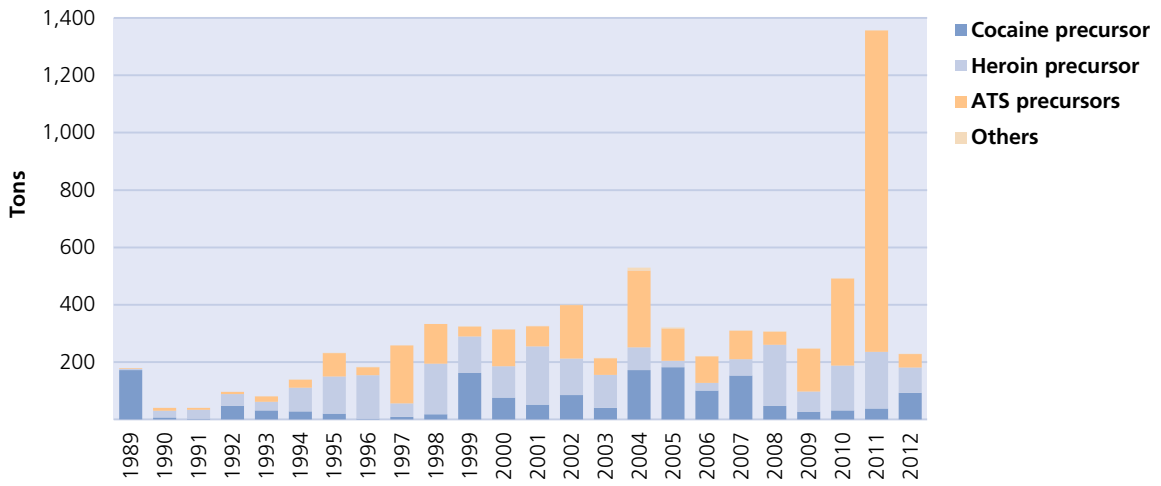
One way to examine trafficking in precursor chemicals is to analyse statistics relating to seizures, although these may reflect variations in law enforcement efforts and changes in trafficking patterns. Information on seizures also provides only a partial picture of trafficking of precursors because law enforcement activities in this area are geared towards the prevention of diversion (e.g. via stopped suspicious shipments) and the detection of clandestine laboratories.

Fig. 12. Global exports of precursor chemicals in constant 2012 dollars, 1996-2012



Source: Data from UN COMTRADE (based on HS96 classification).

Fig. 13. Global seizures of substances in Table I, in tons, 1989-2012



Note: Preliminary data for 2012; figures may increase once additional information becomes available.
Cocaine precursor: potassium permanganate
Heroin precursor: acetic anhydride
Amphetamine-type stimulants precursors: P-2-P, phenylacetic acid, ephedrine, pseudoephedrine, norephedrine, 3,4-MDP-2-P, safrole, isosafrole and piperonal
Others: lysergic acid; ergometrine, ergotamine and N-acetylanthranilic acid.
Source: International Narcotics Control Board, *Precursors Report*, 2013 (and previous years).

Compared with seizures of all drugs, seizures of precursors are concentrated in a smaller number of countries and are the result of fewer operations. They are often the result of joint international operations and are characterized by the interception of large volumes per seizure case. A relatively low, though rising, number of Governments report such seizures. The number increased from 37 in 2002 to 61 in 2012,[62] reflecting improvements in precursor control as well as a greater geographical spread in the smuggling of precursors. The number of Governments reporting seizures of precursors is still, however, only half of the number reporting drug seizures (124 in 2012). Over the 2002-2012 period, 96 Governments reported seizures of precursors, compared with 146 reporting seizures of drugs.[63]

Owing to the smaller number of seizures involved, seizures of precursors are characterized by large annual fluctuations, which makes trend analyses difficult to interpret and often rather speculative.

The annual fluctuations have been very large for seizures of Table I precursors, which peaked in 2011, primarily reflecting a massive rise of seizures of the amphetamine-type stimulants precursor phenylacetic acid and its derivatives[64] and some increases in acetic anhydride, potassium permanganate, ephedrine and safrole.

62 The number of countries reporting seizures of Table I precursors to the Board rose from 32 in 2002 to 51 in 2012; the number of countries reporting seizures of Table II precursors rose from 28 to 45 during the same time period.

63 Data from the annual reports questionnaire of UNODC.

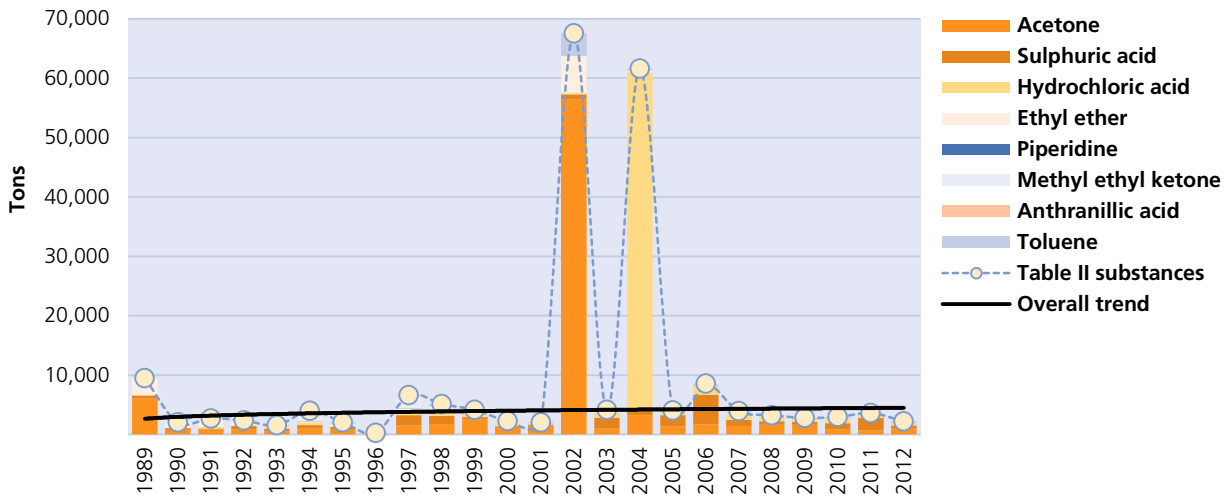
64 The peak in 2011 occurred in the wake of the international Operation Phenylacetic Acid and Its Derivatives, conducted under the auspices of Project Prism, which deals with precursors of synthetic drugs.

Preliminary figures for 2012, in contrast, show some of the lowest seizure figures for substances in Table I in the past two decades (see figure 13). Declines were reported primarily for phenylacetic acid and acetic anhydride. Some of the decline also reflects the fact that seizure information is not yet available from all countries, i.e. totals may still rise. Seizures of potassium permanganate, several of the precursors of amphetamine-type stimulants and the precursors of lysergic acid diethylamide (ergotamine, lysergic acids) rose in 2012.

Seizures of substances in Table II show a different pattern. Overall seizures of such substances peaked in 2002 and in 2004 (see figure 14). The 2002 peak was mainly the result of acetone seizures, while the 2004 peak was linked to seizures of hydrochloric acid. Since then, overall seizures have been at far lower levels. The underlying trend, except for the two peaks, appears to have been stable. This is in contrast to international licit trade in these substances, which has greatly increased over the past two decades. In recent years, seizures of substances in Table II have been dominated mainly by seizures of sulphuric acid and/or acetone. During the 1990-2012 period, seizures of substances in Table II accounted in volume terms for almost 98 per cent of all seizures of chemicals controlled under the 1988 Convention.

The regional distribution of seizures of substances in Table I and Table II shows a concentration in the Americas, followed, depending on the time frame used, by either Europe or Asia. The largest overall precursor seizures in volume terms during the 2002-2012 period were reported by countries in North America (59 per cent of the total), followed by South America (12 per cent), Europe (4 per cent) and

Fig. 14. Global seizures of Table II substances in volume terms, 1989-2012



Note: Preliminary data for 2012; figures may increase once additional information becomes available.

Source: International Narcotics Control Board, *Precursors Report*, 2013 (and previous years).

Asia (3 per cent). Africa accounted for 0.05 per cent and the Oceania region for 0.02 per cent.

If the analysis is restricted to more recent years (2007-2012), the largest seizures were made in South America (60 per cent of the total), followed by North America (17 per cent), Asia (15 per cent, of which the bulk (13 per cent of the world total) were made in East and South-East Asia) and Europe (8 per cent). Seizures in the Oceania region accounted for 0.1 per cent and Africa for 0.04 per cent of the total.

F. KEY PRECURSORS USED IN THE ILLICIT MANUFACTURE OF DRUGS

1. Key chemical used in the manufacture of cocaine: potassium permanganate

(a) Use

Potassium permanganate has a broad range of licit applications, mostly derived from its characteristic as an oxidizing agent in chemical reactions. Those applications include use as a disinfectant for hands; for the treatment of dermatitis, fungal infections and mouth ulcers; for fruit preservation and disinfection of vegetables; treatment of drinking water and wastewater; and as an oxidant and reagent for the synthesis of various organic compounds. Significant amounts are required for the synthesis of ascorbic acid (used for vitamin C tablets) and saccharin (an artificial sweetener). Solutions of potassium permanganate with hydrogen peroxide were used to propel rockets[65] and are still used to propel torpedoes.

Potassium permanganate is also used in the illicit manufacture of cocaine. It is employed in the processing of coca paste into cocaine base, and is critical for achieving a proper crystallization of cocaine HCl later in the process, and ultimately for obtaining high-quality cocaine.[66]

(b) International trade

Global exports of potassium permanganate (based on data from UN COMTRADE) amounted to 25,400 tons in 2012, exceeding globally reported imports (17,500 tons).[67] This indicates discrepancies in the reporting of trade statistics, along with possible underreporting of imports.

The value of global exports of potassium permanganate amounted to slightly more than $70 million in 2012 (equivalent to 0.004 per cent of global chemical exports in 2012), up from $23 million in 1996 (see figure 15).

During the 2007-2012 period, a total of 66 Governments reported exports of potassium permanganate, while 141 Governments reported imports. Total exports amounted to $55.3 million per year during the period. The largest exporters were China (54 per cent of the total), followed by the United States (14 per cent), Belgium (11 per cent) and India (7 per cent).

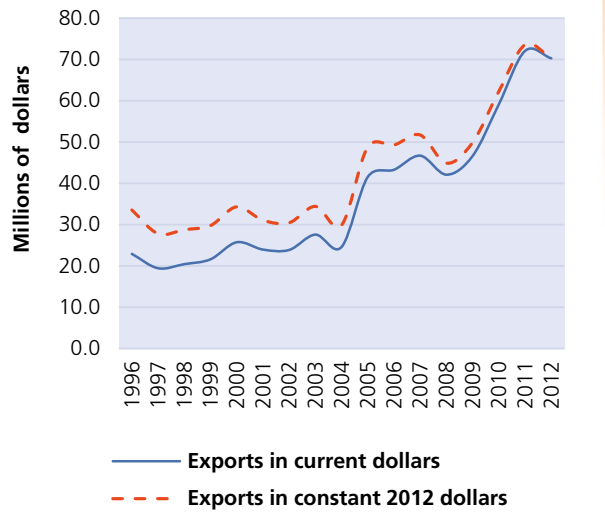
The largest importer of the substance in South America during that period was Brazil, with imports of about 1,000 tons per year, more than 90 per cent of which originated in China. Annual licit imports into the three main cocaine-producing countries were far lower: 45 tons for Peru, 29 tons for Colombia and 6 tons for the Plurinational State of Bolivia. The potassium permanganate required (385

65 Josef Köhler and others, *Explosivstoffe* (Wiley-VCH, July 2008).

66 H. L. Schlesinger, "Topics in the chemistry of cocaine", in *Bulletin on Narcotics*, Issue 1 (1985), pp. 63-78.

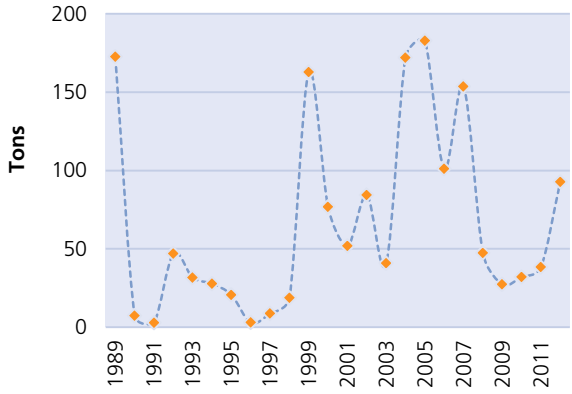
67 If correctly reported, total imports and exports at the global level should be equal in weight terms.

Fig. 15. Global exports of potassium permanganate, 1996-2012



Source: Data from UN COMTRADE.

Fig. 16. Global seizures of potassium permanganate, 1989-2012



Source: International Narcotics Control Board, *Precursors Report*, 2013 (and previous years).

tons per year) for the manufacture of illegal cocaine[68] is rather large compared with an annual total of 1,500 tons of legal imports into South America, Central America and the Caribbean during the 2007-2012 period, suggesting that diversion from the licit market happens before it reaches the region and/or that it is being produced domestically in clandestine laboratories in the Andean region.[69]

(c) Trafficking

Following initially high seizures of potassium permanganate in 1989, when the substance was placed under international control, seizures remained rather modest during the following decade before rising sharply in 1999 in the wake of Operation Purple (launched under the auspices of the International Narcotics Control Board in April 1999), which focused on the tracking of potassium permanganate and led to a temporary shortage of the chemical in the Andean region. As a consequence, alternative substances were used and operators of cocaine laboratories (notably in Colombia) experimented with the illegal production of potassium permanganate in clandestine laboratories. Further noteworthy seizures were made during the 2004-2007 period as part of Operation Cohesion. Seizures subsequently declined, in parallel with declines in global cocaine production and falling purity levels in North America, until 2009 and remained at lower levels before climbing again in 2012 (see figure 16).

Thirty-nine Governments reported seizures of potassium permanganate during the 2002-2012 period, including 31 Governments during the 2007-2012 period. Global average annual seizures of the substance totalled 65 tons during the 2007-2012 period, equivalent to 0.3 per cent of global licit exports.

South America accounted for 88 per cent of seizures, reflecting the use of the substance in the illegal manufacture of cocaine in the Andean region, followed by Asia (9 per cent), mostly China (8 per cent of total global seizures). The bulk of the seizures made by China took place in 2012, reflecting improved control measures in that country. The International Narcotics Control Board reported that more than three quarters of all pre-export notifications for potassium permanganate in 2011 were issued by China, followed by the United States and India.[70]

The largest seizures worldwide were reported by Colombia (80 per cent during the 2007-2012 period), followed, in the Americas, by the Plurinational State of Bolivia (4 per cent) and Peru (2 per cent). Average annual seizures fell by half in Colombia during the 2007-2012 period as compared with the 2002-2006 period, but more than tripled in Peru and rose 27-fold in the Plurinational State of Bolivia.[71] Those patterns reflect a decline in cocaine production in Colombia, as well as the growing importance of both the Plurinational State of Bolivia and Peru as not only coca-producing countries[72] but also cocaine-manufacturing countries.[73]

68 See calculations in subsection 1 (a) of section G below.

69 International Narcotics Control Board, *Precursors Report*, 2013.

70 International Narcotics Control Board, *Precursors Report*, 2012, para. 96.

71 Seizures of potassium permanganate in the Plurinational State of Bolivia surged between 2006 (104 kg) and 2011 (9,914 kg) before falling in 2012 (954 kg). These trends were in parallel with the destruction of coca base and HCl laboratories in that country, rising from 645 in 2000 to 2,622 in 2005, 4,074 in 2006 and 5,299 in 2011, before falling to 4,508 in 2012. (UNODC, *Estado Plurinacional de Bolivia: Monitoreo de Cultivos de Coca 2012* (July 2013)).

72 The average annual area under coca cultivation declined in Colombia by 71 per cent between 2000 and 2012, or 18 per cent during the 2007-2012 period as compared with the 2002-2006 period. In contrast, it increased in Peru by 39 per cent during the 2000-2012 period, or 23 per cent during the 2007-2012 period as compared with the 2002-2006 period, and it increased in the Plurinational State of Bolivia by 73 per cent between 2000 and 2012, or by 15 per cent during the 2007-2012 period as compared with the 2002-2006 period. (See chapter I of this edition and previous *World Drug Reports*.)

73 The number of dismantled cocaine paste, base and crystallization laboratories rose in the Plurinational State of Bolivia from 3,093 units

There are indications that significant amounts of potassium permanganate are produced illegally in the Andean region. In 2011, Colombian authorities dismantled seven laboratories producing the substance; in 2012, eight such laboratories were dismantled.[74] The International Narcotics Control Board cites estimates that between 60 and 80 per cent of the potassium permanganate used in Colombia is obtained nowadays through illicit manufacture of the substance using manganese dioxide as a starting material.[75] Backtracking investigations also suggest that potassium permanganate has been diverted from domestic distribution channels abroad and then smuggled into the Andean region and/or that alternative chemicals have been used.[76]

Smaller amounts were also seized in Argentina, Brazil, Chile, Ecuador and Venezuela (Bolivarian Republic of), i.e. in countries neighbouring the three main cocaine-producing countries, during the 2007-2012 period. In 2013, small amounts were also found in dismantled cocaine-processing laboratories in the Dominican Republic and Panama.[77]

2. Key chemical used in the manufacture of heroin: acetic anhydride

(a) Use

Acetic anhydride is used mainly as an acetylating and dehydrating agent in the chemical and pharmaceutical industries. It is a versatile reagent and is used, inter alia, in the production of aspirin and the conversion of cellulose to cellulose acetate, a substance used for photographic films, adhesives, synthetic fibres and as a frame material for eyeglasses. It is also used as a wood preservative, for polishing metals and in the production of brake fluid, dyes and explosives.

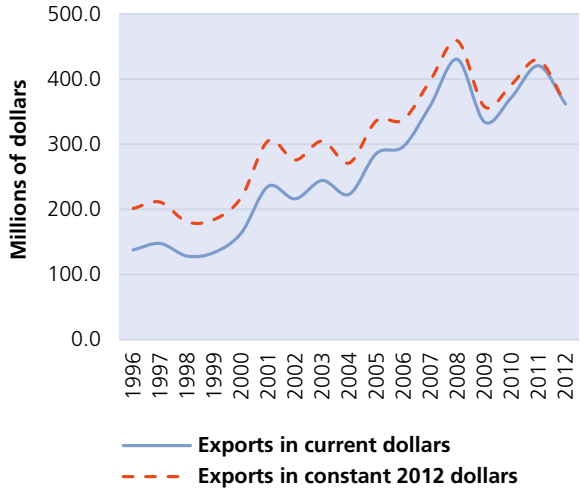
In addition, acetic anhydride is used in the manufacture of heroin and, to a lesser extent, in the manufacture of other drugs, such as methaqualone, or in the conversion of phenylacetic acid to P-2-P. The synthesis of heroin, also known as "diacetylmorphine", is a simple one-step acetylation reaction of morphine using acetic anhydride.[78]

(b) International trade

Estimates of annual licit production of acetic anhydride range from 1.1 million tons (2011)[79] to 2.13 billion litres, or 2.3 million tons,[80] per year. The latest estimate of the International Narcotics Control Board is close to 1.5 million tons per year.[81]

Global exports of acetic anhydride in 2012 reached 397,000 tons, while global imports reached 414,000 tons, suggesting that international trade amounts to some 28 per cent of global production of the substance. Global licit exports of acetic anhydride rose, in real terms, by 80 per cent during the 1996-2012 period (see figure 17). This was less than the rise in chemical exports in general.

Fig. 17. Global exports of acetic anhydride, 1996-2012



Source: Data from UN COMTRADE (based on HS96).

During the 2007-2012 period, 118 Governments reported importing acetic anhydride, while 45 reported exports of the substance. The largest exporters in Asia were China and Japan; in North America, the United States and Mexico; and in Europe, Belgium and the Netherlands. In terms of "net exports", North America predominates (Mexico followed by the United States).

Officially reported licit imports into South-West Asia, however, were very small. There were no licit imports into Afghanistan. Licit imports into Pakistan fell from 149 kg

in 2007 to 5,299 units in 2011. Similarly, the number of dismantled coca paste and base laboratories in Peru rose from 649 in 2007 to 1,498 in 2011 while the number of cocaine crystallization laboratories there rose from 16 in 2007 to 21 in 2010 and still 19 in 2011. In contrast, the number of cocaine paste/base laboratories in Colombia declined from 3,147 in 2008 to 2,200 in 2011 while the number of dismantled cocaine crystallization laboratories fell in Colombia from 296 to 200 over the same period. (UNODC, *Colombia, Monitoreo de Cultivos de Coca 2011* and previous years; Peru, *Monitoreo de Cultivos de Coca 2011* and previous years; and *Estado Plurinacional de Bolivia, Monitoreo de Cultivos de Coca 2011* and previous years.)

74 Data from the annual reports questionnaire of UNODC.

75 International Narcotics Control Board, *Precursors Report*, 2013, para. 97.

76 International Narcotics Control Board, *Precursors Report*, 2012, para. 95.

77 International Narcotics Control Board, *Precursors Report*, 2013, para. 98.

78 United Nations International Drug Control Programme, *Recommended Methods for Testing Opium, Morphine and Heroin* (New York, 1998), p. 7.

79 "Acetic Acid Global Market to 2020" (GBI Research, 1 February 2013). Available from www.companiesandmarkets.com. See also www.plastemart.com/Plastic-Technical-Article.asp?LiteratureID=1918&Paper=global-acetic-acid-market-estimated-15.5-million-tons-2020.

80 International Narcotics Control Board, *Precursors Report*, 2012, box 1. One kilogram of acetic anhydride is equivalent to 0.926 litres of acetic anhydride.

81 International Narcotics Control Board, *Precursors Report*, 2013, para. 106.

in 2008 to 14 kg in 2012, according to data from UN COMTRADE. That is far below the requirements of Afghanistan's opiate industry. No licit acetic anhydride imports were reported by the Islamic Republic of Iran or any of the other countries bordering Afghanistan (except China). Yet, clandestine heroin production and seizures of acetic anhydride in West Asia, notably in Afghanistan, were substantial. This suggests that most of the acetic anhydride destined for the subregion originates as diversions made outside the subregion.[82]

In Asia, relatively large imports of acetic anhydride during the 2007-2012 period were reported by China (24,400 tons per year), the Republic of Korea (10,600 tons), Singapore (6,700 tons), Thailand (4,000 tons) and India (1,200 tons). Historically, the largest importer in South-Eastern Europe has been Turkey (1,400 tons per year), an important trans-shipment location for acetic anhydride diverted in Europe and smuggled into Afghanistan. During the same period in Asia, relatively large exports were reported by Saudi Arabia (17,100 tons per year), the United Arab Emirates (15,800 tons),[83] China (11,400 tons), Japan (8,200 tons), Singapore (5,700 tons) and India (2,300 tons).

(c) Trafficking

Following increases in seizures of acetic anhydride in the 1990s, and a peak reached in 2001 in the wake of the implementation of Operation Topaz (which started in late 2000), seizures fell in the first few years of the new millennium, possibly as a delayed reaction to the 2001 Afghan opium poppy ban, before recovering as precursor control gained a new impetus in the wake of the introduction of Operation Cohesion in 2006. Even though seizures declined in 2012, the underlying trend seems to be upwards (see figure 18).

Seizures of acetic anhydride were reported by 43 Governments during the 2002-2012 period. Global annual seizures during the 2007-2012 period amounted to approximately 131,000 litres, equivalent to just 0.03 per cent of global imports.

The largest seizures were made in "West Asia"[84] (34 per cent of the world total), mostly reflecting seizures made in Afghanistan (22 per cent of the world total).

Afghanistan has no legitimate trade in or manufacture of acetic anhydride. Despite that fact, sizeable quantities of the substance are diverted each year from domestic trade in other countries before being smuggled into Afghanistan.[85]

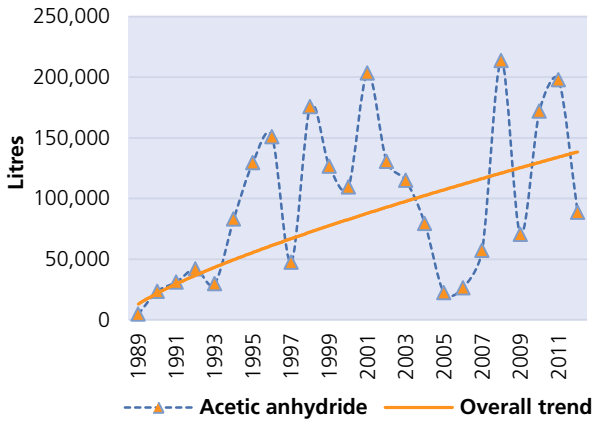
82 International Narcotics Control Board, *Precursors Report*, 2013, paras. 109-112.

83 This reflects huge exports of 94,749 tons of acetic anhydride in 2008, while no exports were reported in other years.

84 According to Board classification, West Asia includes countries in the Near and Middle East, Central Asia, Turkey and the Caucasus.

85 International Narcotics Control Board, *Precursors Report*, 2012, para. 106.

Fig. 18. Global seizures of acetic anhydride, 1989-2012



Source: International Narcotics Control Board, *Precursors Report*, 2013 (and previous years).

Countries close to Afghanistan are at a particular risk of being targeted to obtain and traffic acetic anhydride into Afghanistan. "That applies particularly to China, India, Islamic Republic of Iran and Uzbekistan – countries that manufacture acetic anhydride or countries in which a significant amount of the substance is available because of domestic or international trade" [86] as well as to Iraq [87]. Two recent large seizures made in Pakistan[88] and the Islamic Republic of Iran[89] show how these countries continue to be used as transit countries for such shipments.

The next largest seizures were reported by countries in Europe[90] (27 per cent of the total during the 2007-2012 period). The largest, in order of size, were made in Slovenia, Hungary, the Russian Federation, Bulgaria and Slovakia.

During the 2002-2012 period, Turkey reported regular seizures of acetic anhydride, typically originating in Western and Central Europe.[91] Overall seizures of acetic anhydride in Turkey have shown a downward trend, possibly reflecting the declining importance of Europe as a source region.

86 International Narcotics Control Board, *Precursors Report*, 2012, para. 112.

87 In January 2012, Iraqi authorities objected to a shipment of 32 tons of acetic anhydride from China. (INCB, 2012 *Precursors and chemicals frequently used in the illicit manufacture of narcotic drugs and psychotropic substances*, New York 2013, p. 25).

88 In mid-2013, for instance, 15 tons of acetic anhydride were seized while transiting Pakistan on its way to Afghanistan (International Narcotics Control Board, *Precursors Report*, 2013, para. 111).

89 A recent example was a shipment of 17.8 tons of acetic anhydride from China via the Islamic Republic of Iran to Afghanistan, which was seized by the Iranian authorities in June 2013. (International Narcotics Control Board, *Precursors Report*, 2013, para. 111).

90 According to the International Narcotics Control Board classification, which excludes Turkey.

91 One of the largest cases involved the seizure of 17 tons of acetic anhydride in Turkey in December 2010 on a truck which had loaded the chemicals in Slovakia and was, officially, said to be transporting disinfectants.

Seizures in North America, which accounted for 26 per cent of the world total during the 2007-2012 period, were made mainly by Mexico (15 per cent of the world total) and the United States (11 per cent). Such seizures were increasingly linked to the illicit manufacture of methamphetamine, and increased after 2009.

Seizures in East and South-East Asia accounted for 11 per cent of the world total during the 2007-2012 period, primarily reflecting seizures made in China (8 per cent of the world total), followed by the Republic of Korea and Japan. The only other country in South-East Asia reporting annual seizures during the 2002-2010 period was Myanmar, the world's second-largest producer of opium.

As reported by the Interational Narcotics Control Board, "while seizures are an important indicator of the level of activity of drug trafficking organizations, it is important to note that they are also indicators of known diversions that have been successful. The international precursor control system is primarily aimed at the prevention of diversion. Comparative figures on stopped, suspended or suspicious shipments show that although seizures of acetic anhydride during the period 2008-2011 amounted to 551,000 litres, nearly double that amount — 943,000 litres — was either stopped or suspended (a total of 761,000 litres) or identified as suspicious (182,000 litres) through the PEN Online system."[92]

3. Key methamphetamine precursors: ephedrine and pseudoephedrine

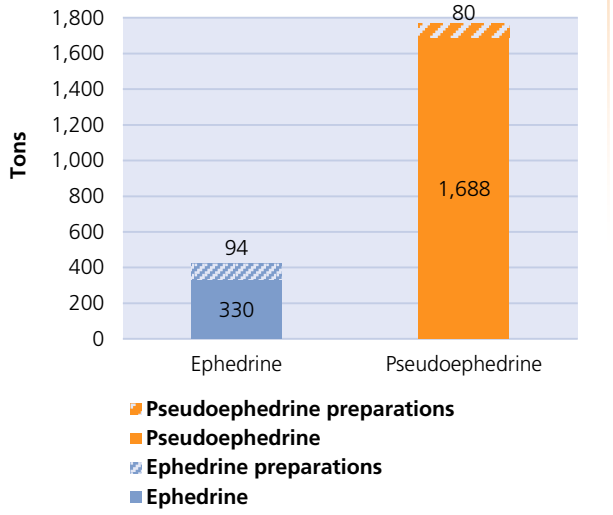
(a) Use

Ephedrine and/or pseudoephedrine have been the key precursors used in the manufacture of methamphetamine for many years. In addition, they are used in the illegal manufacture of methcathinone, another amphetamine-type stimulant.

Ephedra, known as *má huáng* in traditional Chinese medicine, contains both ephedrine and pseudoephedrine. Its use has been documented since the Han Dynasty (206 B.C.-220 A.D.),[93] in the treatment of asthma and bronchitis and as a stimulant. Licit uses of ephedrine as a pharmaceutical product include cough medicine (bronchodilators), while pseudoephedrine is often used in nasal decongestants. In combination with promethazine, ephedrine is used to combat seasickness. Ephedrine is also found on the WHO list of essential medicines "for use in spinal anaesthesia during delivery, to prevent hypotension".[94] In addition, ephedrine preparations are sold as food supplements or pills to lose weight and reduce body fat.

A total of 113 Governments reported licit requirements[95] for ephedrine to the Board, and 108 reported requirements for pseudoephedrine (out of a total of 153 Governments reporting).[96] The bulk of the requirements for these substances concerned pseudoephedrine (see figure 19). The largest licit demand for those substances was in Asia (60 per cent of the total), followed by the Americas (18 per cent), Europe (13 per cent), Africa (8 per cent) and the Oceania region (0.4 per cent). The single largest markets for ephedrine and pseudoephedrine in volume terms were India (18 per cent of the world total) and China (17 per cent), followed by the United States (13 per cent), the United Kingdom (4.2 per cent), the Republic of Korea (3.9 per cent), Switzerland (3.3 per cent), Pakistan (3.2 per cent), Egypt (3.1 per cent), Singapore (2.9 per cent), Indonesia (2.7 per cent), the Islamic Republic of Iran (2.5 per cent), the Syrian Arab Republic (2.3 per cent) and Nigeria (1.5 per cent).[97]

Fig. 19. Licit requirements for ephedrine and pseudoephedrine, 2012 (or latest year available)



Note: Based on information from 153 Governments.

Source: International Narcotics Control Board, *Precursors Report*, 2013, annex II.

92 International Narcotics Control Board, *Precursors Report*, 2012, para. 115.

93 Woodburne Levy and Kavita Kalidas, "Use of addictive medications and drugs in athletics", in *Principles of Addictions and the Law: Applications in Forensic, Mental Health, and Medical Practice*, Norman S. Miller, ed. (Academic Press, 2010), pp. 307-308.

94 World Health Organization, *WHO Model List of Essential Medicines: 18th list* (April 2013).

95 "Annual legitimate requirements for ephedrine and pseudoephedrine include quantities of those substances that may be manufactured domestically and/or imported into the country to provide adequate supplies of each chemical for estimated medical, scientific, research and industrial needs; licit export requirements; and establishment and maintenance of reserve stocks." (International Narcotics Control Board, "Issues that Governments may consider when determining annual legitimate requirements for ephedrine and pseudoephedrine". Available from www.incb.org/incb/en/precursors/precursors/tools_and_kits.html.)

96 International Narcotics Control Board, *Precursors Report*, 2013, annex II.

97 Ibid.

(b) International trade

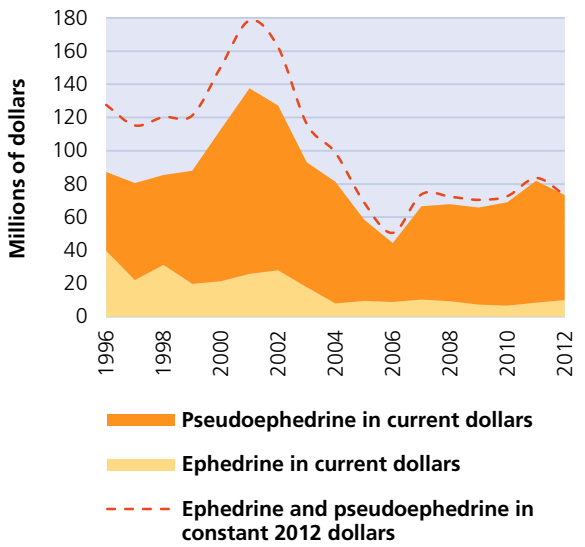
Global international trade in ephedrine and pseudoephedrine declined during the 1996-2012 period (see figure 20).

Global exports of ephedrine amounted to, on average, 133 tons per year during the 2007-2012 period, or roughly half of reported imports (264 tons per year). That discrepancy once again indicates problems with regard to reporting of trade statistics.

Thirty Governments reported exports of ephedrine, while 92 reported imports, during the 2007-2012 period. The largest ephedrine exports were reported by India (59 per cent). The largest imports were reported by the United States (20 per cent) and Egypt (19 per cent), followed by the Republic of Korea (8 per cent) and Nigeria (6 per cent).

Global pseudoephedrine exports amounted to, on average, 1,136 tons per year during the 2007-2012 period, exceeding imports (863 tons per year). Thirty-five Governments reported exports of pseudoephedrine, while 96 Governments reported imports during that period. The largest exports were reported by India (52 per cent of the total), followed by Germany and China. According to the United States Department of State, Taiwan Province of China was actually the third-largest exporter worldwide of pseudoephedrine during the 2009-2011 period.[98] The largest pseudoephedrine imports during the 2007-2012 period were recorded by the United States (25 per cent), followed by Egypt (8 per cent).

Fig. 20. Global exports of ephedrine and pseudoephedrine, 1986-2012



Source: Data from UN COMTRADE.

98 United States Department of State, Bureau of International Narcotics and Law Enforcement Affairs, *International Narcotics Control Strategy Report*, vol. I (March 2013), chapter on "Chemical controls". See also the same report from previous years.

(c) Trafficking

While there has been a marked upward trend in overall seizures of precursors used in the manufacture of methamphetamine and amphetamine (see figure 21), that has not been the case with regard to the "traditional" methamphetamine precursors, ephedrine and pseudoephedrine.

Global seizures of ephedrine and pseudoephedrine peaked in the second half of the 1990s and again in 2004 before falling in subsequent years (see figure 22).

The initial increases were in line with reports of strong growth in the clandestine manufacture of methamphetamine since the mid-1990s. The declines in recent years seem to reflect improved controls for these substances, along with the emergence of alternative precursor chemicals such as phenylacetic acid and a number of chemicals not under international control. In addition, data show that the use of pharmaceutical preparations containing ephedrine or pseudoephedrine has increased in recent years.[99]

Seizures of ephedrine were reported by 54 Governments and seizures of pseudoephedrine by 50 Governments during the 2002-2012 period. Total seizures of both substances amounted to, on average, 56 tons per year during the 2007-2012 period, equivalent to 21 per cent[100] of global licit imports (based on UN COMTRADE data), a very high proportion as compared to potassium permanganate or acetic anhydride, which both had ratios of clearly less than 1 per cent.

The bulk of the seizures were made by countries in North America (43 per cent) and East and South-East Asia (22 per cent), reflecting the concentration of global methamphetamine production in those two regions, followed by Central America (14 per cent), an emerging transit region. The largest seizures by individual countries during the 2007-2012 period were reported by the United States (32 per cent of the total), followed by China (18 per cent) and Mexico (11 per cent).

East and South Asia continue to be the origins of pseudoephedrine and ephedrine used in illicit manufacture of methamphetamine in the region and in Oceania.[101] Seizures of ephedrine and pseudoephedrine in Mexico have been declining strongly following improved controls in the country in 2009, which prompted clandestine operators of methamphetamine to shift to alternative precursors.

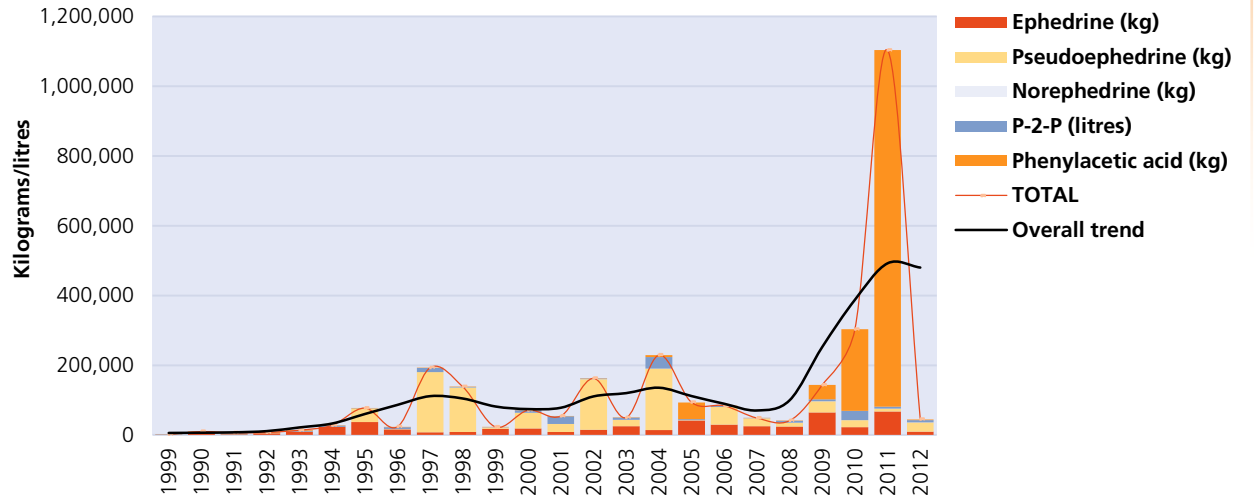
While Mexico is a major supplier of methamphetamine, the country does not seem to have clandestine facilities or

99 International Narcotics Control Board, *Precursors Report*, 2013 (and previous years).

100 Based on international trade data collected by the International Narcotics Control Board, the proportions during the 2007-2011 period amounted to 14 per cent for bulk ephedrine and 2 per cent for pseudoephedrine (*Precursors report*, 2012, table 1).

101 UNODC, *Patterns and Trends of Amphetamine-Type Stimulants and Other Drugs: Challenges for Asia and the Pacific*, Global SMART Programme 2013.

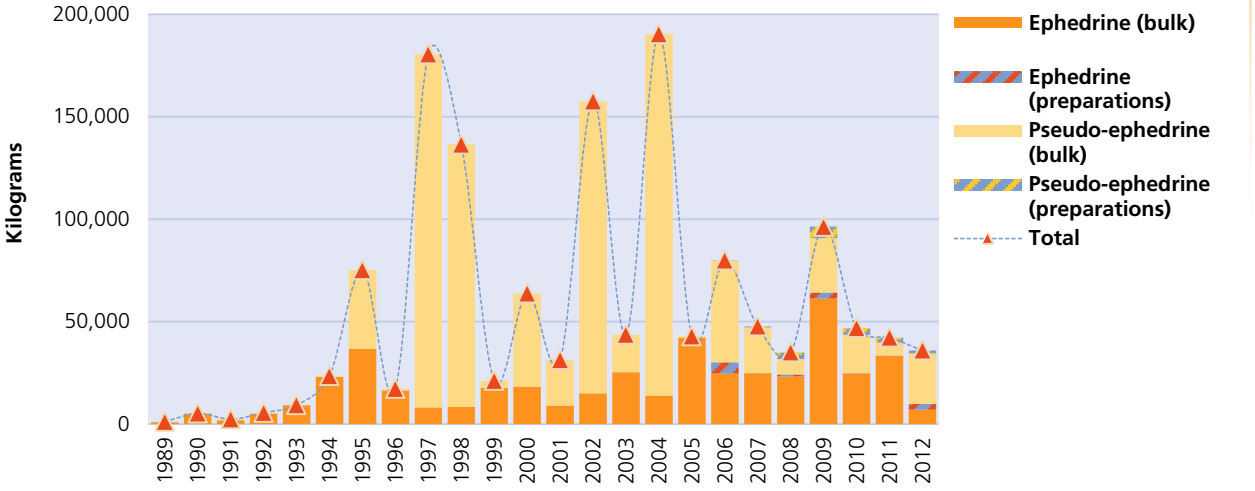
Fig. 21. Global seizures of key amphetamines precursors, 1989-2012



Note: Preliminary data for 2012; data for ephedrine and pseudoephedrine include pharmaceutical preparations.

Source: International Narcotics Control Board, *Precursors Report*, 2013 (and previous years).

Fig. 22. Global seizures of ephedrine and pseudoephedrine, 1989-2012



Source: International Narcotics Control Board, *Precursors Report*, 2013 (and previous years).

chemical plants that synthesize or manufacture pseudoephedrine or ephedrine powder. Mexico dismantled 259 methamphetamine laboratories in 2012, up from a few dozen a few years earlier, and it reported the world's largest aggregrated amount of seizures of methamphetamine for the period 2010-2012.

Most of the seizures of these precursors in East and South-East Asia involved ephedrine (80 per cent). There was also a significant domestic demand for both ephedrine and pseudoephedrine. China alone dismantled 228 clandestine laboratories producing methamphetamine in 2012.[102] Significant seizures of ephedrine were also reported by Myanmar, another key producer of methamphetamine in the region, followed by the Lao People's Democratic Republic; Malaysia; the Philippines; Thailand; Indonesia; Japan; Macao, China; Hong Kong, China; Cambodia; and the Republic of Korea. Traditionally, most of the shipments of ephedrine and pseudoephedrine to countries and areas in the region originate within the subregion or in South Asia.

4. Key amphetamine precursors: P-2-P and phenylacetic acid

(a) Use

One of the key precursors for the manufacture of amphetamine (and in recent years also of methamphetamine) is phenyl-2-propanone (P-2-P), or phenylacetone, also known as benzyl methyl ketone (BMK). This substance is mainly used for the manufacture of amfetamine and some

102 International Narcotics Control Board, *Precursors Report*, 2013, para. 48.

of its derivatives, as well as for the synthesis of another stimulant drug, propylhexedrine. The latter substance is frequently sold over-the-counter as an inhalant (e.g. Benzedrex) to provide temporary relief of nasal congestion, and as an appetite suppressant (e.g. Obesin).

Global licit requirements for P-2-P reported to the Board amount to some 65 tons per year, a modest amount compared with the reported requirements for ephedrine (close to 400 tons) or pseudoephedrine (more than 1,700 tons). The bulk of the reported licit requirements for P-2-P was from countries in North America (96 per cent of the total), followed by Europe (4 per cent). Small requirements were also reported by Governments in Oceania, Asia, South America and the Caribbean.[103]

One of the potential precursors for P-2-P is phenylacetic acid, which itself is employed to treat type II hyperammonemia, a metabolic disturbance characterized by an excess of ammonia in the blood that can lead to encephalopathy (a brain disorder). Moreover, phenylacetic acid is used in the production of penicillin G (benzylpenicillin), as well as in the treatment of syphilis, diphtheria, meningitis, gonorrhoea, aspiration pneumonia and septic arthritis. Phenylacetic acid is also used in some perfumes.

(b) International trade

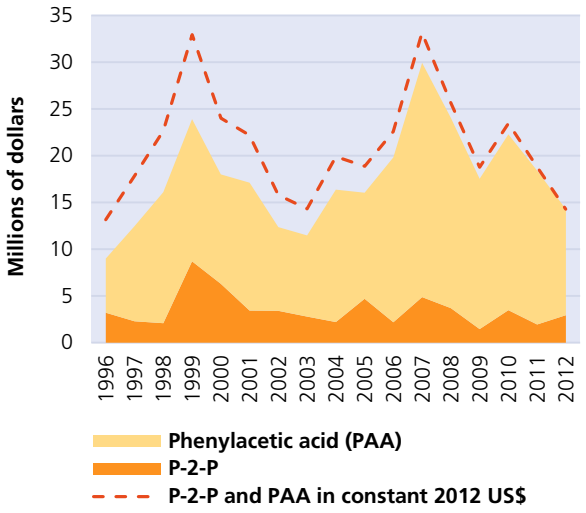
Average global exports of P-2-P during the 2007-2012 period amounted to 77 tons, while average annual imports amounted to 143 tons, once again indicating significant reporting discrepancies. Fifteen Governments reported exports of P-2-P during the 2007-2012 period. The largest exporters were France (51 per cent), followed by India (14 per cent) and Egypt (14 per cent).

The number of Governments reporting imports of P-2-P during the 2007-2012 period amounted to 52. The largest importers were the United States (53 per cent), followed by China (17 per cent), Jordan (6 per cent), Poland (5 per cent) and Egypt (4 per cent). In 2012, the largest importers was the United States, followed by Pakistan.

International trade in phenylacetic acid is substantially larger. Total exports amounted to 4,800 tons per year and total imports to 5,900 tons per year during the 2007-2012 period. The largest exporter during the 2007-2012 period was China (75 per cent), followed by the United States (16 per cent) and India (7 per cent). The largest importer was Mexico (32 per cent). A total of 32 Governments reported exports of phenylacetic acid, while 79 reported imports of phenylacetic acid during the 2007-2012 period.

Combined global exports of P-2-P and phenylacetic acid in 2012 remained at similar levels as in 1996 (see figure 23). A decline of 59 per cent in exports of phenylacetic acid during the 2007-2012 period was linked mostly to lower exports by the United States, China and India, while

Fig. 23. Global exports of P-2-P and phenylacetic acid, 1986-2012



Source: Data from UN COMTRADE.

lower imports were reported mainly from Mexico, the United Kingdom and Spain. Declines in 2012 can be ascribed to falling exports from China; declines in imports were mainly the result of improved controls in Mexico.

(c) Trafficking

The overall trend with regard to total combined seizures of P-2-P and phenylacetic acid appears to have been upwards (see figure 24). The rise in seizures until 2011 was primarily a result of seizures of phenylacetic acid, which is increasingly being used in North American methamphetamine production. The peak in 2011 may in part have been a result of the transfer of phenylacetic acid from Table II to Table I of the 1988 Convention in that year and thus of stricter monitoring and controls. Moreover, the international Operation Phenylacetic Acid and its Derivatives, conducted under Project Prism in 2011 by the Board, appears to have played an important role.

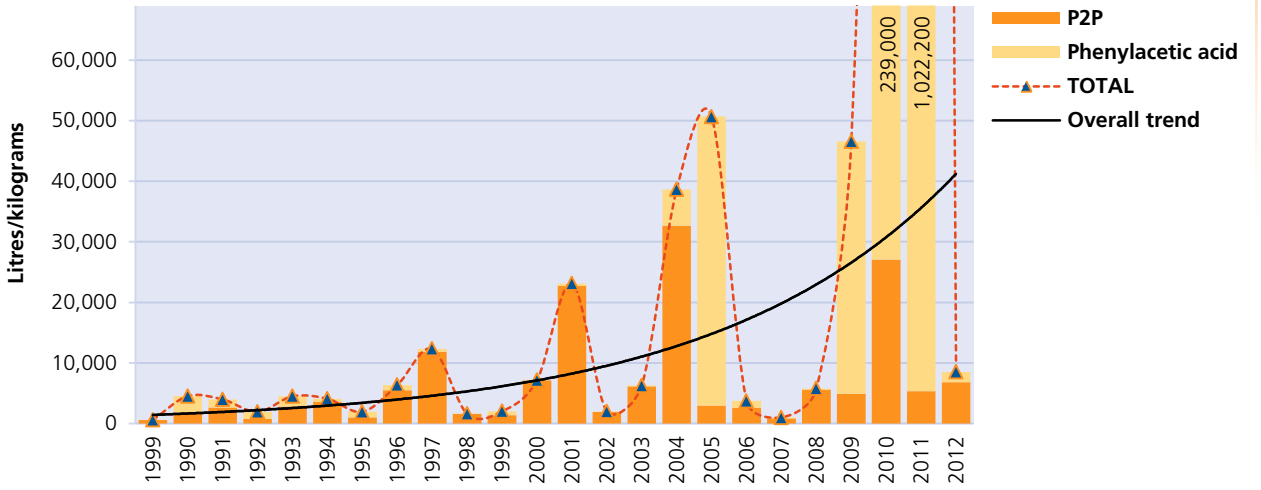
Average annual seizures of P-2-P during the 2007-2012 period amounted to 8.3 tons, while average annual seizures of phenylacetic acid reached 216.7 tons. Seizures of the latter were higher than those of ephedrine and pseudoephedrine. Global seizures of P-2-P were equivalent to 6 per cent of global P-2-P imports, and phenylacetic acid seizures were equivalent to 4 per cent of global phenylacetic acid imports during the 2007-2012 period.[104] These were smaller proportions than for ephedrine and pseudoephedrine (based on UN COMTRADE data).

Seizures of P-2-P were reported by 22 Governments and seizures of phenylacetic acid by 20 Governments during

103 In total, 24 countries reported licit requirements for P-2-P to the Board. (International Narcotics Control Board, *Precursors Report*, 2013, annex II.)

104 Based on international trade statistics collected by the Board, seizures of P-2-P were equivalent to 15 per cent of international trade, and phenylacetic acid equivalent to 11 per cent of international trade during the 2007-2011 period. (International Narcotics Control Board, *Precursors Report*, 2012, table 1.)

Fig. 24. Global seizures of P-2-P and phenylacetic acid, 1989-2012



Source: International Narcotics Control Board, *Precursors Report*, 2013 (and previous years).

the 2002-2012 period, fewer than the number reporting seizures of ephedrine or pseudoephedrine.

During the 2002-2012 period, 38 per cent of global P-2-P seizures were made in Europe, which is the main amphetamine production centre, followed by East and South-East Asia (32 per cent) and North America (30 per cent). During the 2007-2012 period, most seizures were made in North America (50 per cent), where P-2-P has been used in the manufacture of methamphetamine. The largest seizures were reported by Mexico (38 per cent of the total), followed by the Netherlands and Canada (12 per cent each) and Belgium and China (10 per cent each).

In the case of phenylacetic acid, North America accounted for 98 per cent of total global seizures during the 2007-2012 period. Forensic profiling of seized methamphetamine in the United States confirmed that nearly all methamphetamine is now being manufactured using phenylacetic acid or other P-2-P-based methods (94 per cent of all samples tested in the second quarter of 2012, up from 69 per cent in 2010 and close to 0 per cent in 2007).[105]

5. Key "ecstasy" precursors: 3,4-MDP-2-P, safrole, isosafrole and piperonal

(a) Use

The "traditional" precursor for the manufacture of MDMA ("ecstasy") is 3,4-methylenedioxyphenyl-2-propanone (3,4-MDP-2-P), also known as PMK (piperonyl methyl ketone) or in international trade statistics as 1-(1,3-benzodioxol-5-yl)propan-2-one.[106] Its licit use is limited.

Safrole, a precursor of 3,4-MDP-2-P and MDMA ("ecstasy"), is produced mainly from the sassafras plants. According to a study in South-East Asia, the plant is found largely in China, Myanmar and Cambodia[107]. Other studies reveal that it can also be produced from a number of plants grown in other parts of the world, notably in the Americas.[108] In East and South-East Asia, more than 360 plants containing essential oils rich in safrole were identified. The most widely used plants are those of the *Cinnamomum* genus[109]. Sassafras oil is used mainly in the manufacture of safrole, which is used in the manufacture of pesticides, insecticides and some fragrances. Safrole is also used for its antiseptic properties and as a pediculicide to treat lice. In addition, it serves as an additive in products such as root beer, sassafras tea or *pinga com sassafras* (Brazil). Given indications of its carcinogenic properties, however, safrole has been banned as a food additive in a number of countries, including the United States and several European Union countries.[110] Similarly, for health reasons, the International Fragrance Association issued a recommendation in 1987 to prohibit or limit its use in fragrance ingredients.

Isosafrole, another precursor of 3,4-MDP-2-P, is an isomer of safrole. Although it can be produced synthetically out of safrole, it is also derived from sassafras oil. It is used in the fragrance industry. Isosafrole is used for making soaps

105 International Narcotics Control Board, *Precursors Report*, 2012, para. 76.

106 That terminology may have led to some misunderstandings, however, and thus resulted in erroneous classifications.

107 "Safrole-rich essential oils — risk of illicit use", in *Eastern Horizons* (UNODC Regional Centre for East Asia and the Pacific, Summer-Autumn 2007), pp. 9-10.

108 Sérgio Rocha and Lin Chau Ming, 1999, "*Piper hispidinervum*: a sustainable source of safrole" in *Perspectives on new crops and new uses*, J. Janick, ed. (American Society for Horticultural Science Press, Alexandria, VA, 1999), pp. 479-481.

109 UNODC, *Amphetamines and Ecstasy: 2008 Global ATS Assessment* (August 2008), p. 103.

110 Joint FAO-WHO Expert Committee on Food Additives, *WHO Food Additives Series 16*. Available from www.inchem.org/documents/jecfa/jecmono/v16je22.htm.

and perfumes, as well as in the manufacture of preservatives as an antiseptic agent. It is also a key precursor for the manufacture of piperonal.

Piperonal, a further precursor for 3,4-MDP-2-P and 3,4-methylenedioxyamphetamine (MDA), is another organic compound commonly found in fragrances and flavours. Piperonal occurs in a range of plants, including dill, violets, black pepper and vanilla, but it is also produced by oxidation of isosafrole. Piperonal itself is sometimes used in aromatherapy.[111]

(b) International trade

In terms of legal trade, piperonal is nowadays by far the most important substance among the "ecstasy" precursor chemicals. Global piperonal exports increased during the 1996-2012 period, while exports of the other chemicals declined after reaching a peak in 1998. The strong decline in exports of "ecstasy" precursors between 1998 and 2000 was the result mainly of a fall in isosafrole exports, reflecting improvements in precursor control owing to a significant upward trend in "ecstasy" use in key markets in the 1990s (see figure 25).

A total of 38 Governments reported exports of "ecstasy" precursor chemicals during the 2007-2012 period, amounting to, on average, $42 million per year. Imports were reported by 102 Governments ($45 million per year). The largest exporters of"ecstasy" precursor chemicals were China (56 per cent) and Hong Kong, China (21 per cent). The largest importers were Hong Kong, China (18 per cent) and the United States (17 per cent), followed by Germany (9 per cent), Spain (7 per cent), Switzerland (7 per cent) and the United Kingdom (5 per cent). China was the largest net exporter during the 2007-2012 period.

The totals primarily reflect international trade in piperonal of about $41 million per year. Exports of the substance were reported by 26 Governments; imports were reported by 84 Governments.

The second most widely traded substance was isosafrole: 18 Governments reported exports and 53 reported imports. They recorded annual exports of about $1 million and imports of $2.8 million per year during the 2007-2012 period, again indicating some significant reporting gaps.

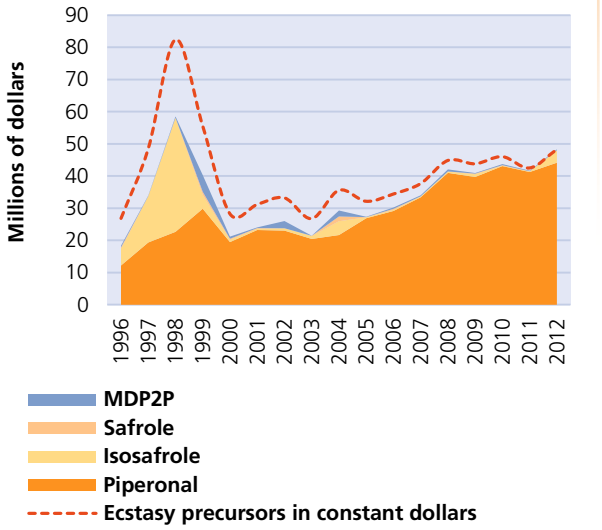
Exports of 3,4-MDP-2-P amounted to about $0.3 million annually, while imports totalled $1.5 million per year during the 2007-2012 period, again indicating inconsistencies in reporting. There were a total of 15 Governments that reported exports and 46 that reported imports.

For safrole, 15 Governments reported exports and 45 reported imports. They recorded total exports of $0.09 million and imports of $0.17 million per year.

In both value and volume terms, piperonal is the most

111 For more information, see http://micro.magnet.fsu.edu/primer/techniques/polarized/gallery/pages/heliotropinsmall.html.

Fig. 25. Global exports of 3,4-MDP-2-P, safrole, isosafrole and piperonal, 1996-2012



Source: Data from UN COMTRADE.

widely traded substance among MDMA precursors, according to UN COMTRADE data. Average annual exports during the 2007-2012 period amounted to 1,759 tons of piperonal, 62 tons of 3,4-MDP-2-P, 25 tons of isosafrole and 9 tons of safrole. If all of these exports are transformed into 3,4-MDP-2-P equivalents (based on the conversion ratios of the International Narcotics Control Board), the aggregated figure amounts to some 1,000 tons per year. The bulk of these exports in volume terms is accounted for by piperonal (91 per cent), followed by 3,4-MDP-2-P (6 per cent), isosafrole (2 per cent) and safrole (1 per cent). Calculations on the import side reveal a similar pattern.[112]

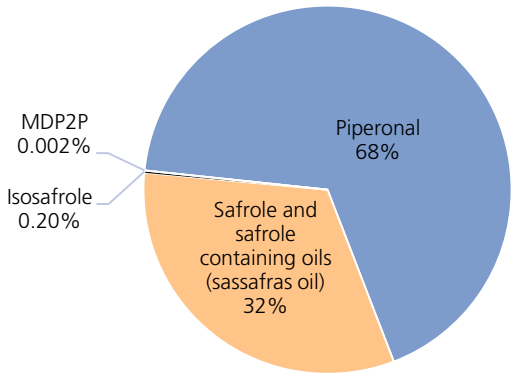
Expressed in common 3,4-MDP-2-P equivalents, Board statistics suggest that about two thirds of international trade in "ecstasy" precursors relates to piperonal, and almost a third to safrole and oils rich in safrole. The other substances, isosafrole and 3,4-MDP-2-P, account for less than 1 per cent of the total (see figure 26).

Based on such figures, the overall international trade in (potential) "ecstasy" precursors would have amounted to, on average, 6,580 tons in 3,4-MDP-2-P equivalents during the 2007-2011 period. This is a significant discrepancy as it is more than six times the figure found in UN COMTRADE[113]. The differences, of course, raise ques-

112 Average annual imports of 1,726 tons of piperonal, 71 tons of isosafrole, 40 tons of 3,4-MDP-2-P and 18 tons of safrole during the 2007-2011 period. This would amount to approximately 1,000 tons in 3,4-MDP-2-P equivalents.

113 The comparison made exaggerates the actual difference, as sassafras oil is not specifically reported in UN COMTRADE statistics. Nevertheless, excluding sassafras oil, the overall total based on International Narcotics Control Board statistics would have still been almost five times larger than shown in the UN COMTRADE statistics. This is mainly owing to differences in the reported trade in piperonal, which

Fig. 26. International trade in potential "ecstasy" precursors in 3,4-MDP-2-P equivalents, 2007-2011



Source: UNODC calculations based on International Narcotics Control Board, *Precursors Report,* 2012.

tions as to the underlying reasons for this apparent over-reporting or underreporting by Member States in the case of "ecstasy" precursors.

(c) Trafficking

In line with global seizures of "ecstasy", the overall trend with regard to the seizure of "ecstasy" precursors was upwards in the 1990s, peaking in 2000 and again in 2007 before falling sharply during the 2007-2010 period and remaining, despite some recovery, at lower levels until 2012 (see figure 27). Overall seizures of "ecstasy" precursors amounted to some 16 tons per year during the 2002-2012 period and were thus far lower than seizures of amphetamine precursors (209 tons per year during the same period).

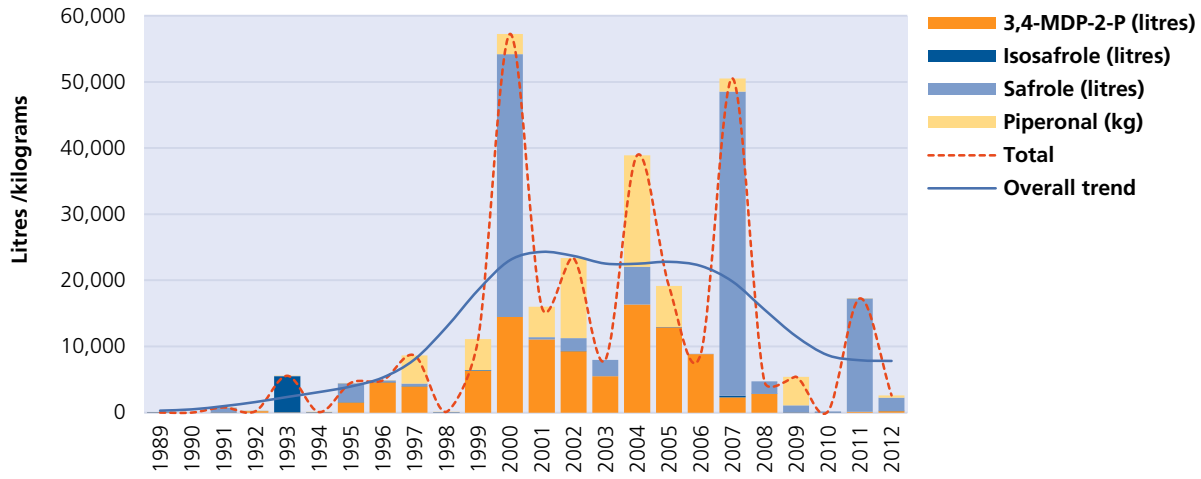
If total seizures during the 2002-2012 period are considered, most seizures of "ecstasy" precursors were for safrole (44 per cent), followed by 3,4-MDP-2-P (33 per cent), piperonal (23 per cent) and isosafrole (0.2 per cent). There have been frequent changes in the type of "ecstasy" precursors used, however. In most years during the 1996-2006 period, the "traditional" "ecstasy" precursor, 3,4-MDP-2-P, was the most widely seized substance. During the 2007-2012 period, improved controls of 3,4-MDP-2-P prompted organized criminal groups to look for alternatives, which led to the use of safrole and various safrole-containing oils. For the same period, about 85 per cent of all seizures of "ecstasy" precursors turned out to be related to safrole, 8 per cent to piperonal and only 7 per cent to 3,4-MDP-2-P. Less than 1 per cent were related to isosafrole. All of this is in sharp contrast to licit international trade, which is dominated by piperonal.

Seizures of all of the "ecstasy" precursors during the 2007-2012 period amounted to, on average, 13.5 tons or, expressed in 3,4-MDP-2-P equivalents (based on Board conversion ratios), 8.5 tons, equivalent to close to 1 per cent of global exports or imports of these substances.[114] This is a higher rate than for potassium permanganate or acetic anhydride, although a lower rate than for amphetamine precursors.

A breakdown by subregion of seizures of "ecstasy" precursors during the 2007-2012 period shows that more than two thirds (69 per cent) of seizures were in East and South-East Asia and a fifth of them in North America, followed by Oceania (6 per cent) and Europe (4 per cent).

Safrole was seized primarily in East and South-East Asia (82 per cent of the total during the 2007-2012 period),

Fig. 27. Global seizures of 3,4-MDP-2-P, safrole, isosafrole and piperonal, 1989-2012



Source: International Narcotics Control Board, *Precursors Report*, 2013 (and previous years).

is much larger in the Board data and more than offsets the smaller numbers reported by the Board in the other categories.

114 The calculation shows a ratio of 0.85 per cent for the 2007-2012 period. Based on trade statistics of the International Narcotics Control Board, the proportion amounted to 0.15 per cent during the 2007-2011 period (see *Precursors Report*, 2012, table 1).

followed by North America, Europe and the Oceania region. The largest seizures were reported by Thailand and Malaysia, followed by Australia, the United States, Canada and Cambodia. Average global seizures of safrole rose almost fourfold between the 1989-2006 period (3,042 litres per year) and the 2007-2012 period (11,381 litres).

Piperonal was seized mainly in North America (accounting for 95 per cent of the total during the 2007-2012 period), followed by Europe. Global piperonal seizures amounted to, on average, 1.1 tons per year during the 2007-2012 period, down from 2.9 tons per year during the 1989-2006 period.

The "traditional" precursor of "ecstasy", 3,4-MDP-2-P, was seized mainly in North America (60 per cent during the 2007-2012 period) and in Oceania (35 per cent) and, to a lesser extent, in East and South-East Asia and Europe. The largest seizures were reported by Canada (60 per cent) and Australia (35 per cent). Global 3,4-MDP-2-P seizures amounted to, on average, 919 litres per year during the 2007-2012 period, down from 5,278 litres per year during the 1989-2006 period. China was often identified to be the most common source of this substance, although improved controls by that country have helped to reduce its availability. Given the shortage of illegal 3,4-MDP-2-P, there are indications, according to the Board, that India may be emerging as a new source.[115]

G. EFFECT OF PRECURSOR CONTROL ON THE SUPPLY OF ILLICIT DRUGS

The most obvious measure of the success of the precursor control system is the number of shipments that are stopped and the number of seizures made. There are, however, additional ways of measuring the effectiveness of precursor control, some of which are set out below.

1. Interception rates of diverted chemicals

Two figures are needed to estimate the interception rates of diverted chemicals: the amount seized and the amount required for the clandestine manufacture of the respective end product. The estimated amount of the chemicals required plus the amount seized gives an estimate of the total amount diverted. Expressing the seizures as a proportion of such diversions gives the interception rate.

Given the strong yearly fluctuations in seizures, the following calculations cover a longer period (2007-2012) and have been made for two substances: potassium permanganate and acetic anhydride. They reveal average interception rates of about 15 per cent of the chemicals diverted.

(a) Key chemical used in the manufacture of cocaine: potassium permanganate

Average annual global cocaine manufacture was an estimated 966 tons (range: 835-1,097 tons) over the period 2007-2012[116]. On average, some 385 tons of potassium permanganate (range: 167-603 tons) per year were required for such cocaine manufacture over this period. When seizures are included, this suggests that, on average, some 450 tons (range: 232-668 tons) of potassium permanganate were diverted from licit channels during the period 2007-2012, which gives a global interception rate of diverted potassium permanganate of about 15 per cent (range: 10-28 per cent) for the period 2007-2012[117] (see table 3).

This is a rather high interception rate, given the small proportion of diverted potassium permanganate as compared with the global international trade in the substance (2 per cent of global exports of potassium permanganate were diverted during the period 2007-2012) (range: 1-3 per cent; see table 4).

Global cocaine manufacture declined by about a quarter over the period 2007-2012 (range: 23-30 per cent),[118]

Table 3. Global interception rate of potassium permanganate for the period 2007-2012

	Minimum	Maximum	Midpoint
Average annual global cocaine manufacture, 2007-2012 (tons)	835	1,097	966
Amount of potassium permanganate needed for the manufacture of 100 kg of cocaine	20	55	-
Average annual amount of potassium permanganate required for illicit cocaine production (tons)	167	603	385
Average annual seizures of potassium permanganate (tons)	65	65	65
Average annual amounts diverted (tons)	232	668	450
Average annual interception rate (per cent)[a]	**10**	**28**	**15**

Source: UNODC estimates based on *World Drug Report* data.

[a] *Minimum: 65 tons/668 tons = 10 per cent; maximum: 65 tons/232 tons = 28 per cent.*

115 International Narcotics Control Board, *Precursors Report*, 2013, para. 75.

116 Global cocaine manufacture estimates amounted to between 1,024 and 1,064 tons for 2007, 865-1,122 tons for 2008, 842-1,110 tons for 2009, 788-1,060 tons for 2010, 776-1,051 tons for 2011 and 714-973 tons for 2012 (*World Drug Report* data).

117 Estimates by the International Narcotics Control Board arrived at an interception rate of between 12 and 25 per cent for the period 2007-2011 (International Narcotics Control Board, *Precursors Report*, 2012, para. 98).

118 *World Drug Report* data.

Table 4. Diversion as a proportion of international trade in potassium permanganate, 2007-2012

	Minimum	Maximum	Mid-point
Average annual amounts of potassium permanganate diverted (tons)	232	668	450
Global average annual exports of potassium permanganate (tons)	22,186	22,186	22,186
Global average annual imports of potassium permanganate (tons)	17,233	17,233	17,233
Global average annual international trade (maximum export/import) (tons)	22,186	22,186	22,186
Diversion as a proportion of international trade (per cent)	**1.0**	**3.0**	**2.0**

Source: UNODC estimates based on data from the International Narcotics Control Board, *World Drug Report* and UN COMTRADE.

Table 5. Global acetic anhydride interception rate, 2007-2012

	Minimum	Maximum	Midpoint
Average annual global heroin manufacture, 2007-2012 (tons)	479	479	479
Amount of acetic anhydride needed for the manufacture of 100 kg of heroin (litres)	100	250	134
Average annual amounts of acetic anhydride required for the manufacture of heroin (litres)	479,000	1,197,500	641,860
Average acetic anhydride seizures, 2007-2012 (litres)	97,000	131,000	114,000
Average annual amounts diverted for the manufacture of heroin (litres)	576,000	1,328,500	755,860
Average annual interception rate (per cent)[a]	**7**	**22**	**15**

Source: UNODC estimates based on International Narcotics Control Board and *World Drug Report* data.

[a] *Minimum: 97,000/(1,197,500+97,000) = 7 per cent; maximum: 131,000/(479,000+131,000) = 22 per cent.*

which suggests that diversions of potassium permanganate may have declined by similar proportions. Falling seizures of potassium permanganate over that period may also indicate a reduction in diversion attempts.

(b) Key chemical used in the manufacture of heroin: acetic anhydride

Global heroin manufacture was estimated at about 479 tons per year[119] during the period 2007-2012, resulting in requirements for some 642,000 litres (range: 479,000-1,197,500 litres) of acetic anhydride per year for the manufacture of heroin.[120] Including seizures,[121] some 756,000 litres were diverted annually (range: 576,000-1,328,500) for use in the clandestine manufacture of heroin. That results in a global interception rate of about 15 per cent for acetic anhydride diverted for the manufacture of heroin[122] (range: 7-22 per cent) (see table 5).

This can be considered a rather high interception rate, given the extremely small proportion of acetic anhydride that is actually diverted as compared with the global international trade in the substance (0.2 per cent of global imports of acetic anhydride during the period 2007-2012 (range: 0.14 per cent-0.33 per cent) (see table 6)).

2. Reduction in drug availability

The present section focuses on the extent to which precursor control results in a reduction in the availability of drugs. A reduction in the availability of drugs may be brought about by seizing drugs or reducing the availability of the raw materials used in their manufacture. It must be pointed out, however, that the seizure of precursor chemicals is only one of the strategies used to reduce the illicit supply of precursors. The prime objectives of precursor control are preventing precursor chemicals from being diverted to

119 The estimate of 479 tons has been calculated as the average of annual heroin manufacture estimates, which are derived from annual opium production (686 tons of heroin in 2007, 600 tons in 2008, 427 tons in 2009, 383 tons in 2010, 467 tons in 2011 and 311 tons in 2012). While the annual heroin figures derived from opium production estimates may be incorrect for individual years as a result of the accumulation or depletion of opium stocks in such years, over a longer period of time such changes in stocks, in general, do not play much of a role. This suggests that the 2007-2012 average may be a good estimate for actual average annual heroin manufacture during that period.

120 According to International Narcotics Control Board data, between 1 and 2.5 litres of acetic anhydride are required for the manufacture of 1 kg of heroin (midpoint estimate of 1.75 litres). However, the bulk of the world's heroin is manufactured in Afghanistan and, according to UNODC studies, the amounts of acetic anhydride used in Afghanistan typically range from 1 to 1.5 litres for a kilogram of heroin (midpoint 1.25 litres). Afghanistan accounted for 83 per cent of the world's total opium production during the period 2007-2012. This gives a best estimate of about 1.34 litres of acetic anhydride per kilogram of heroin at the global level. The best estimate thus suggests that the heroin manufactured required some 642,000 litres of acetic anhydride. UNODC estimates are based on International Narcotics Control Board and *World Drug Report* data.

121 Not all seizures of acetic anhydride have been related to the manufacture of heroin. Acetic anhydride is also used in the conversion of phenylacetic acid to P-2-P, which is of particular importance in North America, where those precursors are then used to manufacture methamphetamine. The subsequent calculation of seizures of acetic anhydride was thus based on two scenarios: (a) all acetic anhydride seized was intended for use in the manufacture of heroin (seizures of 131,000 litres); and (b) all acetic anhydride seized in North America was for use in the manufacture of methamphetamine (remaining acetic anhydride seizures: 97,000 litres). The actual figure is most likely somewhere in between the two.

122 According to International Narcotics Control Board estimates, less than 17 per cent of globally diverted acetic anhydride was seized each year during the period 2007-2011 (International Narcotics Control Board, *Precursors Report*, 2012, para. 106).

Table 6. Estimated diversion as a proportion of international trade in acetic anhydride, 2007-2012

	Minimum	Maximum	Midpoint
Average annual amounts of acetic anhydride diverted for the manufacture of heroin (litres)	576,000	1,328,500	755,860
Global average annual international trade (imports) (litres)	405,218,382	405,218,382	405,218,382
Diversion as a proportion of international trade (per cent)	**0.1**	**0.3**	**0.2**

Source: Based on UN COMTRADE data.

Table 7. Precursor seizures in end product equivalents versus end product seizures, based on averages for the period 2007-2012

Chemical substance/ precursor(s)	Amount of drugs that could have been manufactured, in end product equivalents (in tons)			Drugs	Amount of drugs seized (street purity) (in tons)	Ratio of precursor seizures to end product seizures (per cent)
	Minimum	Maximum	Midpoint			
Potassium permanganate	118.6	326.1	222.4	Cocaine	674.4	33
Acetic anhydride	52.28	130.6	97.4	Heroin and morphine	103.1	95
3,4-MDP-2-P, safrole, isosafrole, piperonal	6.8	9.0	7.9	MDMA ("ecstasy")	6.7	118
Ephedrine, pseudoephedrine, norephedrine, P-2-P, phenylacetic acid	163.1	226.1	194.6	Amphetamine and methamphetamine	81.9	238

Source: UNODC data from the annual reports questionnaire; and International Narcotics Control Board, *Precursors Report*, 2013.

illicit channels and identifying and dismantling clandestine laboratories. Thus, in quantitative terms, stopped shipments of suspicious chemicals are often more important than seizures of precursor chemicals. Nonetheless, seizures of precursor chemicals are quite significant when compared with seizures of end products.

(a) Seizures of precursor chemicals as compared with seizures of drugs

Another approach to assessing reductions in the availability of drugs is to compare seizures of precursor chemicals with seizures of drugs. This provides a comparison between the efforts, which target the end products, with precursor control efforts. Such an analysis for the period 2007-2012 reveals that seizures of potassium permanganate, expressed in terms of the amounts of cocaine that could have been produced with that chemical, were equivalent to about a third of actual cocaine seizures. The acetic anhydride seizures, expressed in terms of the amounts needed for heroin production, were almost equivalent to the total amounts of heroin and morphine seized. When converted into "ecstasy" equivalents, the total amount of "ecstasy" precursors seized over the period 2007-2012 exceeded actual "ecstasy" seizures by a fifth. When converted into amphetamine equivalents, total seizures of amphetamine and methamphetamine precursors were more than twice as high as actual seizures of amphetamine and methamphetamine (see table 7).

One of the explanations for the large amounts of amphetamine-type stimulant precursors seized could be that such precursors are often seized at the sites of clandestine laboratories. The amount of precursors often exceeds the end products found in those laboratories. An additional explanation is that the regions in which parts of the illegal production of amphetamine-type stimulants have traditionally taken place have invested heavily in precursor control in recent years. Moreover, much of the manufacture and consumption of amphetamines tends to be local or regional, while trade in or smuggling of precursor chemicals is often international and entails the crossing of borders. These aspects tend to facilitate the interception of precursors.

(b) Reductions in supply of drugs possibly linked to precursor control

Significant amounts of precursor chemicals have been intercepted in recent years. Taking precursors out of the market, however, may not be sufficient to yield a reduction in the supply of a drug. Nonetheless, in some cases, precursor control appears to have played a role in reducing the supply of drugs.

(i) Lysergic acid diethylamide

Lysergic acid diethylamide (LSD) was highly popular in several countries in the 1960s and the 1970s. However, consumption has declined in most parts of the world, including the main consumer markets, over the past two decades.

Data from England and Wales[123] showed a decline in LSD use among 16-24 year olds from 4.5 per cent in 1996 to

123 United Kingdom, Home Office, *Drug Misuse: Findings from the 2012 to 2013 Crime Survey for England and Wales* (London, 2013).

Table 8. Annual prevalence and perceived availability and risk of using LSD among twelfth-grade students in the United States, 1996-2013

Year	Annual prevalence	Perceived availability	Perceived risk of harm	
		"Fairly easy" or "very easy" to get LSD	Trying LSD once or twice constitutes a great danger	Using LSD regularly constitutes a great danger
1996	8.8	51.3	36.2	77.8
2013	2.2	24.5	34.9	66.8
Change (per cent)	-75	-52	-4	-14

Source: Lloyd D. Johnston and others, *Monitoring the Future National Survey Results on Drug Use: 1975-2013.*

0.4 per cent during the 2012-2013 period, a decline of 90 per cent. A number of surveys in other countries also showed strong declines in LSD use.[124]

Data on secondary school students in the United States[125] showed a decline of 75 per cent in the use of LSD during the period 1996-2013. That decline occurred alongside a strong decline in the reported availability of LSD in the country (reduction of 52 per cent during the period 1996-2013), which seems to have been the prevailing factor in explaining the decline in its use (see table 8).[126] Improved controls over LSD precursors seem to have contributed to the reduction in the availability of LSD. Expressed in constant dollars, global exports of the main LSD precursors (ergotamine, ergometrine and lysergic acid) declined by 78 per cent between 1996 and 2012, which reduced the potential for diversion of those chemicals.[127]

(ii) Methaqualone

There are indications that the misuse of methaqualone, a sedative-hypnotic drug that has similar effects to barbiturates, is less widespread than it used to be. Precursor control appears to have played a role in that reduction. Initially widely used in North America, often under the brand name Quaalude, and in Europe (notably in the United Kingdom) in the late 1960s and early 1970s, it was listed as a controlled substance in the 1971 Convention and was eventually withdrawn from many developed markets in the early 1980s. Though some clandestine laboratories in Mexico and other countries continued underground production in the 1980s, improved controls of *N*-acetylanthranilic acid and anthranilic acid appear to have halted those activities since the 1990s.

However, methaqualone use became increasingly concentrated in South Africa. In the 1980s and the early 1990s, methaqualone, known locally as Mandrax, was the second-most-used drug in the country (after cannabis). While it is still used in South Africa, there are indications that its usage has declined. In 2000, 33 per cent of all treatment related to psychoactive substances (excluding alcohol) in four South African towns was reported to have been related to Mandrax;[128] this proportion fell to 19 per cent by 2011.[129] The decline in methaqualone use around the world is also reflected in seizures: global seizures declined from a peak of 54 tons in 1994 to 11 tons in 2002 and 0.2 tons in 2012. India (47 per cent of total) and South Africa (45 per cent), followed by China (7 per cent), reported the largest seizures of methaqualone during the 2000-2012 period.[130] At the same time, global legal exports of the two main methaqualone precursors, *N*-acetylanthranilic acid and anthranilic acid, fell by some 70 per cent between 2002 and 2012.[131]

(iii) "Ecstasy"

The availability of MDMA ("ecstasy") has declined in recent years, which appears to have been largely a result of improved precursor control at the global level, notably in China.[132]

Reduced availability had an impact on "ecstasy" use. Declines in the use of "ecstasy" were reported from a number of countries in Europe, North America and Oceania in recent years. In England and Wales, a key "ecstasy" market in Europe, use of the drug declined from a peak of 6.8 per cent among 16-24 year olds during the 2001-2002 period to 2.9 per cent during the 2012-2013 period.[133]

124 Annual prevalence of LSD use among young adults (aged 15-34) fell in Ireland from 2.9 per cent in 1998 to 0.6 per cent during the period 2010-2011; in Latvia from 1 per cent in 2003 to 0.1 per cent in 2011; and in Hungary from 1.3 per cent in 2001 to 0.3 per cent in 2007 (European Monitoring Centre for Drugs and Drug Addiction, *Statistical Bulletin 2013* (Lisbon, 2013)).

125 See Lloyd D. Johnston and others, *Monitoring the Future National Survey Results on Drug Use: 1975-2013 – 2013 Overview: Key Findings on Adolescent Drug Use* (Ann Arbor, University of Michigan, 2014).

126 The correlation between annual prevalence and perceived availability of LSD turned out to be very strong during the 1996-2013 period, amounting to $r = 0.93$ (statistically significant at $\alpha = 0.01$). The decline in perceived availability was much sharper than the decline in the perceived risk of harm during that period (see table 8).

127 Data from UN COMTRADE.

128 Andreas Plüddemann and others, *Monitoring Alcohol and Drug Abuse Trends in South Africa, Proceedings of SACENDU Report Back Meetings: January-June 2002, Phase 12, October 2002* (Cape Town, South Africa, South African Community Epidemiology Network on Drug Use, 2002).

129 Siphokazi Dada and others, *Monitoring Alcohol and Drug Abuse Treatment Admissions in South Africa: August 2012, Phase 31, July to December 2011* (and previous years) (Cape Town, South Africa, South African Community Epidemiology Network on Drug Use, 2012).

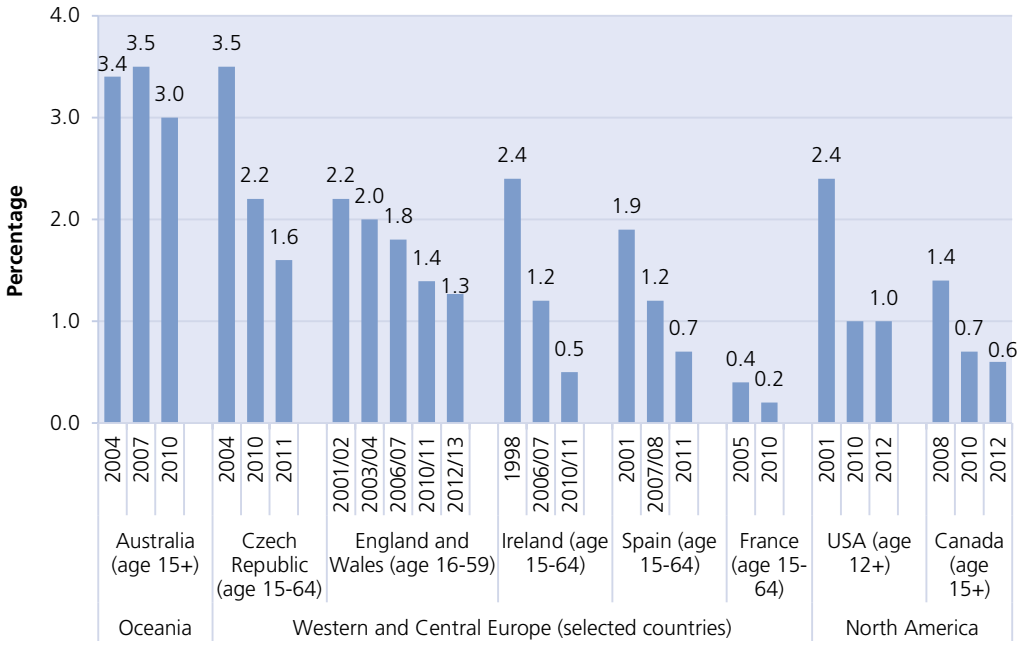
130 UNODC, data from the annual report questionnaires.

131 Data from UN COMTRADE.

132 International Narcotics Control Board, *Precursors Report*, 2013, para. 75.

133 *Drug Misuse: Findings from the 2012 to 2013 Crime Survey for England and Wales.*

Fig. 28. Trends in the annual prevalence of "ecstasy" use among the adult population in selected countries in Oceania, Europe and North America



Source: Australian Institute of Health and Welfare, *2010 National Drug Strategy Household Survey Report*, Drug Statistics Series No. 25 (Canberra, July 2011); United States, Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, *Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings*, NSDUH Series H-46, HHS Publication No. SMA 13-4795 (Rockville, Maryland, 2012); *Drug Misuse: Findings from the 2012 to 2013 Crime Survey for England and Wales*; and European Monitoring Centre for Drugs and Drug Addiction, *Statistical Bulletin 2013*.

Table 9. Annual prevalence and perceived availability of and risk of using "ecstasy" among twelfth-grade students in the United States, 2000-2013

Year	Annual prevalence	Perceived availability (per cent)	Perceived risk (per cent)
		"Fairly easy" or "very easy" to get "ecstasy"	Trying "ecstasy" once or twice constitutes a great danger
2000	3.6	51.4	37.9
2013	1.5	35.1	47.5
Change (per cent)	-58	-32	25

Source: Lloyd D. Johnston and others, *Monitoring the Future National Survey Results on Drug Use: 1975-2013*.

This was not an exception: most European countries reported declines over the past few years and overall "ecstasy" consumption in countries of the European Union and the European Free Trade Association appears to have fallen by almost half among those aged 15-34 in recent years, based on a comparison of the pooled results of recent surveys for the 2007-2012 period with surveys for the 1998-2006 period.[134] General population surveys also indicate declines in the use of "ecstasy" in Oceania, as well as a sharp decline (of more than 50 per cent) in North America in recent years (see figure 28).

Data from the ongoing United States study Monitoring the Future, undertaken by the Institute for Social Research at the University of Michigan, show that the annual prevalence rate of "ecstasy" use among students in the twelfth grade fell by 58 per cent between 2000 and 2013. That went hand in hand with a decline of about 32 per cent in the perceived availability of "ecstasy". While the number of those who considered that there was a great risk in taking "ecstasy" increased between 2000 and 2005, they declined thereafter, and the perceived availability of "ecstasy" on the market declined during the 2000-2013 period (see table 9).

There are also indications in other countries that the decline in the availability of MDMA has played a key role in the decline of "ecstasy" use. Overall exports of "ecstasy" precursors fell by 41 per cent between 1998 and 2012.[135] Average annual seizures of "ecstasy" precursors declined by

134 European Monitoring Centre for Drugs and Drug Addiction, *Statistical Bulletin 2013*.

135 Data from UN COMTRADE.

57 per cent during the 2007-2012 period compared with the 2000-2006 period. At the same time, average annual seizures of the end product, "ecstasy", fell by 39 per cent over the same period and by 70 per cent between 2007 and 2012. The proportion of MDMA found in substances sold as "ecstasy" also declined.[136] All those data suggest that improvements in the control of "ecstasy" precursors at the global level have played a key role in reducing the availability of MDMA, which, in turn, has been an important factor in the decline in "ecstasy" use.

(c) Price: the case of acetic anhydride

Another expected impact of precursor control should be a measurable increase in the prices paid by operators of clandestine laboratories, and hence in illicit production costs, as compared with the normal licit market prices. This is demonstrated in the case of acetic anhydride.

(i) Import and export prices

The average global export and import prices of acetic anhydride,[137] if traded in large quantities, amount to about $1 per litre, according to UN COMTRADE data. They did not change much during the period 2007-2012. Export prices in all major exporting countries fluctuate around that figure. Similarly, according to a market analysis by the International Narcotics Control Board, wholesale prices for acetic anhydride fluctuate around $1.50 per litre.[138]

Of 46 countries for which export prices could be established, 34 indicated an export price of less than $5 per litre over the 2007-2012 period. Higher export prices were reported by, inter alia, some countries along the Balkan route and countries along the "silk route". Similarly, import prices exceeding $5 per litre were reported in, inter alia, several countries along the Balkan route and along the "silk route", as well as countries in East and South-East Asia. It is not clear if the higher prices reflect different market dynamics or attempts by some intermediaries to purchase acetic anhydride for non-legal purposes.

(ii) Prices paid by operators of clandestine heroin laboratories

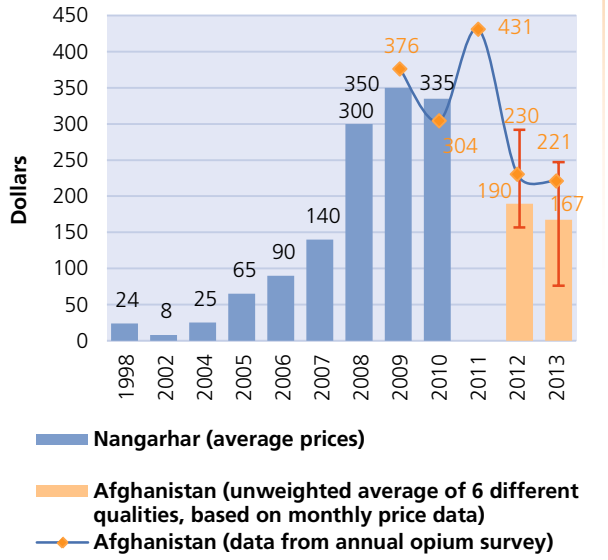
The prices paid by operators of clandestine laboratories, in general, tend to be far higher than those paid for acetic anhydride on the licit market. In Afghanistan, the world's largest opium-producing and heroin-manufacturing country, average prices for acetic anhydride during the 2008-2011 period were reported to have ranged from $300 to $430 per litre (see figure 29), clearly exceeding the price of about $1 charged by the main licit suppliers of the substance.

136 UNODC, *Global Smart Update 2012*, vol. 7, March 2012, p. 4.

137 The export prices are calculated by dividing the global value of exports of acetic anhydride by global exports of the substance in kilograms; import prices are calculated by dividing the global value of imports of acetic anhydride by global imports of the substance in kilograms.

138 International Narcotics Control Board, *Precursors Report*, 2013.

Fig. 29. Prices of acetic anhydride per litre in Afghanistan, in dollars, 1998-2013



Source: UNODC, *The Global Afghan Opium Trade: A Threat Assessment*; UNODC and Afghanistan, Ministry of Counter Narcotics, opium surveys; and Afghanistan drug price monitoring monthly reports.

(iii) Differences in prices depending on the source

Trafficking in acetic anhydride into Afghanistan emerged as a lucrative business as it had limited risks compared with drug trafficking even though traffickers are forced to take the more expensive option of smuggling acetic anhydride from countries where it has already been diverted. During the 2007-2010 period, the prices in Asia of acetic anhydride from illicit sources ranged from $4-$6 in the Republic of Korea, $12 in China and $60 in India to $200-$300 in Pakistan. In Europe, they were reported to have ranged from $25 in Slovakia and $100 in Bulgaria to $200-$225 in Turkey, all in 2010.[139]

Nonetheless, some traders have been making extraordinarily high profits. In a seizure case in 2008, an Afghan trafficker admitted procuring 12 tons of acetic anhydride from the Republic of Korea, for which $50,000 had been paid.[140] That equated to a purchase price of about $4 per litre, at a time when the average wholesale price of acetic anhydride in Nangarhar, Afghanistan, stood at about $300 per litre (see figure 29).

(iv) Differences in price linked to perceived quality

Prices also differ significantly according to perceived quality. In total, six different quality levels of acetic anhydride are regularly monitored in Afghanistan. The monthly price monitoring data for Afghanistan in 2013 showed a range from $76 per litre for quality "C" acetic anhydride in December 2013 to $247 per litre in July 2013 for quality

139 UNODC, *The Global Afghan Opium Trade*, p. 147.

140 Ibid., p. 114.

"A" acetic anhydride.[141] Differences in the price of acetic anhydride in Afghanistan often go hand in hand with differences in the perceptions of the origin of the substance.[142]

(v) Changes of price over time

In addition, prices change significantly over time. Average annual prices of a litre of acetic anhydride amounted to an average of $24 (range: $13-$34) in Afghanistan in 1998. Following the ban on opium production in 2001, heroin manufacture also declined, as did the demand for acetic anhydride. As a consequence, acetic anhydride prices fell to a low of $8 per litre in Nangarhar in 2002. Average annual prices in Afghanistan as a whole increased thereafter to more than $430 per litre by 2011, before decreasing in 2012 and 2013.

Price increases over the 2002-2011 period, notably between 2007 and 2011, may be linked to improvements in precursor control. One element at the international level may have been the rescheduling of acetic anhydride from Table II to Table I of the 1988 Convention in 2001, which resulted in tightened international control, owing to the increasing use of pre-export notifications. In addition, various international cooperation efforts, such as Project Cohesion, reduced the readiness of companies to provide significant quantities of acetic anhydride to unknown or suspicious customers. In 2008, the Afghan authorities officially prohibited all imports of acetic anhydride.[143] Precursor control efforts were also strengthened in Pakistan (which started seizing acetic anhydride 2008 onwards), the Islamic Republic of Iran and some other countries in the vicinity of Afghanistan.[144] In parallel, average annual seizures of acetic anhydride at the global level rose from 46,000 litres per year during the 2004-2007 period to 147,000 litres per year during the 2008-2010 period, and then to 198,000 litres in 2011, thus contributing to a shortage on the Afghan market.

In 2012, however, global seizures of acetic anhydride fell by more than half to about 89,000 litres. At the same time, acetic anhydride prices in Afghanistan fell from $431 per litre to $230 per litre, which suggests that the availability may have increased.

Some of the increases in the price of acetic anhydride between 2002 and 2011 may also have been linked to the expansion of opium production in Afghanistan, and thus the higher demand for acetic anhydride to convert morphine into heroin. This relationship, however, is complex. Acetic anhydride prices in Afghanistan only partially followed the trends of opium production. In fact, the statistical correlation between Afghan opium production and acetic anhydride prices in Afghanistan during the 2002-2013 period is weak (r = 0.17), and not statistically significant.

In 2011, opium production, as well as seizures of heroin and morphine, increased sharply. The increase may have reflected an underlying growth in Afghan opiate manufacture, resulting in greater demand for acetic anhydride, which may explain the further price rise of that substance in 2011.

The situation changed again in 2012, when both opium production and heroin seizures fell in Afghanistan. The apparent decline in Afghan heroin manufacture seems to have prompted a decline in the demand for acetic anhydride. At the same time, the sharp decline in global seizures of acetic anhydride in 2012 may have eased the previous shortage of the chemical. In parallel, a worsening security situation facilitated the smuggling of acetic anhydride into the country. All of this contributed to a reduction of the risk premium and, thus, to lower acetic anhydride prices in 2012. The trend also continued in 2013, leading the International Narcotics Control Board to express fear that the supply of acetic anhydride may be rising again in Afghanistan.[145]

(vi) Importance of the illicit acetic anhydride market in Afghanistan

Based on data contained in the UNODC study *The Opium Economy in Afghanistan: An International Problem*,[146] the overall size of the acetic anhydride market may have been about $5 million in 2002. The market increased drastically over the next few years. By 2009, the total amount of acetic anhydride smuggled into Afghanistan was estimated at between 380 and 570 tons (midpoint estimate: 475 tons). Prices typically ranged between $250 and $450 per litre at the time, which resulted in a market value of between $130 and $200 million in 2009 (midpoint estimate: $165 million).[147]

Based on data reported in UNODC, *Afghanistan: Opium Survey 2013*,[148] demand for acetic anhydride may have amounted to between 525 and 735 tons in 2013 (midpoint estimate: 630 tons). As a result of falling prices, the overall acetic anhydride market in Afghanistan appears to have fallen to between $116 and $162 million (midpoint estimate: $140 million). That compares with a total (farm-gate) value of Afghan opium production of about $950 million in 2013, equivalent to about 0.7 per cent of Afghan GDP.[149]

141 UNODC and Afghanistan, Ministry of Counter Narcotics, Afghanistan drug price monitoring monthly reports.

142 UNODC, *The Global Afghan Opium Trade*, p. 147.

143 United States Department of State, Bureau of International Narcotics and Law Enforcement Affairs, *International Narcotics Control Strategy Report*, vol. 1, *Drug and Chemical Control* (March 2009).

144 International Narcotics Control Board, *Precursors Report*, 2011.

145 International Narcotics Control Board, *Precursors Report*, 2013, para. 112.

146 UNODC, *The Opium Economy in Afghanistan: An International Problem* (New York 2003).

147 UNODC, *The Global Afghan Opium Trade*, p. 146.

148 UNODC and Ministry of Counter Narcotics of Afghanistan (December 2013).

149 In 2013, the UNODC annual opium survey estimated heroin manufacture in Afghanistan at between 350 and 490 tons, which would

(vii) Acetic anhydride as a cost factor in heroin manufacture

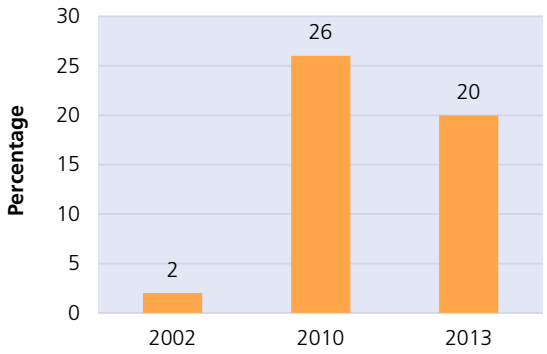
The high prices of acetic anhydride in Afghanistan during the 2008-2011 period, which ranged from $300-$430 per litre, became an important cost factor for Afghan heroin manufacturers.

An estimate of heroin manufacture costs in Afghanistan revealed that acetic anhydride accounted for a mere 2 per cent of the total in 2002.[150] In contrast, an estimate in May 2010[151] found overall production costs of about $1,600 per kilogram of brown heroin (up from less than $600 in 1998[152]). The bulk of the cost came from opium (73 per cent) and acetic anhydride (26 per cent). Other chemicals such as activated carbon (charcoal), ammonium chloride, calcium oxide, hydrochloride acid, acetone and concentrated ammonia solutions accounted for just 1 per cent of the total cost.

The increase could have been even larger, but clandestine laboratory operators seem to have reacted to the rising prices of acetic anhydride by minimizing its use to about 1 litre per kilogram of heroin, often compromising on the quality of the heroin manufactured. While typical purity for Afghan heroin destined for overseas export had remained at about 70 per cent (range: 50-80 per cent)[153] for years, data sent to UNODC by the Special Testing and Research Laboratory of the Drug Enforcement Administration of the United States showed that the average purity of heroin samples seized across Afghanistan had fallen to 37 per cent in 2007 and 32 per cent in 2008.[154] The forensic laboratory of the Counter Narcotics Police of Afghanistan confirmed that many heroin samples continued to have a low level of purity in the first six months of 2011.[155]

In 2011, the cost of acetic anhydride as a proportion of total heroin manufacture costs appeared to have remained at the same level as in 2010 (about 26 per cent), before declining in 2012 and 2013 as a result of falling acetic anhydride prices. Based on data reported in UNODC, *Afghanistan: Opium Survey 2013*, and based on the use of 1.5 litres of acetic anhydride per kilogram of heroin, the proportion of acetic anhydride in the overall production costs for heroin ($1,500-$1,600 per kilogram) declined to some 20 per cent of total manufacture costs by 2013. That is, however, still 10 times higher than in 2002 (see figure 30).

Fig. 30. Estimated proportions of acetic anhydride in total heroin manufacture costs in Afghanistan, 2002-2013



Source: Estimates based on *The Opium Economy in Afghanistan: An International Problem; The Global Afghan Opium Trade: A Threat Assessment*; and *Afghanistan: Opium Survey 2013*.

H. REACTIONS OF CLANDESTINE OPERATORS FACING STRONGER PRECURSOR CONTROLS

Improved precursor controls at the global level have prompted clandestine operators of illegal laboratories to develop a number of counterstrategies, including the use of more sophisticated ways to obtain precursor chemicals, and substitute them with non-controlled "pre-precursors" to manufacture the needed precursors, as well as the development of new psychoactive substances to which the current controls do not apply. While all of these counterstrategies constitute a challenge for the ongoing development of precursor control at the national, regional and international levels, they are at the same time an indication that precursor control is having an impact.

1. More sophisticated ways to obtain precursor chemicals

(a) Creation of specialized groups to obtain precursor chemicals

One of the strategies of operators of clandestine laboratories has been to hire specialists to organize the purchase of precursor chemicals. Such specialists are well aware of the actual status of the implementation of the 1988 Convention by various Governments. Moreover, they tend to be well connected and often can guarantee the supply of the chemicals. In general, chemical trafficking organizations have become increasingly resourceful, organized and adaptable in order to circumvent the growing number of control measures.[156]

have resulted in a demand for acetic anhydride of between 525,000 and 735,000 litres. Given an average price of $221 per litre according to this report, the acetic anhydride market in Afghanistan can be estimated to have ranged from $116 to $162 million in 2013. (Estimates based on data from UNODC, *Afghanistan: Opium Survey 2013*.)

150 UNODC, *The Opium Economy in Afghanistan*, p. 139.

151 UNODC, *The Global Afghan Opium Trade*, p. 151

152 UNODC, *The Opium Economy in Afghanistan*, p. 136.

153 UNODC, *World Drug Report 2010*, p. 138.

154 In total, 41 heroin samples were analysed in 2008 and 40 samples in 2007. In 2007, the tested heroin samples had a purity ranging from less than 1 per cent to 86 per cent; in 2008 the purities ranged from less than 1 per cent to 91 per cent. Data suggested that the purity of heroin was low in the south of Afghanistan. In contrast, high purity levels were reported in Kabul in both 2007 and 2008 and heroin purity levels were also quite high in the north in 2007 and in the east in 2008.

155 UNODC and Afghanistan, Forensic Laboratory of the Counter Narcotics Police of Afghanistan, "Laboratory Information Bulletin" (LIB/1/2011), p. 2.

156 International Narcotics Control Board, *Precursors Report*, 2011, para. 158.

(b) Creation of front companies

Investigations made in El Salvador and Guatemala revealed the set-up of front companies or the use of existing companies operating in industries in which there is a well-established licit demand for the required chemicals. While the competent national authorities are, in general, well aware of the kind of business in which the controlled chemicals are used, it is far more difficult for them to identify actual requirements, as it is often possible to substitute one chemical for another. Unless regularly monitored, or if no inside information from competitors or employees is provided, such diversions of chemicals from licit front companies can remain undetected for many years. Nonetheless, the authorities in a number of countries have been successful in dismantling at least some such companies.[157]

(c) Identification of weak links in the international control system

Another strategy has been to identify weak links in the international control system and to use them as sources for the purchase of precursor chemicals. While practically all countries have signed and ratified the 1988 Convention (187 out of 193 United Nations Member States), there are still a number of countries that have not invoked article 12, paragraph 10 (a), of that Convention and do not require pre-export notifications.

This applies to a number of countries in Africa, as well as some countries in Central America, Western and Central Asia, South-East Asia and Oceania. Those countries are particularly vulnerable to being targeted as transit countries by precursor trafficking organizations.

The same applies to countries that have yet to register with the PEN Online system — mostly countries in Africa — and to countries that do not participate in PICS — again mostly African countries, as well as some countries in South America, the Near and Middle East, Central Asia, South-East Asia and Europe. In fact, the International Narcotics Control Board has in recent years identified a number of shipments of controlled chemicals that transited such countries in Africa, Central America, South America, the Near and Middle East, Central Asia, South-East Asia and the Balkan region.

A special case is Taiwan Province of China, which has a highly sophisticated chemical industry, including for the manufacture of several precursor chemicals; however, owing to its status, it does not participate in international precursor control efforts such as issuing pre-export notifications, participating in PICS and providing relevant information on seizures and suspicious shipments to the International Narcotics Control Board. According to the United States Department of State, in 2011 Taiwan Province of China was the third largest importer of ephedrine and the third largest exporter of pseudoephedrine worldwide.[158] It also trades in a number of other substances under international control, including acetic anhydride. Methamphetamine laboratories have been detected by the authorities. Significant seizures of precursors in recent years have been made by the local authorities.[159] Even though they may act in good faith, the mere fact that significant quantities of such substances are traded outside the international precursor control system constitutes an inherent risk that such trade flows may be diverted. The Board thus stressed in its latest report that "the current situation represents a significant weakness in the international control system."[160]

(d) Identification of weaknesses at the national level (diversion from domestic sources)

Given the ongoing improvements in the control of the international trade in precursor chemicals, another strategy has been to identify weaknesses at the national level in individual countries. Organized criminal groups targeting precursor chemicals often do not wait until the chemicals enter the international market and thus become subject to tight monitoring. Instead, they divert the chemicals in the original manufacturing country, or in some subsequent transit country that has a legitimate demand for such chemicals. The chemicals are then smuggled out of that country to the final country of destination, thus bypassing the international control system developed for monitoring the international trade in such substances.

In this regard, the organizations trafficking precursor chemicals use methods similar to drug trafficking organizations. Their advantage, however, is that the customs and port authorities of most countries are not as well equipped to detect smuggled precursor chemicals as they are to detect smuggled drugs. Moreover, the penalties in most countries are less severe for trafficking of precursors than for drug trafficking, while profit margins can be very high.

(e) Use of the Internet

Another strategy has been to expand the supplier base by looking for new suppliers on the Internet. The specific problems related to the Internet addressed in chapter 1, in

157 In El Salvador and Guatemala, for instance, police investigated the operations of more than a dozen front companies, including companies involved in pesticides, clothes and furniture, that had been set up to smuggle precursor chemicals in large quantities from China into Central America in 2011 and 2012. The clandestine labs were apparently controlled by the Mexican Sinaloa cartel, and the final market for the methamphetamine was the United States. (Elyssa Pachico, "Investigations in El Salvador, Guatemala reveal thriving trade in precursor chemicals" (27 June 2012). Available from www.insightcrime.org.)

158 United States Department of State, Bureau for International Narcotics and Law Enforcement Affairs, *International Narcotics Control Strategy Report* (March 2013).

159 Food and Drug Administration, Ministry of Health and Welfare, Statistics Table for Seized Narcotics Drugs and Controlled Drugs in Taiwan. Available from www.fda.gov.tw/EN/download.aspx.

160 International Narcotics Control Board, *Precursors Report*, 2013, para. 33.

the box titled "the 'dark net' bitcoins and the increasing sophistication of online drug sales", apply to precursors as well.

2. Use of alternative precursors

(a) Pharmaceutical preparations

One way to circumvent the rules governing the international trade in bulk chemicals has been to focus on pharmaceutical preparations containing precursor chemicals.[161] Pharmaceutical preparations are largely excluded by the 1988 Convention, which states, in article 12, paragraph 14, "The provisions of this article shall not apply to pharmaceutical preparations, nor to other preparations containing substances in Table I or Table II that are compounded in such a way that such substances cannot be easily used or recovered by readily applicable means". The lack of controls has, in particular, affected pharmaceutical preparations containing ephedrine and pseudoephedrine. While such substances contained in nasal decongestants, bronchodilators and various cold medicines have positive properties for persons in need, they can be misused.

In this context, in the 2009 Political Declaration and Plan of Action, Member States were explicitly asked to prevent the diversion of such pharmaceutical preparations from domestic and international trade (Plan of Action, para. 41 (s)). In the light of continuing challenges, the Commission on Narcotic Drugs adopted resolution 54/8 in March 2011, in which Governments were encouraged to adopt regulatory frameworks to control the production, distribution and commercialization of pharmaceutical preparations containing ephedrine and pseudoephedrine, to utilize the PEN Online system and to apply similar control measures for such pharmaceutical preparations as for bulk precursor chemicals.

Global seizures of pharmaceutical preparations containing ephedrine or pseudoephedrine increased from negligible levels in the 1990s to 5.6 tons in 2006 and 36.1 tons in 2011 before falling again to 4.1 tons in 2012. The largest diversions of ephedrine and pseudoephedrine preparations over the period 2007-2012 were reported from North America (60 per cent) and East and South-East Asia (20 per cent), the two largest methamphetamine-producing regions, followed by the Oceania region (10 per cent), Europe (4 per cent), South Asia (4 per cent), and Central America and the Caribbean (2 per cent); smaller amounts were seized in South America and West Asia.[162] The number of Governments reporting seizures of pharmaceutical preparations containing such substances amounted to 37 over the period 2007-2012, including 18 reporting seizures of ephedrine preparations and 28 reporting seizures of pseudoephedrine preparations.[163] About 17 per cent of all ephedrine and pseudoephedrine seizures over that period were in the form of pharmaceutical preparations.

Awareness of such problems rose following a number of operations conducted under the auspices of Project Prism in recent years. While in Operation Crystal Flow, conducted in 2007, more than 90 per cent of the ephedrine and pseudoephedrine seizures were still related to bulk ephedrine and pseudoephedrine, that proportion fell to less than 75 per cent in Operation Ice Block in 2008 and to just a third in Operation Pila, conducted in 2009 and early 2010.[164]

Post-operational communications issued between April 2010 and August 2012 led to the seizure of 8.8 tons of ephedrine in bulk and more than 24 tons in the form of preparations, i.e. 73 per cent of the ephedrine and pseudoephedrine seized was in the form of pharmaceutical preparations,[165] clearly indicating the rapidly growing role of pharmaceutical preparations as inputs for the manufacture of methamphetamine. Before 2010, several of the stopped shipments of pseudoephedrine preparations went from South Asia and South-East Asia with the destination of Central America and Mexico, but the shipments to Mexico have declined following stricter controls in that country. [166]

(b) Use of substitute chemicals and "pre-precursors"

Another strategy of the operators of clandestine laboratories has been to shift from substances controlled under the 1988 Convention to non-controlled substitute chemicals and/or to non-controlled "pre-precursors". Instructions on the use of such chemicals are also available on the internet.

Examples of such substitute chemicals for the manufacture of amphetamine or methamphetamine are: APAAN, various esters of phenylacetate and P-2-P bisulfite adduct (see figure 31). An example for the manufacture of "ecstasy" is 3,4-MDP-2-P methyl glycidate, sometimes abbreviated as MMDMG or PMK-glycidate. Substances such as the bisulfite adduct of P-2-P and MMDMG are often also referred to as "masked" precursors, as their use helps criminals to conceal the normal form of precursors of amphetamine-type stimulants by packaging and smuggling them in a way that has heretofore been rather uncommon and thus difficult for law enforcement agencies to detect.

161 Over the years, the operators of clandestine laboratories have identified simple means for extracting pseudoephedrine from such preparations, e.g. by dissolving the tablets in isopropyl alcohol. (UNODC, *Patterns and Trends of Amphetamine-Type Stimulants and other Drugs: Asia and the Pacific*, 2011, p. 43.)

162 International Narcotics Control Board, *Precursors Report*, 2013, annex VI.

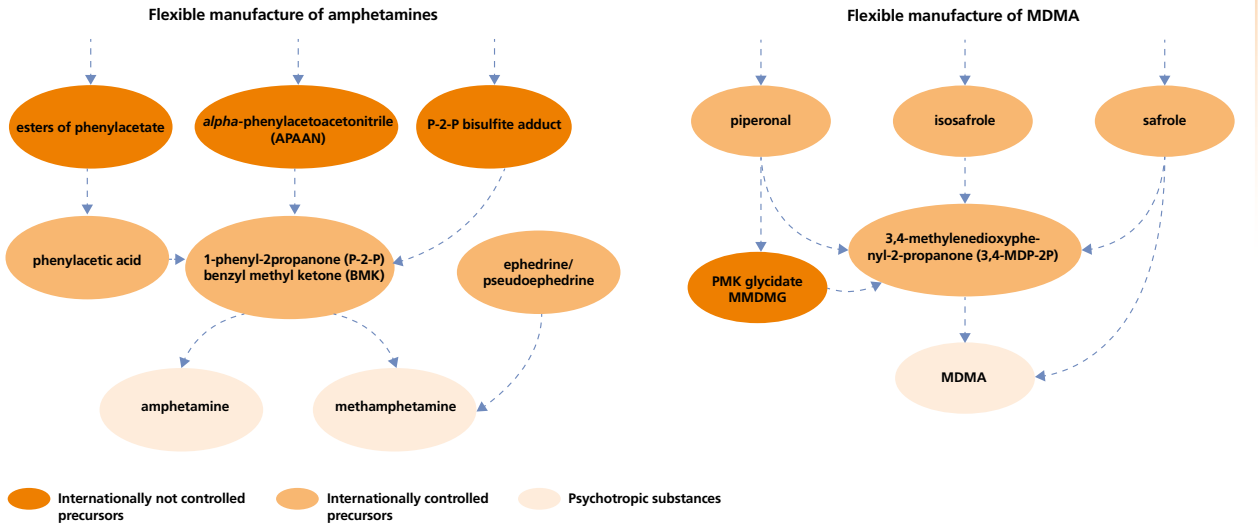
163 International Narcotics Control Board, *Precursors Reports*, 2012 and 2013.

164 International Narcotics Control Board, *Precursors Report*, 2012, figure XI.

165 Ibid., para. 35.

166 International Narcotics Control Board, *Precursors Report*, 2014 and previous years.

Fig. 31. Use of non-controlled substitute chemicals in the manufacture of amphetamine-type stimulants



Source: UNODC, *Global Smart Update*, vol. 7, March 2012, pp. 5-6.

Note: alpha-phenylacetoacetonitrile (APAAN) will be internationally controlled in 2015.

(i) *alpha*-Phenylacetoacetonitrile: a precursor for P-2-P

An example of the use of substitute chemicals has been the ever wider use of APAAN, until recently a non-controlled precursor that can be easily converted into P-2-P at a ratio of 1.4 to 1.[167] It emerged as a substitute chemical for P-2-P-based manufacture of methamphetamine in Asia and for P-2-P-based amphetamine laboratories in Europe, thus circumventing the improved controls over P-2-P.

APAAN was originally discovered in a large-scale methamphetamine manufacturing laboratory in Malaysia in 2006, and since 2009 has been seized in various European countries.[168] The International Narcotics Control Board reported that in 2011 three European countries seized APAAN totalling more than 3.5 tons, of which the bulk was seized in the Netherlands.[169] For 2012, six European countries reported seizures totalling 17.5 tons, with the largest seizures reported from Belgium, the Netherlands and Hungary. Seizures of P-2-P, in contrast, declined in Europe from some 5,500 litres in 2010 to 2,700 litres in 2011 and 800 litres in 2012,[170] possibly indicating a shift away from P-2-P towards APAAN.

Between April and October 2012, authorities in Belgium, Bulgaria, the Netherlands and Romania communicated 17 incidents involving 13.6 tons of APAAN, all of which originated in China. Over the period November 2012-November 2013, 29 incidents were communicated, affecting Austria, Belgium, Estonia, France, Germany, Latvia, Luxembourg and the Netherlands, with the latter country accounting for almost half of all incidents.[171] It appears that the final destination of the shipments was the Netherlands, while the shipments of APAAN typically originated in China.[172]

The misuse of APAAN, however, is not just a European problem. In 2012, Canada informed other countries of the seizure of two shipments of APAAN totalling 6.7 tons. The two shipments originated in China.[173]

The increased trafficking in APAAN has been attributed to its availability and low cost. As a consequence, the International Narcotics Control Board recommended to the Commission on Narcotic Drugs that APAAN be included in Table I of the 1988 Convention.[174]

(ii) Esters of phenylacetic acid and other non-scheduled precursors for the manufacture of amphetamines

Ethyl phenylacetate and methyl phenylacetate

Another example of the spread of non-controlled substances as precursor chemicals has been the use of various

167 International Narcotics Control Board, *Precursors Report*, 2013, para. 82.

168 UNODC, *Global Smart Update 2012*, vol. 7, March 2012, p. 5.

169 International Narcotics Control Board, *Precursors Report*, 2012, para. 88.

170 International Narcotics Control Board, *Precursors Report*, 2013, p. 80.

171 Ibid., para. 85.

172 Ibid., para. 84.

173 International Narcotics Control Board, *Precursors Report*, 2012 para. 89.

174 The Board sent an official communication to the UN Secretary-General to formally initiate procedures for the scheduling of APAAN in March 2013. The Secretary-General invited Member States to express their opinion. A total of 42 Governments responded to the questionnaire, which confirmed that there was practically no legitimate use of that substance for industry. On the basis of those responses, the Board submitted a recommendation to the Commission on Narcotic Drugs to include APAAN in Table I of the 1988 Convention, and the Commission approved that proposal in March 2014.

esters of phenylacetic acid.[175] While phenylacetic acid is a controlled substance under the 1988 Convention, this is not the case for its esters.[176] Examples of such trafficked esters are ethyl phenylacetate and methyl phenylacetate. Both can be easily converted into phenylacetic acid.

Significant amounts of such esters were seized as part of the International Narcotics Control Board's Operation Phenylacetic Acid and its Derivatives, launched in March 2011. It led to seizures of some 610 tons of derivatives of phenylacetic acid in ports, warehouses and laboratories in Latin America. Mexico alone seized 421 tons. The operation also led to important seizures in Belize, El Salvador, Guatemala and Nicaragua. Ethyl phenylacetate was the most commonly identified ester.[177] Mexico seized 369 tons and 177,000 litres of ethyl phenylacetate in 2011 and El Salvador seized 157 tons. In addition, Mexico seized 313,000 litres of methyl phenylacetate in 2011. Those were substantial amounts, exceeding seizures of other methamphetamine precursors.[178]

Though there have been declines in seizures since 2011, they remain significant. Authorities in Mexico, where ethyl phenylacetate has been under control since 2009, reported the seizure of 72 tons and 46,000 litres in 2012[179] and Guatemala reported the seizure of 16 tons in a warehouse in 2012. As in previous incidents, the chemical had originated in China. [180]

Despite extensive misuse of the esters of phenylacetic acid for the clandestine manufacture of methamphetamine, no attempts have been made to schedule them at the international level.

(iii) Phenylacetamide, benzylchloride, hypophosphorous acid, styrene, benzaldehyde and benzyl cyanide

Even if all of the esters of phenylacetic acid were controlled, there would still be a large number of substitute chemicals available. For instance, the Mexican authorities reported the seizure in 2011 of a variety of other non-scheduled chemicals used in the manufacture of methamphetamine, including phenylacetamide (300 tons), benzylchloride (77,000 litres) and small amounts of 2-phenylethanol. Earlier, the Mexican authorities had reported seizures of hypophosphorous acid (1,941 litres in 2009). Large amounts of that substance were also seized in Canada (9.8 tons). In 2012, the Australian authorities reported the seizure of 11 tons of hypophosphorous acid in New South Wales.[181]

In June 2012, the Mexican authorities dismantled a methamphetamine laboratory where styrene, an industrial starting material for the production of plastics (polystyrene), was used as a key precursor. In 2007, there was a report of some smaller seizures of styrene in Australia. [182]

In Europe and in Asia, Governments have reported seizures of a number of other non-scheduled pre-precursors for P-2-P in recent years, including benzaldehyde and benzyl cyanide. Larger amounts were seized in the Philippines (2,400 litres), while smaller amounts of benzaldehyde (less than 100 kg) were seized in 2012 in Estonia, Germany, Hungary, Poland and the Russian Federation. In 2012, attempts were also made to smuggle benzyl cyanide to Lebanon (520 litres), together with equipment for illicit amphetamine manufacture.[183]

(iv) Substitute chemicals for the manufacture of "ecstasy": 3,4-MDP-2-P methyl glycidate

Substitute chemicals have also emerged for the manufacture of MDMA ("ecstasy"), notably following the introduction of improved controls over 3,4-MDP-2-P by China. This led to a shortage of "ecstasy" precursors over the period 2007-2010. In the Netherlands, which is identified by many European countries as the source of "ecstasy", the content of MDMA in products sold as "ecstasy" fell from some 90 per cent over the 2000-2004 period to around 70 per cent in 2009 before recovering to 82 per cent in 2010 and 91 per cent in 2011.[184] Recent trends indicate a further recovery of the "ecstasy" market. This has been made possible by the increasing use of safrole-rich oils and the "discovery" of a number of non-controlled substitute chemicals. One such chemical is 3,4-MDP-2-P methyl glycidate, which can be easily converted into 3,4-MDP-2-P. It is frequently made out of piperonal (a controlled "ecstasy" precursor).[185]

3,4-MDP-2-P methyl glycidate was initially detected in Australia in 2004, following the seizure of a 44-gallon drum mislabelled as glycidyl methacrylate, which the authorities expected to be linked to MDMA production.[186] In 2010

175 UNODC, *Global Smart Update 2012*, vol. 7, March 2012, pp. 5-6.

176 Contrary to the substances controlled under Schedule I of the 1961 Convention, where esters are automatically under international control.

177 International Narcotics Control Board, *Precursors Report*, 2011, para. 90.

178 Average annual phenylacetic acid seizures at the global level amounted to some 217 tons per year over the period 2007-2012, seizures of ephedrine amounted to some 29 tons and seizures of pseudoephedrine to some 18 tons.

179 International Narcotics Control Board, *Precursors Report,* 2013 para. 91.

180 International Narcotics Control Board, *Precursors Report*, 2013 para. 70.

181 International Narcotics Control Board, *Precursors Report*, 2013, para. 93.

182 International Narcotics Control Board, *Precursors Report*, 2012, para. 92.

183 International Narcotics Control Board, *Precursors Report*, 2013, para. 92.

184 European Monitoring Centre for Drugs and Drug Addiction – Trimbos instituut, *Report by the Reitox National Focal Point The Netherlands Drug Situation 2012*, p. 154 (and previous years).

185 UNODC, *Global Smart Update*, vol. 7, March 2012, pp. 4-5.

186 M. Collins and others, "Methyl 3-[3′,4′-(methylenedioxy)phenyl]-2-methyl glycidate: an ecstasy precursor seized in Sydney, Australia", *Journal of Forensic Sciences*, vol. 52, No. 4 (July 2007), pp. 898-903.

the substance was found in the Netherlands,[187] together with instructions on how to convert it into "ecstasy". In total, the Netherlands authorities seized 1.2 tons of the substance in 2010, including 1 ton seized in an air-freight shipment from China that had been mislabelled. Subsequently, the substance also appeared in Slovakia, Belgium, Poland and Estonia[188] as well as in Denmark in a shipment that had originated in China and was destined for the Netherlands.[189] Over the period November 2012-November 2013, the Netherlands authorities reported the seizure of only 690 grams of 3,4-MDP-2-P methyl glycidate, intercepted at the Amsterdam airport in a package sent from China via a courier service to the Netherlands. The substance was mislabelled as methyl cellulose.[190]

(v) Methylamine: a universal precursor in the manufacture of amphetamine-type stimulants

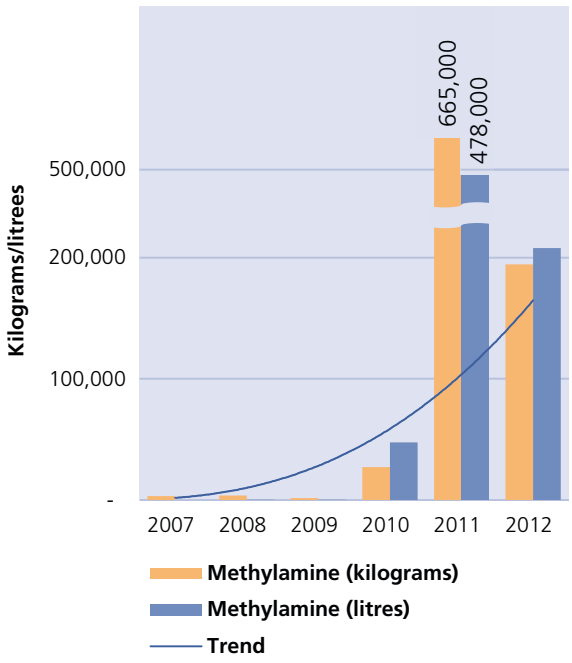
Methylamine is another non-scheduled chemical that has emerged in recent years in the clandestine manufacture of amphetamine-type stimulants. When combined with P-2-P, it can be used for the manufacture of methamphetamine or, if combined with 3,4-MDP-2-P, it can produce "ecstasy".

On the basis of seizure patterns, the largest amounts of this chemical appear to be currently used for the manufacture of methamphetamine. Seizures of methylamine have been reported in increasing numbers since 2004, primarily by countries in North America, though seizures have also been made in Oceania, Europe and East and South-East Asia.

Following years of seizures totalling a few hundred kilograms, the amounts seized rose to 665 tons and 478,000 litres in 2011 (see figure 32). Large-scale seizures also continued in 2012 (197 tons and 208,000 litres).[191] Though smaller than a year earlier, they still exceeded seizures of "traditional" precursors of amphetamine-type stimulants (less than 50 tons in 2012).[192]

The largest seizures of methylamine in recent years have been reported by Mexico, where this chemical has been controlled since November 2009. In 2010, Mexico reported seizures of 44.3 tons and 47,300 litres of methylamine and it accounted for more than 90 per cent of global seizures of this substance. The next largest seizures were reported by the Netherlands, followed by Canada and

Fig. 32. Global seizures of methylamine, 2007-2011



Source: International Narcotics Control Board, *Precursors Report*, 2012, figure III.

the United States. By mid-2011, Mexico had reported three seizures of methylamine at seaports, totalling more than 154,000 litres, originating in China.[193] Large seizures were also reported in some countries in Central America. El Salvador seized almost 69 tons in two shipments in June 2011, destined for Guatemala.[194] In 2011, Mexico accounted for 56 per cent of global seizures of methylamine, followed by the United States (38 per cent).[195] In 2012, seizures of methylamine took place again primarily in Mexico (197 tons and 150,000 litres), followed by Honduras (51,000 litres), the United States (6,929 litres) and Poland (403 litres).[196]

3. Production of new psychoactive substances

Another strategy to circumvent controls of precursor chemicals has been to opt for the manufacture of new psychoactive substances. As of end-2013, 348 such substances had been identified, exceeding the number of substances already under international control (234 in 2013). The categories of such substances most frequently identified have been, in order of frequency, synthetic

187 International Narcotics Control Board, *Precursors Report*, 2010, para. 62.

188 UNODC, *Global Smart Update*, Volume 7, March 2012, pp. 4-5.

189 International Narcotics Control Board, *Precursors Report*, 2011, para. 99.

190 International Narcotics Control Board, *Precursors Report*, 2013, para. 89.

191 Ibid., para. 90.

192 Global seizures in 2012: pseudoephedrine, 25 tons; ephedrine, 7 tons; P-2-P, 6,800 litres; phenylacetic acid, 2 tons; safrole, 2,000 litres; piperonal, 336 kg; 3,4-MDP-2-P, 228 litres; isosafrole, 10 litres (International Narcotics Control Board, *Precursors Report*, 2013, p. 81).

193 International Narcotics Control Board, *Precursors Report*, 2011, para. 95

194 International Narcotics Control Board, *Precursors Report*, 2011, para. 95.

195 International Narcotics Control Board, *Precursors Report*, 2012, para. 93.

196 International Narcotics Control Board, *Precursors Report*, 2013, para. 90.

cannabinoids, phenethylamines, synthetic cathinones, tryptamines, various plant-based substances, piperazines, phencyclidines and ketamine, as well as aminoindanes.[197]

Given the lack of a global control mechanism for new psychoactive substances, the chemicals needed to produce them are, in general, easy to obtain. This offers plenty of opportunities for operators of clandestine laboratories to acquire such chemicals and use them in the manufacture of new psychoactive substances. Nonetheless, for the time being, trafficking in these chemicals at the global level seems to be rather limited.

I. CONCLUDING REMARKS

The analysis of the precursor control sector highlights the substantial progress made over the past two decades, since the international community, in the 1988 Convention, adopted precursor control as one of its strategies to fight illegal drug production. While drug production has not been eliminated by the introduction of precursor control measures, there is sufficient evidence to show that precursor control has had an impact on the illicit manufacture of some drugs. Over the period 2007-2012, about 15 per cent of the diverted precursor chemicals acetic anhydride and potassium permanganate was seized. Reductions in LSD use and "ecstasy" use in recent years appear to have been linked, inter alia, to improved precursor controls.

The new strategies of operators of clandestine laboratories clearly highlight, at the same time, the challenges that precursor control will face in the future, as ever more new chemical substances emerge and are able to replace "traditional" precursor chemicals.

Some of the instruments for dealing with this problem are already in place. In line with the request contained in the Political Declaration adopted by the General Assembly at its twentieth special session, in 1998, and its related action plan on precursor chemicals, a limited international special surveillance list of substances not in Tables I and II of the 1988 Convention is regularly prepared and updated by the International Narcotics Control Board to help authorities to identify potential precursor shipments. The 1998 action plan on precursors also provided that Member States should apply monitoring measures, in cooperation with the chemical industry, to prevent the diversion of substances included on the special surveillance list, and Member States were asked to consider making the diversion of non-scheduled chemical substances a criminal offence. Moreover, in the 2009 Political Declaration and Plan of Action, Member States were invited to expand the use of pre-export notifications to include non-scheduled substances and pharmaceutical preparations. In the 2009 Plan of Action, Member States were also asked to increase efforts to prevent precursors from domestic channels from being smuggled across borders.

While all of these actions have been agreed on by Member States, they await implementation in a number of countries. The challenge is the effective and universal implementation of the international instruments.

At the same time, it is important to note that most precursor chemicals have a wide spectrum of legitimate uses. Any control system, whether local or international, must thus be aimed at effectively limiting the availability of such chemicals for operators of clandestine laboratories, while guaranteeing that licit manufacture of, trade in and use of such chemicals are not jeopardized.

197 UNODC, *World Drug Report 2013*, p. 71.