

Trade monitoring for nuclear and nuclear-related dual-use items



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Information Analysis for Nuclear Security

Biological Weapon Convention
Technology, Trade and Transparency – Lessons from other treaty regimes
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Outline

- How/why we started:
trade analysis & IAEA safeguards
- Web data services on global trade
- The HS trade nomenclature
- Examples of uses of HS trade data
- Discussion

Trade analysis and IAEA safeguards

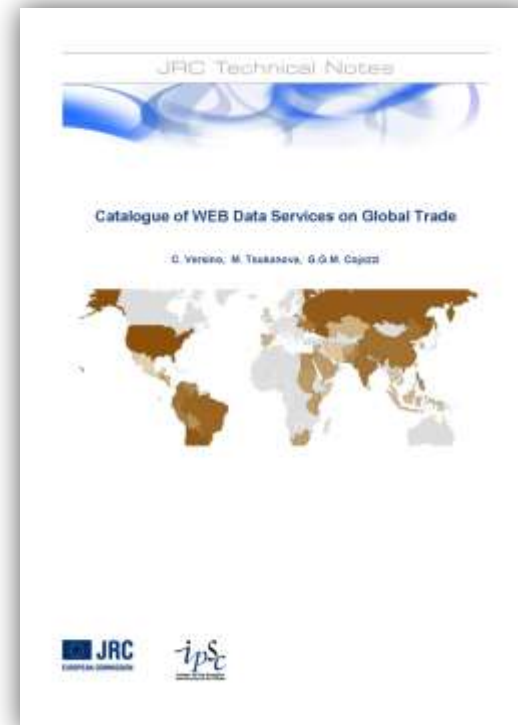
- 2007-now:
EC support task to IAEA.
- ‘Can open source data about the world trade support IAEA’s verification activities?’
- Exploratory activity on, e.g.:

Raw material, Additional Protocol Annex II items, dual-use equipment, source nuclear material.



Web data services on global trade

- **Data derived from exporters/importers declarations to customs.**
- Imports/exports records on:
 - What is traded (Harmonized System descriptor)
 - Value
 - Quantity
 - When
 - Exporting country / entity
 - Importing country / entity
 - ...



Web data services on global trade

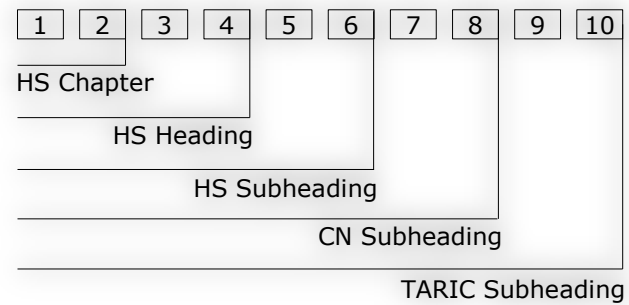
- *Source:*
State/ customs authorities.
- ***Nature of information:***
Official.
- ***Temporal coverage:***
More than 15 years.
- *Temporal granularity:*
By year, month, or shipment.
- *Continuity:*
Regular.
- ***Geographical coverage:***
All States in the world economy.
- *Information type:*
Structured by the HS.
- ***Reliability:***
Medium to low, depending on items' type, value, trade flow, publishing State.
- ***Accuracy:***
Medium to low, depending on items' type.

The trade nomenclature

- The **Harmonized System (HS)** is the **taxonomy of goods** by the World Customs Organization.

- Since trade data is indexed by the HS codes, to retrieve the data it is necessary to **map items of interest to the HS**.

- **The Big Table**





Some useful HS for the nuclear domain

HS Code	HS Description
2612.10.	Uranium ores and concentrates
2612.20.	Thorium ores and concentrates
2844.10.	Natural uranium and its compounds; alloys, dispersions, incl. cermets, ceramic products and mixtures containing natural uranium or natural uranium compound [Euratom]
2844.20.	Uranium enriched in U 235 and its compounds; plutonium and its compounds; alloys, dispersions, incl. cermets, ceramic products and mixtures containing uranium enriched in U 235, plutonium or compounds of these products [Euratom]
2844.30.	Uranium depleted in U 235 and its compounds; thorium and its compounds; alloys, dispersions, incl. cermets, ceramic products and mixtures containing uranium depleted in U 235, thorium or compounds of these products
2844.40.	Radioactive elements, isotopes and compounds, and alloys and dispersions, incl. cermets, ceramic products and mixtures, containing these elements, isotopes and compounds; radioactive residues (excl. natural uranium, uranium enriched and depleted in U 235; plutonium, thorium and compounds of these products)
2844.50.	Spent "irradiated" fuel elements "cartridges" of nuclear reactors [Euratom]
2845.10.	Heavy water "deuterium oxide" [Euratom]
2845.90.	Nonradioactive isotopes; inorganic or organic compounds of such isotopes, whether or not chemically defined (excl. heavy water "deuterium oxide")
8109.90.	Articles of zirconium, n.e.s.
8401.10.	Nuclear reactors [Euratom]
8401.20.	Machinery and apparatus for isotopic separation and parts thereof, n.e.s. [Euratom]
8401.30.	Fuel elements "cartridges", non-irradiated, in casing with handling fixtures, for nuclear reactors [Euratom]
8401.40.	Parts of nuclear reactors, n.e.s. [Euratom]

Example of use of trade data

- *Interest: Nuclear safeguards*

Trade of nuclear-grade graphite

- *Interest: Nuclear-related export controls*

- Trade of machine tools

- - Trade of pressure transducers

Trade of nuclear graphite

Test hypotheses of undeclared nuclear activities through outstanding imports of graphite-based products.

Why export-controlled:

- Moderator in nuclear reactors.

No specific HS descriptor for nuclear grade graphite.



Trade of nuclear graphite

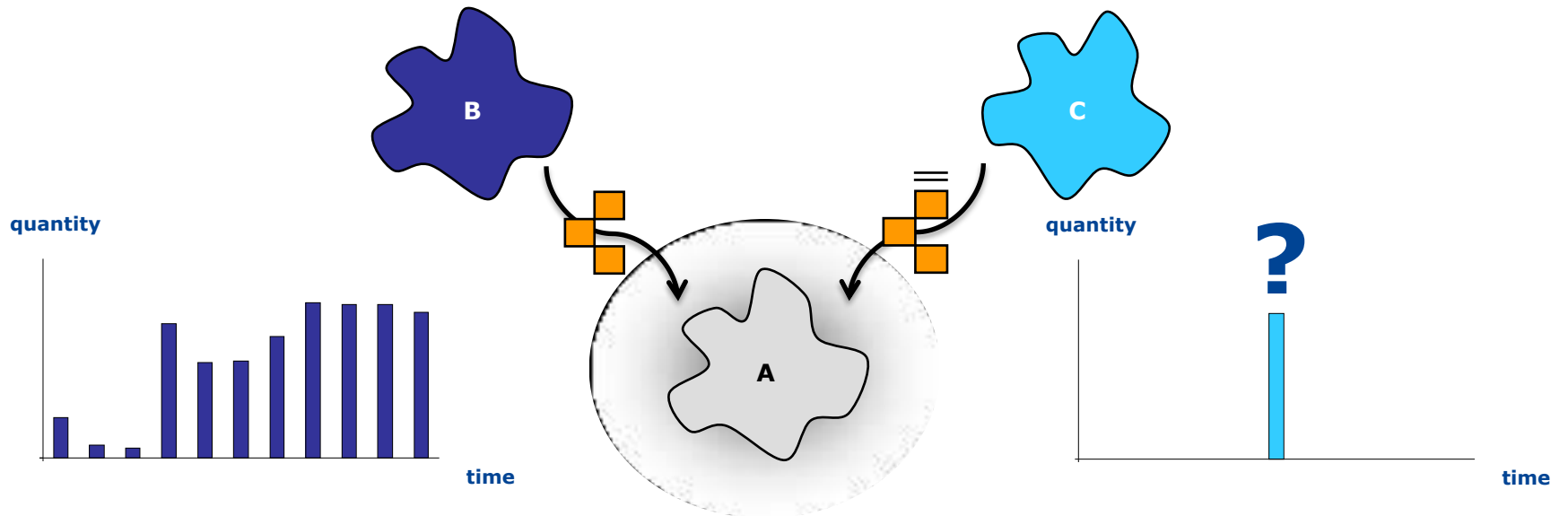
Non-nuclear uses:

- **Graphite electrodes.**
- Optical fiber manufacturing equipment.
- Electrical Discharge Machining (EDM) and EDM electrodes.
- Continuous casting.
- Hot press.
- ...

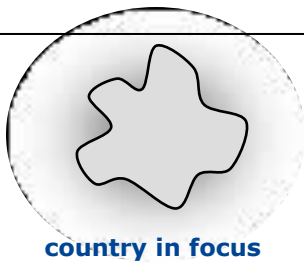


World exporters of graphite-based products above 1000 T in 2009

Trade of nuclear graphite



legend



Trade of machine tools

Milling, grinding, turning machines.

Why export-controlled:

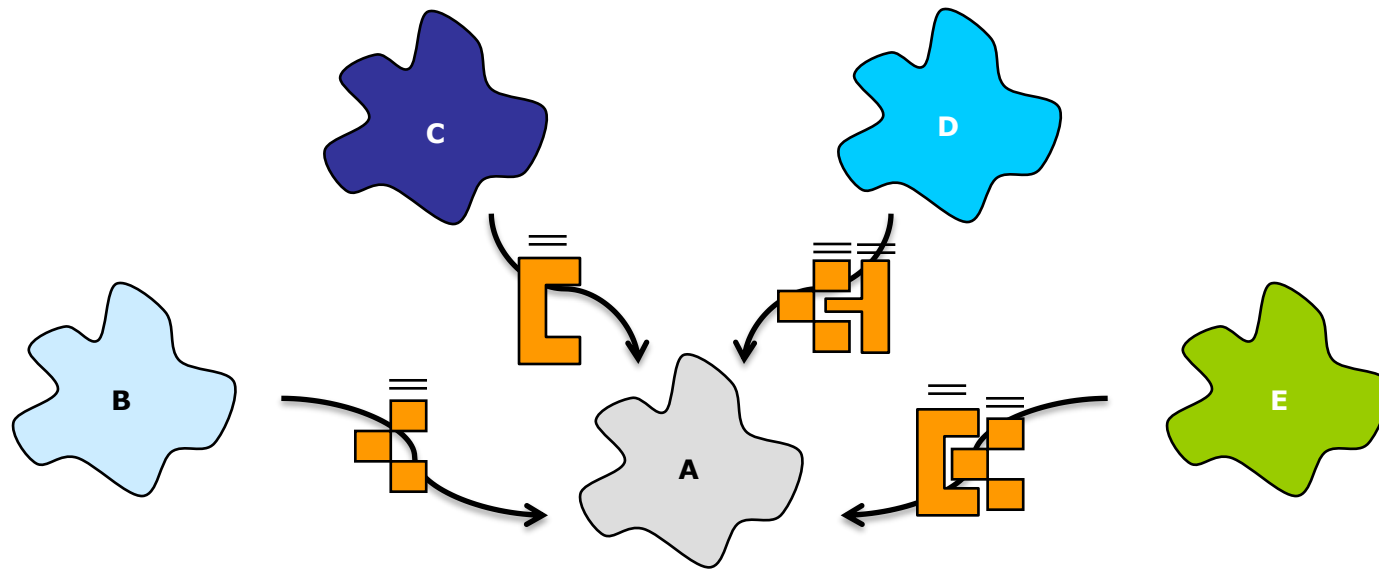
- Nuclear: fabrication of centrifuge parts.
- Non-nuclear: fabrication of missile components, ...
- HS descriptors for machine tools miss the technical parameters to distinguish the export-controlled ones.

Trade of machine tools

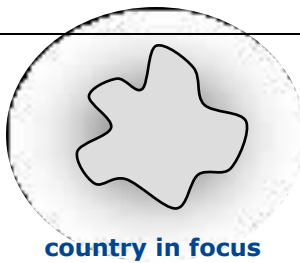
HS Code	Unit	HS Explanatory note	Value in United States Dollars				
			M	M+1	M+2	M+3	M+4
845710	USD	Machining Centers For Working Metal	0	1076148	0	0	0
845811	USD	Horizontal Lathes For Removng Met Numrcal Controld	870106	0	0	0	0
845931	USD	Boring-Milling Mach Remove Met Numerical Controlld	757020	1868760	0	0	0
845961	USD	Milling Mach N Knee Type Remov Met Numerical Contl	0	2815177	0	0	2737801

HS Code	Unit	HS Explanatory note	Quantity				
			M	M+1	M+2	M+3	M+4
845710	NO	Machining Centers For Working Metal	0	2	0	0	0
845811	NO	Horizontal Lathes For Removng Met Numrcal Controld	2	0	0	0	0
845931	NO	Boring-Milling Mach Remove Met Numerical Controlld	2	2	0	0	0
845961	NO	Milling Mach N Knee Type Remov Met Numerical Contl	0	1	0	0	1

Trade of machine tools



legend



Trade of pressure transducers

Why controlled:

- Measure pressure of UF₆ in gas centrifuges.

Non-nuclear uses:

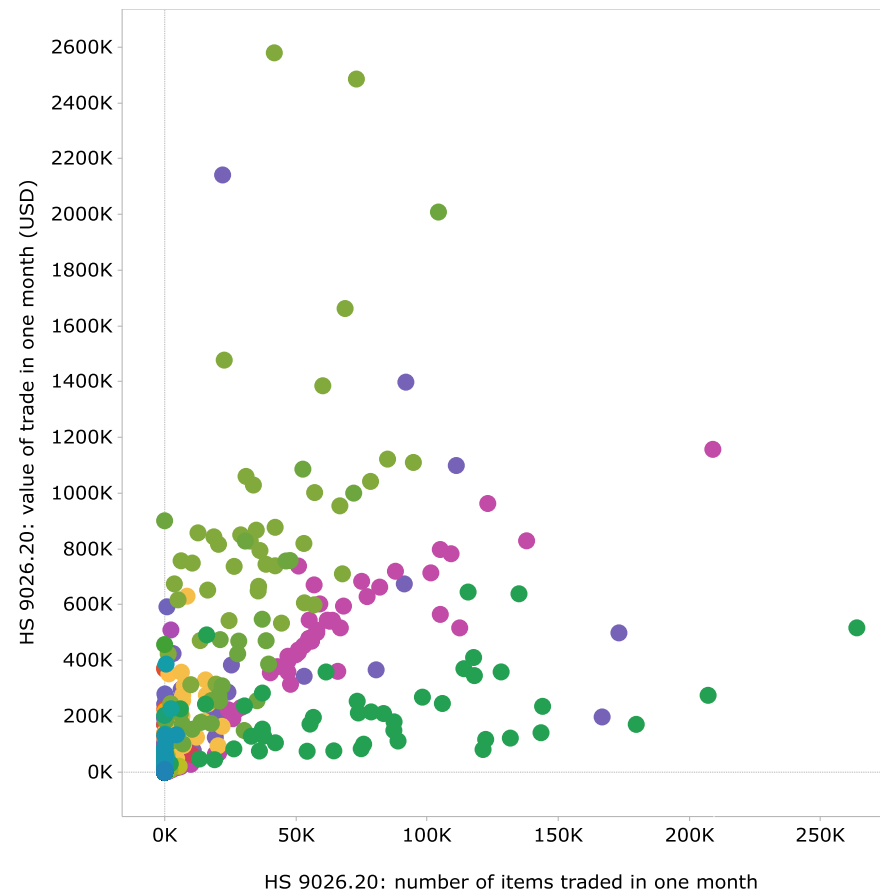
- Control of petrochemical processes, semiconductor manufacturing operations, ...
- HS descriptors for pressure transducers miss the technical parameters to distinguish the export-controlled ones.

Trade of pressure transducers

HS Code	HS Description
90	OPTICAL, PHOTOGRAPHIC, CINEMATOGRAPHIC, MEASURING, CHECKING, PRECISION, MEDICAL OR SURGICAL INSTRUMENTS AND APPARATUS; PARTS AND ACCESSORIES THEREOF
9026	Instruments and apparatus for measuring or checking the flow, level, pressure or other variables of liquids or gases, e.g. flow meters, level gauges, manometers, heat meters (excl. instruments and apparatus of heading 9014, 9015, 9028 or 9032)
9026.20	Instruments and apparatus for measuring or checking pressure of liquids or gases (excl. regulators).
9026.20.20.	Electronic instruments and apparatus for measuring or checking pressure of liquids or gases (excl. regulators)
9026.20.40.	Spiral or metal diaphragm type pressure gauges
9026.20.80.	Instruments and apparatus for measuring or checking pressure of liquids or gases, non-electronic (excl. spiral or metal diaphragm type pressure gauges, and regulators)

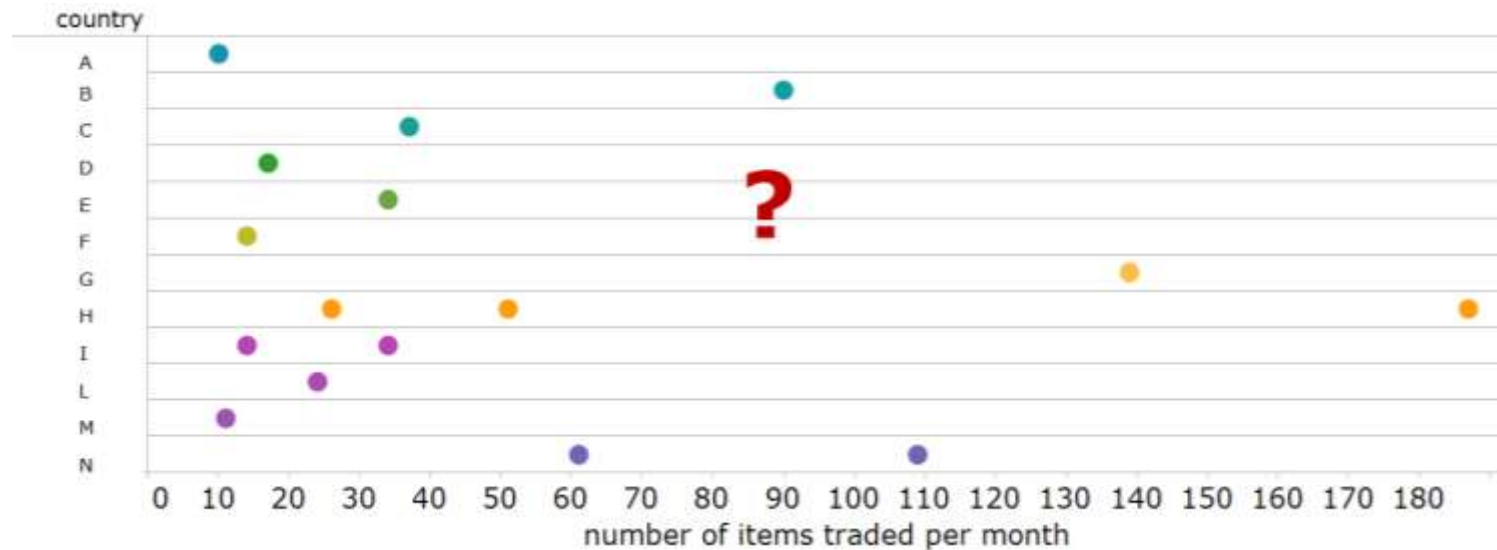
Trade of pressure transducers

- World exports on HS= 9026.20 to a specific destination.
- Quantity vs value plot.
- The coloring of dots represent different exporting countries.

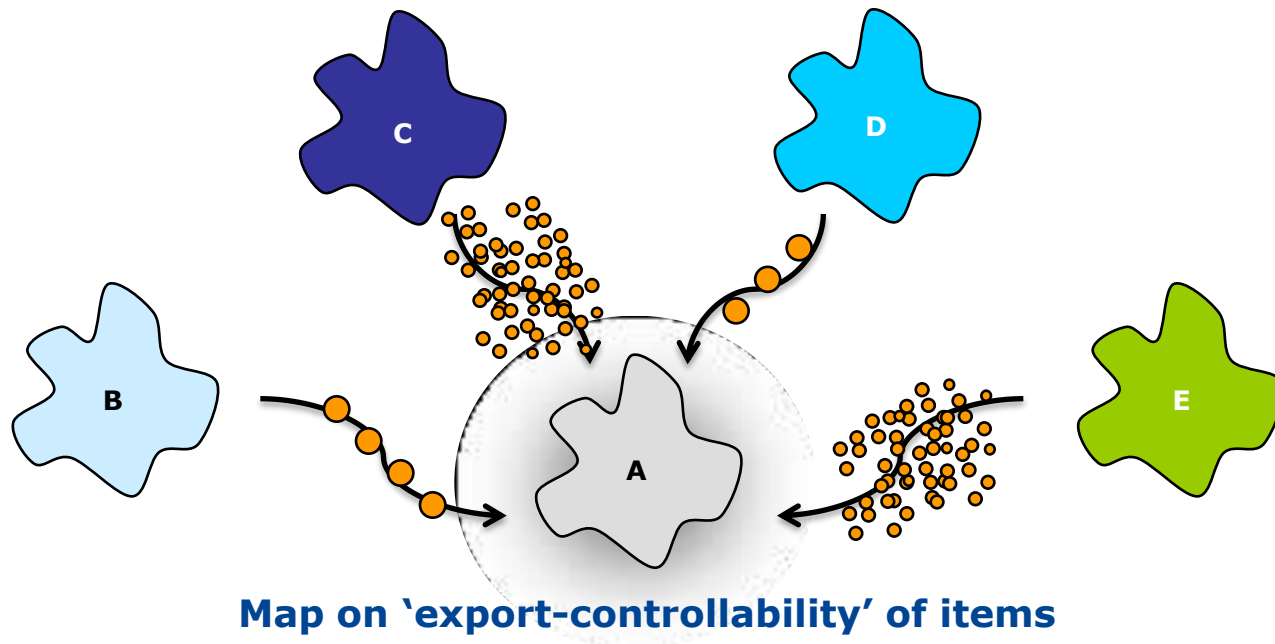


Trade of pressure transducers

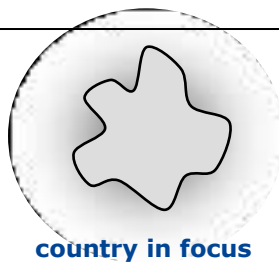
- World exports on HS= 9026.20 to a specific destination.
- Data filtered by:
trade unit value between 800 and 1200 USD & number of items >10.



Trade of pressure transducers



legend



trade flow



commodity with a
low unit value



commodity matching
a target unit value

Discussion

- Trade is **additive** & **parallel** in nature.
 - A global view on trade of export-controlled items is useful for:
 - IAEA safeguards;
 - Export controls of dual-use items
(policy, licensing, enforcement)
 - Non proliferation studies.
- Trade is better understood when placed in **context**:
 - Look at related items, temporal series, pattern of trade between countries.
- No official data exist on the trade of export-controlled items:
 - Necessary to rely on **estimates** (upper bounds) built on data declared to customs in the Harmonized System or its subdivision.

References

Trade analysis & IAEA safeguards:

Versino C., Chatelus R., Cojazzi G.G.M., Contini F., Tarvainen M., Tsois, A. *Global trade data to support IAEA safeguards*. ESARDA Bulletin n. 45, pp. 14-22, 2010.

Global trade data sources:

Versino C., Tsukanova M., Cojazzi G.G.M. *Catalogue of WEB Data Services on Global Trade*. EUR 24657 EN, ISBN 978-92-79-18919-7, JRC62363, 2010.

Trade of pressure transducers, example:

Versino C., Contini F., Cojazzi G.G.M. *Understanding Nuclear Trade: Data Sources and Tools*. IAEA Safeguards Symposium, 2010.

Trade of machine tools, example:

Versino C., Contini F., Cojazzi G.G.M. *The Big Table. An information tool on items listed for export controls*. ESARDA 33rd Annual Meeting, Symposium on Safeguards and Nuclear Material Management, Budapest, May 16-20, 2011.

Trade of high speed cameras, example:

Versino C., Contini F., Cojazzi G.G.M. *An information tool on items listed for export controls*. INMM-52nd Annual Meeting, Palm Desert, CA USA, July 17-21, 2011.

Trade Flows:

Versino C., Cojazzi G.G.M. *Estimation of trade flows related to export-controlled dual use items, Data sources, methodology and tools*. EUR 25214 EN, ISBN 978-92-79-23089-9, JRC68055, 2011.