UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific

TRADE, INVESTMENT AND INNOVATION DIVISION

Exploring linkages between non-tariff measures and the Sustainable Development Goals: A global concordance matrix and application to Asia and the Pacific

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Trade, Investment and Innovation

Working Paper Series

NO. 04 | Dec 19

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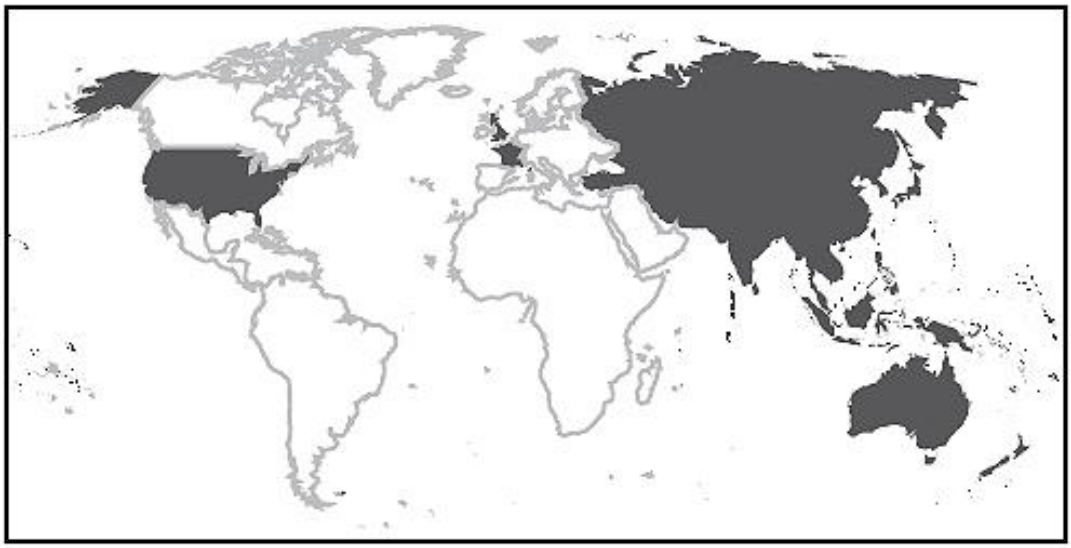

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Please cite this paper as:

Kravchenko, Alexey; Semenova, Maria; Lee, Seul and Duval, Yann (2019). Exploring linkages between non-tariff measures and the Sustainable Development Goals: A global concordance matrix and application to Asia and the Pacific. Trade, Investment and Innovation Working Paper No. 04/19, ESCAP: Bangkok.

Available at http://www.unescap.org/resource-series/tiid-working-papers

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Abstract

Non-tariff measures (NTMs) are policy measures other than ordinary customs tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both. NTMs as policy tools are not inherently good or bad. They often serve important purposes, such as protection of human, animal and plant health or, protection of the environment, and can therefore help achieve the 2030 Agenda for Sustainable Development. This working paper presents a methodology to link NTMs imposed on certain product groups to relevant SDGs and their targets, based on the stated or implied objectives of NTMs as reflected in the UNCTAD's Trade Analysis and Information System (TRAINS) database. A matrix of information strings linking SDG Targets, HS codes, NTM codes, as well as selected keywords is constructed. The matrix is then used to analyse the extent to which NTMs in the TRAINS database are related to SDGs in selected countries, with a specific focus on Asia and the Pacific.

Overall, the global SDG-HS-NTM concordance matrix contains 119 concordance strings (entries), of which 42 are evaluated to have direct intended impact on the following SDGs: SDG 2 on ending hunger, SDG 3 on health, SDG 6 on water, SDG 7 on energy, SDG 11 on cities and human settlements, SDG 12 on sustainable consumption and production, SDG 14 on life below water, SDG 15 on life on land, and SDG 16 on peace and crime. These 42 entries are used in the quantitative analysis of the data from the TRAINS database. The rest of the entries recorded in the matrix cover the full set of SDGs and are considered to have either ambiguous or indirect impacts on the examined SDGs. The complete matrix demonstrates the variety of avenues for potential impact of NTMs and provide ideas for possible directions of further inquiry.

The concordance matrix is used to calculate the share of NTMs that have direct links to SDGs, a potentially useful index to gauge the overall consistency between NTMs and implementation of the Sustainable Development Agenda. On average, 41.5 per cent of the measures in the global TRAINS NTM database are directly addressing the SDGs - 42.5 in per cent Asia and the Pacific. The share ranges from 11 per cent (in India) to 73 per cent (in Tajikistan). The SDG-related NTMs, both in Asia-Pacific and globally, most often directly address SDGs 2 and 3, as well as 12 and 16. Such prominence of SDG 2 and 3 linkages is due to the fact that sanitary and phytosanitary (SPS) measures account for the highest share of all NTMs and have a direct role to play in the achievement of these two Goals. The complete concordance matrix and the global results of linking NTMs to SDGs and targets are available separately online.

Keywords: Non-tariff measures, NTMs, Sustainable Development Goals, SDGs, trade and sustainable development, non-tariff measures and sustainable development, SDG-HS-NTM Concordance Matrix, Asia Pacific

JEL: F14, F23

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Abbreviations and acronyms

3TG	Conflict minerals, including tin, tungsten, tantalum and gold
APL	Priority assistive products
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora
DMC	Domestic material consumption
EML and EMLc	Essential Medicines List and Essential Medicines List for children
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization
FLEGT	Forest Law Enforcement, Governance and Trade
FSC	Forest Stewardship Council
GATE	Global Cooperation on Assistive Technology
GDP	Gross domestic product
GMP	Good manufacturing practice
GRI	Global Reporting Initiative
HS	Harmonized commodity description and coding system
ICGLR	International Conference on the Great Lakes Region
ICT	Information and communications technologies
ICTSD	International Centre for Trade and Sustainable Development
IED	Improvised explosive device
INN	International nonproprietary names
IPR	Intellectual property rights
ISEAL Alliance	International Social and Environmental Accreditation and Labelling Alliance
ISO	International Organization for Standardization
ITC	International Trade Centre
I-TIP Goods	Database of notified non-tariff measures for international trade in goods within the WTO's Integrated Trade Intelligence Portal
IUU fishing	Illegal, unreported and unregulated fishing
LDCs	Least developed countries
MAST	Multi Agency Support Team
MF	Material footprint
MRA	Mutual recognition agreement
NA	Not available

NTM	Non-tariff measure
ODS	Ozone-depleting substance
OECD	Organization for Economic Co-operation and Development
POPs	Persistent organic pollutants
PPM	Processes and production methods
RTA	Regional trade agreement
SCP	Sustainable consumption and production
SDG	Sustainable Development Goal
SME	Small and medium-sized enterprise
SOP	Stages of processing
SPS	Sanitary and phytosanitary
TBT	Technical barriers to trade
TRAINS	Trade Analysis Information System (UNCTAD's database of tariff and non-tariff measures)
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UN Comtrade	United Nations' International Trade Statistics Database
UNCTAD	United Nations Conference on Trade and Development
UNDA	United Nations Development Account
UNESCO	United Nations Educational, Scientific and Cultural Organization
VSS	Voluntary sustainability standards
WCO	World Customs Organization
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WMD	Weapon of mass destruction
WTO	World Trade Organization
WTO EDB	WTO Environmental Database: database of notified non-tariff measures that have environment-related objectives
WWF	World Wildlife Fund

Introduction[1]

Non-tariff measures (NTMs) are policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both (UNCTAD, 2012). The universe of NTMs is diverse. While sanitary and phytosanitary (SPS) measures and technical barriers to trade (TBT) account for the bulk of NTMs, it includes policy tools such as licensing, subsidies, distribution restrictions, quotas, prohibitions, excise taxes and so on. NTMs are not necessarily non-tariff barriers to trade (NTBs) and often serve important purposes, such as protection of human, animal and plant health or, protection of the environment, and can therefore help achieve the 2030 Agenda for Sustainable Development.

At the same time, NTMs generally increase trade costs. While such costs received a lot of attention and are well researched (see Kravchenko and others 2019; UNCTAD and World Bank, 2018), the benefits of NTMs are generally not well understood. This is due, in large part, to the variety and complexity of NTMs and their intended objectives. In this context, the aim of this study is to determine to what extent NTMs reflect economies' commitment to achieving the Sustainable Development Goals (SDGs). The analysis results in quantitative indicators of how many and what share of countries' NTMs directly and positively address the SDGs.

A concordance exercise is conducted to identify linkages that exist between the SDGs and NTMs imposed on certain product groups. For this purpose, targets and indicators within individual SDGs are examined to determine which internationally traded products play a role in their achievement and what regulations imposed on such products may have direct impact on achievement of the examined SDGs. This enables the establishment of clear and direct links between intended impact of NTMs and the achievement of the SDG targets, and the development of a matrix of concordance strings containing information linking SDG target, HS codes, NTM codes and relevant keywords. The matrix is then used to quantify the relationship between NTMs and SDGs using available data.

The paper is structured as follows. Section 1 provides an overview of the data and methodology used. Section 2 features a detailed explanation of the derivation of SDG-NTM concordance for SDG 3 (Good health and wellbeing), with explanation for other SDGs deferred to the Annex. In section 3, the concordance matrix is used to quantify the SDG-NTM linkages in Asia-Pacific economies for which data is available in the UNCTAD TRAINS database. The complete *SDG-HS-NTM Concordance Matrix,* together with quantitative SDG-NTM indicators for all countries included in the TRAINS database are provided online separately.[2]

[1] The analysis presented here is part of the project titled "Developing an index to monitor the impact of non-tariff measures (NTMs) on SDGs progress", under the Development Account 10th Tranche (DA) Programme on Strengthening Statistics and Data for the Sustainable Development Goals. The purpose of the project is to strengthen capacity in developing and least developed countries to measure and monitor the impact of NTMs on the progress towards the sustainable development goals. The objective is to develop an index to measure impact of countries' use of NTMs in achieving economic, social and environmental development. The index will thus complement and integrate existing SDGs indicators with regard to allowing government officials to monitor their countries' progress towards the SDGs.

[2] https://www.unescap.org/resources/exploring-linkages-between-non-tariff-measures-and-sustainable-development-goals-global

1. Data and Methodology

1.1. The 17 Sustainable Development Goals

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future (United Nations, 2015). It stresses that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth, all while tackling climate change and working to preserve our oceans and forests. As shown in figure 1, the Agenda includes 17 SDGs. Each SDG is further subdivided into specific targets. In turn, each target has one or more indicators.[3]

Figure 1. The 17 Sustainable Development Goals

Source: United Nations, 2015

The 2030 Agenda for Sustainable Development recognizes international trade as an engine for inclusive economic growth and poverty reduction, and as an important enabler for achieving SDGs (ESCAP, 2017). In addition to the trade-growth-economic development nexus, trade is strongly linked to SDGs that are related to health and safety, environment and climate, public security and peace.[4] As such, broadly speaking, NTMs can directly contribute to sustainable development as policy instruments, or they can indirectly affect sustainable

[3] For example. SDG 1 (End poverty in all its forms everywhere) includes 7 targets and 13 indicators, see https://sustainabledevelopment.un.org/content/documents/11803Official-List-of-Proposed-SDG-Indicators.pdf

[4] Trade and trade-related policies have a multifaceted link to SDGs. SDG 17 ("Partnerships for the Goals"), in particular, includes targets that seek to "promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system", "significantly increase the exports of developing countries" and "realize timely implementation of duty-free and quota-free market access on a lasting basis for all least developed countries".

development through their impact on trade in goods or through their far-reaching positive and negative externalities. For brevity, description of specific SDG targets and indicators are largely omitted, and users may benefit from referring to the official list of SDG targets and indicators.[5]

1.2. Non-tariff measures: classification and data sources

The Multi-Agency Support Team on NTMs (MAST)[6] defines NTMs as policy measures other than ordinary customs tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both (UNCTAD, 2012). NTMs, by definition, are neutral – there is no *a priori* assessment of their legality, nor on their net impact on trade or welfare. In contrast to the rather succinct definition, the universe of NTMs exhibits an enormous diversity and complexity. For example, some NTMs target the price of goods, such as administrative pricing, variable charges, anti-dumping and countervailing measures etc., while others target the quantity of goods, such as non-automatic licensing, quotas, import prohibitions etc. Some NTMs target the characteristics of goods, such as technical standards and labelling requirements etc. There are also NTMs that do not target goods directly, but instead affect different processes, such as customs procedures and administrative practices, government procurement policies and so on.

Through the years, MAST has developed a coding system to provide a base to collate and tally NTMs. The objective of the International Classification of Non-Tariff Measures (ICNTM) is to provide information and clarification on new and existing measures, so as to improve their comparability across countries (UNCTAD, 2016). The ICNTM serves as a common language on categorizing NTMs. It is officially endorsed by the United Nations Statistics Division (UNSD, 2012) as the International Classification of NTMs for data collection across countries and for reporting on internationally comparable data on NTMs. As shown in table 1, NTMs are categorized via a hierarchical tree into 16 chapters from A to P. Each chapter consists of three further levels of sub-branches.[7] Chapters A to O are import-related measures, whereas chapter P concerns exports only. In accord with the definition, the classification only acknowledges the existence of an NTM, and does not pre-judge on its legitimacy, adequacy, necessity, or whether or not it is discriminatory.

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[5] https://sustainabledevelopment.un.org/content/documents/11803Official-List-of-Proposed-SDG-Indicators.pdf

[6] The MAST team comprises eight international organizations – the Food and Agriculture Organization of the United Nations (FAO), International Monetary Fund (IMF), International Trade Centre (ITC), Organization for Economic Cooperation and Development (OECD), United Nations Industrial Development Organization (UNIDO), UNCTAD, the World Bank and WTO.

[7] For example, under chapter A (SPS), A2 level contains “Tolerance limits for residues and restricted use of substances”, which further contains more detailed classification, such as A21, “Tolerance limits for residues of or contamination by certain (non-microbiological) substances”.

Table 1. International Classification of NTMs

Imports	Technical measures	A.	Sanitary and Phytosanitary Measures
		B.	Technical Barriers to Trade
		C.	Pre-shipment inspection and other formalities
	Non-technical measures	D.	Contingent trade-protective measures
		E	Non-automatic licensing, quotas, prohibitions and quantity-control measures other than for SPS or TBT
		F	Price-control measures, including additional taxes and charges
		G	Finance measures
		H	Measures affecting competition
		I	Trade-related investment measures
		J	Distribution restrictions
		K	Restrictions on post-sales services
		L	Subsidies (excluding export subsidies under P7)
		M	Government procurement restrictions
		N	Intellectual property
		O	Rules of Origin
Exports		P	Export-related measures

Source: UNCTAD, 2016.

The only true comprehensive sources of policy regulations that could "potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both" are national repositories of legislative acts. However, member States of WTO, under certain circumstances, are also required to notify the WTO Secretariat of new or changed NTMs. Several WTO agreements set out multilateral rules on NTMs. For example, the WTO SPS Agreement sets out the basic rules on technical measures related to food safety as well as animal and plant health standards (WTO, 2018b), while the TBT Agreement sets out rules on other types of technical measures. According to the WTO SPS and TBT Agreements, WTO members are required to provide advanced notice of new or changed regulations. Additionally, pursuant to other WTO Agreements, such as the Agreement on Subsidies and Countervailing Measures and Anti-Dumping Agreement among others, members must notify subsidies and contingent trade protective measures etc.

While notifications of initiated SPS and TBT measures to WTO provide a good indicator of the increasing trend of notifications across time (see ESCAP, 2019), they do not provide an accurate representation of the overall stock of measures in force. The main purpose of the WTO notification mechanism is to provide an opportunity for trade partners to comment on upcoming new or modified measures that could potentially have a significant impact on trade (whether positive or negative), rather than to act as a repository of measures. Furthermore, only measures that are different to international standards are required to be notified. Some economies notify all the new potential NTMs, irrespective of whether they adhere to international standards or not. Others only notify those that adhere to international standards. Yet others do not notify either. Some countries potentially confound national standards with NTMs (i.e., notify voluntary standards). Moreover, countries are required to notify only if the "regulation may have a significant effect on trade of other members" (Annex B, WTO SPS Agreement and Article 2.9 in the WTO

TBT Agreement). In addition, while it is encouraged to publish final regulations as they come in force, few countries follow this recommendation with all regulations. As such, the repository often only contains draft versions of regulations with no clear indication on whether they were adopted, when, or in what form. Finally, pre-1995 regulations, since they were not "new" or "amended", are not in the WTO database.

The lack of consistent notification, coupled with the fact that not all economies are WTO members, prompted UNCTAD to lead an international effort with many national, regional and international partners, including ESCAP, to collect comprehensive data on NTMs. The UNCTAD TRAINS database has a coverage of close to 90 per cent of world trade. All data are published online and are accessible free of charge through several web-portals.[8] The database also allows quick access to full-text regulations of many countries. NTM data are collected by extensively reading and analysing national legislative documents, such as laws, decrees or directives. Once a relevant regulation is identified, each specific provision is classified into the detailed NTM codes and respective Harmonized System (HS) product codes. As of May 2019, more than 60,000 measures from 88 economies (counting the European Union as a single economy) have been classified and made publicly available.[9] More than 25,000 measures came from 28 Asia-Pacific economies included in the database.

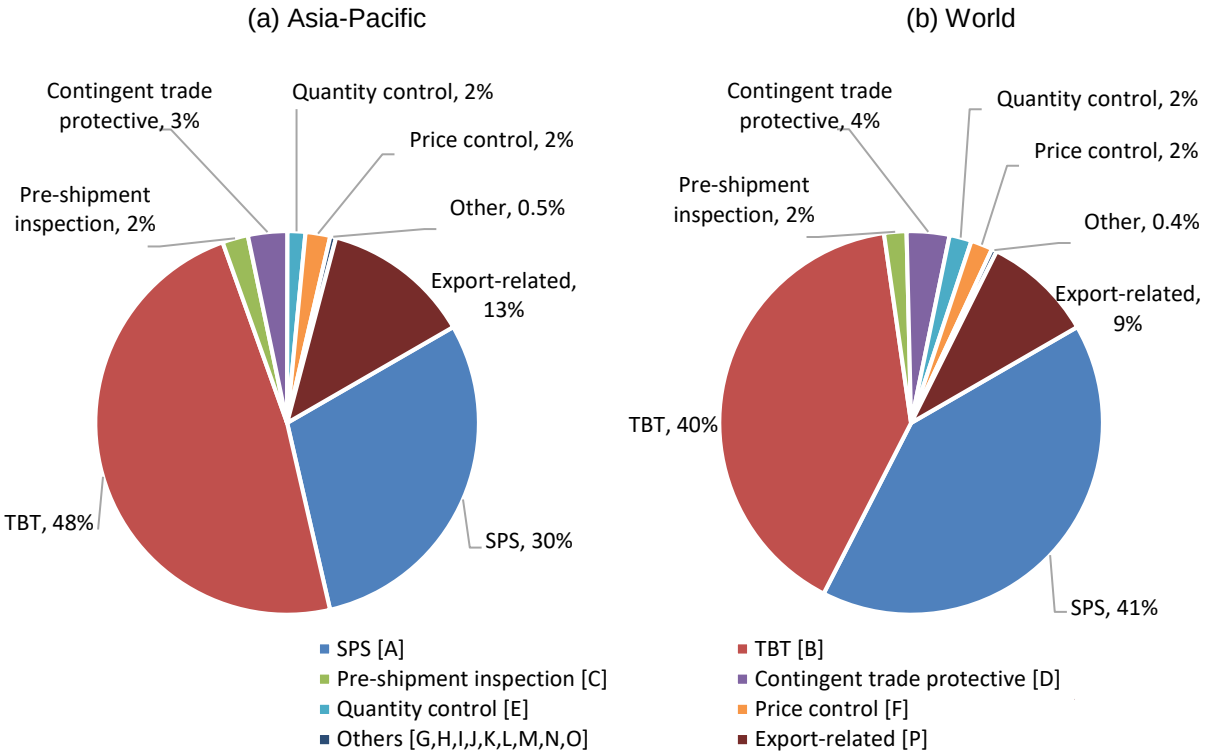
The majority of measures in the database are SPS measures and TBTs (figure 2). Globally, 41 per cent of measures in the database are SPS (30 per cent in the Asia-Pacific region) and 40 per cent are TBTs (48 per cent in the Asia-Pacific region). The third-largest category, export-related measures, accounts for 9 per cent of measures globally and 13 per cent of measures in the Asia-Pacific region. Notably, NTMs in Chapters J to O have not been actively collected yet, but are included in the database if reported. For brevity, description of NTM classifications and codes are largely omitted, and users may benefit from referring the ICNTM classification of NTMs.[10]

[8] UNCTAD TRAINS portal trains.unctad.org; World Integrated Trade Solution (WITS) platform at wits.worldbank.org; and ITC/UNCTAD/WTO's Global Trade Helpdesk at www.globaltradehelpdesk.org

[9] Caution should be exercised when comparing these figures to WTO notifications and measures under ICNTM classification disaggregates into specific Chapters, whereas WTO notifications by individual economies often compound many clusters into one measure.

[10] https://unctad.org/en/Pages/DITC/Trade-Analysis/Non-Tariff-Measures/NTMs-Classification.aspx

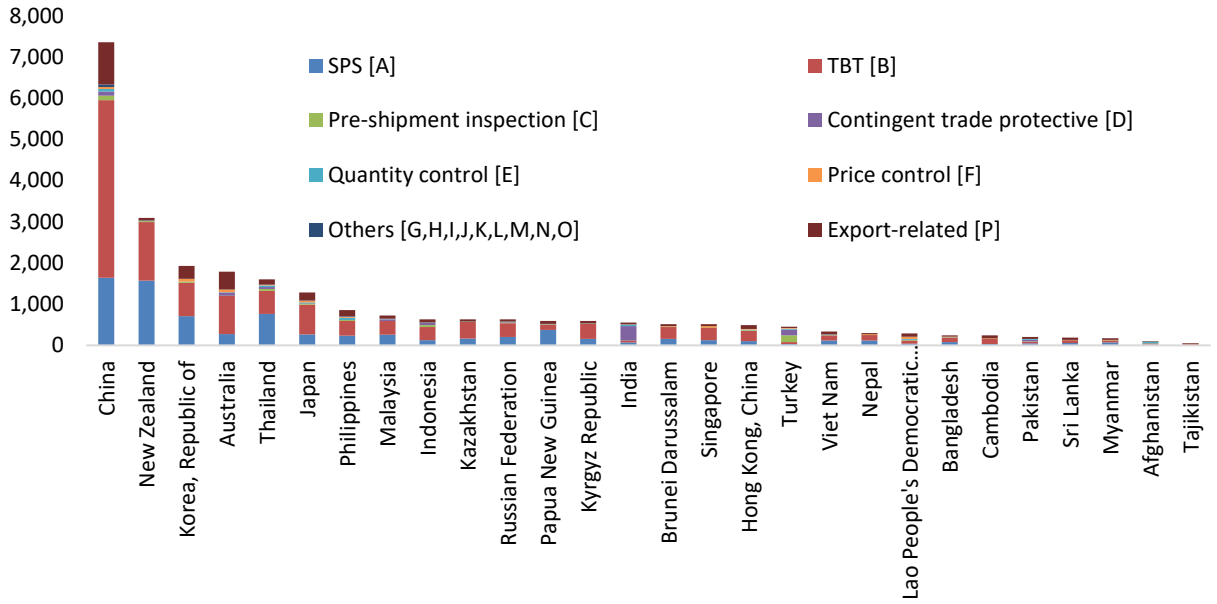
Figure 2. NTMs in Asia-Pacific and globally, by type



Source: Authors, based on the UNCTAD TRAINS database, accessed 15 May 2019.

In terms of individual economies, the largest stock of NTMs in Asia-Pacific is China, followed by high-income economies of New Zealand, Republic of Korea and Australia (figure 3). In general, the stock of NTMs relates to the level of development – higher developed countries generally have stronger legislative frameworks. However, caution should be exercised when comparing the stock of measures across the countries. For once, as the process is labour-intensive, the NTM database is not continuously updated for each economy, and as such, recent legislature may be missing. Second, data collection is carried out by different local consultants, and although efforts are made to ensure cross-country comparability, consultant-specific idiosyncrasies in data collection may exist (including due to translation).

Figure 3. NTMs in Asia-Pacific, by economy



Source: UNCTAD TRAINS database, accessed May 2019

1.3. Methodology overview: Matching NTMs to SDGs

In essence, the methodology is a set of rules linking NTMs records from the TRAINS database to 26 Targets of the SDGs.[11] An example of an NTM record from TRAINS database (one out of more than 60,000) is presented in table 2. As part developing the linkage between NTMs and SDGs, all SDG targets were examined to see what products and NTM types affecting trade in those products could ostensibly directly and positively address each target. As discussed further below, in many cases this was complemented by deriving keywords that should be present in description of individual NTMs to reduce ambiguity of which SDG target.

Table 2. An example of an NTM record from TRAINS database

Country imposing (1)	Partner affected (2)	NTM Code (3)	HS code (4)	Measure description (English) (5)	Product description (English) (6)	Source (English) (7)	National legal basis (English) (8)
AFG	WLD	P11	290314, 290319, 290339, 290341, 290342, 290343…	Chloro Floro Carbons (CFS) and Products containing CFS and certain halons and products containing them are banned from export.	Ozone depleting substances and products containing ozone depleting substances.	Ministry of Justice, Government of Afghanistan	Regulation on controlling materials destructive to the ozone layer

[11] While SDGs contain 169 Targets, only 26 were evaluated to be susceptible to be directly and positively addressed by NTMs. Other targets could also be affected by NTMs, but either the link was evaluated to be indirect or no existing NTMs were found in the TRAINS database to unambiguously directly and positively address such targets as part of their primary objective, whether stated or implied.

A specific HS-NTM code pair was considered to have a direct linkage to an SDG Target if (1) it has a clearly stated SDG Target-related objective (supported by relevant keywords in the descriptive information present in the TRAINS database), or (2) the examined HS-NTM code combination is not likely to have any objective other than the one that is relevant to an SDG (e.g. trade in hazardous chemicals and waste, endangered species of flora and fauna, cultural heritage items, arms and weapons, etc.). Thus, the derived concordance only takes into account the stated or implied intended objective of the NTMs, as the actual impact or any unintended impact (positive or negative externalities) on the adopting or affected countries cannot be inferred from the data registered in the NTM databases. This is an important limitation of this index, and to gauge the actual net impact of NTMs it is necessary to conduct a detail sustainability assessment analysis. At the same time, such direct intended impact of the examined NTMs can be assumed as positive based on a premise that NTMs are public policy tools that are adopted to address important public policy priorities, including those that are reflected in the SDGs. Negative impact of the NTMs in most cases reflects unintended negative externalities, which may extend to the adopting and affected countries.

Product groups relevant to the individual SDGs were identified at six-digit level of the HS. They were inferred from the texts of the targets and/or indicators, as well as from the SDG indicator metadata. Specific lists of goods were then derived from a variety of authoritative sources, such as the relevant international conventions and product correlation lists published by the World Customs Organization (WCO), research literature, country regulations, as well as the examples of relevant non-tariff measures registered in the NTM databases. In most cases the texts of the SDG targets were used to determine relevant products groups, as the majority of indicators are too specific and offer very little to tie them to the internationally traded goods. Most of the six-digit code lists are based on the 2007, 2012 and 2017 versions of the HS, and subsequent analysis used United Nations Department of Economic and Social Affairs (DESA) official concordance tables to correlate them to the 2012 version of HS since at the time of writing this report most NTM data in the TRAINS database was in that version.

NTM codes are based on the 2012 version of the international classification of ICNTM (M3). Various sources, including international conventions, guidelines, recommendations, actions plans and reports of the specialized international agencies, research papers, as well as NTM databases were used to determine what NTMs affect trade in the examined product groups as well as have public policy objectives embedded in SDGs. This information was then used to assign such measures in the concordance matrix an appropriate code from the ICNTM classification of NTMs. The NTM code lists for each of the concordance strings cover typical NTMs that may be applied by any country at any time multilaterally or bilaterally.

The methodology further uses keywords to ensure higher accuracy of the results of the matching process, as the same HS-NTM code combinations may have more than one regulatory objective relevant to different SDGs. For example, similarly-coded technical regulations for motor vehicles (TBT measures) may address car safety (SDG 3), exhaust and noise generation (SDG 11) and fuel economy (SDG 7). Furthermore, goods relevant to different SDGs may share same HS codes at the six-digit level and above. For example, goods that can be characterized as hazardous chemicals, precursors of chemical weapons, narcotics and medicines share a few HS codes at the six-digit level but are relevant to SDGs 12, 16 and 3. In most cases, keywords were

derived from relevant literature and, where possible, from regulations already recorded in the TRAINS database.

The derived concordance linkages are considered as "clear" if the presence of the HS-NTM codes and keywords is sufficient to allow to make a conclusion about the presence of the direct and intended impact on the examined SDG's achievement. Absence of the relevant HS code-NTM code-keyword combination reflects no impact on the achievement of the examined SDG. There are few examples of NTMs, discussed in the subsequent sections, that are considered harmful in general or inhibiting economic development if applied to the developing or least developed countries. Although in this case elimination of such NTMs could be considered as having positive intended impact on the achievement of the relevant SDGs, their absence cannot be used as a reliable criterion both due to the nature of the NTMs as public policy tools and due to the fact that absence of NTMs in the TRAINS database in some cases may be the result of omissions or incomplete data collection (for example, agricultural subsidies).

The identified concordance linkages were confirmed by the presence of relevant examples in various authoritative sources indicated throughout the sections below and in NTM databases. The main source of such examples is the UNCTAD's TRAINS database. As some measure descriptions and accompanying fields were published in local languages, all non-English language fields were translated using Google Translate.[12]

Another database of NTMs that provided useful insights and helped to confirm viability of some of the SDG Target-HS code-NTM code linkages, is the WTO's I-TIP Goods database, which provides comprehensive information on notified NTMs applied by the WTO members in merchandise trade (WTO, 2019). Other databases of regulatory notifications submitted by member-states to the WTO were also consulted (WTO, 2019a; WTO, 2019b; WTO, 2019c), along with the notifications themselves, whenever necessary. The databases reflect all the regulations notified by the member-states each year under various WTO agreements. Notifications reflect regulatory objectives for some of such regulations, especially those that are notified under the WTO's *Agreement on Technical Barriers to Trade* and *Agreement on the Application of Sanitary and Phytosanitary Measures* (TBT and SPS Agreements). For the environment-related SDGs, another important source of data is the *WTO Environmental Database (WTO EDB)*, which contains systematized data on all member-states' notifications under various WTO agreements from 2009 until 2016 that have a clearly stated environment-related objective (WTO, 2017a). It classifies trade measures based on harmonized lists of environmental objectives and types of trade measures (not based on MAST classification of NTMs). Despite the continuous nature of notifications' submission to the WTO, it is not done in a consistent manner. Note that these additional databases were only used to generate NTM-SDG concordance, and the final analysis used NTMs records in TRAINS database only.

Overall, the concordance matrix contains 119 entries. An abridged example of one entry is presented in table 3. Forty two entries are evaluated to potentially have a direct and positive impact on the following SDGs: SDG 2 on ending hunger, SDG 3 on health, SDG 6 on water, SDG

[12] Using Google Sheets, it is possible to use GoogleTranslate() function, in a similar way it is done in MS Excel, for example =GoogleTranslate(A2, "es", "en"), where "A2" is the reference cell, from Spanish to English.

7 on energy, SDG 11 on cities and human settlements, SDG 12 on sustainable consumption and production, SDG 14 on life below water, SDG 15 on life on land, and SDG 16 on peace and crime. These are the entries that are used in the quantitative analysis of the data from UNCTAD's TRAINS database of NTMs. The rest of the entries, recorded in the matrix but not used in the quantitative analysis, cover the full set of the SDGs and are either too ambiguous (e.g. due to TRAINS data not containing relevant information), or are evaluated to have indirect impact on the examined SDGs, or for which not enough information is available to build conclusive concordance strings. Such strings are still kept in the matrix for illustrative purposes to demonstrate the variety of avenues for potential impact of NTMs.

Table 3. An abridged example of one SDG-NTM matching entry

Entry # (1)	SDG (2)	Target (3)	HS (4)	NTM (5)	Keywords (6)	neg_Keywords (7)
67	SDG 12	Target 12.4; Target 12.5	290314; 290315; 290319; 290331; 290339; 290371…	B11; B14; P11; P13; P14; P61; P62; …	Basel; carbon tetrachloride; CFC; chemicals; chemical substances; ozone; ozone depleting;…	N/A

To facilitate matching each economies' NTMs available in the TRAINS database (more than 60,000 measures in total at the time of writing this report), R code was developed that evaluated each measure against the criteria in the concordance entries that were evaluated to potentially have a clear, direct and positive impact on SDG targets. Each countries' NTM in the TRAINS database had to match at least one HS code, one NTM code and one keyword (when applicable) in the concordance table. In some cases, negative keywords were also utilized to remove false positives (described below).

To demonstrate the algorithm, in the case of an NTM record from TRAINS from Afghanistan (table 2), the data in the record was compared against each of the concordance entries in the matching matrix. When comparison was done against concordance entry number 67 (abridged version is shown in table 3), the algorithm checked whether any of HS codes matched (columns (4) in tables 2 and 3). In this simplified example, HS codes 290314, 290319 and 290339 matched (underlined). Next, the algorithm checked whether any NTM codes in column (5) of table 3 matched the NTM code of the actual regulation (column (3) in table 2 – P11). In this case, P11 was indeed in the matching entry. Because the SDG-NTM matching entry had keywords column populated (table 3 column (6)), the algorithm then also checked whether any of the keywords were present in 'Measure description', 'Product description', 'Source' or 'National legal basis' columns (columns (5)-(8) in table 2). "CFS", "ozone depleting" and "ozone" keywords/phrases were present in the descriptive columns of the Afghani NTM.[13] There were no "negative keywords" in the matching entry (column (7) in table 3), but if there were, the algorithm

[13] Note in other examples keywords were not necessary (i.e. match between HS codes and NTM codes were sufficient to establish a direct relationship). For example, most SPS measures on food products could be directly linked to reducing premature mortality due to non-communicable diseases (Target 3.4), and no keywords were necessary (see entry for Target 3.4 in the concordance matrix).

would have checked if any of the such keywords existed and if so, would penalize the match.[14] Since the Afghani NTM record had a match with HS codes, NTM code and keywords, it was thus determined that the NTM in question was directly and positively related to SDG 12 through targets 12.4 and 12.5.

The following section examines in detail the thought and research process involved in generating SDG-NTM matching entries that can be considered as having a direct and positive linkage to the achievement of SDG 3 targets for illustrative purposes. An abridged discussion on other SDGs is deferred to the Appendix 2. For some of such strings, the linkage is clear. For all cases where certain concordance strings may be equally applicable to more than one SDG, effort was made to assign the strings to only one SDG, to which they have the most direct linkage; linkages to other closely related SDGs are considered as indirect. All such cases are clearly marked and described in the methodology and in the *SDG-HS-NTM Concordance Matrix*. At the same time, for some SDG targets, no concordance strings with potential impact of NTMs have been identified; they are not included in the matrix.

2 NTM-SDG Concordance: An illustration with SDG 3

A review of SDG 3 (Ensure healthy lives and promote well-being for all at all ages) targets suggested linkages to NTMs in relation to the following six issues:

(i) Access to medicines and medical technologies
(ii) Safety and predictable efficacy of medicines and healthcare products
(iii) Regulating trade in products for human consumption that are undeniably harmful to human health
(iv) Regulating characteristics of products intended for human consumption
(v) Reducing injuries and deaths on roads
(vi) Maintaining a safe living environment and reducing exposure to harmful substances

Sources and rationale for establishing SDG-HS-NTM concordance for each of these issues are explained below. As noted, only concordance strings that have a clear/unambiguous potential to directly and positively address SDG targets are used in the subsequent analysis of NTMs in Asia and the Pacific. However, the extensive discussion below presents the thought process involved in including/excluding certain product groups and related NTMs in the concordance matrix. Those in grey colour in concordance tables are excluded from the analysis of SDG-relevant NTM prevalence presented later in this report, but are included in the matrix should other researcher(s) wish to extend the analysis to include the potentially indirect/ambiguous relationships. In addition, for brevity, only the main descriptive columns of the concordance matrix entries are presented.

[14] For example, NTMs determined to be positively and directly addressing Target 2.4 (sustainable food production systems and resilient agricultural practices) concerned agricultural goods excluding intermediate and final goods for human consumptions. As such, while keywords such as “pests”, “animal protection”, “vaccination” were included, there are also negative keywords such as “pesticide”, “MRL”, “food safety”, helping to ensure that there were no false positive matches due to similarities of regulations targeting the same goods but with different objectives.

Other columns, namely HS codes, keywords, negative keywords, and list description are available in the full matrix.[15]

2.1 Access to medicines and medical technologies

Access to products essential to the provision of adequate healthcare services is needed to prevent and treat a wide range of communicable and non-communicable diseases and achieve SDG Targets 3.1, 3.2, 3.3, 3.4, 3.7, 3.8. The trade-related barriers to access to medicines and medical technologies are caused by tariffs and by NTMs. Tariff protection is outside of the scope of this methodology, but there is a noteworthy observation on aspects of it in a WTO working paper of 2012 (Helble, 2012). Developed countries tend to have insignificant levels of applied tariffs for relevant products (Helble list above), which are also very close to their WTO bound tariffs for the same groups of products. Developing countries, where access to medicines and medical technologies can be more problematic, have applied tariffs at comparatively higher levels (least developed countries' tariffs are the highest), while their WTO bound tariffs are set even at significantly higher levels, providing an opportunity to raise applied tariffs and to increase the level of tariff protection at any time.

To build the concordance string between countries' NTM and these targets, the first task was to generate a list of relevant products (HS codes). A literature review yielded three sources of lists of relevant products. The first is a list of 207 six-digit HS codes containing a wide range of products, including medicines, inputs to the pharmaceutical industry, inputs to hospitals and laboratories, and medical technologies and equipment (Helble, 2012). This is a broad list, which with a few exceptions, provides the most complete list of products relevant to the provision of adequate healthcare services and to personal health management activities.[16]

The second is a regularly updated Essential Medicines List (EML, and EMLc for children), developed by WHO, which countries can use for reference when developing their own lists for such medicines for the purposes of formulating relevant national policies, including trade policy (WHO, 2017a). However, there is no readily available concordance table of these products with HS codes, and it is not utilized in the matrix.

The third list includes International non-proprietary names (INNs). The list of HS codes for goods, for which use of INNs is relevant is available through the World Customs Organization (WCO, 2017a).

Additionally, access to certain types of medicines or health-related products (such as contraceptives (HS code 401410) and female hygiene products (HS code 961900)) can be regulated by the countries based on their national priorities. For example, certain types of

[15] https://www.unescap.org/resources/exploring-linkages-between-non-tariff-measures-and-sustainable-development-goals-global

[16] Notably, Helble's list does not contain means of transportation, such as motor vehicles, helicopters and airplanes equipped to provide medical services outside the medical facilities or to transport patients to such facilities. Perhaps, this is due to the fact that at six-digit level these goods have a distinct primary function of facilitating transportation of passengers and cargo, while goods relevant to the provision of medical services are not identifiable. A review of measures included in the TRAINS database does not yield examples of measures specifically aimed at regulating "medical" functions of these goods.

products, such as contraceptives, may be banned[17], a measure which most likely inhibits the successful achievement of SDG 3 and Target 5.6 of SDG 5. However, the application of such measures is confined only to a limited number of countries. At the same time B11 NTM applied to a medical or health-care related HS code, as with many other products, does not necessarily constitute a ban, but rather a prohibition to import a product unless in conforms to a certain technical or procedural requirement (i.e. such measure under UNCTAD guidelines should be classified under different NTM codes - B7 or B8 (UNCTAD, 2016).

The next step was to generate a list of relevant NTM codes applied to the product lists. The most relevant NTMs to medicines and medical technologies are technical regulations and intellectual property rights (IPR) regulations (WHO, WIPO & WTO, 2013)**.** Technical regulations are technical requirements set for products, production processes and methods, storage and transportation conditions, labelling, marking, packaging, product testing and inspection procedures, registration of importers/exporters/products, traceability, etc. Connected to these are measures related to licensing for exports and imports. These regulations have an important function of ensuring high quality, safety and efficacy of medical products, and accountability of importers and exporters for the quality of these products, which makes application of these NTMs relevant to the achievement of SDG 3.

Table 4 summarizes the concordance string for technical regulations for medicines, (including generic medicines, sheath contraceptives and menstrual hygiene products) potentially addressing SDG 3 targets. The string specifies the relevant SDG 3 targets, the products that are relevant to them (with related HS codes), together with the relevant types of regulatory NTMs (with MAST codes). The last part of the string specifies whether the link between the SDG 3 targets and the NTMs is clear (i.e., positive) or ambiguous. In this case, it is specified as ambiguous as technical regulations may constitute barriers due to the differences in regulations imposed by different countries, as well as a lack of harmonization or mutual recognition of technical standards, testing procedures and testing results, and conformity certificates. In some cases, testing requirements may be excessive as compared to authoritative international standards. Technical regulations can become a burden also due to purely procedural barriers, lack of consistency and transparency, long waiting times, informal payments, etc (ESCAP & ITC, 2019)**.**[18]

[17] An example of Bahrain banning imports of sequential oral contraceptives (B11) from the TRAINS database.

[18] While the presence or absence of such NTMs is reflected in TRAINS and other databases, there is no information on whether they constitute a barrier, rather than just a safeguard against, e.g., potentially dangerous fake medicines.To determine that, it may be useful to compare technical regulations applied by the countries to selected authoritative internationally recognized standards and guidelines on quality control, such as, for example, the WHO recommended regulations and guidelines, GMP standards, etc. (analysis based on distance in regulatory stringency (Cadot, Asprilla, Courdon, Knebel, & Peters, 2015)).

Table 4. Concordance string for technical regulations on access to medicines

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Targets 3.1, 3.2, 3.3, 3.4, 3.7, 3.8	Medicines (dosified and bulk, inputs to pharmaceutical industry, hospital and laboratories inputs, medical technology equipment), generic medicines, sheath contraceptives and menstrual hygiene products	HS 2007 codes from Helble list (all groups) (Helble, 2012) and HS 2017 codes for generic medicines (WCO, 2017a); plus 401410 and 961900	B11; B14; B15; B31; B32; B33; B2; B4; B7; B8; B6; P13; P14; P6; B19; P19	Ambiguous, as whether an NTM constitutes a barrier to access cannot be judged based on the presence/absence of NTMs. In TRAINS, B11 does not necessarily constitute a ban, but rather a prohibition to import a product unless it conforms to certain technical or procedural requirement (i.e. such measure under UNCTAD guidelines should be classified under a different NTM code (B7 or B8) (UNCTAD, 2016).

Source: Authors' compilation

Note: Grey highlight indicates that the concordance string is ambiguous/indirect, and is not included in the subsequent analysis

Table 5 summarizes the concordance between potential IPR-related provisions on medicines, which consist of three separate strings of overlapping HS-NTM codes. Three separate entries are compiled because they have different rationales, namely NTMs relating to protecting IPRs, related to TRIPS flexibility mechanism and on dual use products. In addition, the TRIPS entry is further used in the analysis in combination with relevant keywords (see full matrix).[19]

IPR measures can be significant barriers to access to medicines and medical technologies impacting availability and affordability of relevant products. At the same time IPR measures are essential for achieving SDG 9 and SDG 16, as they can encourage innovation, contribute to economic development, help combat illicit trade and reduce cash flows generated by it. As such, the impact of such measures on SDG 3 targets cannot be assessed based on the presence/absence of an IPR-related NTM alone and remain generally ambiguous.[20]

IPR-related barriers to the access of medicines and medical technologies are to some extent addressed in the WTO *Agreement on Trade-Related Aspects of Intellectual Property Rights* (TRIPS) (WTO, 2017b). It has been long recognized that protection of IPR for medicines and medical technology raises the cost of these products and makes them unaffordable in the context of some countries, regardless of whether they have the potential capacity to manufacture such products. To address this issue the TRIPS Agreement allows for issuance of compulsory licenses for domestic distribution or for export (import) of such products to the countries that lack manufacturing capacity, regardless of the fact whether the IPR for such products is protected on the territory of the country of distribution (several procedural conditions need to be met, which are very relaxed for the LDCs) (Kampf, 2015). This is an important trade-based mechanism for improving access of developing countries or LDCs to essential medicines. Although the NTMs of concern are the ones related to the issuance of licenses for exports (imports), these are not likely to be reflected in the NTM databases as regular measures for product groups, as they only involve specific pairs of countries (exporter and importer) and a specific amount of specific product, which

[19] Note that to avoid double counting, in the final analysis only unique target/SDG concordances with NTMs are tallied up, i.e. if an NTM is found to address a certain SDG/target due to different rationales, the summary counts consider the relationship only once

[20] IPR-related NTMs (ICNTM Chapter N) are not yet actively collected by UNCTAD and are not present in the TRAINS database.

is of interest to the importer at a specific time. To use the flexibility provisions of the TRIPS Agreement related to compulsory licensing for export and import, interested countries must adopt or amend relevant national legislation. Such legislative changes must be notified to the WTO, but it is not clear how consistently this is done. Potential sources of information include: the WTO Members' notifications under Article 63.2 of TRIPS, WIPO's database WIPO Lex (WIPO, n.d.), and websites of the relevant national government authorities (Kampf, 2015).[21] It must be noted that with respect to these flexibility provisions, some economies stated in their national policies that they will not use a compulsory licensing mechanism for importing or for domestic production in case of public health emergency and, thus, choose to uphold intellectual property rights of the IPR-holders (WTO, 2005; Kampf, 2015), which indirectly contributes to the achievement of SDG 9. Another flexibility mechanism is related to the national legislation on exhaustion of IPR that may allow "parallel imports" in cases when IPR-protected products are already being sold in the domestic market (Correa, 2002). Information on such regulations is not present in NTM databases.

Export and import regulations for controlling and restricting transboundary movement of dual-use and strategic goods, which are essential for SDG 16, also may become barriers for access to essential medicines, medical technologies and inputs for pharmaceutical industries. For more details see Appendix 2 Section A2.18 on Access to technologies (page 94).

[21] For possible further collection of data on relevant IPR-related NTMs, which may be useful for the purpose of assessing the extent to which countries support the implementation of flexibility provisions under the WTO TRIPS (Target 3.b), national IPR legislation can be reviewed to detect the following elements: - Legislation that clearly references "Paragraph 6 System" or Article 31 bis of TRIPS ;- Waivers to the national IPR legislation to allow production under compulsory licenses for domestic use, exports or imports;- Conditions under which such licenses can be granted (national emergencies, etc.); types of diseases and products for which such licenses can be granted; - Pre-grant conditions that have to be satisfied before application for compulsory license is submitted (e.g. failure to negotiate voluntary license with IPR holder under reasonable terms, etc.);- Limits on product quantity, intended product use, license validity period and extension provisions, conditions for revoking and termination of license, methods to calculate renumeration to the IPR holder; reimport prohibitions;- Requirements that labels, marking and packaging carry distinctive indications setting such medicines apart from other similar products.

Table 5. Concordance strings for potential IPR-related provisions on access to medicines

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Targets 3.1, 3.2, 3.3, 3.4, 3.7, 3.8, 3.b	Medicines (dosified and bulk, inputs to pharmaceutical industry, hospital and laboratories inputs, medical technology equipment), generic medicines	HS 2007 codes from Helble list (all groups) (Helble, 2012) and HS 2017 codes for generic medicines (WCO, 2017a)	N; B31; B32; B33; E1; E3	**NTMs protecting IPRs.** Very ambiguous, as: Relevant products can be country specific. The issue is access to products or technologies and the cost of such access. Whether an NTM constitutes a barrier to access or raises the cost excessively cannot be judged based on the presence/absence of NTMs. IPRs are essential to SDG 9 and SDG 16.
Targets 3.1, 3.2, 3.3, 3.4, 3.7, 3.8, 3.b	Medicines (dosified and bulk, inputs to pharmaceutical industry, hospital and laboratories inputs), generic medicines	HS 2007 codes from Helble list (minus medical technology equipment) (Helble, 2012) and HS 2017 codes for generic medicines (WCO, 2017a)	N; B31; B32; B33; E1; E3; P13; P14	**NTMs related to TRIPS flexibility mechanism.** Could be clear with keywords, but currently IPR data is not present in the TRAINS database. Data could be collected with specific search for regulations related to the flexibility mechanisms under WTO TRIPS Agreement (relevant policy elements are described above).
Targets 3.1, 3.2, 3.3, 3.4, 3.7, 3.8	Medicines (dosified and bulk, inputs to pharmaceutical industry, hospital and laboratories inputs, medical technology equipment)	HS 2007 codes from Helble list (all groups) (Helble, 2012) and HS 2017 codes for generic medicines (WCO, 2017a)	B11; B14; B31; B32; B33; B42; B81; B82; B83; B85; E111; E112; H; P11; P13; P14; B19; P19; P6; P2	**NTMs on dual use products.** Very ambiguous. Dual use product controls are essential for SDG 16 but may be a barrier to access to medicines and related products.

Source: Authors' compilation

Note: Grey highlight indicates that the concordance string is ambiguous/indirect, and is not included in the subsequent analysis

Regulations on mandatory importation of goods through authorized entities (government and non-government) and sale though licensed and well-regulated distribution channels could potentially constitute a barrier. However, given the sensitivity of medicines and healthcare products in terms of their impact of human health, such regulations can be essential in contributing to the achievement of SDG 3, as discussed in the next section.

2.2 Safety and predictable efficacy of medicines and healthcare products

Technical NTMs under Chapter B of ICNTM are essential in regulating consistent quality and predictable efficacy of medicines and healthcare products, as well as their safety for human health. In addition to regulating characteristics of the medicines themselves, these regulations set mandatory guidelines on information provision (e.g. chemical formula, indications, counterindications, administration, restrictions, etc.), standard dosages and dosage forms, etc. These technical NTMs are instrumental for overall achievement of SDG 3, unless they are insufficient, or excessive, or are not implemented in a transparent and consistent manner and constitute a barrier (discussed above). Thus, although the presence or absence of such NTMs is reflected in relevant NTM databases, this information would not reflect whether they are adequate (or excessive) in ensuring consistent quality and predictable efficacy. As was mentioned in item 2.1 above, the adequacy of a technical NTM could better be assessed by conducting analysis based on distance in regulatory stringency comparing them to authoritative international standards as well as their effect on prices. However, it is important to take into account that even for such a sensitive and highly standardized type of good, the acceptable level of quality may

differ from country to country. While populations in developed countries would predictably demand the highest quality of medicines, some developing and least-developed countries with very poor and vulnerable population might benefit more from ease of access to cheaper versions of generic medicines than face a complete lack of access to medication. See the first row of table 6.

Medicines, inputs to the pharmaceutical industry, and medical equipment are sensitive products that have a direct impact on human health. They require specialized facilities, equipment and knowledge to ensure adequate handling and storage conditions to prevent medicines from becoming harmful to human health or from losing their efficacy, or, in case of medical equipment, precision. To ensure proper handling, as well as to improve accountability for cases of non-compliance, countries impose measures specifying entities that are authorized to import, distribute, and sell such products, and apply other traceability measures for TBT reasons. See the second row of table 6.

Table 6. Concordance strings for issues related to safety and predictable efficacy of medicines and healthcare products

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Targets 3.1, 3.2, 3.3, 3.4, 3.7, 3.8	Medicines (dosified and bulk, inputs to pharmaceutical industry, hospital and laboratories inputs, medical technology equipment), generic medicines, sheath contraceptives and menstrual hygiene products	HS 2007 codes from Helble list (all groups) (Helble, 2012) and HS 2017 codes for generic medicines (WCO, 2017a); plus 401410 and 961900	B11; B14; B15; B31; B32; B33; B2; B4; B7; B8; B6; P13; P14; P6; B19; P19	**Technical regulations on medicines (actual products).** The relationship is ambiguous, as effectiveness of technical regulation in insuring safety and predictable efficacy cannot be judged based on the presence/absence of NTMs. B11 does not necessarily constitute a ban, but rather a prohibition to import a product unless it conforms for certain technical or procedural requirement (i.e. such measure under UNCTAD guidelines should be classified under a different NTM code (B7 or B8) (UNCTAD, 2016)
Targets 3.1, 3.2, 3.3, 3.4, 3.7, 3.8	Medicines (dosified and bulk, inputs to pharmaceutical industry, hospital and laboratories inputs, medical technology equipment), generic medicines	HS 2007 codes from Helble list (all groups) (Helble, 2012) and HS 2017 codes for generic medicines (WCO, 2017a)	B14; B15; B81; B853; J2; H; E1; E3; B3; A3; B42; A64; C1; C3; P13; P14; P6; P2; B19; P19	**Technical and regulations on handling and distributing.** Regulations for mandatory importation of goods through authorized entities (government and non-government), pre-shipment inspection and importation through certain ports of customs, sale through licensed pharmacies or other controlled distribution channels, other traceability measures for TBT reasons, import license. Regulations on proper labelling, marking, packaging, storage and transportation (indirect impact on Target 3.9 which concerns with unintentional poisoning). Related export measures.
Targets 3.1, 3.2, 3.3, 3.4, 3.7, 3.8	Generic pharmaceutical substances and medicines	HS codes list for generic medicines developed by WCO (2017) (WCO, 2017a)	B31; B32; B33; B11; B6; P11; P13; P14; P6	**Labelling and information for generic medicines.** Out of 239 HS lines with full and partial coverage 101 lines (approx. 42%) are also covered by conventions on hazardous chemicals, narcotic drugs, chemical weapons and ozone depleting substances (WCO, 2017a). Thus, use of keywords is essential.

Source: Authors' compilation

Note: Grey highlight indicates that the concordance string is ambiguous/indirect, and is not included in the subsequent analysis

INNs are also important for ensuring quality. The list of INNs is intended for use in pharmacopoeias (publications listing the effects of medicinal drugs and directions for their use), labelling, product information, advertising and other promotional materials, drug regulation and scientific literature, and as a basis for product names, e.g. for generics (WHO, 2017b). INNs are used to avoid confusion on the part of medical professionals, pharmacists and consumers that could lead to unintended consequences, including human health. It is recommended by the WHO,

and often required by countries, that medicines marketed and sold on their territories carry a generic name on their packaging (either in addition to or instead of a trademark; including requirement on the size of the font in which generic name is printed) and that such generic names and their stems are not used as a basis for trademarks (WHO, 2017c). See the third row of table 6.

2.3 Regulating trade in products for human consumption that are undeniably harmful to human health

Narcotic drugs are harmful to human health in general or if not administered in controlled manner by medical professionals. Trade in narcotic drugs and psychotropic substances is to some extent addressed by three international drug control conventions (United Nations Office on Drugs and Crime, 2013). SDG-HS-NTM linkages are rather clear – see table 7. In addition, some of the relevant HS codes, as identified by WCO, are also covered by international conventions regulating transboundary movement of hazardous chemicals or chemical weapon precursors (WCO, 2017a). Thus, it is important to review the description of the regulations and to use relevant keywords (see the full concordance matrix available separately online). Relevant NTMs include prohibition, authorization and registration requirements for TBT reasons, inspection, traceability, licensing for specified use, restriction on distribution channels, and authorized importing channels, etc.

Table 7. Concordance strings for issues related to narcotic drugs

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 3.5	Narcotic drugs regulated under international conventions on preventing illicit traffic in narcotic drugs and psychotropic substances	six-digit HS codes compiled by WCO (as of 2017) (WCO, 2017a)	B11; B14; B15; B31; B32; B33; B42; B81; B84; B85; E1; E3; J2; H; P11; P13; P14; P61; P62; C1; C3; P2; B19; P19	There is significant intersection with HS codes regulated by conventions on hazardous chemicals, chemical weapons, generic pharmaceutical drugs (WCO, 2017a). Keywords are essential. Regulations for mandatory importation of goods through authorized entities (government and non-government), pre-shipment inspections and importation through specified ports of customs, sale through licensed pharmacies or other controlled distribution channels, other traceability measures for TBT reasons, import license, prohibition. Regulations on proper labelling, marking, packaging, storage and transportation. Relevant export regulations.

Source: Authors' compilation

Note: Grey highlight indicates that the concordance string is ambiguous/indirect, and is not included in the subsequent analysis

Trade-related mechanisms of tobacco control are reflected in the *WHO Framework Convention on Tobacco Control* of 2003 (WHO, 2003) and the *WHO Protocol to eliminate illicit trade in tobacco products* of 2012 (WHO, 2013a). These documents regulate such products as tobacco, tobacco products and tobacco product manufacturing equipment. The documents above recommend that the following measures should be adopted by the members to the extent deemed appropriate: import and export bans, import and export licensing, registration of importers, exporters and products, authorizations, technical requirements for the constituents of the tobacco products and their emissions, labelling of such constituents on the packaging, labelling of health warning (verbal and pictorial), prohibition to use labelling that misrepresents the dangers of smoking (e.g. non-use of the words "light, mild, low-tar, etc."), labelling of origin and destination

market and other traceability requirements, and regulations of size of packaging (e.g. bans on small packages, which would make purchases less accessible to the minors) – see NTM code column in table 8. NTMs increasing the cost of the products to the final consumer are also relevant (such as an excise or consumption taxes). Additionally, the conventions recommend regulating (banning) cigarette-shaped products like toys and sweets, as they may make smoking attractive to underage persons. Table 8 summarizes the relevant concordance strings.

Table 8. Concordance strings for issues related to tobacco and tobacco-related products

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 3.a	Tobacco, tobacco products, tobacco product manufacturing equipment	All HS under chapter 24 and some other codes related to production of tobacco and cigarettes (847810; 847890; 481310; 481320; 481390)	B11; B14; B15; B21; B22; B31; B32; B33; B42; B7; B81; B82; B83; B84; B85; E1; E3; P11; P13; P14; P61; P62; F; H; J2; C1; C3; P2; B19; P19	Clear with keywords. NTM codes list is based on measures described in relevant multilateral agreements, partially confirmed by examples in the TRAINS database. Regulations for mandatory importation of goods through authorized entities (government and non-government), pre-shipment inspection and importation through specified ports of customs, sale through licensed points of sale or other controlled distribution channels, other traceability measures for TBT reasons, import license, prohibition, excise tax. Regulations on proper labelling, including on false or misleading claims, marking, packaging, including pictorial health warnings, storage and transportation. Regulations of tar and nicotine content. Relevant export measures.
Target 3.a	Toys, sweets, candies and chocolates shaped like cigarettes and cigars	HS codes for toys, sweets and candies	B11; E311; E32; B7; B8	Clear with keywords, but very likely to have extremely small coverage of six-digit HS codes by NTMs with relevant objectives. There are a few examples in the TRAINS database.

Source: Authors' compilation

Note: Grey highlight indicates that the concordance string is ambiguous/indirect, and is not included in the subsequent analysis

2.4 Regulating characteristics of products intended for human consumption

This issue considered regulation characteristics of products intended for human consumption so as to prevent them from becoming harmful or excessively harmful to human health, or of providing relevant information to the consumer, so as to allow consumers to make an informed decision about their consumption choices. SDG 3 does not contain a separate target on foodborne diseases, even though their prevention would be an important element of ensuring healthy lives and promoting well-being for all at all ages. According to WHO, "31 global hazards caused 600 million foodborne illnesses and 420,000 deaths in 2010" (WHO, 2015), and in international trade SPS measures are instrumental in reducing the risks of occurrence of foodborne diseases. SPS measures also regulate the level of various substances - additives, residues and contaminants – in products intended for human consumption that may have adverse impact on human health. In fact, definition of SPS measures, as elaborated in the SPS Agreement[22], directly states such purpose as the protection of "*human … life or health … from risks arising from additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs*." Target 3.4 seems to be most suitable to include this objective as it intends to *"…reduce by one third premature mortality from non-communicable diseases through prevention…*".

[22] https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm

2.4.1 Food safety

Thus, one can say that there is a linkage between SDG 3, all HS codes for intermediate and final food products intended for human consumption, SPS measures under ICNTM codes A2, A3, A4, A6, A8, A9 (clear linkage). Some TBT measures (B33 and B42), which relate to the prevention of food products from spoiling during transit, transhipment and storage en route to the consumer, may also serve this purpose. However, this connection is ambiguous, as measures falling under these NTM codes may have other unrelated regulatory objectives (see table 9).

The resulting HS-NTM code pairs can be quite clear without keywords, due to the inherent characteristics of regulated goods and the regulatory objectives of A2, A3, A4, and A6 measures. NTM code A8 includes conformity assessment measures that complement other NTM codes under ICNTM Chapter A and are relevant to all SPS purposes (including regulation of agricultural raw materials to prevent spreading of pests, animal and plant disease). Although code A8 is intended to include supporting measures for SPS regulations, this code should not be ignored in analysis, as often technical SPS measures are misclassified as A8 measures or incorporate both the conformity assessment regulation and the technical regulation not included elsewhere in the database (UNCTAD, 2016). Combination of A8 measures with the relevant HS codes is in itself quite clear due to the inherent characteristics of the regulated goods. NTM code P6, which may contain relevant SPS export measures is too ambiguous, as it also includes TBT measures that may have other unrelated regulatory purposes.

At the same time, some combinations of these HS and NTM codes are also relevant for Target 12.3 on reducing food loss and Target 3.9 on preventing unintentional poisoning with foods that do not meet essential food safety requirements. For the purpose of this methodology relevant NTMs can be considered as having indirect impact on the achievement of Targets 12.3 and 3.9, while having direct impact on Target 3.4 – see table 9.

Table 9. Concordance string for all intermediate and final food products to ensure food safety

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 3.4	All intermediate and final food products	UNCTAD SOP2 and SOP3 (H3); only chapters 02-22 EXCLUDING chapters 05, 06 (WITS; WITS)	A2; A3; A4; A6; A8; A9	Clear. Regulations to ensure food safety to human health from foodborne diseases, as well as from harmful additives, contaminants, residues, toxins or disease-causing organisms in foods and beverages. Linkage is clear without keywords due to the intrinsic purpose of SPS measures. This string also has indirect linkage to Target 12.3 (food loss) and Target 3.9 (unintentional poisoning). Linkage is clear without keywords due to the intrinsic purpose of SPS measures. This string also has indirect linkage to SDG 12 (food loss).
			B33; B42; P6	Too ambiguous due to the possibility of other unrelated regulatory purposes.

Source: Authors' compilation

Note: Grey highlight indicates that the concordance string is ambiguous/indirect, and is not included in the subsequent analysis

2.4.2 Healthy foods

The *WHO Global Action Plan for the Prevention and Control of Noncommunicable diseases 2013-2020* contains a subset of recommended policy options aimed at promoting healthy diets under the Objective 3 "*To reduce modifiable risk factors for noncommunicable diseases and underlying social determinants through creation of health promoting environments*" (WHO, 2013). Such policies include, but not limited to, reducing the level of salt/sodium added to food (prepared or processed); reducing saturated fatty acids and replacing them with unsaturated fatty acids; replacing trans-fats with unsaturated fats; reducing the content of free or added sugars in foods and non-alcoholic beverages; limiting energy density of foods; promoting nutrition labelling, according to but not limited to international standards, in particular Codex Alimentarius for all pre-packaged foods; recommendations on marketing of foods and non-alcoholic beverages to children.

Relevant to this are regulations containing requirements on such food composition or such ingredient characteristics that are considered healthy (NTM codes B7 and B8) and applied to all HS codes for intermediate and final food products. Although the impact of NTMs in this case is direct, the linkage is very ambiguous as the relevant NTM codes may have other unrelated regulatory objectives, so the coverage of this HS-NTM code combination by SDG 3-relevant objective would only be partial and very limited (see the first row of table 10).

In addition, relevant to this topic are regulations on providing consumers with information on food product ingredients. These may be applied to all final food products. Specifically, regulations on labelling certain ingredients that are associated with higher or lower risks of non-communicable disease development (e.g. sugar, salt, alcohol, saturated fats and trans fats, other potentially harmful additives, constituents derived from GMOs, meat from animals that did not receive antibiotics and/or hormones or other chemicals through their feed, organic ingredients, meat from wild-caught fish, etc.), and health warnings (e.g. for alcohol). These NTMs in combination with the relevant HS codes for intermediate and final food products also have direct impact on SDG 3 (NTM codes B31, B32, B33) – see table 10 second row.

The concordance between these HS-NTM code pairs is clearer and less controversial than the former one (first row), as regulations on "healthy" composition and characteristics of food may be seen as going above the level that is considered a required food safety minimum (Bureau & Marette, 2002), and thus, excessive and a trade barrier. Some of such regulations may result in disputes within the framework of the multilateral trading system (Unnevehr, 2003). Additionally, perception of what is "healthy", as well as the population's nutritional needs may differ across countries. Indeed, there is no commonly accepted definition of what constitute a "healthy" food. Furthermore, relevant scientific information and resulting nutrition-related recommendations constantly evolve. Some countries with vulnerable populations may be not be able to afford "healthy" food products, as the ingredients and production processes are often significantly costlier. In this context, the requirement to provide information on food product composition and ingredient characteristics through labelling does not ban less "healthy" products from importation but allows end consumers to make independent purchasing decisions (Golan & Unnevehr, 2008). The linkage, however, is still rather ambiguous, as these NTM codes can have objectives not

related to the provision of health-related information to the consumers. Usage of keywords may be helpful, but it is hardly possible to come up with an exhaustive list of relevant keywords.

Table 10. Concordance strings for "healthy foods"

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 3.4 Indicator 3.4.1	All intermediate and final food products	UNCTAD SOP2(H3) (WITS) and SOP3 (H3) (WITS); only chapters 02-22 EXCLUDING chapters 05, 06	B7; B8; P6	Very ambiguous. Regulations containing requirements on such food composition or such ingredient characteristics that are considered healthy. Such requirements can differ from country to country.
Target 3.4 Indicator 3.4.1	All intermediate and final food products	UNCTAD SOP2(H3) (WITS) and SOP3 (H3) (WITS); only chapters 02-22 EXCLUDING chapters 05, 06	B31; B32; B33; P6	Ambiguous; may be clear with keywords, but exhaustive list of keywords is hardly possible. Regulations on providing consumers with information on food product ingredients, specifically marking certain ingredients that are associated with higher or lower risks of non-communicable disease development, and health warnings (e.g. for alcohol).

Source: Authors' compilation
Note: Grey highlight indicates that the concordance string is ambiguous/indirect, and is not included in the subsequent analysis

2.4.3 Harmful use of alcohol

Target 3.5 is concerned with substance abuse, including harmful use of alcohol. There is no international convention on controlling alcohol use, although there have been proponents for the establishment of such an international framework (Taylor & Dhillon, 2013). Currently, WHO conducts work aimed at reducing alcohol consumption and minimizing the health impacts of such consumption. The priorities of this work are reflected in the *Global Strategy to Reduce the Harmful Use of Alcohol*, which was endorsed by the 63rd World Health Assembly in 2010 (WHO, 2010). As opposed to the convention on tobacco control, this document does not have a strong trade component. It focuses on country-level policies aimed at raising awareness, restricting use by regulating selling locations and hours, restricting age for sale of alcohol, regulating marketing and distribution activities, limiting points of sale and distribution channels, issuance of sale licenses and permits, minimum sale prices and excise taxes, etc. Some of such measures may affect international trade in alcohol products, and ICNTM classification contains some relevant NTM codes.

Some NTMs relevant to reducing alcohol consumption can be derived from the recommendations of the WHO global strategy (WHO, 2010) and Global Status Report on Alcohol and Health (WHO, 2014), including regulations on labelling and packaging (health warnings, traceability, marketing not targeted towards youth, etc.) (IARD, 2019), traceability measures, price control measures and excise taxation in particular, import/export licenses and permits, registration of products and importers/exporters, etc. Importantly, blanket prohibitions cannot always be considered as effective measures, as they may lead to illicit trade in alcohol (negative impact on

SDG 16) or to consumption of low quality or surrogate alcohol[23], which is more dangerous to human health. Moreover, Target 3.5 aims to only prevent harmful use of alcohol, while its moderate consumption is still accepted in most countries. Despite this, B11 code is still included in the concordance string, as the TRAINS database often registers measures that are not necessarily bans, but rather prohibitions to import a product unless it conforms to certain technical or procedural requirements (i.e. such measures under the UNCTAD's NTM collection guidelines should be classified under other NTM codes of Chapter B) (UNCTAD, 2016). There are also some examples of import prohibitions motivated by cultural and religious reasons. Application of such measures is confined only to a limited number of countries.

Regulations controlling distribution and sale of alcohol and reducing its affordability may to some extent contribute to reduction in violence, including gender based violence (SDGs 5 and 11) (WHO, 2006), improved road safety (SDG 11), reduction of illicit trade in alcohol (SDG 16), as well as involvement of population in productive activities (SDG 2, 4 and 6). Within SDG 3, the reduction of alcohol use can contribute to Target 3.4, as alcohol abuse is one of the significant causes of a wide array of non-communicable diseases and health conditions (UNGA, 2012). See table 11 for a summary of derived concordance strings.

Table 11. Concordance strings for alcoholic beverages

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 3.5	Food grade alcohol	Food-grade alcohol: six-digit HS codes under 2203, 2204, 2205, 2206, 2207, 2208	B31; B32; B33; B7; B8; B11; B14; B15; B81; B83; B85; P11; P13; P14; P61; P62; E1; E3; F; H; J2; B42; C1; C3; P2; B19; P19;	Clear with keywords. Some B7 and B8 measures in TRAINS are related to labelling. Regulations for mandatory importation of goods through authorized entities (government and non-government), pre-shipment inspection and importation through specified ports of customs, sale through licensed points of sale or other controlled distribution channels, other traceability measures for TBT reasons, import license, prohibition, excise tax. Regulations on proper labelling, including on health warnings, marking, packaging, storage and transportation. Relevant export measures.

Source: Authors' compilation

Note: Grey highlight indicates that the concordance string is ambiguous/indirect, and is not included in the subsequent analysis

2.5 Reducing injuries and deaths on roads

The reduction of deaths from road accidents is to be achieved primarily through a wide range of domestic policies and improvements to road and urban infrastructure, as evident from the *WHO Road Safety Technical Package of 2017* (WHO, 2017d). A component of the *Road Safety Technical Package*, for which use of NTMs is most relevant, calls for establishment and enforcement of vehicle safety standard regulations, including those that relate to seat-belts, air bags, seat-belt anchorages, minimum standards on car performance during frontal impact and side impact, electronic stability control, pedestrian protection vehicle features, ISOFIX child

[23] As described in the WHO global strategy (WHO, 2010), "surrogate alcohol" refers to liquids usually containing ethanol and not intended for consumption as beverages, that are consumed orally as substitutes for alcoholic beverages with the objective to producing intoxication or other effects associated with alcohol consumption.

restraint points in cars, etc.; as well as anti-lock braking system and daytime running lights in motorcycles (WHO, 2017d). Although each country is free to set their own minimum technical safety standards, it is recommended to adhere to the international motor vehicle safety standards developed by the United Nations World Forum for Harmonization of Vehicle Regulations.[24] It is also recommended that imported and exported new and used vehicles are compliant with the minimum safety standards, while international trade in vehicles with reduced safety standards is restricted.

Such HS-NTM code pairs have an important linkage to the achievement of SDG 11's target on safe city environment. For the purpose of this methodology, such HS-NTM code pairs may be considered as having direct impact on achievement of SDG 3, and indirect impact on achievement of SDG 12.

Table 12. Concordance string for addressing road safety

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 3.6	Motor vehicles, motorcycles, their parts	Vehicles: six-digits under 8701, 8702, 8703, 8704, 8705, 8708, 8709, 8711, 8716, and 871480	B11; B7; B8; B31; E316; P;	Clear with keywords (their list is hardly exhaustive).

Source: Authors' compilation

Note: Grey highlight indicates that the concordance string is ambiguous/indirect, and is not included in the subsequent analysis

2.6 Maintaining a safe living environment and reducing exposure to harmful substances

This objective is addressed through several SDG targets, in particular Target 3.9, which aims to substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. Indicators 3.9.1 and 3.9.2 are concerned with air pollution, water pollution and water sanitation and are addressed by relevant targets of SDG 6, SDG9, SDG11, SDG12, SDG 14, SDG 15 (see relevant sections in Appendix 2). Indicator 3.9.3 is concerned with unintentional poisoning and is partially addressed by SPS measures applied to final food products (see above in section on Target 3.4). For the purpose of this methodology impact of NTMs on this target's achievement can be considered indirect (table 13 row 1).

Unintentional poisoning by non-food products can be addressed by the proper labelling of potentially dangerous products used by households or for commercial purposes. However, a relevant HS list may be hard to derive, while relevant NTMs (B31, 32, 33) may have other regulatory purposes. Some of the relevant measures can be identified in the TRAINS database by filtering all measures by NTM codes for labelling, marking and packaging and keyword "poison". Use of keywords "not for human consumption" and "nonedible" yields a significant number of NTMs that have unrelated regulatory objectives (table 13 row 2).

[24] Webpage of the World Forum for Harmonization of Vehicle Regulations cab be accessed here: https://www.unece.org/trans/main/wp29/meeting_docs_wp29.html

Other SDG targets that address the above-mentioned objective are Target 12.4 on hazardous chemicals, Target 16.4 on chemical and biological weapon precursors, and relevant targets of SDG 3, where NTMs are aimed at proper labelling and handling of hazardous chemicals, medicines, and narcotic drugs for medicinal use. As shown in table 13, impact of NTMs on this Target's achievement are considered indirect (table 13 row 3).

Table 13. Concordance string for addressing harmful substances

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 3.9 Indicators 3.9.1 and 3.9.2	NA	NA	NA	Ambiguous, or covered by other SDGs (SDG 6, SDG9, SDG11, SDG12, SDG 14, SDG 15). Indicators 3.9.1 and 3.9.2 are concerned with air pollution, water pollution and water sanitation.
Target 3.9 Indicator 3.9.3	All HS	All HS	B31; B32; B33	Only for Indicator 3.9.3. Clear with keyword "poison". Very limited coverage. Use of keywords "not for human consumption" and "nonedible" yields a significant number of NTMs that have unrelated regulatory objectives.
Target 3.9 Indicator 3.9.3	NA	NA	NA	Ambiguous, or covered by SDG 3's other targets, Target 12.4 on hazardous chemicals, and Target 16.4 on precursors for chemical and biological weapons

Source: Authors' compilation

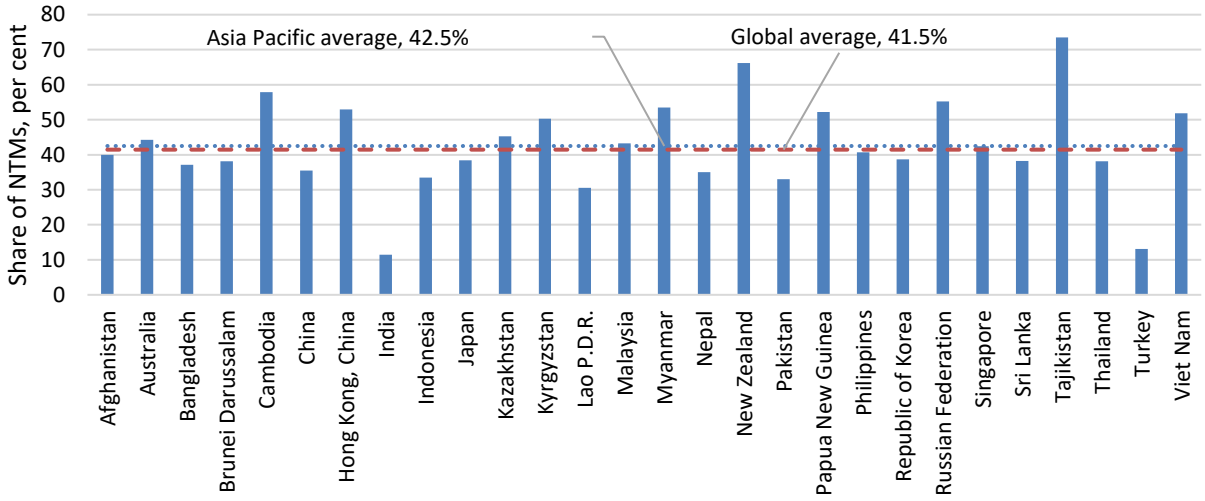
Note: Grey highlight indicates that the concordance string is ambiguous/indirect, and is not included in the subsequent analysis

This section presented a detailed overview of the process involved in creating concordance string, using SDG 3 as an example – similar description is available for other SDGs in Appendix 2. The following section presents a detailed discussion of the application of the concordance matrix to NTMs of Asia-Pacific economies available in the TRAINS database. Global results and tables are available in the Excel file attached to this publication.

3. NTMs in Asia Pacific and their linkages to the SDGs

Below are the results of examination of the NTM data available in the UNCTAD's TRAINS database for Asia Pacific economies. Figure 4 below reflects the extent to which NTMs in each economy directly address specific SDGs. In line with a-priori expectations, India has the lowest share of NTMs directly addressing SDGs as the vast majority of its measures are non-technical measures (refer back to figure 3). New Zealand, on the other hand, has one of the highest shares of NTMs that directly address SDGs in the region, as more than 97% of its measures are technical measures. Similarly, Tajikistan has a very high share of NTMs addressing the SDGs, but unlike New Zealand, with only very few individual measures (there are over 3,000 individual NTMs in New Zealand, and only 49 in Tajikistan, according to UNCTAD TRAINS database).

Figure 4. Share of NTMs that directly address SDGs

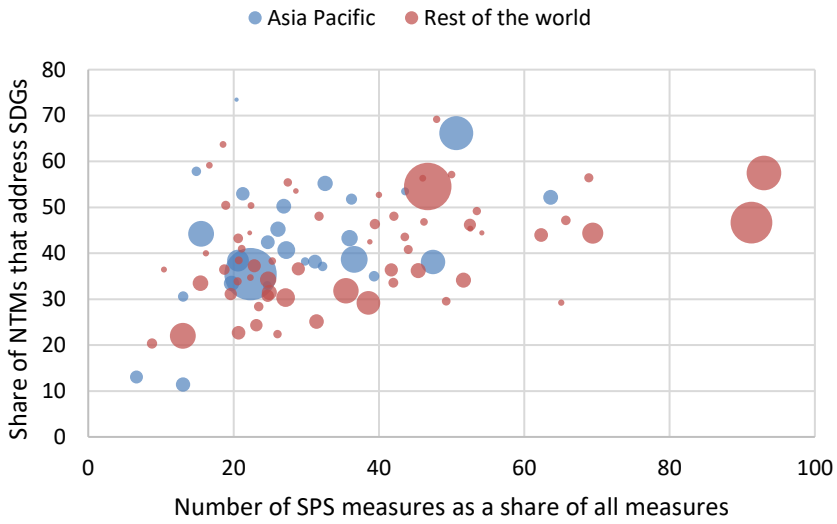


Source: Authors' calculations based on UNTRAD trains database

Indeed, there is a positive association between the share of NTMs that address SDGs and the share of technical measures (particularly SPS) of all NTMs imposed by an economy (see Figure 5). In general, albeit with a few notable exceptions, it also seems that the more NTMs are imposed by an economy, the lower the share of an economy's NTMs addressing SDGs.[25] Paradoxically, there is also a positive association between the overall number of measures and the share of technical measures – meaning that countries that have more measures tend to regulate more through technical measures. Controlling for the number of measures and shares of SPS measures, economies in Asia and the Pacific have, on average, more than six per centage points higher share of NTMs addressing the SDGs than economies outside of the region.

[25] When the share of NTMs addressing SDGs is regressed on the log of total measures and the share of SPS measures, the coefficient on the log of total measures is negative and significant, whereas the coefficient on share of SPS measures is positive (and significant). At the same time, log of total measures and share of SPS measures are positively correlated.

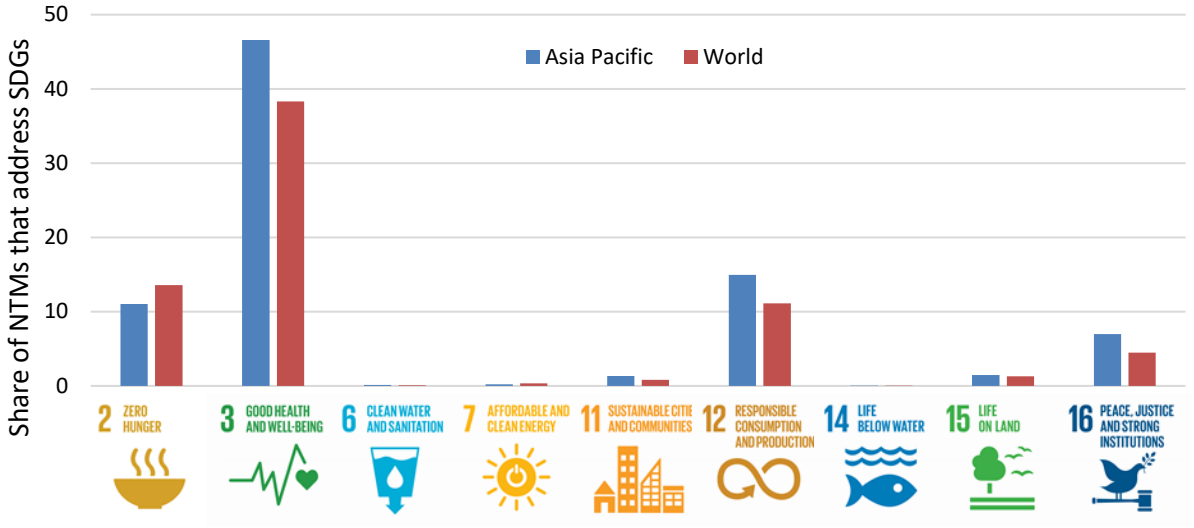
Figure 5. Share of SPS measures vis-à-vis share of NTMs that address SDGs



Source: Authors' calculations based on UNTRAD trains database
Note: Size depicts total number of NTMs

Figure 6 depicts how NTMs in Asia-Pacific and the world address individual SDGs. It should be noted, however, that the shares of NTMs should not be misinterpreted with stringency of any such measures. A large number of measures that are relatively easy to comply with addressing an SDG may potentially be inconsequential in helping to achieve that SDG. At the same time, certain individual measures may not show up in high shares of overall NTMs, but still have a significant impact on SDGs, such as in the case of the European Union's import ban on seafood from Sri Lanka, which resulted in the uptake of sustainable fishing practices in the country and in improved safety of fishermen at sea (Sandaruwan & Weerasooriya, 2018). Additionally, one country may adopt one single NTM to address energy efficiency in several types of products, while another would have separate regulations for specific types of products. As such, these limitations must be kept in mind when interpreting the shares of NTMs addressing each SDG.

Figure 6. Share of NTMs that directly address SDGs, by Goal



Source: Authors' calculations based on UNTRAD trains database

The highest shares of NTMs in Asia-Pacific directly address SDGs 2, 3, 12 and 16. Such prominence of SDG 2 and 3 is due to the fact that SPS measures, that take the highest share of all NTMs, have a direct role to play in the achievement of these goals. Additionally, protection of human health from illness or from exposure to various external factors (food, medicines, narcotics, alcohol, tobacco, medicines, hazardous chemicals and poisons, etc.) is, perhaps, one of the most prominent development priorities, contributed to by a wide array of technical and non-technical measures (see section 2 on SDG 3 above). SDG 12 is also quite prominent, as it has a strong environmental and, indirectly, health-related component addressed through Targets 12.4 and 12.5 on sound management of hazardous and non-hazardous chemicals and wastes. It is also in line with normal expectation that NTMs with the potential to directly address priorities linked to enhancing peace and security and curbing crime are of high prominence, as they address trade in a large group of sensitive goods such as arms, weapons of mass destruction and their precursors, potentially dual use goods, conflict minerals, and illicit trade, in general.

The share of NTMs addressing SDGs in Asia-Pacific roughly follows the global pattern, though, notably, SDGs 3, 12 and 16 are addressed by NTMs relatively more intensively than on average, worldwide. It should be noted that (as discussed above) most of product-NTM pairs are relevant to more than one SDG. To minimize double counting, effort was made to create a one-to-one correspondence to match one product-NTM pair with one most directly affected SDG. However, as some instances of recorded measures state objectives and regulate products relevant to more than one SDG, some double counting was unavoidable.[26] The following briefly

[26] For example, one regulation may impose controls on transboundary movement of narcotics, drugs and guns – goods that are relevant to SDG 3 and 16, while another may regulate hazardous chemicals in general and chemicals suitable as precursors for weapons of mass destruction in particular (SDG 12 and 16).

describes some prominent examples where NTMs have strong potential to contribute to the achievement of SDGs, as well as some other public policy objectives.

3.1 Goal 2 – Zero hunger

Prevention of spreading of pests, plant and animal diseases is essential to ensuring food security. This objective to some extent fits under Target 2.4 (resilient agricultural practices)[27] and is directly addressed by SPS and some other measures applied to agricultural raw materials and related products that may harbour dangerous pests, disease-carrying or disease-causing organisms. Target 2.b (export subsidies)[28] specifically mentions the need to eliminate harmful export subsidies and all export measures with equivalent effects. However, absence of relevant NTMs in the TRAINS database could not be used as a reliable criterion since such absence may be the result of omissions, incomplete data collection or the consequence of a country's export structure. Additionally, any reduction of subsidies is to be implemented gradually with different level of commitment by different countries. Such progress cannot be clearly reflected in the TRAINS database, which at the time of writing recorded only 18 measures related to the provision of export subsidies.

3.2 Goal 3 - Good Health and Well-being

This Goal aims to ensure healthy lives and promote well-being for all at all ages. Among its 13 targets ten[29] are directly addressed by NTMs imposed on relevant groups of goods. Within these targets, the main issues addressed by NTMs are generally related to the following:

- The issue of improving access to medicines and healthcare products, while ensuring their safety and predictable efficacy
- The issue of reducing human consumption of products that are undeniably harmful to human health (i.e. narcotics and tobacco)
- The issue of food safety
- The issue of increasing consumption of healthier foods, while reducing consumption of foods or additives that can contribute to the occurrence of non-communicable diseases (i.e. food quality and labelling, regulation of trade in alcohol products)
- The issue of reducing injuries and deaths on roads (i.e. motor vehicle safety)
- The issue of maintaining a safe living environment and reducing exposure to harmful substances (e.g. hazardous chemicals)

Based on the analysis, by far the largest share of all NTMs address this SDG for the reasons stated above. NTMs that address this SDG include regulation of medicines (quality, labelling, storage, certification, licensing, traceability, registration of goods/importers, importation and distribution channels, etc.), food safety (primarily SPS measures), nutrition labelling of

[27] By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

[28] Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round

[29] Target 3.1- Target 3.9, Target 3.a

packaged foods and health warnings on alcohol and tobacco products, technical regulations on vehicle safety, restrictions and price control measures for trade in alcohol and tobacco products, etc.

3.3 Goal 12 - Responsible Consumption and Production

SDG 12 aims to ensure sustainable consumption and production patterns. Targets within this SDG, for which NTMs are relevant, aim to address such issues as resource efficiency of goods and production processes, reduction of resource waste, environmentally and socially responsible company practices and public procurement, sound management of hazardous chemicals and waste, etc. TRAINS database features very prominently regulations that are relevant to Targets 12.4[30] and 12.5[31], which intend to control and restrict transboundary movement of hazardous substances and waste, ozone depleting substances, persistent organic pollutants and hazardous pesticides. This is largely due to the fact that trade in relevant goods is addressed by international agreements, such as the Basel Convention, Stockholm Convention, Rotterdam Convention, Minamata Convection and Montreal Protocol, which is a good illustration of the important role played by international collaboration in achieving SDGs. Trade in these goods is primarily regulated by technical regulations (product certifications, import/export permits, registration of goods/traders, traceability, labelling, marking, packaging, etc.), as well as export controls, licensing and prohibitions, etc.

Quite importantly, NTMs also have an ever-growing potential to address the environmental and social components of SDG 12, as stipulated by its Targets 12.6 and 12.7 on sustainable and socially responsible practices of the companies and governments, by regulating sustainability and environmental impact of production processes and methods, as well as procurement. The concordance strings for these linkages are included in the matrix section describing direct impact of NTMs, with the purpose of monitoring likely appearance of relevant measures in the TRAINS database with time.

Technical regulations aimed at preservation of products during their transport, transhipment, storage en route to the buyer, reduction of their excessive loss (through leakage, spillage, excessive evaporation, spoilage), prevention from damage from external factors or due to internal characteristics of the product (food, wood, cement, agricultural non-food products, etc.) are difficult to isolate in the TRAINS database within the bulk of NTMs on packaging, storage, transportation, labelling and marking. However, as described in the Section **Error! Reference source not found.** above, they have a very high potential to contribute to the achievement of Targets 12.1 and 12.2 on the efficient use of natural resources and reducing food waste.

3.4 Goal 16 - Peace, Justice and Strong Institutions

Within this goal, with regards to Target 16.4 NTMs are used to curb trade in arms, ammunitions, dual-use goods that could be used to make chemical, nuclear and biological weapons and their delivery systems, as well as goods suitable for making improvised explosive

[30] By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment

[31] By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

devices. Both import and export measures typical for regulating trade in controlled goods are prominent here, while some export measures are applied on bilateral basis targeting specific countries.

Additionally, relevant to this target are measures aimed to control international trade in precious stones and metals, and other valuable minerals, as it may generate illicit financial flows, which in turn may fuel all forms of human rights abuses and violence, and finance armed conflict. This is achieved through implementation of certification schemes that require companies engaged in such trade to implement due diligence with regard to the sources of traded goods and to ensure full transparency and traceability of the entire supply chain of the minerals. One example featured in the TRAINS database are national regulations based on the standards of the Kimberley Initiative Certification Scheme for rough diamonds. Another notable example pertains to similar regulations for trade in tin, tungsten, tantalum, and gold, such as The Dodd Frank Act Section 1502 of the US detailing measures to ensure responsible sourcing of these 4 metals from the Democratic Republic of the Congo and the neighbouring countries. The latter is not present in the TRAINS database, but it is likely that such measures will be recorded as more countries will adopt related regulations.[32] Relevant measures affecting trade are inspection, certification and auditing of mine sites/smelters/refineries, mineral chain of custody tracking and mineral tracking databases (traceability), registration of exporters and importers, mineral export certification and permits, licensing, pre-shipment inspection, marking and transportation in tamper-proof containers.

3.5 Other Goals

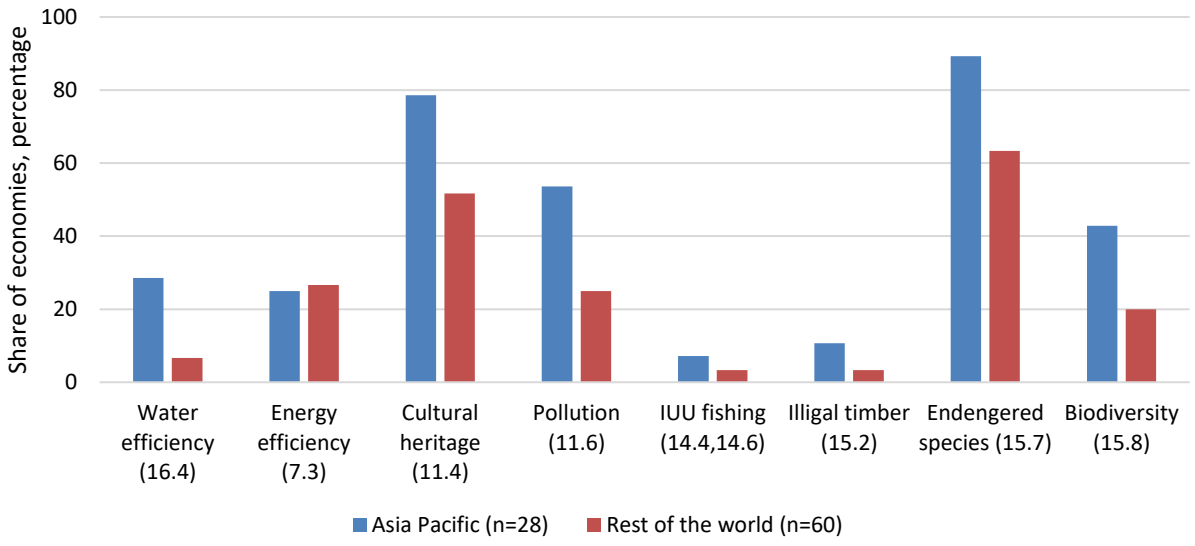
There are a number of product and NTM pairs that are less prominently featured in the TRAINS database than the ones described above, but that can potentially have a significant impact on the affected SDGs. Technical regulations on water and energy efficiency targeting water and energy using appliances, equipment and machines are relevant to Targets 6.4 and 7.3. Reduction of pollutant and noise emissions from transport, machines and equipment used in the cities can contribute to Target 11.6. NTMs can play a significant role in protecting the world's movable cultural and historical heritage, which is relevant for Target 11.4. Trade-related measures described in the 2001 International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) which was adopted to facilitate sustainable sourcing of fish and to reduce impact of fishing on the marine environment and on the health of fish stocks are relevant to Targets 14.4 and 14.6 . Finally, NTMs are used to regulate trade in endangered species of flora and fauna (Target 15.7), to curb trade in illegally and unsustainably harvested timber (Target 15.2) and to control transboundary movement of the invasive species that may threaten biodiversity (Target 15.8).

Figure 7 depicts share of economies for which NTM data was available (88 globally, with the European Union counting as a single economy) that have at least one measure in place to address the targets described above. In all but Target 7.3 (doubling the global rate of improvement in energy efficiency) Asia Pacific is ahead of the rest of the world. While most economies in the

[32] EU will from 1 January 2021 enact Regulation (EU) 2017/821 of the European Parliament and of the Council of 17 May 2017 laying down supply chain due diligence obligations for Union importers of tin, tantalum and tungsten, their ores, and gold originating from conflict-affected and high-risk areas.

region use NTMs to address Target 15.7 (regulating trade in protected species), and, to a lesser extend target 11.4 (protecting cultural and historical heritage), lack of trade regulations addressing other feasible targets is a cause for concern. In particular, less than 50 per cent of economies have regulations affecting product-related water and energy efficiency (Targets 6.4 and 7.3), and only approximately 10 per cent have measures addressing IUU and illegal timber trade (Targets 14.4, 14.6 and 15.2). As such, there seem to be more scope for member States in the region to address these aspects of sustainable development through trade measures. Caution should be exercised, however, to ensure than any such measures do not place unnecessary burden on compliant traders. Furthermore, any regulations must be non-discriminatory in nature, meaning not only trade partners are affected equally, but so are the domestic producers.

Figure 7. Share of economies with at least one NTM targeting specific targets



Source: Authors' calculations based on UNTRAD trains database

3.6 NTMs that have no direct links to SDGs

As noted, many NTMs were found to have no direct linkages to SDGs. This is not to say that they lack public policy objective. For example, while motor vehicle safety can be linked to reducing traffic accident fatalities (Target 3.6), safety of consumer and commercial products cannot be directly linked to any SDG target.

Furthermore, for some potentially feasible cases it was not possible to establish conclusive product-NTM-keyword combinations. One such examples are the NTMs on packaging, storage, transportation, labelling and marking that stipulate requirements aimed at preservation of products during their transport, transhipment, storage en route to the buyer. Such NTMs may contribute to Targets 12.1 and 12.2 on the efficient use of natural resources and reducing food waste, as they help reduce excessive loss of goods, which may occur due to leakage, spillage, excessive evaporation, spoilage, damage from external factors or due to internal characteristics of the

products. However the exact same concordance strings in the majority of examples recorded in the TRAINS have regulatory objectives relevant to other SDGs, such as: protection of human health from foodborne diseases caused by spoiling of food products; protection of human health from exposure to hazardous substances (sensitive goods that have medical purpose, toxins, viruses, microorganisms, chemicals, wastes, narcotics, etc.); protection of the environment from exposure to hazardous substances and goods that may pose biohazard (chemicals, wastes, toxins, viruses, microorganisms, living modified organisms, alien species, radioactive substances, potentially poisonous substances, etc.); protection of public security (guns and arms, weapons, explosives and their precursors, etc.); other highly regulated or sensitive goods regulated for various reasons, including for the purpose of ensuring strict traceability of trade in these goods (rough diamonds, alcohol, narcotics for medicinal purposes, etc.). This makes this combination of SDG Target-HS code-NTM code-keywords too ambiguous for the purpose of this methodology.

Finally, some measures have an indirect impact on SDGs (discussed below) or impact SDGs negatively (such as agricultural export subsidies), and hence, lack of, rather their existence, contributes to the achievement of the SDGs.

3.7 Indirect effects

As was noted above, the focus of the matrix and the quantitative analysis of the TRAINS data are those product-NTM pairs that describe a direct intended (and positive) impact of NTMs on the achievement of SDG targets (stated or implied). The matrix additionally explores linkages that are evaluated for various reasons as indirect under the selected approach.

Although effort was made to assign each product-NTM pair to one most directly affected SDG, some of them are relevant to more than one SDG, either due to similar or interlinked objectives, or due to the potential of certain positive impacts of NTMs extending beyond the SDGs to which the examined concordance strings have a direct linkage. For example, NTMs regulating water and energy efficiency of water and energy using goods (Targets 6.4 and 7.3) are also relevant to Target 12.2 on efficient use of natural resources. NTMs regulating safety of motor vehicles and addressing Target 3.6 on reducing deaths and injuries from road accidents are also relevant to Target 11.2 on road safety. Trade measures to control trade in narcotic drugs to curb substance abuse (Target 3.5) are also relevant to Target 16.4 on reducing illicit financial flows, including from illicit trade. Some regulations aimed at ensuring sound management of hazardous chemicals (Target 12.4) can also contribute to Target 3.9 on reducing deaths and illnesses from hazardous chemicals.

Apart from the above examples describing very close connection of product-NTM pairs to more than one SDG, there are examples of more subtle linkages. For example, Target 5.2, aimed at elimination of all forms of violence against women and girls in the public and private spheres, can be indirectly addressed by product-NTM pairs that are directly relevant to Target 16.4, where it is concerned with control over transboundary movement of small arms and IEDs. Target 3.5 NTMs aiming to control and reduce use of alcohol and narcotic drugs (Target 3.5) can also reduce gender-based violence, including by intimate partners. Safe cities and inclusive urban environments, which are the objective of SDG 11, can reduce gender-based violence by persons other than intimate partners (Target 5.2) and contribute to women's productive involvement in employment and education (Target 5.5). Target 5.6 on universal access to sexual and

reproductive health and reproductive rights is partially addressed by SDG 3. Responsible practices by private and public sectors, as invoked in Targets 12.6 and Target 12.7, can contribute to equal employment opportunities and equal pay for work of equal value regardless of gender (Targets 5.1, 5.5, and 8.5).

For easy reference, below for each SDG target that has an associated concordance string describing direct intended impact of NTMs, Table 14 lists other identified targets within the same or other SDGs, for which impact of the same NTMs imposed on the same product groups was evaluated as indirect for the reasons stated above. Notably but unsurprisingly, NTMs that are directly relevant to Target 12.6 on environmentally and socially responsible practices of companies are also to varying extent relevant to pretty much to all of the other SDGs.

Table 14. SDG targets directly and indirectly impacted by NTMs

Directly impacted by NTMs	Indirectly impacted by NTMs
Target 2.4	Target 2.5; Target 3.4;
Targets 3.1; Target 3.2; Target 3.3; Target 3.4; Target 3.7; Target 3.8;	Target 5.6; Target 16.4
Target 3.4	Target 2.1; Target 2.2; Target 3.9
Target 3.5	Target 5.2; Target 16.4;
Target 3.6	Target 11.2
Target 3.9	Target 3.4
Target 3.a	Target 16.4
Target 6.4	Target 11.3; Target 11.4; Target 11.5; Target 12.2; Target 12.8; Target 13.1; Target 13.2; Target 13.3; Target 14.4; Target 11.b;
Target 7.3	Target 11.3; Target 11.4; Target 11.5; Target 12.2; Target 12.8; Target 13.1; Target 13.2; Target 13.3; Target 14.3; Target 11.b;
Target 11.4	Target 16.4
Target 11.6	Target 3.9; Target 11.3; Target 11.4; Target 11.5; Target 13.1; Target 13.2; Target 13.3; Target 11.b
Target 12.2	Target 8.4; Target 11.3; Target 11.4; Target 11.5; Target 12.8; Target 13.1; Target 13.2; Target 13.3; Target 11.b
Target 12.4; Target 12.5;	Target 3.9; Target 14.3; Target 16.4; Target 11.b
Target 12.6	Target 2.4; Target 2.5; Target 3.9; Target 5.1; Target 5.5; Target 6.4; Target 7.3; Target 8.5; Target 8.7; Target 8.8; Target 9.4; Target 11.3; Target 11.4; Target 11.5; Target 12.2; Target 12.5; Target 12.8; Target 13; Target 13.1; Target 13.2; Target 13.3; Target 14.2; Target 14.3; Target 14.4; Target 14.6; Target 14.7; Target 15.1; Target 15.2; Target 15.3; Target 15.4; Target 15.5; Target 16.2; Target 11.b; Target 14.b; Target 15.c
Target 12.7	Target 5.1; Target 5.5; Target 8.5; Target 8.7; Target 8.8; Target 11.3; Target 11.4; Target 11.5; Target 14.4; Target 11.b; Target 14.b
Target 14.4; Target 14.6	Target 15.7; Target 2.4; Target 2.5;
Target 15.2	Target 16.4; Target 15.7; Target 2.4; Target 2.5;
Target 15.7	Target 2.5; Target 11.4; Target 16.4; Target 2.4;
Target 15.8	Target 2.5; Target 11.4;
Target 16.4	Target 5.2; Target 8.5; Target 8.7; Target 8.8; Target 9.5; Target 16.1; Target 9.b

Source: Authors' compilation

It is also important to emphasize that the positive direction of the intended impact of an NTM on an SDG's achievement is inferred from its stated public policy objective or implicit intention, as it is not possible to accurately assess the full range and extent of an NTM's impact due to data limitations. The actual impact of an NTM is usually much broader than the stated objective and the regulated economic sector. Moreover, different contexts of adopting and affected countries (geographical, historical, economic, institutional, regulatory, etc.) contain important factors that influence the impact of an NTM. Although the implementation of regulatory impact assessment at the stage of NTM design is a globally accepted best-practice, countries do so rather inconsistently, if at all (OECD, 2017).

4. Conclusion and way forward

NTMs have a long-standing history of addressing the important development priorities, some of which have been included in the Sustainable Development Goals. Moreover, as such priorities evolve to tackle newly emerging issues, so do the NTMs. Specifically, NTMs in the past were primarily tackling issues related to human health, safety and security, protection of the environment, animal and plant life, especially those within the national borders of the imposing countries and at the time of NTM administration. Presently, as is reflected in UNCTAD's TRAINS database, WTO's I-TIP Goods and EDB databases, NTMs are increasingly addressing these issues outside of the national borders of the imposing countries, including with the aim to curb certain negative impacts that are likely to manifest themselves in the future. NTMs additionally attempt to control environmental sustainability and social aspects of the entire life-cycle of the traded goods, including by regulating non-product-related processes and production methods. A gradual transition or adaptation of certain authoritative voluntary sustainability standards into national legislation of some countries can also be seen.

This narrative is supported by the fact that, NTMs addressing issues that traditionally have been considered as public policy priorities, take the lion's share of all NTMs globally and in the Asia-Pacific region. These include SPS and TBT measures relevant to SDGs 2, 3, and 12, as well as the related non-technical measures, such as prohibitions, licensing and permits, registration of goods and traders, etc. At the same time, the analysis of the TRAINS data yields the examples of measures tackling such issues as resource efficiency (SDGs 6, 7, 12) and environmentally and socially responsible production methods (SDGs 14, 15, and 16). There are even more examples of the latter in literature, even though they may not be yet reflected in the NTM databases.

Additionally, following the new edition of the ICNTM classification, there are plans to collect detailed data on NTMs falling under the Chapters, data for which previously were not consistently collected. In that, the SDG-HS-NTM Concordance Matrix and the concordance methodology may prove to be a useful tool in monitoring appearance of new NTMs addressing specific SDGs. SDH-HS-NTM Concordance Matrix is created as a flexible tool that can be updated as new insights come to light or new data become available. It can also be adjusted to the specific needs of the researcher and contains some data that may provide ideas for additional directions of further inquiry. The concordance matrix attempts to describe a wide range of possible interconnections between NTMs and SDGs based on the available literature and research, but it is definitely not exhaustive. The identified linkages are not exhaustive, as some of the NTMs addressing important public priorities do not necessarily have an SDG target associated with them.

Additionally, there are a number of examples of NTMs in the TRAINS database that address priorities reflected in the SDG targets, but for which it is was not possible to generate conclusive and consistent concordance strings that can be utilized for quantitative analysis of the TRAINS data. In that, flexibility of the concordance matrix allows to record any relevant linkages that may have been omitted for various reasons.

The application in Asia and the Pacific presented previously is the first attempt on utilizing the concordance matrix to implement initial analysis of the data in the TRANS database. Although analysis results offer an interesting insight into how NTMs in the Asia Pacific region address SDGs directly, interpretation of these results needs to be done with caution. As was stated above, the identified linkages are not exhaustive. For SDGs 1, 4, 5, 8, 9, 10, 13 and 17 and for a number of targets under other SDGs no links were identified describing direct intended impact of NTMs. However, this does not mean that trade in general and NTMs in particular do not play any role here. Also, when looking at more disaggregated data (subregional or country level), prevalence on NTMs targeting certain goods and directly impacting certain SDGs may be affected by product or partner structure of trade, country-specific development priorities, geopolitical and geographical factors, etc. Thus, these factors need to be taken into account when interpreting country-level data. Interesting insights may potentially be obtained from making comparisons between countries at the level of specific product groups.

To conclude, it is important to reiterate, that although NTMs, being public policy tools, often intend to contribute to the sustainable development, the important questions remain, whether the specific NTMs are effective in achieving their stated objectives, and whether these contributions outweigh the costs associated with NTMs.

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Appendix 1. SDG-HS-NTM-Keywords Concordance Matrix

As the result of the concordance exercise described in the sections above, a concordance matrix was built linking SDG Targets, HS codes, NTM codes, and relevant keywords. The matrix additionally provides some descriptive information for easy reference, such as the description of the regulated product group, the composition of the HS codes list, the corresponding version of the HS, and additional notes.

The following colour coding is used in the methodology below and in the matrix: (1) concordance strings that describe direct linkage and are clear enough to enable further quantitative analysis are not color-coded (in the Excel *SDG-HS-NTM Concordance Matrix* they are also marked as “C” for “Clear” or “CwK” for “Clear with keywords”); (2) concordance strings that are too ambiguous, or for which their impact on NTMs is considered indirect, or for which not enough information is available, are colour coded in grey (in the Excel *SDG-HS-NTM Concordance Matrix* they are marked as “A” for “Ambiguous” and “IND” for “Indirect”). Thus, in the *SDG-HS-NTM Concordance Matrix* the latter type of strings can be easily filtered out and excluded from quantitative analysis. Such approach to discussion and data presentation in the methodology and the *SDG-HS-NTM Concordance Matrix* provides an illustrative overview of different avenues in which NTMs may impact trade in the products that are relevant to the SDGs. Examination of all these cases helped finalize the overall approach to building those strings of the concordance matrix that are used in quantitative analysis.

Overall the matrix contains 119 entries. 42 entries are marked as “Clear” and “Clear with keywords” and describe concordance strings where NTMs are characterized by direct positive intended impact on the achievement of the SDG targets and where such linkage is clear enough to attempt further quantitative analysis of the NTM data available in the UNCTAD’s TRAINS database. Such strings cover the following SDGs: SDG 2 on ending hunger, SDG 3 on health, SDG 6 on water, SDG 7 on energy, SDG 11 on cities and human settlements, SDG 12 on sustainable consumption and production, SDG 14 on life below water, SDG 15 on life on land, and SDG 16 on peace and security.

The rest of the entries covering the full set of the SDGs are marked as “Ambiguous” and “Indirect”; they mark concordance strings that are too ambiguous, or for which their impact on NTMs is indirect, or for which not enough information is available. Such strings are still kept in the matrix for illustrative purposes to demonstrate the variety of avenues for potential impact of NTMs. Their limitations are described in the sections above. Moreover, examination of these cases helped finalize overall approach to building those strings of the concordance matrix that are used in quantitative analysis.

There are a few concordance strings, for which TRAINS database contains very few or no records of corresponding NTMs and that are still marked as “Clear” or “Clear with keywords”. This is due to the fact that more of the relevant NTMs are likely to be registered in the NTM databases with time. In some such cases there are plans to collect more detailed NTM data for the TRAINS database, and that may operationalize such concordance strings in the near future. For example, data on NTMs related to compulsory licensing to overcome IPR-related barriers to access to essential medicines in case of public health emergency (SDG 3) may be collected at the later

stage. Detailed IPR-related regulations (SDG 16), as well as NTMs related to subsidies and government procurement (SDG 12) will be collected and classified at a later stage, as is reflected in the preliminary edition of the 2019 version of the MAST's international classification of NTMs (UNCTAD, 2019). As is stipulated in the section on *Regulation of non-product-related processes and production methods*, measures regulating sustainability and social aspects of production processes and methods for a wide variety of traded goods are likely to become more present in international trade (SDGs 12, 14, 15 and 16).

It is important to note that use of keywords is essential for the vast majority of the concordance strings, which is due to the way data is represented in the TRAINS database. Specifically, against each regulation all potentially affected HS codes, including those that come from different chapters of the HS, are included within the same row, which essentially reduces the level of product group disaggregation for each instance of the recorded NTMs. At the same time, there are many instances where HS codes are recorded at 4- or 2- digit level, or where all chapters of the HS are indicated as affected (e.g. a number of NTMs recorded in the TRAINS for Nepal are marked as covering all 2-digit codes of the HS). Moreover, some goods relevant to the achievement of different SDGs share the same HS codes even at six-digit level of disaggregation (e.g. medicines, hazardous chemicals, narcotics, precursors of chemical and biological weapons of mass destruction). Thus, the only way to assign a string to a specific SDG target is to search for matching keywords. There are also cases where at six-digit level HS codes have only partial coverage by relevant NTMs, e.g. regulations on transboundary movement of hazardous chemicals, precursors of chemical or biological weapons, dual use goods or endangered species.

Matching exercise on the data available in TRAINS database was conducted with the use of the concordance matrix and the R code that follows the following rules:

- Matching is conducted only for the strings marked with "C" and "CwK".
- Keyword matching is conducted in all 4 descriptive fields of TRAINS database, namely "Measure description", "Product description", "Source" and "National legal basis".
- Targets, HS codes, NTM codes and keywords are separated by semicolon. Note: one comma is present in keywords for Target 14.1/14.6: "Illegal, unregulated and unreported fishing".
- Case sensitive keywords (abbreviations) are marked with exclamation marks.
- Some strings contain alternative lists of HS codes. They either come from different sources (Target 16.4 for weapons of mass destruction and dual use products) or contain a basic group of products that are more likely to be covered by the examined NTMs and a broad group of products that may be covered by the examined NTMs but are likely to have less coverage (e.g. groups of products for which such characteristic as water efficiency might be regulated). Search is implemented in all alternative lists of the HS with the application of the same corresponding NTM codes and keywords. If necessary broad lists maybe excluded from analysis.
- Corresponding SDG target is assigned only if there is a match to at least one HS code, one NTM code and 1 keyword simultaneously. If concordance string has negative keywords, corresponding SDG target is assigned only if there is a match to at least one HS code, one NTM code and 1 keyword simultaneously and if there are no negative keywords present. Specifically, one set of negative keywords is included for Target 2.4.

- If a concordance string has more than one SDG target associated with it (always within the same SDG), it will appear in the results more than once in association with the corresponding targets. If a string has alternative list of HS codes, the identical SDG Target-HS code-NTM code-keyword concordance strings will appear in the results as many times as there are alternative lists.
- If the concordance string contains six-digit HS code, and TRAINS database has entries with the corresponding 2- or 4-digit HS codes, these entries from TRAINS database will be assigned a corresponding SDG target if they contain both the matching NTM codes and the keywords (and do not have any matching negative KWs). If concordance string contains 2- or 4-digit HS codes, then matching is conducted for all more disaggregated codes under them.
- For any NTM code specified in the concordance string, matching within TRAINS database is conducted following the same rule as for the HS codes.
- Keywords are treated as a combination of symbols and not as the exact words or phrases. For example, KW "emission" will match the corresponding sequence of symbols in the word "emissions", while keyword “infect” will match the corresponding sequence of symbols in the word “disinfection”. To take account of abbreviations, (such as, for example, “ODS” (this sequence of symbols may be found in words such as “foods, goods”), case sensitive search is used. Case sensitivity is only applied to abbreviations, as unabbreviated words may also be found at the beginning of a sentences and be capitalized.

Description of the results of the latest trial code run on the data available in the TRAINS database at the time of writing (May 2019) for the ESCAP member-states conducted with the use of the concordance matrix and the coding rules above is available below.

The following are the factors established after a series of trial matching exercises that reduce accuracy of the produced results:

- Inconsistencies or errors in assigning NTM classification codes to the regulations (e.g. labelling measures can be coded as B31, B32, B7, B8 codes). Another example is use of more aggregated NTM codes, instead the available disaggregated ones, including those intended for measures no elsewhere specified. Code B11 is often used in place of other Chapter B codes, especially B7 and B8.
- Uninformative or missing descriptions, thus lacking key words; typos and grammar issues;
- Presence of descriptions in languages other than English (Japanese, French, Spanish, etc.). Code was applied to translate all descriptive fields into English, however, level of accuracy of such translation is not always clear;
- The R code does not take into account cases when negation is used in the measure description, e.g. "not for medical purposes" when the keywords is “medical purposes”;
- HS codes at six-digit level in combination with the same NTM codes and keywords may be relevant to more than one SDG (e.g. regulations on transboundary movement of hazardous chemicals, narcotic drugs, and precursors of chemical or biological weapons). In such cases such strings are be assigned more than one SDG.
- Similar to the above point, instances where HS codes for controlled goods relevant to different SDGs are covered by one NTM, while the measure description suggests that only one of them is targeted by the examined regulation. In such cases such strings are be assigned more than one SDG.

Appendix 2. NTM-SDG linkages and concordance with SDG1-17

A2.1. SDG 1: End poverty in all forms everywhere

A review of the targets and indicators of SDG 1 allows one to conclude that the scope for direct impact of NTMs is rather limited, as domestic policies and international cooperation remain the primary drivers for achieving this goal. Overall, targets of SDG 1 can be contributed to by actions under other SDGs, and NTMs can indirectly play a role here too.

One aspect of reducing poverty concerns improving access of poor households to technologies and products that can improve their living conditions, enhance access to education and employment opportunities, increase productivity of their labor, reduce consumption of various inputs essential to their everyday life (electricity and fuel, water, etc.), improve access to such inputs, improve access to food, healthcare services and medicines, allow for equitable participation in policy development and decision making, enhance understanding of one's rights and opportunities, increase resilience of households to natural disasters, contribute to equal opportunities for women, people with disabilities and different ethnic groups. Some of such technologies and products are addressed in sections on other SDGs and in the section on Access to technologies.

Improving access of poor households is essentially about reducing the cost of relevant technologies and products, which can be achieved through tariff reduction, which is outside of the scope of this methodology.

Access can also be improved by streamlining technical NTMs for such technologies (across countries or within regions with similar conditions), by adjusting excessively strict technical NTMs that are not based on scientific evidence or technical specifications relevant to the importing country, by improving efficiency of NTM implementation and by reducing burden of compliance and inspection measures. Thus, the impact of NTMs on access to relevant products and technologies cannot be assessed solely on the presence or absence of an NTM. For some cases, comparison may be made to authoritative international or regional standards (analysis based on distance in regulatory stringency (Cadot, Asprilla, Courdon, Knebel, & Peters, 2015)); presence of MRAs and local context need to be evaluated as well (OECD, 2017).

Measures aimed at protecting intellectual property rights (IPR) may also raise the cost of essential technologies and products, which may make them unaffordable to poor households. IPR-related NTMs are not collected by UNCTAD at this stage and are not reflected in the TRAINS database. Also, the impact of such measures cannot be assessed based on the presence/absence of an IPR-related NTM. At the same time IPR measures are essential for achieving SDG 9 and SDG 16, as they can encourage innovation, contribute to economic development, help combat illicit trade and reduce cash flows generated by it.

Another barrier to access to essential production inputs and technologies, which is cited in literature as exacerbating poverty and inhibiting achievement of some other SDGs, is the issue

of controlling or restricting transboundary movement of dual use (strategic) goods[1] (State of Palestine, 2018), which is essential to the achievement of SDG 16 (see section on Target 16.4). It may be useful to examine to what extent products that are crucial to the achievement of SDG's are affected by regulations aiming to control trade in dual use products. For more details, see section on Access to technologies.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
NA	Potentially all products that meet basic needs of a household. Also, products and technologies, access to which can contribute to achievement of other SDGs (see relevant sections)	NA	A; B; C; P6	Very ambiguous, as: - Products that meet basic needs can be country specific. - The issue is access to products or technologies and the cost of such access. Whether an NTM constitutes a barrier to access or raises the cost excessively cannot be judged based on the presence/absence of NTMs.
NA	All products and technologies that can improve lives of poor households and for which IPR can be an essential barrier	NA	N	Very ambiguous, as: - Relevant products can be country specific. - The issue is access to products or technologies and the cost of such access. Whether an NTM constitutes a barrier to access or raises the cost excessively cannot be judged based on the presence/absence of NTMs. - IPRs are essential to SDG 9 and SDG 16.
NA	All products and technologies that can improve lives of poor households and for which dual use product controls can be an essential barrier	NA	B11; B14; B31; B32; B33; B42; B81; B82; B83; B85; E111; E112; H; P11; P13; P14; B19; P19; P2	Very ambiguous. Dual use product controls are essential for SDG 16.

A2.2. SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

As with SDG 1, domestic policies and international cooperation are the primary drivers for achieving SDG 2. In the area of trade policy, an important role can be played by the reduction of tariffs for certain food products that are essential for poor households (these products may differ from country to country). However, this is outside of the scope of this methodology.

As for the potential scope for the role of NTMs, an important part can be played by the removal or adjustment of excessive technical NTMs (Chapters A, B, C, and code P6 of MAST Classification) regulating final food products and agricultural products intended for food production, as well as by mitigating issues related to the implementation of NTMs (e.g. procedural obstacles). Assessing the extent to which such NTMs may constitute a barrier would require closer examination of the content of such NTMs and their comparison to authoritative internationally

[1] Dual-use items are goods, software and technology that can be used for both civilian and military applications (European Commission, 2017). Strategic goods are weapons of mass destruction (WMD), conventional weapons, and related items involved in the development, production, or use of such weapons and their delivery systems (WCO, 2017b).

accepted standards, such as, for example, Codex Alimentarius (analysis based on distance in regulatory stringency (Cadot, Asprilla, Courdon, Knebel, & Peters, 2015)).

In cases of restrictions on importation of food products containing GMO-derived ingredients, it may be useful to evaluate whether lifting such restrictions for some products may contribute to ending hunger and improving food security (e.g. import of genetically modified crops that are significantly more resilient to pests and unfavorable climate conditions). Quantitative restrictions to exports and imports of final food products and agricultural products intended for food production need to be evaluated case by case to determine whether they are applied to resolve food security issues or whether they contribute to food security issues. Overall, these cases are not conclusive for generating concordance strings.

Another relevant dimension is the degree of access to technologies and machinery necessary for food production (including those technologies that allow for sustainable food production and for increasing resilience of agriculture to climate change), which may be impacted by high tariffs (outside of NTM scope), or by non-transparent, inconsistent and prohibitively strict technical requirements and compliance procedures, IPR issues and controls on trade in dual use technologies (ambiguous linkage). This cannot be evaluated based on presence/absence of an NTM. At the same time, IPR measures are essential for SDG 9 and SDG 16, as they can encourage innovation, contribute to economic development, help combat illicit trade and reduce cash flow generated by it. Controls on trade in dual use technologies are also essential for SDG 16.

Strict regulations on the transboundary movement of goods that may fall under the category of hazardous chemicals or persistent organic pollutants may negatively impact access to fertilizers and pesticides that may be essential to agriculture and food production (at six-digit level HS codes do not differentiate between safe and hazardous fertilizers and pesticides (WCO, 2017a)). However, whether such regulations represent an unnecessary burden cannot be evaluated only based on the presence/absence of an NTM.

Safety and the nutritional value of final food products, as potentially included in Targets 2.1 and 2.2, are partially addressed by SDG 3 (Target 3.4). Sustainability of food production systems and the resilience of agricultural practices, as invoked in Target 2.4, are addressed by relevant targets of SDGs 12, 13, 14, and 15. Biodiversity conservation as invoked in Target 2.5 is addressed by relevant targets of SDGs 14 and 15 related to preserving biodiversity, controlling invasive species and genetically modified living organisms, and preventing illegal and unregulated fishing. For the purpose of this methodology relevant NTMs can be considered as having an indirect impact on the achievement of SDG 2, while having a direct impact on other SDGs mentioned above (they are examined in other sections of this report).

SDG 2 does not contain a specific target for the protection of agriculture and the food production industry from the adverse impacts of pests, plant and animal diseases. This objective to some extent fits under Target 2.4. This issue is addressed by sanitary and phytosanitary measures (especially MAST Classification codes of A1, A5, and A8) applied to agricultural raw materials intended for food and non-food production, including live animals, live plants, seeds for sowing, and other products that may harbor dangerous pests, disease-carrying or disease-

causing organisms. The Excel matrix contains two alternative HS code lists: (1) basic list containing all agricultural raw materials for food and non-food production, and (2) broad list containing all products except intermediate and final food products for human consumption. The basic list includes products that are most sensitive in terms of their potential for spreading pests, animal and plant diseases. However, many other types of products (as found in the broad list), as well as containers, packaging and vehicles used in transportation of goods may be able to harbor pests and disease-carrying organisms and, therefore, are also subject to relevant SPS regulations. MAST codes C1 *Pre-shipment inspection*, C3 *Requirement to pass through specified port of customs* and P6 *Export technical measures* are also used to facilitate monitoring of conformity of goods with SPS measures, as is reflected in relevant examples of measures in the TRAINS database.

These measures are aimed at preventing the transboundary spreading of pests, animal and plant diseases. The resulting HS-NTM code pairs can be quite clear without keywords, due to the inherent characteristics of regulated goods and the objectives of A1 and A6 measures. However, use of keywords increases accuracy of search results significantly, as some entries in the TRAINS database that match this concordance string may also be relevant to Target 3.4. NTM code A8 includes conformity assessment measures that complement other NTM codes under chapter A and are relevant to all SPS purposes (including, regulation of food products to protect human health). Although A8 code is intended to include supporting measures for SPS regulations, this code should not be ignored in the analysis, as often technical SPS measures are misclassified as A8 measures or incorporate both the conformity assessment regulation and the technical regulation not included elsewhere in the database. These HS-NTM code pairs are also relevant to SDG 3, as some such diseases can spread to the human population (linkage to SDG 3 can be considered as indirect), and to the biodiversity target of SDG 15 on invasive species (linkage to SDG 15 may be considered indirect).

Target 2.b specifically mentions the need to eliminate harmful export subsidies and all export measures with equivalent effects. Absence of measures under the MAST code of P7 could signal positive impact on the achievement of this target. However, under this methodology, absence cannot be used as a reliable criterion due to the fact that absence of NTMs in the TRAINS database may be the result of omissions or incomplete data collection (at the time of writing, there were only 18 P7 measures in the TRAINS database, and while agricultural export subsidies are and SDG indicator, the data was not yet availalbe). Additionally, any reduction of subsidies is to be implemented gradually with different level of commitment by different countries (Article 27 on special and differential treatment of developing country members and Articles 28 and 29 of Part IX on transitional arrangements of the WTO *Agreement on Subsidies and Countervailing Measures* (WTO)). Therefore, the progress towards elimination of export subsidies cannot be accurately assessed with the data from TRAINS database only.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
NA	Agricultural products intended for food production, and final food products	HS chapters 01-24, excluding chapters 01, 05, 06, 13, 14, 23, 24	A; B; C; P6	Very ambiguous, as whether an NTM constitutes a barrier to access or raises the cost excessively cannot be judged based on presence/absence of an NTM.

NA	Technologies, machinery and equipment for agricultural production	Relevant 6- digit codes of HS chapters 84-89	B; N For dual use also: E111; E112; H; P11; P13; P14; P2	Very ambiguous, as whether an NTM constitutes a barrier to access or raises the cost excessively cannot be judged based on the presence/absence of NTMs.
NA	Fertilizers and pesticides	Relevant 6- digit codes of HS chapters 28-38	B11; B14; B15; B31; B32; B33; B42; B81; B82; B83; B84; E112; E311; P11; P13; P14; P61; P62; B22; E316; B19; P19; P2	Very ambiguous, as some of these products may fall under category of hazardous chemicals or persistent organic pollutants. Whether an NTM constitutes a barrier to access or raises the cost excessively cannot be judged based on the presence/absence of NTMs.
Targets 2.1, 2.2	All intermediate and final food products	See relevant section	See relevant section	Indirect. Regulations on safety and nutritional value of foods. Addressed by Target 3.4
Target 2.4	Any product produced using sustainable management of processes and production methods in various sectors, including processes and methods allowing for more sustainable management of agriculture, aquaculture, forestry and for preservation of ecosystems essential to food security	See relevant sections	See relevant sections	Indirect. Addressed in Target 12.6, also relevant to targets of SDGs 14, 15 and 13
Target 2.5	Endangered species of flora and fauna	See relevant sections	See relevant sections	Indirect. Addressed in Targets 14.4, 14.6 and 15.7, 15.8, Target 2.4
Target 2.4	(Basic) Agricultural goods excluding intermediate and final food products for human consumption (Broad) All products except intermediate and final food products for human consumption	[HS-WTO_Aggri H3 (WITS) PLUS UN Comtrade Commodity Classifications H3 (UN Comtrade) for codes under 3, 1504, 1603-1605, 230120 (fish), 44 (wood), 45 (cork)] PLUS UNCTAD-SoP1_Raw Materials H3 (WITS) for codes under 40 (natural rubber), 41 (skins and hides), 43 (fur skins), 46 (straw), 52 (cotton), 53 (vegetable textile fibres)] MINUS [SOP2 (WITS) and	A1; A5; A8; C1; C3; P6	Narrow list includes products that are most sensitive in terms of their potential for spreading pests, animal and plant diseases. However, many other types of products (broad list), as well as containers, packaging and vehicles used in transportation of goods, may be able to harbor pests and disease-carrying organisms and, therefore, are also subject to relevant SPS regulations. Selected NTM A codes are the most relevant for controlling spreading of pests, except A8 Conformity assessment related to SPS, which are relevant for all SPS purposes. Keywords are essential.

		SOP3 (WITS) only chapters 02-22 less 05, 06 (H3)]. Duplicates removed. [All HS from UN Comtrade Commodity Classifications (H3) (UN Comtrade)] MINUS [SOP2 (WITS) and SOP3 (WITS) only chapters 02-22 less 05, 06 (H3)]		
Target 2.b	Agricultural products intended for food production, and final food products	HS chapters 01-24, excluding chapters 01, 05, 06, 13, 14, 23, 24	P7	All export subsidies should be eliminated. However, under this methodology absence of an NTM cannot be used as a reliable criterion for the establishment of positive direct linkage to an SDG's achievement.

A2.3. SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

SDG 4 does not offer much scope for the direct impact of NTMs. All targets of SDG 4 are concerned with inclusive and equitable education at different ages and stages of professional development, accessible for different social groups, including vulnerable or disadvantaged groups. They are also concerned with learning about sustainable lifestyles, human rights, cultural diversity and gender equality, and with improved access to scholarships for higher education and qualified teachers. These targets are to be primarily achieved through national policies and international cooperation. However, their achievement can be significantly aided by improved access to modern information and communications technologies (ICTs) and to related electronic and digital goods that can be used for acquiring relevant information and for continued learning from any location. Relevant six-digit HS codes can be derived from the ICT goods categories and composition list (UNCTAD, n.d.a). The goods in the list are identified by the UNCTAD following the OECD's definition of the ICT products: "ICT products must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display" (OECD, 2008; OECD, 2011). For trade policy issues affecting access to technologies in general, and ICT in particular, see the section on Access to technologies. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.

Targets 4.5 and 4.a additionally focus on improving access to learning and education for people with disabilities, which can be aided by improved access to assistive technologies and products. The resolution 71.8 of the World Health Assembly adopted in 2018 states that "*90% of those who need assistive technology do not have access to it, and … this has a significant adverse impact on the education, livelihood, health and well-being of individuals, and on families, communities and societies*" (WHO, 2018). As defined by the WHO, an assistive product is an external product (including devices, equipment, instruments or software), especially produced or generally available, the primary purpose of which is to maintain or improve an individual's functioning and independence, and thereby promote their well-being (WHO, 2016). The list of

priority assistive products (APL) has been developed by the WHO as part of the implementation of the Global Cooperation on Assistive Technology (GATE) with the aim to serve a similar role to the Essential Medicines List (EML) (WHO, 2016). It identifies 50 priority assistive products; however, there are no readily available HS concordance lists, while many products are not likely to be visible at the HS six-digit level. For trade policy issues affecting access to technologies in general, and assistive technologies and products in particular, see the section on Access to technologies. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs. As "assistive products enable people to live healthy, productive, independent and dignified lives; to participate in education, the labor market and civic life", improved access to them is also relevant to other SDGs, especially SDG 1, 3, 8, and 10.

Additionally, there are other examples of potential indirect positive impacts of NTMs. Regulations and controls on the price of and distribution channels for food-grade alcohol (Target 3.5) and strict controls over trade in narcotic drugs (Target 3.5) can make these substances less accessible to the youth, reducing the risk of addiction and its interference with the attainment of education. Reduced poverty, hunger and increased health also can be essential for education attainment and productive learning (see relevant HS-NTM code pairs in the sections on SDG1, 2 and 3). Reduced gender-based violence can contribute to women's participation in learning (see SDG 5). SDG 11, through making city environments more inclusive, safe and accessible to all kinds of population groups, can contribute to making education more accessible for all.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
All	ICT products (for education and access to education-related information)	The ICT goods categories and composition list (UNCTAD, n.d.a)	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	ICT technologies that can improve access to education for all. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.
Targets 4.5, 4.a	Assistive technology and products	NA	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	Assistive technology and products that can improve access to education for all. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.

A2.4. SDG 5: Achieve gender equality and empower all women and girls

SDG 5 does not offer much scope for direct impact of NTMs. All targets are to be primarily achieved through national policies and international cooperation. Some targets can be indirectly addressed by HS-NTM code pairs that have a direct impact on other SDGs.

Targets 5.5, 5.6, 5.a, 5.b overall are concerned with the full and equal participation of women in political, economic and public life, attainment of education, access to knowledge about legal and reproductive rights, participation in decision making at all levels, and access to enabling technology. These can be aided by improved access to modern ICTs and to related electronic and digital goods that can be used for acquiring relevant information, remote employment, easy participation in decision making and continued learning from any location. Relevant six-digit HS codes can be derived from the ICT goods categories and composition list (UNCTAD, n.d.a). The goods in the list are identified by the UNCTAD following the OECD's definition of the ICT products:

ICT products must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display" (OECD, 2008; OECD, 2011). For trade policy issues affecting access to technologies in general, and ICT in particular, see the section on Access to technologies. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.

Target 5.2, aimed at the elimination of all forms of violence against all women and girls in the public and private spheres, can be indirectly addressed by HS-NTM code pairs that are directly relevant to Target 16.4, where it is concerned with control over transboundary movement of small arms and IEDs. NTMs aiming to control and reduce use of alcohol and narcotic drugs (Target 3.5) can also reduce gender-based violence, including by intimate partners. Safe cities and inclusive urban environments, which are the objective of SDG 11, can reduce gender-based violence by persons other than intimate partners (Target 5.2) and contribute to women's productive involvement in employment and education (Target 5.5). Target 5.6 on universal access to sexual and reproductive health and reproductive rights is partially addressed by SDG 3. Responsible practices by private and public sectors, as well as sustainable production practices, as invoked in Targets 12.6 and Target 12.7, can contribute to empowerment and equal employment opportunities for women. For the purpose of this methodology impact of NTMs here can be considered indirect. Additionally, the issue of regulating non-product-related processes and production methods associated with the internationally traded goods, including the social aspects of such regulations, are covered below in the relevant sections of this methodology.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Targets 5.5, 5.6, 5.a, 5.b	ICT products (for education, participation in decision making, acquiring information on legal rights, sexual health and reproductive rights)	The ICT goods categories and composition list (UNCTAD, n.d.a)	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	Access to ICT technologies that can contribute to the empowerment of women and girls. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.
Target 5.2	Small arms, IEDs	See relevant section	See relevant section	Addressed in Target 16.4. For the purpose of this methodology the impact of NTM can be viewed as indirect.
Target 5.2	Food-grade alcohol	See relevant section	See relevant section	Addressed in Target 3.5. For the purpose of this methodology the impact of NTM can be viewed as indirect.
Target 5.2	Narcotic drugs regulated under international conventions on preventing illicit traffic in narcotics drugs and psychotropic substances	See relevant section	See relevant section	Addressed in Target 3.5. For the purpose of this methodology the impact of NTM can be viewed as indirect.
Targets 5.2, 5.5	Good essential for safe and inclusive urban environment	See relevant section	See relevant section	Addressed in SDG 11. For the purpose of this methodology the impact of NTM can be viewed as indirect.
Target 5.6	Reproductive health products	See relevant section	See relevant section	Indicator 5.6.2. Access to reproductive health products is addressed in SDG 3. For the purpose of this methodology the impact of NTM can be viewed as indirect.
Targets 5.1, 5.5	Any product produced under socially responsible management practices	See relevant sections	See relevant sections	Very ambiguous. Addressed in Targets 12.6 and 12.7. Impact for this SDG may be considered indirect.

A2.5. SDG 6: Ensure availability and sustainable management of water and sanitation for all

SDG 6 contains targets that can be achieved through:

- Implementation of national policies, and international and intergovernmental cooperation.
- Improving access to technologies. Technologies that are relevant to the achievement of SDG 6 include water sanitation, purification, desalination, water pollution reduction, assessment of water quality, sustainable water management, wastewater reuse and reclamation, etc. Some such technologies and products, as well as trade policy barriers affecting them are examined in the section on Access to technologies.
- Increasing water efficiency of consumption and production in various economic sectors by regulating water efficiency of water-using equipment, appliances, and machinery for household, commercial and industrial use, both electrical and non-electrical. The matrix below contains two separate groups of products. The first basic group covers more standardized water-using products for household and commercial use, and the second broad group additionally covers less standardized machinery for commercial, industrial and urban infrastructure use.
- Decreasing water intensity of the entire lifecycle of a product by regulating efficiency of water use during its production process or throughout its entire supply chain (non-product-related characteristics). For the purpose of this methodology the impact of NTMs here can be considered indirect, while direct for Target 12.6, which concerns with sustainable consumption and production. For additional information on regulating non-product-related processes and production methods, their social and environmental aspects, see the relevant section below.

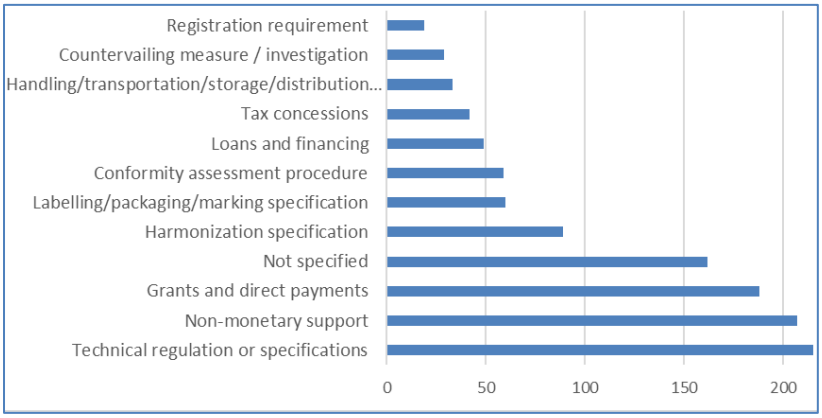
Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
All	Technologies and products relevant to the achievement of SDG 6	NA	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	See examples of environmental goods in section on Access to technologies. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.
Target 6.4	(Basic) Water-using equipment and appliances for commercial and household use; electrical and non-electrical	HS codes confirmed through literature review, the TRAINS database and the WTO EDB. See HS codes in the SDG-HS-NTM Concordance Matrix	B31; B32; B33; B7; B8; B11; E316; P	Clear with keywords. Products of the basic list are highly standardized. Although the WTO EDB has plenty of relevant examples, such regulations are less visible in the TRAINS database, as regulations for these HS-NTM code pairs may address a variety of product characteristics, e.g. safety regulations, electrotechnical standards, performance standards, specifications for the product and its components and materials, energy efficiency, etc. Thus, it is necessary to check descriptions, regulation texts, use keywords. B11 and B8 are often used in place of relevant B7 codes.
Target 6.4	(Broad) Water-using machinery, equipment and appliances for industrial and urban infrastructure use	All codes of chapters 84-85 are included at 4-digit level, as well as the codes from the basic list (duplicates removed). See HS codes in the SDG-HS-NTM Concordance Matrix	B31; B32; B33; B7; B8; B11; E316; P	Potentially clear with keywords and review of description/text of regulation. Specific list of HS codes for this group is difficult to identify. Products are not as standardized; specifications may be developed by the buyer based on specific requirements; non-water characteristics of such machinery and equipment might be more important. At the same time water efficiency of a complete engineering system or production line, as a whole, needs to be assessed for each given case.

Target 6.4	Any product produced using sustainable management of processes and production methods, including processes and methods allowing for more efficient use of water	See relevant section	See relevant section	Addressed in Target 12.6. See **Error! Reference source not found.**.

Examples of relevant measures in the TRAINS database are few. The WTO EDB contains a larger set of measures under the objective “water management and conservation” – total of 934 out of 8615 over the period of 2009-2016. Due to the formulation of this objective, without examining the regulations’ description or text it is not clear whether the measures are applied to products or to processes and production methods (these are included separately in the matrix above). This objective also covers a broad scope of purposes, such as water efficiency, water sanitation, management of in-land waterways and the protection of marine environment. Refining search results by using the filter "technical regulation" provides a number of entries for technical regulation of various water-using electrical and non-electrical appliances and equipment aimed at improving their water efficiency.

As reflected in figure 8, technical regulations are the largest group of measures applied for the environmental objective “water management and conservation”, followed by various support measures (grants, subsidies, loans, tax concessions and non-monetary measures). Harmonization specifications essentially are technical measures that amend existing regulations or set new ones that are harmonized with relevant international or regional standards to facilitate trade in the targeted products.

Figure 8 - Top-12 trade measures concerned with water management and conservation, WTO EDB, 934 measures out of 8615, 2009-2016



Source: Authors’ calculations based on data from WTO EDB, accessed March 2019.

A2.6. SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all

SDG 7 contains targets that can be achieved through:

- Implementation of national policies, and international and intergovernmental cooperation.

- Improving access to technologies. Technologies that are relevant to the achievement of SDG 7 include alternative and renewable energy technologies, cleaner fossil fuel technologies, energy efficiency, smart-grid, small-scale off-grid technologies, etc. Some of such technologies and products, as well as trade policy barriers affecting them are examined in the section on Access to technologies. Additionally, see figure 9 for top-12 NTMs affecting trade in alternative and renewable energy technologies (based on the WTO EDB data).
- Increasing energy efficiency of consumption and production in various economic sectors by regulating energy performance of energy and fuel using equipment, appliances, and machinery for household, commercial and industrial use. The matrix below lists 3 groups of products that are all combined into one group in the *SDG-HS-NTM Concordance Matrix.*
- Decreasing energy intensity of the entire life-cycle of a product by regulating efficiency of energy use during its production process or throughout its entire supply chain (non-product-related characteristics).

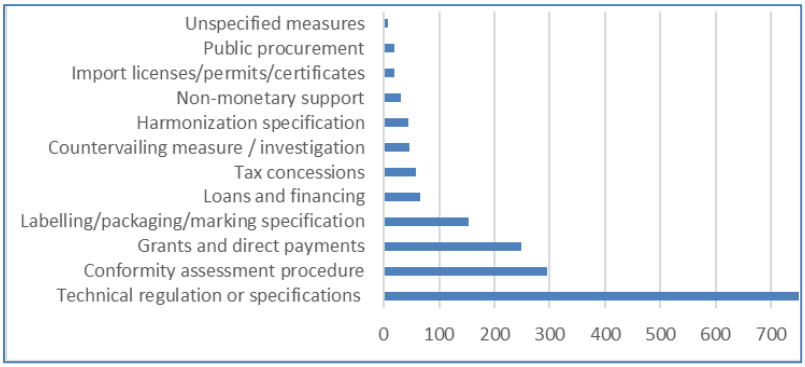
For the purpose of this methodology the impact of NTMs here can be considered indirect, while direct for Target 12.6, which concerns with sustainable consumption and production. For additional information on regulating non-product-related processes and production methods, their social and environmental aspects, see the relevant section below.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
All	Technologies and products relevant to the achievement of SDG 7	NA	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	See examples of environmental goods in section on Access to technologies. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.
Target 7.3	Electricity-using equipment and appliances for commercial and household use	All HS 2017 codes under Chapters 84-89 to potentially cover all energy and fuel using goods	B31; B32; B33; B7; B8; B11; E316; P	Clear with keywords. Products are highly standardized. Although the WTO EDB has plenty of relevant examples (figure 9 below), such regulations are less visible in the TRAINS database as regulations for these HS-NTM code pairs may address a variety of product characteristics, e.g. safety regulations, electrotechnical standards, performance standards, specifications for the product and its components and materials, water efficiency, etc. Thus, it is necessary to check descriptions, regulation texts, use keywords. B11 and B8 are often used in place of relevant B7 codes.
Target 7.3	Fuel-using motor vehicles			Clear with keywords. Products are highly standardized. Although the WTO EDB has plenty of relevant examples (figure 9 below), such regulations are less visible in the TRAINS database as regulations for these HS-NTM code pairs may address a variety of product characteristics, e.g. safety regulations, emissions regulations, performance standards, specifications for the product and its components and materials, etc. Regulations often additionally target emissions of various pollutants into the air, which is directly relevant to Target 11.6 and indirectly to Target 3.9. Thus, it is necessary to check descriptions, regulation texts, use keywords.
Target 7.3	Electricity and fuel-using machinery, equipment and appliances for industrial and urban infrastructure use			Potentially clear with keywords and review of description/text of regulation. Specific list of HS codes for this group is difficult to identify. Characteristics not related to energy efficiency of such machinery and equipment might be more important. At the same time energy efficiency of a complete engineering system or production line, as a whole, needs to be assessed for each given case. Products are less standardized. Specifications may

				be developed by the buyer based on specific requirements.
Target 7.3	Any product produced using sustainable management of processes and production methods, including processes and methods allowing for more efficient use of energy	See relevant section	See relevant section	Addressed in Target 12.6. See figure 12.

Examples of relevant measures in the TRAINS database are few. The WTO EDB contains a larger set of measures under the objective "energy conservation and efficiency" – total of 1244 out of 8615 over the period of 2009-2016. The improvement of energy efficiency can be realized both at the product level and at the level of non-product-related processes and production methods (these are included separately in the matrix above). Product-level energy efficiency is covered by technical regulations on energy performance and fuel efficiency (Chapter B of MAST classification) applied to a wide variety of products, most of which are electrical and electronic equipment, appliances, machines, and vehicles (in the WTO EDB fuel efficiency is covered under the same objective of "energy conservation and efficiency"). Given the above, for this environmental objective the WTO EDB registers a significant prevalence of technical regulations and specifications, followed by conformity assessment, and labelling. Harmonization specifications essentially are technical measures amending existing regulations or setting new ones that are harmonized with relevant international or regional standards to facilitate trade in the targeted product. Measures to support achievement of energy conservation and efficiency also take a notable share (grants, subsidies, loans, tax concessions and non-monetary measures).

Figure 9 - Top-12 trade measures concerned with energy conservation and efficiency, WTO EDB, 1244 measures out of 8615, 2009-2016

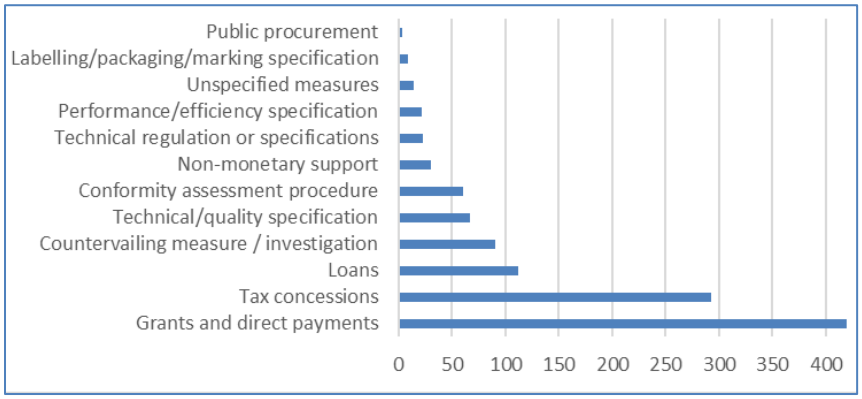


Source: Authors' calculations based on data from WTO EDB, accessed March 2019.

In the WTO EDB, among trade measures that have an objective related to "alternative and renewable energy", the majority are aimed at promoting use of alternative and renewable energy technologies through grants, direct payments (subsidies), tax concessions, and financing measures. According to some of the literature on the topic, such measures can sometimes be considered discriminatory by other countries, if applied to domestically produced technologies

and products (ICTSD, 2013). This might be the reason behind countervailing measures and investigations being among the top trade measures applied.

Figure 10 - Top-12 trade measures concerned with alternative and renewable energy, WTO EDB, 2009-2016



Source: Authors' calculations based on data from WTO EDB, accessed March 2019.

A2.7. SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

SDG 8 does not offer much scope for the direct impact of NTMs. All targets are to be primarily achieved through national policies and international cooperation.

Target 8.4, which is concerned with resource efficient and sustainable consumption and production, shares indicators with Target 12.2. For the purpose of this methodology the impact of NTMs here can be considered indirect, while direct for Target 12.2.

Target 8.6 on youth involvement in employment, education and training, and Target 8.5, which aims to achieve "full and productive employment and decent work for all women and men, including for young people and persons with disabilities…", both can be aided by improved access to ICTs and related products (for learning, access to information, remote training and employment opportunities) and to assistive technology and products. Both product groups and the related trade policy issues are already examined in the section on SDG 4 and in the section of Access to technologies.

Targets 8.7 and Target 8.8 are concerned with forced labor, abuse of work force, including women and vulnerable groups, violation of human rights in the workplace, and unsafe working environments, etc. Apart from national policies, these targets can be addressed by socially responsible behavior of companies and public sector institutions, including through socially responsible procurement. Currently, these are the domain of voluntary sustainability standards (see advanced filters under category "Social" of the International Trade Center's Standards Map (ITC, n.d.)) and voluntary sustainability reporting initiatives (e.g. see the list of social standards of the Global Reporting Initiative (GRI, n.d.)). Although currently there are very few related examples in the TRAINS database, such regulations have the potential to become reflected in the national

trade policies and in the NTMs applied to internationally traded products (Partzsch & Vlaskamp, 2016). In fact, literature review yielded some examples of countries adopting measures regulating social aspects of production processes that adapt provisions of relevant VSS into their legislation (Aidenvironment, WWF & ISEAL, 2018; D'Hollander & Tregurtha, 2016). Moreover, there are examples of such regulations in literature and in the TRAINS database for trade in rough diamonds and conflict minerals, which have a direct linkage to Target 16.4. Some related issues are also examined in sections on Targets 12.2, 12.6, 12.7; impact for SDG 8 is indirect. Additionally, the issue of regulating non-product-related processes and production methods associated with the internationally traded goods, including the social aspects of such regulations, are covered below in the separate section of this methodology.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 8.4	Groups of products relevant to Target 12.2	See relevant section	See relevant section	Indicators are identical to Target 12.2. For the purpose of this methodology impact of NTMs here can be considered indirect, while being direct for Target 12.2.
Targets 8.5, 8.6	ICT products (for education and access to education-related information)	The ICT goods categories and composition list (UNCTAD, n.d.a)	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	ICT technologies that can improve access to education, employment and training for all. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.
Targets 8.5, 8.6	Assistive technology and products	NA	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	Assistive technology and products that can improve access to education, employment and training for all. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.
Targets 8.5, 8.7, 8.8	Any product produced using socially responsible management practices	See relevant sections	See relevant sections	Addressed in Targets 12.6 and 12.7. Impact for this SDG may be considered indirect.
Targets 8.5, 8.7, 8.8	Rough diamonds, tungsten, tantalum, tin, gold, other valuable gemstones and metals, timber, etc.	See relevant section	See relevant section	Addressed in Target 16.4. For the purpose of this methodology impact of NTM here can be considered indirect.

A2.8. SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

SDG 9 contains targets that can be achieved through:

- Implementation of national policies, and international and intergovernmental cooperation.
- Improving access to technologies. Technologies that are relevant to the achievement of SDG 9 include resource efficiency through more efficient use of raw materials, water, energy; alternative, renewable and cleaner fossil fuel technologies; sustainable waste management and disposal; safe management of hazardous chemicals; air pollution reduction; ICT technologies etc. Some of such technologies and products, as well as trade policy barriers affecting them are examined in the section on Access to technologies.
- Application of sustainable production practices, including those aimed at resource efficiency and the minimization of environmental impact of processes, production methods and machinery used in various sectors. These are examined in the section on Target 12.6, and the impact of SDG 9 can be considered as indirect.

- Applying measures to protect intellectual property rights in merchandise trade covering patents, trademarks, industrial designs, layout designs of integrated circuits, copyright, geographical indications and trade secrets. These are already addressed in the section on Target 16.4 where in concerns with the trade in IPR-infringed goods; thus, impact here can be considered as indirect. It is necessary to note, that IPR-related regulations in some cases constitute barriers to access to technologies and products that are essential to the achievement of this and some other SDGs (see section on Access to technologies).

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
All	Technologies and products relevant to the achievement of SDG 9	NA	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	See examples of environmental goods and other technologies in section on Access to technology. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.
Target 9.4	Any product produced using sustainable management of processes and production methods	See relevant section	See relevant section	Addressed in Target 12.6. See figure 12.
Target 9.5, 9.b	NA	NA	E315; N	HS codes are not possible to isolate. Addressed in Target 16.4. May have negative impact on some SDGs by inhibiting access to relevant technologies.

A2.9. SDG 10: Reduce inequality within and among countries

SDG 10 does not offer much scope for the direct impact of NTMs. All targets are to be primarily achieved through national policies and international cooperation.

Targets 10.2. 10.3, 10.4 and 10.7, which are overall concerned with social, economic and political inclusion for all and equality of outcome for all through just and non-discriminatory law, policies and practices, can be aided by improved access to ICT technologies (for learning, access to information, for remote training and employment opportunities, for participation in decision making and policy development, etc.) and to assistive technology and products. Both product groups and the related trade policy issues are already examined in the section on SDG 4 and in the section on Access to technologies.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Targets 10.2. 10.3, 10.4, 10.7	ICT products (for education and access to education-related information)	The ICT goods categories and composition list (UNCTAD, n.d.a)	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	ICT technologies that can improve access to learning, information, remote training and employment opportunities, participation in decision making and policy development, etc. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.
Targets 10.2. 10.3, 10.4, 10.7	Assistive technology and products	NA	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	Assistive technology and products that can improve access to learning, information, employment opportunities, participation in decision making and policy development, etc. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.

A2.10. SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable

Significant role in the achievement of the targets of SDG 11 belongs to the adoption and implementation of national policies, and to the international and intergovernmental cooperation.

The use of modern technologies is one way of making cities and human settlements inclusive, safe, resilient and sustainable. An inexhaustive list of technologies relevant to this Goal includes energy and water efficient technologies for urban infrastructure; waste management technologies; technologies for water sanitation, purification, reuse and recycling, air pollution reduction, disaster resilience and early warning, modern and smart ICTs, accessibility infrastructure, etc. Thus, improved access to such technologies, which can be facilitated by adequate use of NTMs, can contribute to the achievement of SDG 11. Trade policy barriers affecting access to technologies are separately examined in the section on Access to technologies. Trade-policy-related issues inhibiting access to modern technologies relevant to SDG 11 do not allow generating concordance strings with clear direct intended impact of NTMs.

Overall, increasing the environmental sustainability and reducing the environmental impact of cities through energy efficiency, water efficiency, fuel efficiency, waste reduction, sustainable ecosystem management, can contribute to the achievement of SDG 11's Targets 11.3, 11.4, 11.5, 11.6, and 11.b. The role of NTMs in addressing these challenges is examined in sections on SDG 6, SDG 7, SDG 12 - see relevant sections. Impact here can be considered indirect.

Reduction of pollutant emissions from transport, machines and equipment used in urban infrastructure, household appliances can contribute to Target 11.6, which aims to "reduce the adverse per capita environmental impact of cities", especially by paying special attention to air quality. Here, technical requirements regulating levels of pollutant emissions and composition of pollutant emissions belonging to Chapter B of the NTM classification are of interest, when applied to motor vehicles and machinery/equipment used in urban infrastructure. This combination of HS-NTM codes also addresses requirements for noise emissions by the same group of products. Noise abatement technologies, in fact, are included in the illustrative list of "environmental goods" developed by the OECD (OECD, 2005a; OECD, 2005b). Noise pollution also impacts the comfort and safety of urban environment and have potential consequences for human health (SDG 3). Bans on importation of old vehicles and machinery that do not conform to the modern requirements on noise and pollutant emissions should also be monitored.

Relevant to Target 11.2 is the objective of increasing safety of urban transport though regulating relevant characteristics of motor vehicles. This issue is already examined in the section on Target 3.6, and the impact here can be considered indirect.

Target 11.4 concerns with the protection and safeguarding of world's cultural and natural heritage. Protection and safeguarding of natural heritage, as defined in the 1972 UNECSO's Convention Concerning the Protection of the World Cultural and Natural Heritage2 (UNESCO, 1972), is primarily addressed though domestic policies. Some NTMs contributing to the protection

[2] Natural heritage includes natural features, geological and physiographical formations and delineated areas that constitute the habitat of threatened species of animals and plants and natural sites of value from the point of view of science, conservation or natural beauty. It includes nature parks and reserves, zoos, aquaria and botanical gardens.

of endangered species and to the reduction of environmental impact of human activities, as well as the affected goods are examined in sections on SDGs 6, 7, 12, 13, 14, and 16. Their impact on SDG 11 is indirect.

At the same time, NTMs can play a significant role in protecting the world's movable cultural heritage, and specifically items that fall under the category of "cultural property" which is defined in the 1970 UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property (UNESCO, 1970) as "property, which on religious or secular grounds, is of importance for archaeology, prehistory, history, literature, art or science". The Convention provides a long list of items that may fall under the category of "cultural property", all of which are included in the HS's Chapter 97 for works of art, collector's pieces and antiques. The Conventions specifically stipulates that the member States should introduce and administer appropriate export certification that would authorize export of such goods from its territory. All member states also undertake to implement necessary measures that would prevent illegal importation of cultural property onto its territory and to ensure recovery and return of illegally imported cultural property items. In this connection, relevant NTMs able to address these objectives include prohibitions, export and import certificates, permits, registration of goods and importers/exporters, licensing, transportation, storage and packaging requirements, and other measures relevant to import/export of controlled goods. Some of the HS-NTM code combinations are confirmed by the presence of relevant examples in the TRAINS database.

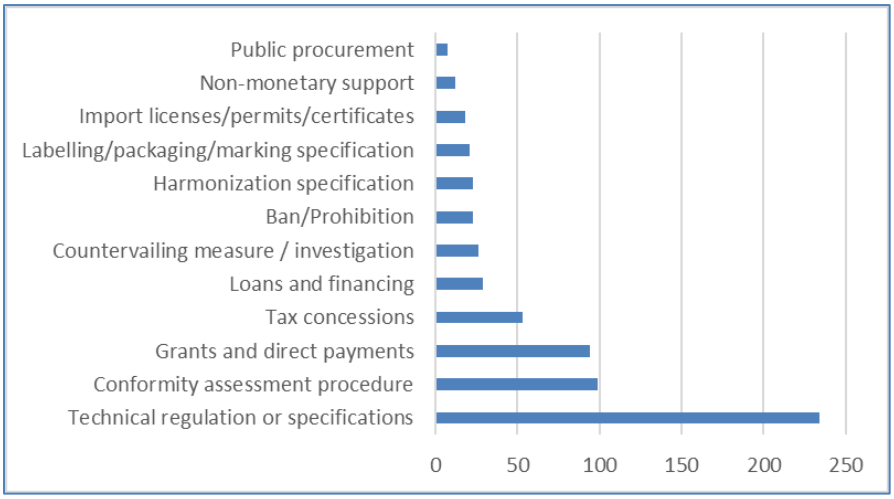
Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Targets 11.5, 11.6, 11.7, 11.b	Technologies and products relevant to the achievement of SDG 11	NA	B; N For dual use technologies also: E111; E112; H; P11; P13; P14; P2	See examples for environmental goods and other technologies in section on technology access. The impact of NTMs in this case cannot be judged based on the presence/absence of NTMs.
Targets 11.3, 11.4, 11.5, 11.6 11.b	NA	NA	NA	Environmental sustainability and environmental impact of the cities can be indirectly addressed by NTMs relevant to SDGs 6, SDG 7, SDG 12
Target 11.6	Fuel-using motor vehicles	Vehicles: six-digits under 8701, 8702, 8703, 8704, 8705, 8709, 8711, 8716	B31; B32; B7; B8; B11; E316; P6	Regulations on fuel exhaust and on noise generation by vehicles. Clear with keywords, as these HS-NTM code pairs may have other regulatory purposes.
Target 11.6	Fuel-using and electrical equipment used in urban infrastructure; household appliances	Chapters 84-85 of the HS	B31; B32; B7; B8; B11; E316; P6	Regulations on fuel exhaust and on noise generation by regulated products. Clear with keywords, however coverage of products by relevant NTMs is significantly lower than for motor vehicles
Target 11.2	Motor vehicles, motorcycles, their parts	See relevant section	See relevant section	Vehicle safety regulations. Addressed in Target 3.6. For the purpose of this methodology the impact of NTM can be viewed as indirect.
Target 11.4	NA	NA	NA	Goods and regulations that may contribute to the protection and preservation of natural heritage. Partially addressed by SDGs 6, 7, 12, 13, 14, and 16
Target 11.4	Works of art; collectors' pieces and antiques	All HS six-digit codes under HS 2-digit 97	B11; B14; B15; E121; E112; P11; P13; P14; B32; B33; B42; P2;	Clear with keywords. NTM codes confirmed via the TRAINS database.

			B19; P19; H; C1; C3;	

Although the WTO EDB has plenty of examples of regulations of air pollution (figure 11 below), such regulations are less visible in the TRAINS database as regulations for these HS-NTM code pairs may address a variety of product characteristics, e.g. safety regulations, fuel efficiency, performance standards, specifications for the product and its components and materials, etc. Thus, it is necessary to check measure descriptions using keywords.

The vast majority of WTO EDB's NTMs related to air pollution are technical regulations, followed in prevalence by conformity assessment procedures. A review of the search results in the WTO EDB shows that most of the measures target motor vehicles (industrial, commercial and private) and combustion equipment used in urban and industrial sectors. Out of total of 499 measures related to air pollution, the majority are in fact also related to energy efficiency and conservation (136), alternative and renewable energy (59) and chemical, toxic and hazardous substances management (46), which are already addressed in sections on SDG7 and SDG12.

Figure 11 - Top-12 trade measures concerned with air pollution, WTO EDB, 499 measures out of 8615, 2009-2016



Source: Authors' calculations based on data from WTO EDB, accessed March 2019.

A2.11. SDG 12: Ensure sustainable consumption and production patterns

Target 12.2, which concerns with the achievement of the sustainable management and efficient use of natural resources, contains the following two indicators:

- Indicator 12.2.1: Material footprint, material footprint per capita, and material footprint per GDP (MF)
- Indicator 12.2.2: Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP (DMC)

These two indicators used in combination reflect the amount of actual and attributed material use by the economy's production and consumption processes (Metadata 12.2.1 MF; Metadata 12.2.2 DMC). The DMC reports the actual amount of material in the economy, while the

MF is the virtual amount required across the whole supply chain to service final demand.[3] Material in this case is understood as biomass, fossil fuels, metal and non-metal ores. These inputs for domestic consumption and production are often traded between economies directly as raw materials, or in the form of intermediate or final products.

Although the target does not state specifically what level of actual and attributed material use per capita or per GDP is considered sustainable or efficient, it essentially aims to achieve reduction of the per unit use of these material resources. As far as the domestic consumption patterns or domestic production processes go, efficiency of material use is to be regulated primarily at the national level. However, it is possible to regulate (1) imports of materials (raw materials, intermediate, capital and final goods), (2) material (resources) consumption by products during their operation life, and (3) material use during the entire life-cycle of imported intermediate and final products.

These challenges can be addressed by the following regulations:

1. Technical regulations aimed at preservation of products during their transport, transshipment, storage en route to the buyer, reduction of their excessive loss (through leakage, spillage, excessive evaporation, spoilage), prevention from damage from external factors or due to internal characteristics of the product (wood, cement, agricultural non-food products, etc.);
2. Technical regulations aimed at reduced resource consumption during the products' production processes or throughout the supply chain or the entire products' life-cycle, and environment-friendly management of production processes.
3. Technical regulations aimed at reduced resource consumption by products during their operation life;

The first group of regulations may be addressed by SPS (A33, A5, A64, A32) and TBT (B33, 32, 42) measures. However, the primary objective of SPS measures is to protect human health, and animal and plant life, including by preventing spreading of disease-causing organisms, microorganisms and transboundary movement of harmful pests. These objectives are fully covered by Target 2.4 above.

As for the relevant TBT measures, although this combination of SDG Target-HS code-NTM code-keywords seemed sufficiently straightforward and clear (and supported by a number of examples from TRAINS database), the results of the search algorithm run on the full set of TRAINS's data contained very few measures that had sole intention of preventing spoilage, deterioration, loss of goods or of their functionality in transit and storage. The majority of the resulting measures had intentions already covered elsewhere in this methodology, such as: protection of human health from foodborne diseases caused by spoiling of food products; protection of human health from exposure to hazardous substances (sensitive goods that have medical purpose, toxins, viruses, microorganisms, chemicals, wastes, narcotics, etc.); protection of the environment from exposure to hazardous substances and goods that may pose biohazard (chemicals, wastes, toxins, viruses, microorganisms, living modified organisms, alien species,

[3] MF is calculated as raw material equivalent of imports plus domestic extraction minus raw material equivalent of exports. DMC is calculated as direct imports of material plus domestic extraction of materials minus direct exports of materials measures in metric tonnes.

radioactive substances, potentially poisonous substances, etc.); protection of public security (guns and arms, weapons, explosives and their precursors, etc.); other highly regulated or sensitive goods regulated for various reasons, including for the purpose of ensuring strict traceability of trade in these goods (rough diamonds, alcohol, narcotics for medicinal purposes, etc.). This makes this combination of SDG Target-HS code-NTM code-keywords too ambiguous for the purpose of this methodology.

The second group of regulations is potentially applicable to all HS codes (only Chapters 93 and 97 and goods under code 0106 of the HS were excluded, as they are the least sensitive in this respect). These are general or industry-specific sustainability standards that can be applied to reduce material consumption and environmental impact throughout the production process, the whole supply-chain or the full life cycle of a product. Relevant NTMs here are technical requirements for production processes, storage and transportation, product quality requirements (as non-product-related production requirements are faced by the resulting internationally traded products), conformity assessment requirements, labelling, marking and packaging requirements, and sometimes the related export measures. Currently, these issues are mostly addressed by international standards, voluntary sustainability standards and certification schemes. However, such initiatives often attempt to address a wider variety of issues in combination, some of which are relevant to the social and economic pillars of sustainability. For reference, see advanced filters under category “Social” of the International Trade Center’s Standards Map (ITC, n.d.) and the list of social standards of the Global Reporting Initiative (GRI, n.d.). Therefore, these HS-NTM code combinations are more directly relevant to Target 12.6 which is concerned with companies adopting sustainable practices in their operations. See relevant section below, as well as the section on Regulation of non-product-related processes and production methods.

The third group of regulations is already covered by SDG 6 and SDG7; impact on Target 12.2 may be considered as indirect.

Additionally, certain countries may restrict exportation of certain valuable natural resources, which are important for the domestic economy and overexploitation of which, especially in a situation of high demand from third countries, may lead to their depletion and even to detrimental impact on the environment. Relevant measures here are may be export prohibitions, quotas, and export price-control measures or export taxes and charges. For example, the TRAINS database contains examples of Thailand prohibiting export of natural sand and Bahrain imposing licenses and fees for the export of marine sand - measures motivated, according to the available literature, by these particular concerns (ECOLEX, n.d.). However, such sensitive natural resources may differ for different countries, and some of them are already addressed in other sections (such as, for example, timber and its products in SDG 15). Also, unless the regulatory purpose is clearly stated in the description, the actual intention of the NTM is not clear. List of keywords that would help isolating relevant measures is hardly possible.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 12.2	Raw and intermediate inputs to production of non-food products (including fuels, metal and non-metal resources, and excluding waste and	UNCTAD-SoP1 and SoP2 (H3) (WITS; WITS); excluding Chapters 02, 03, 04, 07, 08, 09, 10, 11, 12,	B32; B33; B42	Very ambiguous, as this combination of SDG Target-HS code-NTM code-keywords in the majority of cases regulates packaging, marking, storage and transportation of sensitive goods for safety, security and traceability purposes.

	agricultural raw materials intended for food production) Agricultural raw materials intended for food production are addressed in Target 12.3	15, 16, 17, 18, 19, 20, 21, 22, 24 (food and inputs for food production)		
Target 12.2	Final and capital goods (non-food) Final food products are addressed in Target 12.3	UNCTAD SOP3 and SOP4 (H3) (WITS; WITS) excluding chapters 01-24		
Target 12.2	Any product produced using sustainable management of processes and production methods in various sectors, including those aimed at reduced resource consumption during the products' production processes or throughout the supply chain or the entire products' life-cycle	See relevant section	See relevant section	Addressed in Target 12.6. See figure 12.
Target 12.2	Products that use other resources during their operation: 1)Water-using equipment and appliances for commercial and household use; electrical and non-electrical 2)Electricity and fuel using appliances, equipment, vehicles and machinery for household and commercial use 3)Water, electricity and fuel using equipment and machinery for industrial use	See HS codes in sections on SDG 6 and 7	B31; B32; B33; B7; B8; B11; E316	All three groups are already addressed in SDG 6 and SDG 7. For the purpose of this methodology impact of NTM can be viewed as indirect.
Target 12.2	Valuable natural resources threatened with depletion	NA	P1; P3; P5	Ambiguous. Sensitive natural resources may differ for different countries, and some of them are already addressed in other sections (such as, for example, timber and its products in SDG 15). Also, unless the regulatory purpose is clearly stated in the description, the actual intention of the NTM is not clear. List of keywords that would help isolating relevant measures is hardly possible.

Target 12.3 is concerned with the reduction of global food losses and waste at the retail, consumer levels and along production and supply chains, including post-harvest losses and is to be assessed with the Indicator 12.3.1: Global food loss index (UNEP and FAO, 2017). Reduction of food waste at the retail and consumer levels is to be addressed through national-level policies aimed at improving the management of food products and at changing consumer behavior. For the purpose of this methodology, the part of the target concerning with the reduction of food loss

along production and supply chains, including post-harvest losses, is of interest. This can be addressed through NTMs designed to preserve products from spoilage during production, handling, storage and transportation to the buyer in the importing country. A number of research papers conclude that although the majority of food loss along the food supply chain happens at immediate post-harvest stage and at retail and consumption stage, the quality of packaging and ability to maintain proper storage conditions during transportation (Alexander et al., 2017; Parfitt, Barthel, & Macnaughton, 2010). Transshipment and storage in transit are also important factors in minimizing food loss on the way to the final consumer

In this case, food is understood broadly and includes both food products for final consumption and agricultural raw and intermediate materials from which food products can be manufactured in the importing country. Therefore, the products of relevance are coded under HS sections of 01-24, excluding Chapters 01, 05, 06, 13, 14, 23, 24.[4] For these groups of products spoilage may occur: (1) due to natural deterioration over time; (2) due to suboptimal storage conditions during transportation and transshipment; (3) due to the presence of certain organisms, (4) microorganisms and fungi, which, if not eliminated or controlled, will spread within the product and render it unusable; (5) due to contamination with such microorganisms and fungi while in transit; (6) due to external impacts, including elements, introduction of toxic or non-toxic substances that are considered not safe for human consumption, etc.

To mitigate the impact of the above factors the following methods are used that can be addressed by NTMs: proper packaging; proper handling of products and proper conditions during storage, transportation and transshipments; treatments of products to eliminate organisms, microorganisms and fungi (cold treatment, heat treatment, irradiation[5], etc.); treatments to prolong shelf-life of products. Relevant NTMs in this case are A33 Packaging, A51 Cold/heat treatment, A52 Irradiation, A64 Storage and transport conditions, B33 Packaging, B42 TBT regulations on transport and storage.

On one hand, linkages here are similar to those described for Target 12.2 but are clearer due to the inherent characteristics of the products (perishable). However, on the other hand, the primary objective of SPS measures (NTM chapter A) is to protect human health, and animal and plant life, including by preventing spoilage of these perishable goods or occurrence in them of disease-causing microorganisms. These objectives are fully covered by SDG 2 and SDG 3 (direct impact of NTMs). For the purpose of this methodology the impact of Chapter A NTMs here can be considered as indirect.

As for the relevant TBT measures, although this combination of SDG Target-HS code-NTM code-keywords seemed sufficiently straightforward and clear, the results of the search algorithm run on the full set of TRAINS's data contained very few measures that had sole intention of preventing spoilage, deterioration, loss of goods in transit and storage. The majority of the resulting measures had intentions already covered elsewhere in this methodology, such as:

[4] Excluding the following HS 2-digit products, which are not intended for human consumption: 01-Live animals, 05 - Products of animal origin, not elsewhere specified or included, 06 - Live trees and other plants, bulbs, roots, and the like; cut flowers and ornamental foliage, 13 - Lac; gums, resins and other vegetable saps and extracts, 14 - Vegetable plaiting materials; vegetable products not elsewhere specified or included, 24 - Tobacco and manufactured tobacco substitutes and 23 - Residues and waste from the food industries; prepared animal fodder.

[5] Categories of food that could be irradiated: https://www.food.gov.uk/safety-hygiene/irradiated-food

protection of human health from foodborne diseases caused by spoiling of food products; protection of human health from exposure to hazardous substances (sensitive goods that have medical purpose, toxins, viruses, microorganisms, chemicals, wastes, narcotics, etc.); protection of the environment from exposure to hazardous substances and goods that may pose biohazard (chemicals, wastes, toxins, viruses, microorganisms, living modified organisms, alien species, radioactive substances, potentially poisonous substances, etc.); protection of public security (guns and arms, weapons, explosives and their precursors, etc.); other highly regulated or sensitive goods regulated for various reasons, including for the purpose of ensuring strict traceability of trade in these goods (rough diamonds, alcohol, narcotics for medicinal purposes, etc.). Such prominent presence of non-food related regulations in the search results are to a significant extent due to the fact that TRAINS database contains many entries registered at 4- or 2-digit level of the HS, while some entries cover the entire list of goods present in the HS. This makes this combination of SDG Target-HS code-NTM code-keywords too ambiguous for the purpose of this methodology.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 12.3	Foodstuffs and agricultural products intended for their production	Chapters 02, 03, 04, 07, 08, 09, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22 from UN Comtrade Commodity Classifications (H4) (UN Comtrade)	B32; B33; B42	Very ambiguous, as this combination of SDG Target-HS code-NTM code-keywords in the majority of cases regulates packaging, marking, storage and transportation of sensitive goods for safety, security and traceability purposes.

Targets 12.4 and 12.5 are concerned with environmentally sound management of chemicals and all wastes throughout their life cycle, reduction of all waste generation and reduction of release of chemicals and wastes into air, water and soil to minimize their adverse impacts on human health and the environment. These targets have indicators, for which there is no obvious scope for the role of NTMs. However, NTMs are relevant for the overall achievement of these targets, as they help to control and regulate the transboundary movement of hazardous chemicals and waste, and products that may become sources of hazardous chemicals and unnecessary waste. Target 12.4 has stronger leaning towards managing of hazardous chemicals and toxic wastes, although it also covers wastes that are not characterized as hazardous.

The following international conventions that give great importance to regulating international trade in certain products are directly mentioned in the metadata for the indicators 12.4.1 and 12.4.2: Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal[6], Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade[7], Stockholm Convention on Persistent Organic Pollutants (POPs)[8], Montreal Protocol on Substances that Deplete the Ozone

[6] Basel Convention covers non-hazardous wastes, as well as hazardous wastes that are explosive, flammable, reactive, poisonous, infectious, corrosive, toxic or ecotoxic; aims to achieve environmentally sound management of these substances; contains prior informed consent procedure for exports and imports; allows bans, prohibitions, restrictions or strict requirements for transboundary movement.

[7] Rotterdam Convention covers pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons; contains prior informed consent procedure for esports and imports; allows prohibitions, restrictions on transboundary movement.

[8] Stockholm Convention covers 14 pesticides, and 7 industrial chemicals and by-products; restricts export and import of POPs

Layer (Montreal Protocol), Minamata Convention on Mercury (Minamata Convention). These conventions are aimed at regulating the use and transboundary movement of hazardous and non-hazardous chemicals and waste, persistent organic pollutants and pesticides, ozone depleting substances, and mercury. These documents stipulate measures that are listed in the "NTM Code" column in the matrix below, as well as some measures not included in MAST classification, such as: provisions on advance notifications to the importing countries and on obtaining of their prior informed consent, requirements to have a waste recovery or recycling contract with the relevant disposer in the importing country certified as capable to ensure such disposal of waste that is harmless to human health and the environment, duty to re-export and re-import the product if the importing country fails to have the capability to properly dispose of the product, requirements for the documentation accompanying the chemical product, etc.

For the matrix below, the NTM code list is compiled based on (1) trade measures described in the conventions (WTO, 2017c) and on (2) NTM codes used in the TRAINS database (keyword for "Measure description" is "Basel", "Rotterdam", "Stockholm", "persistent organic pollutants", "Montreal", "ozone", "ODS"). The hierarchy of NTM codes related to the implementation of Basel, Rotterdam, Stockholm, Montreal and Minamata Conventions is available in Figure 14, Figure 15, Figure 16 and Figure 17 in the Appendix. Without the keywords, the linkage of HS-NTM code pairs may sometimes be inconclusive, due to partial coverage of HS codes by goods classified as hazardous or waste, as well as due to other purposes for such regulations, or due to the relevance of these HS-NTM code pairs other SDGs (e.g. SDG 3 target on narcotic drug use).

The HS codes are compiled based on the HS list titled "*Correlation between the product coverage of selected international conventions and the Harmonized System"* compiled by the WCO (WCO, 2017a), on other literature and on the review of descriptions of six-digit codes in the HS. The final Excel matrix provides 3 alternative HS lists for testing out the methodology:

- *Basic*: All codes of Basel A (hazardous) and B (non-hazardous) Lists 9 Rotterdam/Stockholm list; Ozone list; HS codes for mercury as substance or compound; plus, all other 2017 HS codes with "waste" in the description;
- *Narrow*: all codes of Basel A (hazardous) and B (non-hazardous) Lists less seemingly non-hazardous and non-waste codes10; Rotterdam/Stockholm list; Ozone list; HS codes for mercury as substance or compound; plus, all other HS codes with "waste" in the description;
- *Broad*: All HS codes from chapters most represented in the WCO correlation list, to eliminate issue of different revisions of HS; less seemingly non-hazardous and non-waste HS codes, especially if only partially covered under Basel A List; plus, all other HS codes with "waste" in the description. Specifically, all six-digits from chapters 25, 26, 27, 28; 29; 38; 68; 81; and 300692; 320417; 360490; plus, all other HS codes with "waste".

The WCO correlation list does not include a list of HS codes relevant to the Minamata Convention. Mercury and mercury compounds are regulated under the Basel Convention and are included in List A of hazardous chemicals. However, the Minamata Convention has a wider scope, as it not only regulates the chemical, its compounds and waste products containing it, but also

[9] Basel Convention covers all chemicals and waste, hazardous (List A of the convention) and non-hazardous (List B of the convention).
[10] Some codes that are included under Basel List A seemingly have nothing to do with hazardous chemicals or waste

attempts to regulate mercury-added products, as they generate mercury-containing waste at the end of their live cycle. Mercury-added products are further examined below in this section.

Additional considerations:

- Certain chemicals under the conventions are included in the lists for complete elimination from use and transboundary movement, while others are only restricted and controlled. However, overall the same set of NTM codes is applicable for both groups of chemicals due to the overall sensitivity of chemical and waste products.
- Overall, conventions encourage the transboundary movement of hazardous and non-hazardous chemicals and waste from countries that lack facilities capable of proper disposal to those countries that have adequate disposal facilities and capacity. This element can partially be addressed by NTM codes E112 Licensing for special use or B11 Prohibition for TBT reasons with additional requirements, however, currently this is not very well reflected in the TRAINS database. When conducting country specific analysis, it might be useful to consider the context of the importing/exporting countries.
- In some cases where B11 measures are recorded, those measures belong to other B-codes, as they state that the products are banned from imports unless certain technical specifications or TBT requirements are met.
- There is a significant room for the use of bilateral NTMs (especially, when one of the trading countries is not a party to a relevant convention).

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Targets 12.4, 12.5	Goods regulated under Basel Conv (A and B lists), Stockholm Conv, Rotterdam Conv (hazardous or potentially hazardous chemicals and waste), Montreal Protocol (ozone depleting substances), Minamata Conv (pure mercury and its organic and inorganic compounds)	See description of alternative basic, narrow and broad HS lists above and the SDG-HS-NTM Concordance Matrix	B11; B14; B15; B19; B31; B32; B33; B42; B81; B82; B83; B84; B85; E1; E3; P11; P13; P14; P61; P62; B22; E316; B21; J2; H; C1; C3; P2; P19	Clear but partial coverage, keyword search can be essential. Some HS codes targeted by these conventions overlap. Indirect impact on Target 3.9 which concerns with unintentional poisoning.

Apart from the transboundary movement of hazardous substances, trade policy also attempts to regulate the transboundary movement of goods that may contain such substances. For the purpose of this methodology the following relatively visible groups of products were identified that can be sources of e-waste[11], mercury and ozone-depleting substances.

[11] Hazardous e-waste regulated under Basel Convention includes “waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III”. Non-hazardous e-waste regulated under Basel Convention is a mirror of the above and includes “Electrical and electronic assemblies: * Electronic assemblies consisting only

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Targets 12.4, 12.5	Commonly used household and commercial appliances and equipment that contain electronic components that may be sources of e-waste	HS codes from UNU-Key classification (2015) (UNU-IAS, 2015)	B11; B31; B22; E316; E112; B83; B85; P11; P13; P14; P6	Potentially clear with keywords, partial coverage – HS list is based on classification of products that are likely sources of e-waste. It includes a variety of appliances and electronic devices for household, commercial and partially for industrial use. However, it does not include large industrial machinery and vehicles, which can also be sources of e-waste, if they have electronic components. – HS codes do not differentiate between new products versus used products destined for direct reuse versus used (end-of-life) products destined for recycling or disposal. Relevance of measures has to be identified based on combination of HS code, NTM code, and measure description or regulation text.
Targets 12.4, 12.5	Goods that can be sources of mercury (mercury-added products)	HS headings and subheadings for mercury-added products (for some HS lines keyword "mercury" is essential: Batteries 8506, 8513, 8548, Cosmetics 34, Lamps 8504, 8513, 8539, 8540, Measuring devices 90, Pesticides 38, Power devices 85, 90, Dental fillings 3006	B11; B31; B22; E316; E112; B83; B85; P11; P13; P14; P6	Potentially clear with keywords, partial coverage – Coverage is mostly partial. The HS list is likely non-exhaustive. HS codes selection is based on review of relevant literature (Garcia, 2018; Maxson), the TRAINS database and HS 2017. – Most of mercury-added commodities (other than lamps and some batteries) do not have separate HS codes to differentiate them from similar mercury-free products. There is a plan to work with WCO to change that in the future (Maxson). – Complex machinery and equipment, not included in this HS list, may contain mercury-added components. – May be useful to differentiate between transboundary movement of mercury-containing products and their scrap to those member-states that DO NOT have facilities capable of proper disposal versus transboundary movement to those countries that DO have such facilities. – In some cases where B11 measures are stated, those measures belong to other B-codes, as they state the products are banned from imports unless certain technical specifications are met.
Targets 12.4, 12.5	Goods that can be sources of ozone depleting substances (ODS)	See the SDG-HS-NTM Concordance Matrix for basic and broad lists of HS codes	B11; B31; B22; E316; E112; B83; B85; P11; P13; P14; P6	Potentially clear with keywords, partial coverage HS codes are based on literature review (UNEP/SEI/Multilateral fund for the Implementation of the Montreal Protocol, 2000; Ozone Secretariat, UNEP, 2016) and HS 2017. Ozone depleting chemicals covered under Basel A List and Montreal Protocol are excluded (covered above). Coverage is mostly partial; content of ozone depleting substances is not evident from product description. The SDG-HS-NTM Concordance Matrix contains two lists (1) basic with HS Codes for goods that clearly have elements that may utilize ODS12 and (2) broad with HS codes for all goods that are present in the TRAINS database and covered by regulations for ODS. The latter list is broader, as the former list excludes HS codes for goods that may or may not be equipped with air conditioning equipment

of metals or alloys; * Waste electrical and electronic assemblies or scrap (including printed circuit boards) not containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or not contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) or from which these have been removed, to an extent that they do not possess any of the characteristics contained in Annex III; * Electrical and electronic assemblies (including printed circuit boards, electronic components and wires) destined for direct reuse, and not for recycling or final disposal."

[12] *Annex 4: List of Products Containing Controlled Substances Specified in Annex A* which was adopted by the Third Meeting of Parties in Nairobi, 21 June 1991 as required by paragraph 3 of Article 4 of the Protocol. 1. Automobile and truck air conditioning units (whether incorporated in vehicles or not) 2. Domestic and commercial refrigeration and air conditioning/heat pump equipment such as refrigerators, freezers, dehumidifiers, water coolers, ice making machines, air conditioning and heat pump units containing controlled substances as a refrigerant and/or in insulating material of the product. 3. Aerosol products except medical aerosols 4. Portable fire extinguishers 5. Insulation boards, panels and pipe covers 6. Pre-polymers

				or cooling equipment, e.g. transport (rail, motor, boat, etc.); and excludes foam products.

Target 12.5 additionally contains components generally aimed at the prevention of waste. In this context, the potential role of NTMs is illustrated by a recent rise in bans and restrictions on the importation of single-use plastics, microplastics, metal scrap, e-waste, old used electronic devices, including by countries in the Asia-Pacific region (Reuters, 2018; The Straits Times, 2018; Reuters, 2018; The Nation, 2019).

All "waste" products have been addressed above in this section. Additional cases are covered in the matrix below and include trade in single-use plastics, goods containing microplastics, old or used appliances, equipment, machinery and vehicles. For the case of used appliances, machinery, and vehicles, the following reservations are relevant:

- At the six-digit level there are no HS codes to differentiate new products from used and old;
- There are no HS codes to differentiate used products intended for reuse from used products intended for recycling and disposal;
- Reuse may be beneficial for SDG 12, as it prolongs useful life of a product. However, in some cases it means persistence of products that are technologically less advanced and thus less efficient in terms of resource use and emissions vis-a-vis new products. Thus, the benefits of bans on used products are not straightforward.
- Trade in old products intended for recycling and disposal may be crucial for moving such goods from countries that lack recycling and disposal facilities to those that have them. Thus again, the benefits of bans on importation of old and scrap products intended for recycling and disposal are also not clear.

Another potential way to address this target is through the application of regulations on the full life cycle of products, which, among other things, are aimed at reducing waste at all stages of a product life cycle, or at increasing recyclable or recycled content of various products, or at reducing undesirable hard-to-recycle content of some products (partially addressed by Target 12.6).[13]

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 12.5	Goods that can be sources of single use plastics and microplastics (excluding plastic waste covered under Basel Conv)	All HS six-digit codes under Chapter 39, excluding plastic waste, and 340111, 340130, 330610 (the TRAINS database contains examples for the latter)	B11; B31; B32; B33; B7; P6	Potentially clear with keywords, but partial coverage. Reduced use of single-use plastic is essential for reduction of waste generation. Some countries ban importation of such products, regulate characteristics of such products and of packaging materials. There are no separate HS codes for microplastics or microbeads, as this material is usually part of other products (personal care products). So, use of keywords may be useful.

[13] Some examples include: Textile Exchange's Recycled Claim Standard and Global Recycled Standards (https://textileexchange.org/integrity/); The Cradle to Cradle Certified™ Product Standard (https://www.c2ccertified.org/get-certified/product-certification); Recycled Content Certification For Products and Recycling Programs (https://www.scsglobalservices.com/services/recycled-content-certification)

Target 12.5	Used and old appliances, machinery, vehicles	HS codes under chapters 84-89	B11; E112; E316; P11; P2	Ambiguous At six-digit level there are no HS codes to differentiate new products from used and old. Purpose of importation is not clear: direct reuse or recycling/disposal. Reuse has positive linkage to SDG 12, unless the product is too old to comply with modern requirements on resources efficiency or emissions. Importation into countries with adequate recycling and disposal facilities may also be beneficial to the achievement of this target.
Target 12.5	Any product produced using sustainable management of processes and production methods in various sectors, including practices aimed at reducing waste generation, employing waste recycling, reusing and environmentally conscious disposal, as well as goods made from recyclable or recycled materials	See relevant section	See relevant section	Addressed in Target 12.6. See figure 12.

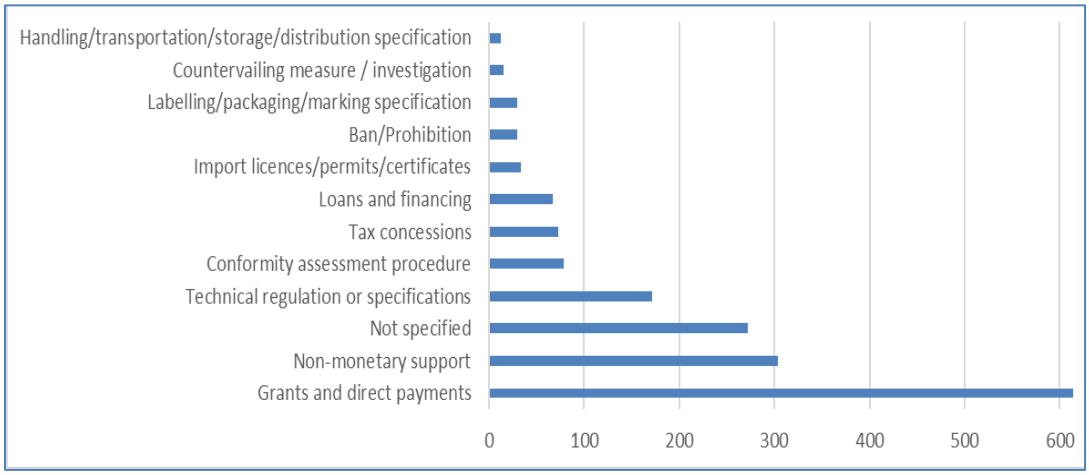
SDG 12 contains some other targets that can potentially directly benefit from the use of NTMs. Target 12.6 on transnational companies adopting sustainable practices can be partially addressed by regulations on environmental performance of production processes and methods, and on the environmental sustainability of a product's supply chain or the entire life cycle. Relevant to this also is the adoption by the companies of socially responsible practices in their routine operations, which would also contribute to the achievement of relevant targets of SDG 5 and SDG 8, which concern with eliminating any kind of forced labor, child labor, violation of human and labor rights, abuse of work force, including of women and vulnerable groups, while providing equal employment opportunities and equal pay for work of equal value, etc. Inclusion of social dimension here is all the more appropriate due to the fact that various initiatives of sustainability reporting (invoked in Indicator 12.6.1) and voluntary sustainability standards include social component. For reference, see advanced filters under category "Social" of the International Trade Center's Standards Map (ITC, n.d.) and the list of social standards of the Global Reporting Initiative (GRI, n.d.). Currently these are mostly addressed by VSS, but there are examples of governments adopting such regulations that have both environmental and social dimensions, some of which are based on the guidelines set forth by the VSS that gained popularity and authority in certain industries (Aidenvironment, WWF & ISEAL, 2018; D'Hollander & Tregurtha, 2016; Partzsch & Vlaskamp, 2016).

Such regulations are potentially applicable to all HS codes (only Chapters 93 and 97 and goods under code 0106 of the HS were excluded, as they are the least sensitive in this respect). Relevant NTMs here are technical requirements for production processes, storage and transportation, product quality requirements (as non-product-related production requirements are faced by the resulting internationally traded products), conformity assessment requirements, labelling, marking and packaging requirements, and sometimes the related export measures. Some of relevant measures can also be classified under the relevant codes of Chapter C (pre-shipment inspection and requirement to pass through specified port of customs), Chapter E (licensing and prohibition) (UNCTAD, 2019), F (price control measures, including taxes and

charges) (Vranes, 2009), L (subsidies) and under the codes of Chapter P for export measures. It is worth noting that the 2019 version of the MAST classification of NTMs stipulates separate codes for licensing and prohibitions for the purposes of protection of the environment, public health and for security reasons (UNCTAD, 2019). Very few related examples of NTMs are present in the TRAINS database, and they have a specific connection to other SDGs (e.g. regulations utilizing Kimberley Process Certification Scheme in Target 16.4 and FLEGT certification scheme in Target 15.2). This HS-NTM code combination can also contribute to a number of other SDGs, as is reflected in the relevant sections. Additionally, the issue of regulating non-product-related processes and production methods associated with the internationally traded goods, including the social aspects of such regulations, are covered below in the section on *Regulation of non-product-related processes and production methods*.

As was mentioned above, there are few examples of NTMs that relate to goods produced using sustainable management of processes and production methods in the TRAINS database. The WTO EDB contains a larger set of relevant measures under a number of environment-related objectives, including: soil management and conservation, sustainable agriculture management, sustainable and environmentally friendly production, sustainable fisheries management, sustainable forestry management, and sustainable mining management. As is illustrated by figure 12, measures related to the provision of support though grants, direct payments (subsidies), non-monetary measures, tax concession and financing are the most prevalent. Notable presence of technical regulations and conformity assessment requirements is likely due to the fact that as non-product-related production requirements are ultimately faced by the resulting internationally traded products.

Figure 12 - Top-12 trade measures concerned with sustainable production management in various economic sectors (agriculture, fishery, aquaculture, forestry, mining, manufacturing), WTO EDB, 2009-2016



Source: Authors' calculations based on data from WTO EDB, accessed March 2019.

Grants, direct payments (subsidies), non-monetary measures, tax concession and financing – measures that collectively fall under Chapter L of the MAST classification of NTMs - potentially can be used to encourage companies to adopt sustainable practices. These can be applied to a wide variety of goods to address a very broad range of environmental, social and

economic challenges prioritized by countries adopting such measures. However, at the time or writing, there was only 1 L-coded NTM registered in the TRAINS database. 2019 version of the MAST classification offers a more detailed typology of NTMs under Chapter L associated with the plans to collect more detailed data on such measures in the future.

Target 12.7 is aimed at promoting public procurement practices that are sustainable in accordance with national policies and priorities. This is mostly to be addressed by national policies. However, the WTO EDB contains a few examples of environment-related trade measures submitted by some member-states under the WTO Agreement on Government Procurement. Potentially, these measures can be applied to a wide variety of goods to address a very broad range of environmental, social and economic challenges prioritized by countries adopting such measures. MAST classification contains Chapter M for measures which are imposed to restrict government procurement to specific providers. However, at the time of writing, there was only 1 M-coded NTM registered in the TRAINS database. Potentially, this code can be used to reflect government regulation aimed at addressing environmental and social issues through the mechanism of public procurement, including public procurement from foreign suppliers. 2019 version of the MAST classification offers a more detailed typology of NTMs under Chapter M associated with the plans to collect more detailed data on such measures in the future.

Target 12.8 on information and awareness for sustainable development and sustainable lifestyles can benefit from proper labelling of goods that are sustainable throughout their life cycle and are produced with sustainable production processes and methods from recycled or easily recyclable materials. Labelling can be instrumental in spreading relevant information and awareness and attracting consumer choice to products that are sustainable and that are produced with reliance on sustainable practices. However, labelling has many purposes, including product safety, electromagnetic compatibility, ingredient composition, etc. Potentially associated with such labelling are conformity assessment measures, especially certification and traceability measures. However, these can also have a variety of other unrelated objectives, including those mentioned above. In any case, product- and non-product-related sustainability labelling, certification and traceability measures are already addressed in this and other sections.

Additionally, targets of SDG 12 can be achieved through:

- Implementation of national policies, and international and intergovernmental cooperation.
- Improving access to technologies. Technologies that are relevant to the achievement of SDG 12 include all of the technologies that are relevant to most of the other environment-related targets of the SDGs. Some of such technologies and products, as well as trade policy barriers affecting them are examined in the section on Access to technologies.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 12.6	Any product produced using sustainable management of processes and production methods in various sectors, addressing environmental, social and economic dimensions of the	All HS except 0106, 93 and 97	B4; B7; B8; B11; B31; B32; B33; C1; E; F; P6; P;	Can be used to address a very broad range of environmental, social and economic challenges that may be prioritized by countries adopting such measures. Potentially, may be clear once more regulations are registered in the TRAINS database with time. Exhaustive list of keywords is hardly possible at this stage.

	sustainable development			
Target 12.6	Any product produced using sustainable management of processes and production methods in various sectors; any product that conforms to sustainability requirements in a broad sense	All HS except 0106, 93 and 97	L	Can be used to address a very broad range of environmental, social and economic challenges that may be prioritized by countries adopting such measures. Potentially, may be clear once more regulations are registered in the TRAINS database with time or once data is collected following 2019 classification of NTMs.
Target 12.7	Any product	Potentially all HS	M	Can be used to address a very broad range of environmental, social and economic challenges that may be prioritized by countries adopting such measures. Potentially, may be clear once more regulations are registered in the TRAINS database with time or once data is collected following 2019 classification of NTMs.
Target 12.8	Any product	Potentially all HS	B31; B8	Very ambiguous, can be considered indirect, as such labelling, conformity and traceability measures are addressed in connection with other targets.
All	Technologies and products relevant to the achievement of SDG 12	NA	B; N; For dual use technologies; E111; E112; H; P11; P13; P14; P2	See examples of environmental goods and technology groups in section on Access to technologies. The impact of NTMs in this case cannot be judged based on presence/absence of NTMs.

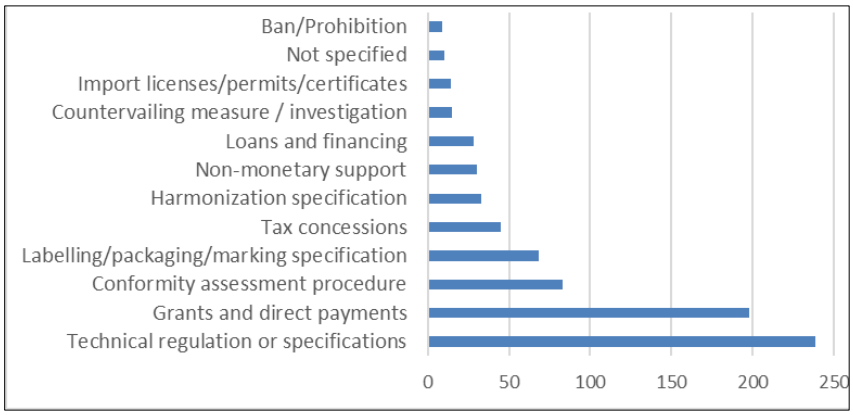
A2.12. SDG 13: Take urgent action to combat climate change and its impacts

SDG 13 does not have any targets or indicators that allow room for understanding the direct impact of NTMs. The targets for the most part shall be achieved by implementation of national policies, international and intergovernmental cooperation, as well as by actions under other SDGs. For example, the reduction of CO2 emissions can be achieved through NTMs regulating energy efficiency of consumption and production in various sectors (SDG 7 and SDG 12). Adaptation to climate change can be achieved by using sustainable practices in agriculture and by making cities resilient (SDG 11 and 15). Mitigation can be achieved by protecting on-land and marine ecosystems, as some changes may lead to release of greenhouse gases, such as methane (SDG 14 and 15). The potential scope for the impact of NTMs in addressing these challenges is examined in relevant sections of this methodology.

Conclusion regarding linkages to measures under other SDGs is supported by the data from the WTO EDB. Over the period of 2009-2016, the WTO EDB registers a total of 573 measures with the objective "climate mitigation and adaptation". Among them, 280 measures additionally have objectives related to energy conservation and efficiency, 131 measures have objectives related to alternative and renewable energy, and 131 measures have objectives related to air pollution prevention. Prevalent measure types include technical regulation, conformity assessment and labelling, and various support measures. Harmonization specifications essentially are technical measures that amend existing regulations or set new ones that are harmonized with relevant international or regional standards to facilitate trade in targeted products. Among the technical measures, the majority cover machinery and electrical equipment (100) and manufacturing (53). Therefore, the most relevant and potentially visible types of NTMs here are product-related technical measures (regulations, conformity, labelling) for electronic and electrical machinery, devices, equipment, motor vehicles related to energy efficiency and energy

performance, fuel efficiency and emissions, which are addressed in other sections of this document.

Figure 13 - Top-12 trade measures concerned with climate change mitigation and adaptation, WTO EDB, 573 measures out of 8615, 2009-2016



Source: Authors' calculations based on data from WTO EDB, accessed March 2019.

Access to technologies is also important to the achievement of SDG 13. Relevant technologies include alternative and renewable energy sources, cleaner fossil fuel, energy efficiency, CO2 capture and storage, etc. Some of such technologies and products, as well as trade policy barriers affecting them, are examined in the section on Access to technologies. See figure 9 in the section on SDG 7 for the top-12 NTMs affecting trade in alternative and renewable energy technologies (based on WTO EDB data). Finally, Border Carbon Adjustment (BCA) taxes are currently being discussed as a way forward to address carbon emissions via trade regulations, where imports are taxed based on their greenhouse gas content. However, the effects of such taxes have been analysed and shown to disproportionately negatively affect the poor (International Institute for Applied Systems Analysis, 2018). They are currently not implemented anywhere, although considered by major economies, and can potentially become a significant NTM addressing this Goal.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Targets 13.1, 13.2, 13.3	Technologies and products relevant to the achievement of SDG 13	NA	B; N; For dual use technologies; E111; E112; H; P11; P13; P14; P2	See examples of environmental goods and technology groups in section on Access to technologies. The impact of NTMs in this case cannot be judged based on presence/absence of NTMs.
Targets 13.1, 13.2, 13.3	NA	NA	NA	Via HS-NTM codes pairs relevant to other SDGs and that can contribute to climate change mitigation and adaptation efforts (e.g. 6, 7, 11, 12, 14, 15)

A2.13. SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development

In terms of the potential impact of NTMs on the achievement of SDG 14, targets under this goal are, for the most part, to be addressed by NTMs under other SDGs (see matrix below). Thus, the impact of NTMs on SDG 14 for the most part can be described as indirect.

The only two exceptions are Targets 14.4 and 14.6, which are concerned with illegal, unreported and unregulated (IUU) fishing. Prevention of IUU fishing can be contributed to by the regulations adopted to support implementation of the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This is especially relevant for those species of fish that are included in Appendix I of the CITES; such species are considered threatened with extinction and for them commercial trade is generally prohibited. Relevant HS-NTM code pairs are already examined in the section on SDG 15.

However, inclusion of new threatened commercial species under the CITES protection is a highly political and contentions matter. This leaves protection of certain endangered species of fish outside of the scope of the CITES. In this context, the 2001 *International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU)* (FAO, 2001) was adopted to facilitate sustainable sourcing of such species and to reduce impact of fishing on the marine environment and on the health of fish stocks. The IPOA-IUU describes some of the relevant trade-related measures aimed at preventing or reducing IUU fishing. It is possible to derive some applicable NTM codes from that document and some other literature (Hosch, 2016; Bellmann & Tipping, 2015). Relevant to this is also the issue of subsidies to fishing industry that contribute to overfishing and over exploitation of fishery resources (Bellmann & Tipping, 2015), which are already addressed in the section of Target 2.b for export subsidies for agricultural goods and in section of Target 12.6 on sustainable practices of companies.

Affected six-digit product codes are those classified under Chapter 3 of the HS. Very few examples of measures that are clearly linked to IUU fishing can be found in the TRAINS database. Since, some of the resulting HS-NTM code pairs are already covered by SDG 15's target on biodiversity (Targets 15.7, 15.c), especially for those species that are considered threatened with extinction if not used at a sustainable rate, use of keywords is essential. Regulations related to IUU fishing are relevant for a limited number of countries, as major role belongs to the coastal and port states (including export measures); however, any importing country wishing to regulate the origin and harvesting methods of any fish imported into its territory can use relevant import regulations (Hosch, 2016).

The TRAINS database contains a few examples of countries regulating or prohibiting importation of fishing rods and nets. However, descriptive information for these regulation does not seem to contain information clearly linking their objective to the prevention of IUU fishing. Moreover, B11 code is often used in place for B7 and B8 codes, which may have a variety of regulatory objectives. We could assume that all instances of such regulations most likely are relevant to the prevention of IUU fishing, however, words "nets" and "rods" are too short to serve as qualifying keywords, as these sequences of symbols are also present within certain longer words. Thus, no conclusive concordance strings can be generated for the use in the quantitative analysis.

Prevention of IUU fishing can also contribute to the achievement of Target 16.4 aimed at reducing illicit financial flows from trade.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 14.1	NA	NA	NA	Eutrophication prevention is to be achieved by reduction of nutrient pollution of sea water, including by way of reducing runoff of pollutants and untreated waste water from various

				on-land economic activities into the sea. Plastic debris density to be decreased via reduction and proper management of plastic waste and single-use plastic products. See sections on SDGs 6, 9, 11, 12, and 15.
Targets 14.2, 14.4, 14.7	Any product produced using sustainable management of processes and production methods in various sectors, including processes and methods allowing for more sustainable management of marine and coastal ecosystems	See relevant section	See relevant section	Regulations related to the sustainable management of marine and coastal ecosystems and destructive fishing practices. Addressed in Target 12.6. See figure 12.
Targets 14.4, 14.6	Fish and crustaceans, mollusks and other aquatic invertebrates	HS codes for fish and crustaceans, mollusks and other aquatic invertebrates (Chapter 3)	A83; B83; B11; B14; B15; B31; B32; B33; B42; B81; B84; B85; P11; P12; P13; P14; P61; P62; E1; E3; B19; P19;	Regulations to control illegal, unreported and unregulated fishing. Potentially clear with keywords.
Targets 14.4, 14.6	Fishing rods, nets, other fishing gear	Relevant HS codes	B11; B7; B8;	Too ambiguous. No examples in TRAINS clearly associated with IUU fishing. Other qualifying keywords have not been identified.
Target 14.3	NA	NA	NA	Acidification prevention is to be achieved by preventing eutrophication (see above) and reduction of CO2 emissions (SDGs 7,12,13).
Target 14.b	NA	NA	NA	Regulations to facilitate access of SMEs to marine resources and to international markets. This target can be facilitated by sustainable and responsible procurement by public and private sectors, and by sustainable practices of large companies (see SDG 12's Targets 12.6 and 12.7)

A2.14. SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

In terms of the potential impact of NTMs for the achievement of SDG 15, targets under this goal are, to a significant extent, addressed by NTMs under other SDGs (see matrix below). Thus, for such targets the impact of NTMs can be described as indirect.

At the same time SDG 15 contains a few targets in the achievement of which NTMs may play a direct role. Their common feature is conservation and the sustainable use of biodiversity that can be achieved through (1) sustainable management of forests that serve as an important habitat for multiple species of plants and animals; (2) regulating trade in endangered or potentially endangered species of plants and animals, (3) through controlling transboundary movement of invasive species and modified living organisms (plants and animals), and (4) sustainable management of processes and production methods in various sectors, including processes and methods allowing for more sustainable management of land ecosystems and protection of biodiversity. These are also relevant to SDG 2 (loss of some species may lead to irreversible damage to ecosystems which are crucial for supporting production of food).

Target 15.2 is concerned with the implementation of sustainable management of all types of forests and is aimed at halting deforestation, restoring degraded forests and increasing

afforestation and reforestation globally. Relevant to this target, as well as to Targets 15.7 (impact considered as indirect) is trade in illegally sourced timber and in products made from it. There is a wide variety of voluntary initiatives and certification schemes (such as, for example, Forest Stewardship Council) prescribing companies to conduct supply chain due diligence and to apply for certification from authoritative organizations, some of which has translated into mandatory national legislation. TRAINS database contains very few examples of relevant measures concerned with the implementation of supply chain due diligence and with participation in FLEGT[14] voluntary partnership agreements and certification schemes. However, there is a strong potential that the multitude of voluntary initiatives will eventually lead to the establishment of a new norm in international trade transaction and consequently to a widespread adoption of relevant national legislation with mandatory requirements (Partzsch & Vlaskamp, 2016). Thus, it may be useful to monitor NTM databases for such the emergence of such regulations.

Target 15.7 is concerned with international trade in endangered or potentially endangered species of plants and animals and aims to protect biodiversity and illegal exploitation of protected species. International trade in endangered or potentially endangered species of plants and animals is addressed in the *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES),* which among other things stipulates specific NTMs that should be utilized by the countries, Parties to the Convention, to control or restrict transboundary movement of sensitive species of animals. CITES specifically targets animals, plants, their parts and derivatives of the species that are threatened with extinction and of the species that are not yet threatened with extinction but would become so without trade regulation (WTO, 2017c).

The list of relevant six-digit HS codes was published by the World Customs Organization (WCO, 2017a). However, for all codes, except HS 440721 *Tropical wood*, coverage by the CITES regulations is only partial. At the same time, the severity of trade restrictions greatly depends on the level of extinction threat that certain species face. Certain animals are included in the list for animals close to extinction (all commercial trade in them is prohibited), while others are considered only threatened if they are not used at a sustainable rate (commercial trade is allowed but restricted by export quotas and other regulatory requirements). Lastly and quite importantly, lists of endangered or potentially endangered species are country specific.

The list of NTM codes for this section was compiled based on (1) trade measures described in the CITES[15] (WTO, 2017c) and on (2) NTM codes used in the TRAINS database. Without use of keywords, the linkage of HS-NTM code pairs to SDG 15 is inconclusive, due to very limited coverage by the examined regulations and by the use of NTM codes for other purposes. For example, packaging and transportation requirements have the objective to ensure safety and humane treatment of animals in transit and potentially is applicable to all living animals. At the same time packaging requirements might be instrumental for conducting inspection of animals and plants in transit to confirm their species. Some NTM codes may be not correct, e.g. measures recorded as B11 may belong to other B-codes, as they state that the products are

[14] The EU's Action Plan on Forest Law Enforcement, Governance and Trade operational since 2003 (http://www.euflegt.efi.int/flegt-licensed-timber)

[15] Trade measures mentioned in the convention: shipment and preparation of shipment, so as to minimize risk of injury, damage to health or cruel treatment; import, export, re-import, re-export permit and certification; prohibition of trade in Annex I animals, and where appropriate in Annex II and III animals; for Annex I noncommercial trade may be allowed; export quotas (voluntary export quotas); designate ports of exit and ports of entry; documentation requirements.

banned from imports unless certain technical specifications, certification requirements or other requirements are met.

At the same time, when the filter is applied to the TRAINS data to isolate only those measures that are applied to HS code 440721 (Tropical wood; the only HS code with full coverage under CITES), the resulting 222 measures by 41 countries seem to exhibit a pretty close linkage to the objectives of CITES, even if CITES is not specifically mentioned (and each cell contains other HS codes regulated under CITES).[16] With the use of "440721" filter, NTM codes appeared in the following order of prevalence (P13, B14, A83, A14, P4, A84, P11, P14, B11, P62, P69, etc.) A significant role is played by export measures, as countries have high motivation to protect endemic endangered species. Performing a search in the WTO EDB (filters "CITES" and "endangered") returns 118 results for 30 countries over 2009-2016 period containing primarily such measures as bans, import and export licenses, permits, certifications.

For the purpose of this methodology, Target 15.8 is considered as indirectly contributing to the achievement of Target 15.c.

Target 15.8 is concerned with control over transboundary movements of invasive species. Trade is recognized as one of the important factors that facilitates movement of species beyond naturally occurring bio-geographical barriers, which contributes to the occurrence and spread of invasive alien species. Invasive alien species are those which have been introduced and/or spread outside their natural ranges and as a result threaten biological diversity. Species that are classified as invasive and especially dangerous (Aichi Target 9 (CBD)) are country specific, constantly changing, and would have very limited coverage at the six-digit HS level. At the same time any organism can become invasive: plants, animals, fungi, bacteria, virus, other organisms (CBD) and even living modified organisms (Ansari & Jamal, 2011). Thus, although specific invasive species cannot be clearly identified at the six-digit HS level, for the purpose of this methodology all HS codes for living plants, animals and seeds for sowing could be examined in combination with NTM codes similar to those included under Target 15.7 and with relevant keywords.

It is important to note, that pests may also become invasive alien species and pose a threat to biodiversity. In this context, Target 15.8 is indirectly contributed to by NTMs that have direct linkage to Target 2.4 (see relevant section).

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 15.2	Timber, pulp, paper, furniture	44, 47, 48, 9403, 9406	B11; B14; B15; B31; B32; B33; B42; B81; B83; B84; B85; E11; E12; E321; E311; E312; E32; P11; P13; P14; P6; P9; C1; C3; B19; P19	Clear with keywords. Very few examples in TRAINS. However, literature suggests that the multitude of the existing voluntary initiatives has strong potential to transform into a new norm and become reflected in national legislation.

[16] Based on the data of the TRAINS database accessed in August 2018.

Target 15.7	HS codes regulated under CITES	Full list of six-digit HS codes compiled by WCO in 2017 is available (WCO, 2017a) (all codes have partial coverage except 440721 Tropical wood)	A11; A14; B11; B14; B15; B19; B31; B32; B33; B42; B81; B83; B84; B85; E1; E3; P11; P12; P13; P14; P4; P61; P62; H; C1; C3; P2; B19; P19	Clear with keywords. Partial coverage.
Target 15.8	All living species of flora and fauna, and seeds for sowing	See the SDG-HS-NTM Concordance Matrix for HS codes	A11; A14; A19; A64; A82; B11; B14; B15; B19; B31; B32; B33; B42; B81; B82; B83; B84; B85; E1; E3; P11; P12; P13; P14; P4; P61; P62; P69; H; C1; C3; P2; P19	Clear with keywords. Limited coverage. HS codes derived from Target 15.7 and the TRAINS database (goods to which measures related to "biosafety; biotechnology; transgenic; biotechnologic, living modified organisms" are applied)
Targets 15.1, 15.2, 15.3, 15.4, 15.5, 15.c	Any product produced using sustainable management of processes and production methods in various sectors, including processes and methods allowing for more sustainable management of land ecosystems and protection of biodiversity	See relevant section	See relevant section	Addressed in Target 12.6. See figure 12.

A2.15. SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Target 16.4 is concerned with reducing illicit financial and arms flows and combating all forms of organized crime. Illicit trade is an essential source of illicit financial flows and involves a wide range of sensitive or highly valuable products. Customs authorities (apart from law enforcement) are primarily responsible for controlling and preventing illicit international trade by conducting activities at the border, such as routine control, risk profiling, random checks, intelligence led investigation, etc. (WCO, 2017b). However, certain NTMs can aid this effort, namely export/import licensing, authorization, permits, registration of importers and products, marking and labelling, import/export prohibitions, prior notifications and prior informed consent for importation (sometimes for transit), traceability measures.

Certain such measures for the most sensitive products are stipulated in international conventions and protocols. For certain types of products relevant HS-NTM code pairs have already been covered in sections on other SDGs: medicines, narcotic drugs, tobacco products,

alcohol (SDG 3), waste and hazardous chemicals (SDG 12), cultural and natural heritage items (SDG 11), timber, endangered species of flora and fauna (SDG 14 and 15). Other sensitive or valuable products, which are covered in this section, include:

1. small arms and light weapons;
2. components suitable for assembling improvised explosive devices;
3. chemicals, biological, nuclear materials that can be used for production of chemical, biological and nuclear weapons;
4. weapons of mass destruction, their precursors, production inputs and delivery systems;
5. precious stones and metals, and other valuable minerals and gemstones;
6. IPR-infringed products,
7. Excise goods.

The first four are connected but listed separately due to availability of separate potential sources of HS codes with a different degree of detail and comprehensiveness.

For controlling illicit trade in arms and weapons, some certain measures are envisaged in *the Protocol Against the Illicit Manufacturing of and Trafficking in Firearms, Their Parts and Components and Ammunition, Supplementing the United Nations Convention Against Organized Crime of 2001* (United Nations, 2001) and in the *Programme of Action to Prevent, Combat and Eradicate the Illicit Trade in Small Arms and Light Weapons in All its Aspects of 2001* (United Nations, 2001). Relevant HS and NTM codes and associated keywords are reflected in the matrix below.

Another point of concern is trade in products suitable for producing improvised explosive devices (IEDs) and arms. There is no single authoritative list of relevant HS codes. For the purpose of this methodology such a list was derived from Item 5 of Appendix D of the *Controlled HS Codes Lists* published by Singapore Customs (Singapore Customs, 2018). Relevant HS and NTM codes and associated keywords are reflected in the matrix below.

A further sensitive group of goods includes chemical, biological, nuclear weapons, collectively viewed as weapons of mass destruction (WMD), their precursors, delivery systems, inputs for production (including, equipment, software, personal protective equipment and clothing, air crafts, etc.). The list of relevant products is extremely long and contains both those items that are extremely sensitive and trade in which has to be tightly controlled and regulated (nuclear, chemical and biological material, specialized equipment and reagents, etc.), as well as those items that are very commonly used for peaceful purposes and serve as very important inputs to production of crucial civilian goods and technologies (including those that are relevant to other SDGs, such as, for example, medicines, software, advanced technologies for SDG 3, 4, 6, 7, 9, 11, 12, 13, 14, 15). They have varying levels of sensitivity, which is not sufficiently reflected in the existing versions of the HS. For example, there were recommendations from the *Research Group for Biological Arms Control* in 2009 for such revision of the HS that would more comprehensively reflect those items that are relevant to production of biological weapons. Those revisions were not incorporated, but the proposal indicated some six-digit HS codes that are of concern from the point of view of biological arms proliferation through trade (Gunnar, 2009).

To date the only list of six-digit HS codes that has been agreed upon and published by the WCO is based on the Annexes of the *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction* (OPCW, 1997). However, for the purposes of this document, it is necessary to mention that many six-digit HS codes intersect with the product lines that are controlled by other conventions relevant to other SDGs (e.g. SDG 3 and SDG 12). See notes on them in the matrix below.

Another comprehensive and authoritative list of items, from which six-digit HS codes can be derived, is the one used by the EU (WCO, 2013). It covers a wide range of products relevant to production of chemical, biological, nuclear weapons as well as missile technologies, conventional arms and related dual use goods and technologies. The 2018 list of 10-digit codes of the EU's Combined Nomenclature is published in the *Correlation List between TARIC and Dual-Use Annex of the Regulation 428/2009* (European Commission, 2018). However, it does not seem to contain the most obvious sensitive code for biological arms proliferation (382100) while covering an extremely wide list of products (Bromley & Maletta, 2018) that have varying levels of sensitivity and relevance to other crucial peaceful uses.

Taking into account what is stated above, the matrix contains two alternative lists: (1) basic list containing HS codes for chemicals, biological, nuclear materials that can be used for production of chemical, biological and nuclear weapons, compiled based on a variety of sources (Gunnar, 2009; WCO, 2017a; European Commission, 2018; Foreign Trade Online), and (2) broad list of dual use goods compiled based on the 2018 *Correlation List between TARIC and Dual-Use Annex of the Regulation 428/2009* (European Commission, 2018).

It is well recognized that international trade in precious stones and metals, and a number of other valuable minerals, gemstones and natural resources (timber, mineral oil), may generate illicit financial flows, which in turn may fuel all forms of human rights abuses and violence, and finance armed conflict (Columbia Center on Sustainable Investment (CCSI)/UNDP/UNSDSN, 2016). In an attempt to curb this problem, and to strengthen international framework for the enforcement of legal accountability of companies for their sourcing of production inputs abroad (foreign accountability)[17], various guidelines and voluntary certification schemes have emerged, some of them resulting in the adoption of mandatory national legislation.

Well recorded in TRAINS database are regulations based on the standards and procedures of the Kimberley Process Certification Scheme (KPCS). KPCS is operational since 2003 and aims to control international trade in rough diamonds through implementation of a certification scheme between participating countries and restriction of imports from non-participating countries (Kimberley Process, 2003). The scheme attempts to make the entire supply chain more transparent and secure by tracking diamonds from the source and throughout the supply chain (traceability measures); requiring registration and licensing of producers/exporters/importers, certification of diamonds, implementation of due diligence and reporting by companies, and reducing the number of intermediaries. Additionally, it requires that rough diamonds are transported in sealed and tamper resistant containers accompanied by

[17] Foreign accountability involves legal accountability of companies for their actions abroad. This norm is "expressed by the fact or condition of companies being legally required to disclosure information that allows holding them accountable for socially and/or environmentally harmful practices regarding natural extraction in their supply chain abroad."

certificates. To comply with the KP certification scheme, which started as a voluntary initiative, a number of countries enacted relevant mandatory legislation, such as, for example, the EU's Council Regulation (EC) No 2368/2002, or the Clean Diamond Trade Act of the USA. Such regulations by other countries are also recorded in the TRAINS database. Additionally, some countries implement voluntary initiatives based on the Kimberley Process (Partzsch & Vlaskamp, 2016).

Another sensitive group of minerals, responsible sourcing of which is high on the international agenda, are tin, tungsten, tantalum and gold (3TG). In 2012 the USA adopted rules to implement Section 1502 of the Dodd-Frank Act detailing measures to ensure responsible sourcing of these 4 metals from the Democratic Republic of Congo and the neighboring countries (The US Securities and Exchange Commission, 2012). To facilitate transparency of trade in 3TG, and potentially in any other conflict mineral, the OECD and eleven countries of the International Conference on the Great Lakes Region (ICGLR)[18], together with other stakeholders, developed recommendations on due diligence guidance for responsible mineral supply chains (adopted at the Ministerial level in 2011; third edition titled "*Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas"* was published in 2016 (OECD, 2016)). Following the framework laid out by the Due Diligence Guidance, a number of economies have since been adopting relevant domestic legislation. For example, *Regional Certification Mechanism* with the purpose of curbing illegal exploitation of mineral resources in the Great Lakes Region in Africa was established in compliance with the procedures and standards outlined in the OECD's Due Diligence Guidance (International Conference on the Great Lakes Region). Following these standards, the EU will from 1 January 2021 enact *Regulation (EU) 2017/821 of the European Parliament and of the Council of 17 May 2017 laying down supply chain due diligence obligations for Union importers of tin, tantalum and tungsten, their ores, and gold originating from conflict-affected and high-risk areas* (European Union, 2017). Such legislation and certification schemes include a number of measures that affect international trade in these goods: inspection, certification and auditing of mine sites/smelters/refineries, mineral chain of custody tracking and mineral tracking databases (traceability), registration of exporters and importers, mineral export certification and permits, pre-shipment inspection, etc.

Despite a few examples of adoption of relevant regulations at the national and regional levels that can be found in literature, there are no such records in the TRAINS database. Accountability for conflict-free sourcing of 3TG minerals lies mainly with various voluntary schemes lead by NGOs, governments and industries, some of which seek to internalize environmental concerns as well (Partzsch & Vlaskamp, 2016; EPRS, 2014).[19] This is also true for other minerals, trade in which have been or have the potential to be similarly sensitive: ruby, sapphire, jadeite, lapis lazuli, some other colored gemstones (emerald, tanzanite, corundum, etc.), platinum metals, cobalt, zinc, copper, bauxite and alumina, lithium, mica, iron ore, sulphur, nickel, molybdenum, silver, rare earths, etc (Responsible Minerals Initiative, n.d.; SOMO, 2015; IISD, 2018; Archuleta, 2016; Elliot, 2018; Pye, 2016). However, despite prevalence of voluntary

[18] Angola, Burundi, Central African Republic, Republic of Congo, Democratic Republic of Congo, Kenya, Rwanda, Sudan, Tanzania, Uganda and Zambia

[19] Some examples include: Certified Trading Chains Initiative (CTC), Conflict-Free Tin Initiative (CFTI), – Tin Supply Chain Initiative (iTSCi), Solutions for Hope (SfH), Conflict Free Smelter Programme (CFS), World Gold Council (WGC), Responsible Jewelry Council (RJC), London Bullion Mark Association (LBMA), and many others.

certification schemes in this area, there is a strong potential that the multitude of voluntary initiatives will eventually lead to the establishment of a new norm in international trade transaction and, consequently, to a widespread adoption of relevant national legislation with mandatory requirements (Partzsch & Vlaskamp, 2016). Thus, eventually related NTMs are likely to become better recorded in NTM databases and, therefore, they should be monitored.

A further natural resource that is relevant as a source of financing for armed conflict is timber, which sometimes is even more lucrative than 3TG. However, the emergence of foreign accountability norm for timber sector has been driven mainly by social and environmental harm connected with illegal logging. Hence, this element is already addressed in the section of SDG 15, while its impact on SDG 16 can be considered indirect.

Measures to ensure ethical sourcing of minerals, diamonds and other resources can indirectly contribute to SDG 8, 5 and Targets 12.6 and 12.7.

One of primary functions of IPR-related measures is to protect the right of the IPR-holders to benefit from the result of their creative work or from the investment into such work, including by having economic/material gains associated with the exclusive use of their creation over a certain period of time (WIPO, 2004). IPR-related NTMs that would fall under the MAST classification code of "N" are not yet reflected in the TRAINS database. However, 2019 version of the MAST classification offers a more detailed typology of NTMs under Chapter N associated with the plans to collect more detailed data on such measures in the future. TRAINS database does reflect a few measures classified under code E315: *Prohibition of products infringing patents or other intellectual property rights*. IPR-related measures may be relevant to a wide range of products, while at the same time they are not necessarily clearly associated with the specific internationally traded goods, as they may be incorporated into or themselves be an input to such goods. Indeed, examples of measures recorded in the TRAINS database under code E315 feature a wide variety of goods. At the same time, as far as the prevention of illicit trade in IPR-infringed goods go, the primary role still belongs to the customs authorities conducting activities at the border and behind the border (WCO, 2017b).

For excise goods, the primary role in ensuring compliance with the national excise regulation belongs to the customs authorities conducting activities at the border and behind the border (WCO, 2017b).

Target 16.1 on reduction of all forms of violence everywhere are indirectly linked to HS-NTM code pairs under Target 16.4 above and Target 3.5 of reduction of narcotic drug and alcohol abuse, and some others. Target 16.2, which is aimed at ending abuse, exploitation, trafficking and all forms of violence against and torture of children, can be to some extent contributed to by regulations requiring companies and public institutions adopting sustainable and socially responsible practices (covered by Targets 12.6, 12.7 and 16.4).

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 16.4	Arms and ammunition; parts and accessories thereof	All HS six-digit codes under Chapter 93	B31; B32; B33; B11; B14; B15; B85; P11; P13; P14; B42; E1;	Clear. NTM codes confirmed from the text of the Protocol (United Nations, 2001), TRAINS database.

			E3; H1; H11; C1; C3; P2; B19; P19	
Target 16.4	Products suitable for assembly of improvised explosive devices (IEDs) or for military use	HS codes from Item 5 of Appendix D of the Controlled HS Codes Lists published by Singapore Customs (Singapore Customs, 2018) other than Chapters 93, 95, 96	B11; B14; B31; B32; B33; B42; B81; B82; B83; B85; E111; E112; H11; H1; P11; P13; P14; C1; C3; P2; B19; P19	Some are ambiguous or clear with keywords
Target 16.4	Products suitable for assembly of improvised explosive devices (IEDs) and guns, from chapters 95 and 96	Relevant HS codes from Item 5 of Appendix D of the Controlled HS Codes Lists published by Singapore Customs (Singapore Customs, 2018)	B11; E311; E32	Only clear with keywords. Very limited coverage.
Target 16.4	(Basic) Chemicals, biological, nuclear materials that can be used for production of chemical, biological and nuclear weapons	HS list based on a number of sources (Gunnar, 2009; WCO, 2017a; European Commission, 2018; Foreign Trade Online)	B11; B14; B31; B32; B33; B42; B81; B82; B83; B85; E1; E3; H11; H1; P11; P13; P14; C1; C3; P2; B19; P19	Only clear with keywords; export control measures seem prevalent. NTM codes are confirmed in the TRAINS database for some codes that have partial coverage; those with full coverage seem not present. None of the HS codes from the WCO list of sensitive chemicals seemed to be present in the WITS DB data for the EU, Thailand and Singapore. Almost all partial coverage codes intersect with the HS codes for international non-proprietary names (INNs) and some with narcotic drugs. Many of them are dual use (as reflected by partial coverage), therefore, NTM codes for bans are not necessarily the most efficient method, as these codes may be important for other industries, including pharmaceutical. At the same time, B11 code is often used in place of B7 and B8 Also relevant to Target 3.9
Target 16.4	(Broad) Chemical weapons, biological, nuclear weapons, collectively viewed as weapons of mass destruction (WMD), their precursors, delivery systems, inputs for production (including, equipment, software, personal protective equipment and clothing, air crafts, etc.), conventional arms and related dual use goods and technologies	six-digit HS codes based derived from list of items based on CN of the EU (European Commission, 2018)	B11; B14; B31; B32; B33; B42; B81; B82; B83; B85; E1; E3; H11; H1; P11; P13; P14; C1; C3; P2; B19; P19	Only clear with keywords; export control measures seem prevalent. Extremely low coverage by NTMs with relevant objectives is likely, as the potential list of items is very long, comprehensive and contains a lot of general use products. Contradiction of measures SGDs for which access to certain products and technologies is essential (negative). Such measures may often be especially problematic for those developing economies and LDCs, that are not parties to relevant non-proliferation conventions and that may have regulatory or capacity gaps to control end-use of such dual use items (State of Palestine, 2018; Saner, 2015)
Target 16.4	Rough diamonds	six-digit HS codes under 7102	B11; B14; B15; B31; B32; B33; B81; B83; B85; E11; E12; E321;	Clear with keywords. Very few examples in TRAINS: less than is adopted by the countries, according to the reviewed literature. Potential is high, that more relevant NTMs may be registered with time.

			E311; E312; E32; P11; P13; P14; P6; P9; C1; C3; B19; P19;	
Target 16.4	Tungsten, tantalum, tin, gold, other valuable gemstones and metals	six-digit HS codes under 2603-2616, 284330, 71 (except, 7102, addressed above), 81, 26 (except 2612)	B11; B14; B15; B31; B32; B33; B81; B83; B85; E11; E12; E321; E311; E312; E32; P11; P13; P14; P6; P9; C1; C3; B19; P19;	Potentially clear with keywords. Although literature contains examples of relevant national regulations, search in TRAINS database does not return such records neither for 3TG (for which some international regulatory framework already exists), nor for other valuable minerals. Potential is high, that more relevant NTMs may be registered with time. Keywords are based on literature and NTMs registered for rough diamonds and timber; may need to be adjusted.
Target 16.4	Timber, pulp, paper, furniture	See relevant section	See relevant section	Directly impacted by NTMs under Target 15.2
Target 16.4	IPR-infringed goods	All HS	E315; N	Prohibition of products infringing patents or other intellectual property rights; measures related to intellectual property rights in trade. There are a few E315 measures in TRAINS database. There are no data on N measures in TRAINS: potentially, more regulations will be registered in the TRAINS database once data is collected following 2019 classification of NTMs.
Target 16.4	Narcotic drugs regulated under international conventions on preventing illicit traffic in narcotics drugs and psychotropic substances	See relevant section	See relevant section	Addressed in Target 3.5.
Target 16.4	Food grade alcohol	See relevant section	See relevant section	Addressed in Target 3.5.
Target 16.4	Tobacco, tobacco products	See relevant section	See relevant section	Addressed in Target 3.a
Target 16.4	Medicines	See relevant section	See relevant section	Addressed in SDG 3
Target 16.4	Hazardous chemicals and waste	See relevant section	See relevant section	Addressed in Target 12.4
Target 16.4	Goods regulated under CITES	See relevant section	See relevant section	Addressed in Target 15.7
Target 16.4	Works of art; collectors' pieces and antiques	See relevant section	See relevant section	Addressed in Target 11.4
Target 16.1	Product groups addressed in 16.4	See relevant section	See relevant section	Indirectly impacted by NTMs under Target 16.4
Target 16.2	Any product produced using socially responsible management practices, including not involving abuse, exploitation, trafficking and all forms of violence against and torture of children	See relevant section	See relevant section	Addressed in Target 12.6 responsible practices of companies and Target 12.7 on sustainable public procurement

A2.17. SDG 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

In achieving the targets of SDG 17 the most important role belongs to international cooperation and domestic policies. However, Targets 17.10, 17.11, 17.12 have strong trade policy component, which, however, does not generate clear SDG-HS-NTM concordance strings.

Target 17.10, which concerns with establishment of a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the World Trade Organization, has the "Worldwide weighted tariff-average" as the indicator. This suggests that the primary role is to be played by tariffs. NTMs could potentially play a role, as NTM should be applied so as not to serve as a tool for discrimination or constitute a barrier to trade. Reference can be made to all product groups and all NTM codes. However, whether an NTM is discriminatory cannot be judged based on its presence/absence.

Target 17.11 aims to increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020. Here tariffs and non-discriminatory NTMs of Target 17.11 can play a role, application of preferential rules of origin for LDC exports (Target 17.12), as well as removal of export subsidies for agriculture products applied by some developed and developing countries (Target 2.b), measures to improve access of SMEs from developing countries to export markets (through Targets 12.6 and 12.7).

Target 17.12 intends to realize timely implementation of duty-free and quota-free market access for all least developed countries, including by ensuring that preferential rules of origin applicable to imports from LDCs are transparent and simple, and contribute to facilitating market access. The indicator of this target suggests that the primary role is to be played by tariffs applied by developed countries to the products originating from developing countries and LDCs.

Target 17.14 invokes enhancement of policy coherence for sustainable development, which can be contributed to by improving transparency and coherence of NTMs across countries and regions where feasible, as well as transparency and coherence of NTM implementation procedures, including through harmonization of national NTMs with authoritative international standards, conclusion of MRAs and RTAs. Whether NTMs are coherent and their implementation is transparent, cannot be judged based on their presence/absence.

Target	Product description	HS code	NTM Code	Ambiguous/Clear and Notes
Target 17.10	All HS	All HS	NA	Ambiguous. Whether an NTM is discriminatory cannot be judged based on its presence/absence.
Target 17.11	All HS	All HS	NA	Ambiguous. Can be contributed to by Targets 17.11, 17.12, 2.b, 12.6 and 12.7.
Target 17.12	All HS	All HS	E2; O	Ambiguous.
Target 17.14	All HS	All HS	NA	Ambiguous. Whether NTMs are coherent and their implementation is transparent, cannot be judged based on their presence/absence.

A2.18. Access to technologies

Error! Reference source not found. below is an illustrative and not exhaustive list of SDG-relevant technology groups, improved access to which can facilitate achievement of SDGs. These technologies are referenced in the sections on the corresponding SDGs above.

A review of the literature that attempts to identify what NTMs constitute the most significant barriers to or enablers of trade in environmental goods and transfer of technologies relevant to sustainable development suggests that the most frequently cited trade barriers are tariffs and non-tariff barriers, such as testing and certification requirements, regulations on terms of payment, intellectual property rights protection measures, foreign exchange restrictions, technical regulations and standards, in some cases – local content requirements (OECD, 2007; WTO, ITC & UNCTAD, 2019; ICTSD, 2007). However, with regard to NTMs, the literature mostly describes issues related to the implementation of NTMs (procedural obstacles) or barriers arising from discrepancies between technical standards and testing procedures of different countries. These are the elements that are not reflected in NTM databases, which only register the presence or absence of an NTM. Other issues are caused by lack of differentiation between “like” products within the HS (especially at six-digit level, but even within more detailed national tariff lines), by lack of an agreement about appropriateness of differentiation of products based on their non-product-related characteristics, by standards shifting due to technological advancement, and by differences in technological ambition of different countries, as reflected in technical regulations applied by the countries (OECD, 2005b).

For cases where there are discrepancies in technical NTMs, as well as in their compliance and testing procedures, judgement on whether an NTM is excessive and constitutes a barrier to access to regulated goods cannot be made solely based on the presence/absence of an NTM. Implementation of analysis based on distance in regulatory stringency can be useful for some of the more standardized products (such as essential food products and medicines, typical home appliances, civilian motor vehicles, etc.), whereby NTMs existing in a country are compared to the relevant international or other authoritative standards (Cadot, Asprilla, Courdon, Knebel, & Peters, 2015). However, in this case it might be necessary to take into account local contexts, which may provide legitimate basis for such discrepancies, and to examine whether mutual recognition regimes have been established to overcome such legitimate discrepancies. Some of such cases are described in relevant sections of the methodology.

Other NTM-related barriers to access to the goods and technologies that are relevant to the achievement of SDGs are IPR regulations and trade controls aimed at regulating and restricting transboundary movement of dual use technologies.

IPR measures may prohibitively raise the cost of essential technologies and products, which may make them unaffordable for certain countries. IPR-related NTMs are not yet consistently collected by UNCTAD and are not reflected in the TRAINS database. At the same time, their impact as a barrier cannot to inferred solely from the fact of presence or absence of an IPR-related measure in a database. IPRs are also essential for SDG 9 and SDG 16, as they can encourage innovation, contribute to economic development, help combat illicit trade and reduce cash flows generated by it. The only attempt to partially resolve the issue of IPR-related barriers to access, for which international legal framework has been to some extent established, was

undertaken by including flexibility provisions to the WTO's TRIPS Agreement, which aim to facilitate access to essential medicines in cases of public health emergency or persisting healthcare challenges (see section on SDG 3).

Another barrier to access to essential production inputs, goods and technologies relevant to the achievement of various SDGs is that some them may fall under export/import regulations intended for restricting, controlling and regulating transboundary movement of dual use (or strategic) goods[20] (partially addressed in these sources (Saner, 2015; Deloitte, 2010; Bromley & Maletta, 2018; Bauer, Brockmann, Bromley, & Maletta, 2017)). Regulation of trade in dual use products is essential to the achievement of SDG 16 (Target 16.4). Relevant goods and technologies may themselves be dual-use or contain dual-use components. This leads to difficulties in identifying whether the goods or technologies fall under dual-use export controls. New technologies may have dual-use potential that has not been formally established yet, forcing exporters choose to err on the side of caution by applying for export licenses, which may be a cumbersome, time-consuming and cost-intensive process, or by choosing not to export/import a product (Bauer, Brockmann, Bromley, & Maletta, 2017). In summary, strict export controls for dual-use products, lack of clarity on whether certain goods fall under the category of dual-use products and whether export controls apply to them, discrepancies in dual-use regulations in different countries - all constitute potential barriers to access to certain goods and technologies that may be essential to the achievement of SDGs. Affected countries are those that trade in such products, participate in supply chains for such products, or even just provide routes for transit. Whether such measures provide adequate control over the movement of dual use goods or whether they constitute barriers to access to some essential inputs, cannot be judged based on the presence/absence of NTMs.

One more potential barrier is the strict regulation of transboundary movement of products that are hazardous or potentially harmful, but at the same time may be essential for the achievement of some of the SDGs. Examples of such products are narcotic drugs and hazardous chemicals that may have important applications in healthcare and pharmaceutical industry; some fertilizers or pesticides that are necessary inputs to agricultural production; some chemicals that may have hazardous characteristics but are essential as production inputs for certain industries, etc. Trade in such goods is regulated through licensing, the issuance of permits for export and import, traceability measures, measures restricting channels for importation and distribution, measures restricting purpose of importation, prohibitions, etc. Whether such measures provide adequate protection from illicit trade and illegitimate uses of such goods, or whether they constitute barriers to access to some essential inputs, cannot be judged based on the presence/absence of NTMs.

To summarize the points made above: although NTMs may constitute a significant barrier to access to technologies and goods that are crucial for addressing issues relevant for the achievement of the SDGs, the presence/absence of an NTM is not a sufficient criterion to judge whether an NTM is a barrier. Additionally, given the nature of many NTMs as public policies with primary objective to address important public policy priorities, any negative impact, including the

[20] Dual-use items are goods, software and technology that can be used for both civilian and military. Strategic goods are weapons of mass destruction (WMD), conventional weapons, and related items involved in the development, production, or use of such weapons and their delivery systems (WCO, 2017b).

impact of the NTMs as barriers, reflects the unintended negative externalities, which may extend to the adopting and affected countries and may have negative implications for the achievement of the targets under the examined SDG target or other SDGs. Since the TRAINS database registers only the presence or absence of NTMs, it can only reflect the intended impact of NTMs as stipulated in their objectives or purposes stated in the descriptive fields of the database. Thus, although the described above trade-policy-related barriers to access to technologies are important to consider, no viable SDG Target-HS code-NTM code-keyword concordance strings could be generated for the use in the concordance matrix.

Table 15. Technology groups relevant to SDGs

TECHNOLOGY GROUP	DESCTIPTION AND/OR LINK TO SDG
Pollution management	Product and technology groups included in the illustrative "environmental goods"[21] list developed by OECD (OECD, 2005a; OECD, 2005b). Includes technologies relevant to environment-related SDGs. Some of them are also able to contribute to the non-environment-related SDGs: SDG 6, SDG 7, SDG 9, SDG 11, SDG 12, SDG 12, SDG 14, SDG 15.
Air pollution control	
Wastewater management	
Solid waste management	
Remediation and cleanup	
Noise and vibration abatement	
Environmental monitoring, analysis and assessment	
Resources management	
Indoor air pollution control	
Water supply	
Recycled materials	
Renewable energy generation technologies	
Heat/energy savings and management	
Sustainable agriculture and fisheries	
Sustainable forestry	
Natural risk management (satellite technologies)	
CO2 capture and storage	SDG 13, SDG 14, SDG 15
Assistive technologies (urban mobility and accessibility technologies, etc.)	SDG 1, SDG 11
Medical and health care technologies and equipment	SDG 3, SDG 1
Goods related to sports and fitness	SDG 3
Urban technologies to increase resilience of cities to natural disasters	SDG 11, SDG 1
ICT (including household-appropriate technologies) relevant to increasing access of people to information, public and banking services, education, remote employment, participation in public decision making, etc.	SDG 1, SDG 4. SDG 5, SDG 8, SDG 10
Technologies to increase productivity of agricultural industry and resilience of food production to natural disasters (including biotechnologies)	SDG 2, SDG 1, SDG 9, SDG 13, SDG 12

[21] According the WTO, environment-related products are the "products that can help achieve environmental and climate protection goals, such as generating clean and renewable energy, improving energy and resource efficiency, controlling air pollution, managing waste, treating waste water, monitoring the quality of the environment, and combatting noise pollution" (WTO, 2018). The Eurostat also states that "The purpose of environmental goods and services is to prevent, reduce and eliminate pollution and any other form of environmental degradation (environmental protection - EP) and to conserve and maintain the stock of natural resources, hence safeguarding against depletion (resource management - RM)" (European Commission, 2018). These are very wide definitions that include products and technologies relevant to all environment-related SDGs. To date there are three potential sources of classifications or lists of goods that are considered "environmental" or "environment-related": OECD, APEC and WTO (not finalized negotiations). For APEC and OECD list of environmental goods HS codes have been identified and listed here (OECD, 2005a). Description of the WTO's "Friends of EGs" list is available here **Invalid source specified.**.

A2.19. Regulation of non-product-related processes and production methods

In the sections above there are a number of examples, where regulations are applied not to the traded products but to the processes associated with their production and where such processes do not impact the physical characteristics of the final goods. These are referred to as "unincorporated" or "non-product-related processes and production methods" (non-product-related PPMs) (WTO, n.d.a). Examples of such non-product-related PPM measures that appear in the sections above include:

- Regulations on preventing IUU fishing, where it concerns with sustainable fishing practices that allow to reduce amount of discarded bycatch, to avoid harm to threated species of marine animals and to the marine environment;
- Regulation of timber products, where it concerns with sustainable forestry practices that allow reducing negative impact on terrestrial ecosystems;
- Regulations on preventing conflict minerals entering global supply chains, where it concerns with ensuring that none of the stages of the supply chains are associated with human rights abuse, exploitation, crime, violence, and armed conflict;
- Regulations that aim to reduce environmental impact of any product throughout its complete supply chain at the stages of production inputs' sourcing (raw and intermediate), production, packaging, storage, transportation, distribution, marketing, and even after-sale and at the end of a product's lifecycle;
- Regulations that aim to ensure that the companies are socially responsible in their operations, which do not involve any kind of forced labor, child labor, violation of human and labor rights, abuse of work force, including of women and vulnerable groups, while providing equal employment opportunities and equal pay for work of equal value.

As can be seen from the examples, these measures do not leave any trace in the final product, i.e. they do not impact their appearance, composition, physical and performance characteristics. It is not possible to easily differentiate between a conflict and a conflict-free mineral, or between illegally and legally caught fish, or between timber harvested sustainably with minimal impact on the environment and timber, harvesting of which contributed to deforestation. Within the 2012 version of the MAST classification of NTMs such measures can be classified primarily under the codes of Chapter B (technical regulations). Some of relevant measures can also be classified under the relevant codes of Chapter C (pre-shipment inspection and requirement to pass through specified port of customs), Chapter E (licensing and prohibition) (UNCTAD, 2019), F (price control measures, including taxes and charges) (Vranes, 2009), L (subsidies) and under the codes of Chapter P for export measures. It is worth noting that the 2019 version of the MAST classification of NTMs stipulates separate codes for licensing and prohibitions for the purposes of protection of the environment, public health and for security reasons (UNCTAD, 2019).

Regulation of non-product-related PPMs is sensitive and is associated with a number of issues that make them considered as contradicting the basic principles and disciplines of the functioning of the multilateral trading system and some principles of the international law.

One challenge is how to set the products produced through ethical or sustainable methods and processes apart from other "like products", so as to avoid illegitimate discrimination of internationally traded goods (WTO, n.d.a; Sifonios, 2018). This issue is exacerbated by the fact

that the HS does not differentiate between products based on their production methods. Moreover, ethical, social or sustainability requirements for production processes and methods may potentially be set for any product group. At the same time, the variety of issues that can be addressed through such requirements is very broad, while different issues may have different levels of priority in the contexts of different countries. These issues also evolve or become better understood, which also impacts their priority globally or locally over time. Few of such issues have well established internationally accepted authoritative standards or guidelines that can be universally applied or used as benchmarks when developing national legislation. Thus, there is likely no easily standardized manner in which differentiation of goods based on non-product-related PPMs can be introduced to the HS.

Additionally, the attempt to regulate production processes and methods in other countries can also be viewed as a violation of the exporting country's right to regulate activities occurring within its jurisdiction (territoriality principle), as an interference with internal affairs (non-intervention principle), as a violation of the principle of permanent sovereignty over natural resources, as an act that is in conflict with comparative advantages (foundational principle for trade liberalization) and that may lead to unrestrained proliferation of barriers to trade (Sifonios, 2018). Given prevalence of developed countries among those setting strict sustainability standards for products sold in their territory, such measures can be considered as discriminating against developing and least developed states, that may have different developmental priorities and limited institutional and financial resources to ensure compliance with such requirements.

However, the understanding of the role of the multilateral trading system in addressing the international development agenda has also been evolving. Environment-related provisions are already included or are gradually being introduced into the various agreements under the WTO, and over-time they gain weight in interpretation of the WTO law during the trade dispute resolution process (Sifonios, 2018; Maggio, 2017; Koul, 2018; Droege, van Asselt, Das, & Mehling, 2016). Urgency of environmental and social issues is increasing, which is facilitated by better understanding of their underlying causes and the far-reaching consequences, as well as by the ever-increasing awareness of the general public and their demand for consumer products that are produced in an environmentally conscious and socially acceptable process.

Some of non-product-related PPM measures, due to their high sensitivity, overall face less resistance. These are the measures that are concerned with the clear violation of basic human rights (especially involving violence, crime and armed conflict), violation of law, protection of endangered species and threatened highly sensitive ecosystems. Examples include measures regulating trade in conflict minerals, especially rough diamonds, tin, tungsten, tantalum and gold (SDG 16), illegal, unregulated and unreported fishing (SDG 14), illegal and unsustainable harvesting of timber (SDG 15). Although these measures started out as voluntary industry, NGO or government-led initiatives, gradually, the magnitude of such measures started to transform into a new norm of international transaction and to be adopted as regulations by a number of countries (Partzsch & Vlaskamp, 2016). Thus, we see some examples of such measures recorded in the TRAINS database, and their number is likely to increase, as more countries adopt new related regulations (European Union, 2017).

Those non-product-related PPM measures that concern with the sustainable use of resources and reducing impact of production processes on the environment face more resistance (SDG 12 directly, and indirectly a number of other SDGs). Apart from challenges in their application that are already stated above, they overall may be seen as less urgent, as some of the negative impacts are likely manifest themselves in the future (depletion of natural resources, climate change, loss of biodiversity and degradation of ecosystems, etc.). The TRAINS database currently has only a handful of the related measures, while a larger set of relevant examples can be found in the WTO EDB.

Social or ethical non-product-related PPM measures that are not aimed at curbing violence, crime and conflict are even more controversial, as there are many potential regulatory dimensions, urgency of which may depend on may factors (Koul, 2018). Possible issues to address through the use of such measures could include forced labor, child labor, violation of human rights and labor rights, abuse of work force, including women and vulnerable groups, and on provision of equal employment opportunities and equal pay for work of equal value. At the same time, consequences of social issues do not have the physical and material manifestation, which is as immediate or as quantifiable as the consequences of environmental issues. Search within the TRAINS database did not produce any examples of such measures applied by the countries. One well-known example is the United States Child Labor Deterrence Act of 1999, which prohibited importation into the United States of goods made using child labor. Its discussed introduction in 1993 resulted in substantial decreases in the number of children employed in Bangladesh (UNICEF, 1997).

However, issues of both environmental and social impact of companies' operations are addressed by a large variety of voluntary sustainability standards. One important actor in this respect is the International Standards Organization that has developed or is currently developing standards that aim to address a wide range of sustainability issues, some of which may be applied to the internationally traded goods by traders and governments. Most notable examples of such standards include: ISO 14000 family of standards for environmental management systems, ISO 50001 standard for energy management systems, ISO 20400 standards for sustainable procurement, ISO 26000 standards for social responsibility, ISO 38200 standard for chain of custody of wood and wood-based products, ISO 34101 series of standards on sustainable and traceable cocoa beans, ISO 24526 standard on water efficiency management systems, ISO 20245 on cross-border trade of second-hand goods, etc. Additionally, Standards Map of the International Trade Center (ITC) currently contains information on 210 relevant voluntary standards, reporting initiatives and certification schemes (International Trade Center, n.d.), while Ecolabel Index tracks 463 voluntary standards worldwide (Big Room Inc, 2019).[22]

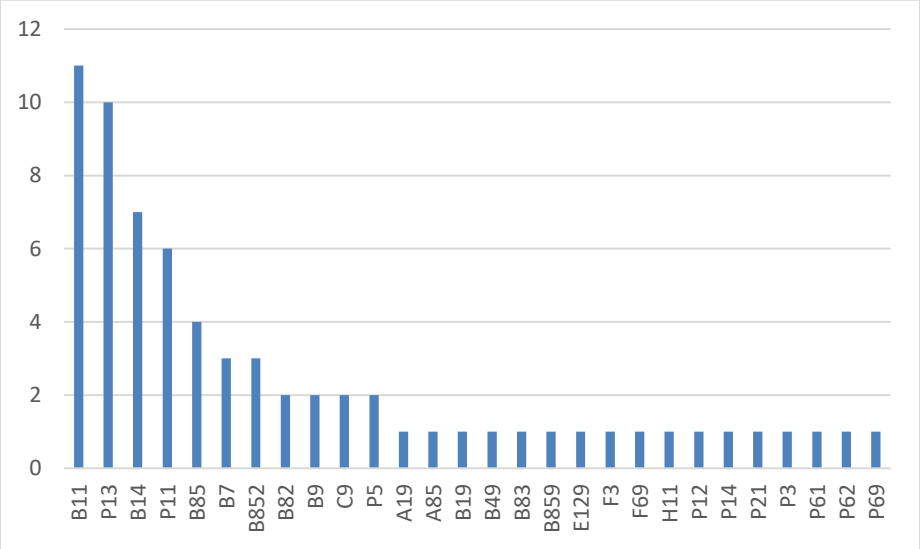
Such requirements increasingly can be found in direct transactions between parties, more specifically in international sales contracts or in codes of conduct aimed at the suppliers of production inputs (e.g. requirement to comply with the ISO standards for environmental and energy management, sustainable procurement, etc.) (Schenzer & Kee, 2011; Schwenzer & Leisinger, 2007; BMW Group, n.d.), and even national regulations established by some countries (Aidenvironment, WWF & ISEAL, 2018; D'Hollander & Tregurtha, 2016). As such, potentially, with

[22] As of 1 May 2019.

time these also may transform into a new norm and bring about wide-spread adoption of national legislation aimed at regulating environmental and social sustainability of production processes and methods of the imported goods (Partzsch & Vlaskamp, 2016).

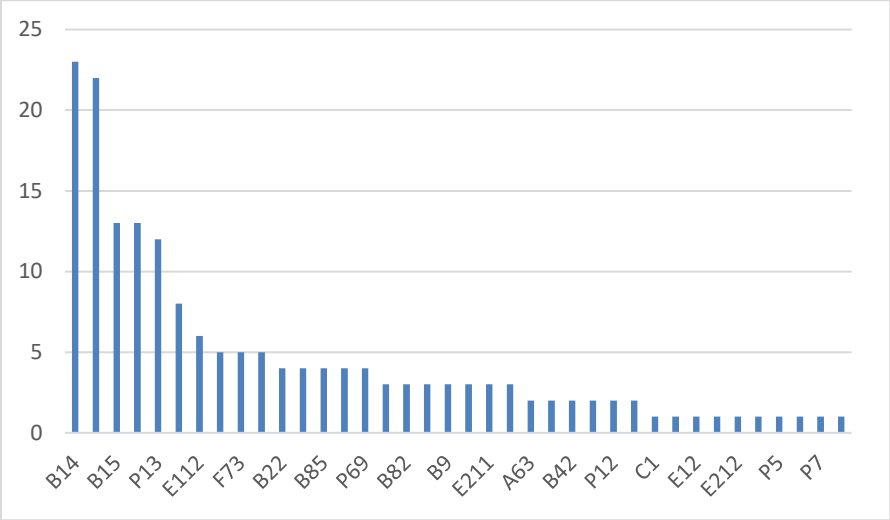
In conclusion, NTMs are likely to play a significant role in regulating non-product-related PPMs associated with the internationally traded products, even though currently only the most sensitive ones are to some extent reflected in the TRAINS database. With time, the number of relevant NTMs recorded in NTM databases is likely to increase, as the regulated issues are likely to gain more urgency or visibility. The foundation for such process is laid down by the vast variety of industry, NGO and government-led voluntary certification initiatives and authoritative international standards. Therefore, the relevant SDG Target-HS code-NTM code-keyword concordance strings are included in the concordance matrix. Some of them are more specific and clearer, such as the concordance strings under Targets 16.4, 14.4, and 15.2. Concordance string under Target 12.6 is included but does not yield many results (mostly for the ecodesign measures adopted by the European Union). Although the keyword list suggested in the concordance matrix can hardly be exhaustive at this stage and does not include any keywords related to social issues, it still maybe useful to monitor NTM databases for appearance of environmental and social non-product-related PPM measures relevant to Target 12.6 and to update the keywords list as necessary.

Figure 14 - NTMs related to implementation of Basel, Rotterdam and Stockholm Conventions, TRAINS database



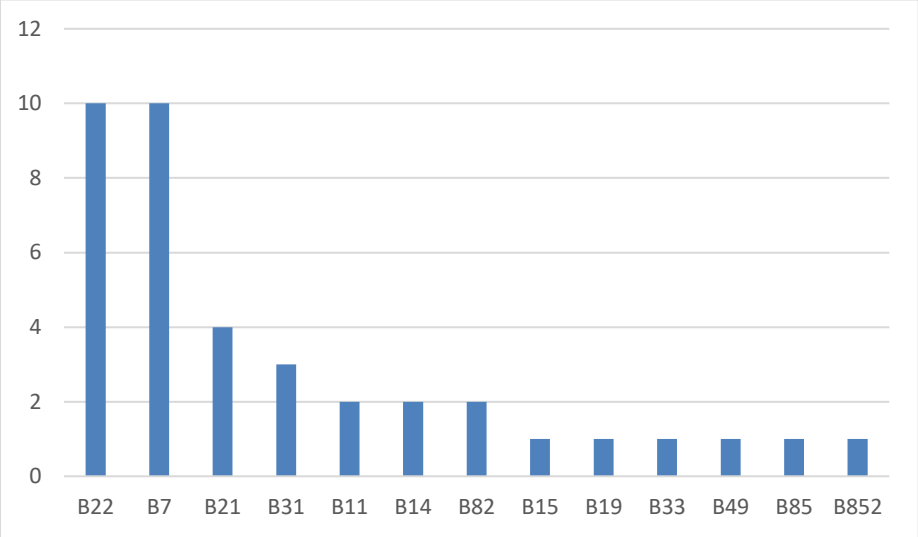
Source: Authors' calculations based on data from WTO EDB, accessed March 2019.

Figure 15 - NTMs related to ozone layer protection and Montreal Protocol implementation, TRAINS database



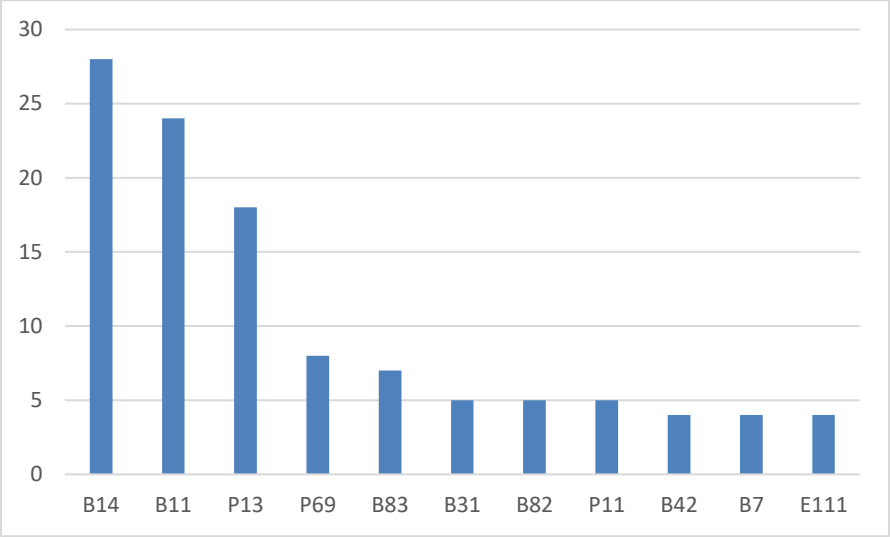
Source: Authors' calculations based on data from WTO EDB, accessed March 2019.

Figure 16 - NTMs related to regulation of mercury, mercury compounds and mercury-added products and Minamata convention implementation, TRAINS database



Source: Authors' calculations based on data from WTO EDB, accessed March 2019.

Figure 17 - NTMs related to regulation of transboundary movement of hazardous e-waste, TRAINS database (filter "contains 854810 and 854890")



Source: Authors' calculations based on data from WTO EDB, accessed March 2019.