

WHITE PAPER

ON

EMISSION CONTROL NORMS

FOR

AGRICULTURAL

TRACTORS & EQUIPMENT

IN INDIA

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1. Executive Summary

1.1. Conclusion

We conclude by submitting the following:

- Agricultural tractors need a special status, and special attention while developing an emission-control roadmap.
- Introduction of Bharat (TREM) IV in April 2022.
- Introduction of Bharat (TREM) V to be scheduled for April 2026, after reviewing in 2020 the EU Stage-V cut in Europe scheduled to be introduced in 2019.
- There is also a need to formulate AIS 137 for Agricultural Tractor for TREM IV/ TREM V. This need to be taken up expeditiously by AIS.

Tractor and Mechanization Association (TMA), the apex body representing tractor and agricultural equipment manufacturers in India, has been actively in discussion with the Government of India on various policy matters including the implementation of all Bharat (TREM) emission norms (inception till the current Bharat (TREM) IIIA and road map for future Bharat TREM IV and V). While, TMA is fully supportive of controlling emissions and pollution in congested cities and is of the view that such emission norms are need of the hour, it also calls for implementation of Bharat (TREM) IV and V, for agricultural tractors and equipment with an abundant caution and a strategic approach.

TMA supports government's efforts to control pollution & advocates thought through road map.

- 1.2. While India rushes towards aligning its vehicle emission norms in tractors with internationally accepted standards, TMA requests the Government of India to consider implementing the suggestions made in the report submitted by the Sub-Committee Chaired by Mr. G.R.M. Rao (Director, Vehicle Research and Development Establishment [VRDE]) in October 2016 to the Standing Committee on Implementation of Emission Legislation (SCOE). This report, which was tabled after thorough study proposes a well-defined roadmap formulated in consultation with relevant stakeholders. This roadmap considers the uniqueness of Indian agricultural practices, infrastructure hiccups and the rural market trend, with an evaluated impact on the Indian farmer and his practices, the agrarian stress India is experiencing and the paltry ROI that farmers are able to achieve. Honourable Prime Minister's call to have programmes to double the farmers' income in the light of aforesaid is to ensure that farmer's poverty is alleviated.

Indian agricultural practices are unique. Indian farmers stressed.

GRM Rao Committee recommendations is after deep delving into the farmers' space.

- 1.3. TMA is of the view that while it is very pertinent and urgent to implement measures to control vehicle emission. Based on the vast in-depth relation and day to day engagements of the "GRM Rao committee" members with Indian farming community, the report of the sub-committee chaired by GRM Rao submitted the following points for the consideration of Government of India:

TMA supports GRM Rao committee's recommendations.

- 1.3.1. Agricultural tractors and equipment need a considered status, and attention while developing an emission-control roadmap. These actions should not burden farmers by increasing owning and operating costs without any apparent immediate benefits to farmers. The ministry of Petroleum and Natural Gas is currently talking about fuel efficiency norms for agricultural tractors. In a drawbar product such as tractors, fuel efficiency and stringent emission norms tend to be oxymoronic as far as cost of ownership is concerned. Thus, it appears that the Ministry of Road Transport and Highways and the Ministry of Petroleum and Natural gas may end up working at cross purposes, as far as the farmer's interest is concerned.
- Emission control measures should not adversely affect the already stressed farmers.*
- MoRTH & MoP&NG are working at cross purposes.*
- 1.3.2. Tractors with new emission norms need to be tested under Indian farming conditions to ensure smooth and trouble free acceptance and adoption by farmers. The need for testing, proving the technology and usage side by side with the farmer, needs adequate time; Three levels of testing are needed to ensure 100 % compliance in the adverse usage conditions in the Indian farm for a namely:
- Urgency of implementation should not be at the cost of testing and farmers' acceptance*
- 1.3.2.1. Proving by Tier 1 suppliers of fuel injection systems and after treatment systems, in Indian farming conditions. Establishing PAN India network with proximity to user for product support to ensure 100% availability.
- To ensure 100% reliability after introduction – Three levels of testing is mandated –*
- By Tier 1 supplier
 - Engine Mfg
 - TMA with end users
- 1.3.2.2. Engine system proving thereafter and finally
- 1.3.2.3. Tractor testing across India in various usage conditions by TMA members and actual customer usage of a large pilot lot, all linked to the farming season. Thereafter, all the feedback needs to be input and evaluated before the commencement of production. Hence the earliest possible introduction time for Bharat (TREM) IV is indicated by the GRM Rao Committee as April 2022, subject to availability of the appropriate fuel across the country, by April 2020. Ministry of Petroleum and Natural Gas (MoP&NG) is yet to notify Pan India availability.
- There is no notification from MoP&NG on availability despite consistent follow-up by TMA since 2006...Annexure1*
- 1.3.3. Introduction of Bharat (TREM) V can be attempted with a minimum gap of 4 years from Bharat (TREM) IV, after farmer's experiencing electronic systems and accepts it. Currently GRM Rao Committee has considered this and proposed for Bharat (TREM) V, in April 2026, after reviewing Bharat (TREM) IV introduction in 2022 and the experience of EU Stage-V cutting in (scheduled for 2019), in Europe.
- Farmers cannot handle frequent technology changes. Europe is cautious on EU5. We need to learn from their actions.*

1.3.4. There is also a need to formulate a clear testing and acceptance procedure, to bring in transparency and ease of working, by the early introduction of AIS 137 for Agricultural Tractors for TREM IV/ TREM V. This need to be taken up expeditiously by AIS.

Long way to go on stabilizing, testing and acceptance norms

2. Objective

Through this white paper, TMA would like to submit to all relevant Ministries of the Government of India, to look at practical timelines for implementing higher emission-control standards, as covered in the report submitted by the Sub-committee on Emission-Control of Agricultural Tractors Chaired by Dr. G.R.M. Rao (VRDE) to the SCOE, in October 2016.

TMA requests IMG understanding to protect farmers' interest. The best option is to follow GRM Rao Committee recommendations

2.1. Background - Indian Regulations on Emission Norms

2.1.1. TMA is the apex body representing the agricultural tractor and equipment manufacturers in India. It considers agricultural tractors as an integral part of the Indian economy and cornerstones for the continued development of the agricultural sector in the country. These machines, primarily powered by diesel engines, till date have provided proven and trouble free performance advantages for the tasks required to be carried out of such equipment.

Agricultural tractors are the cornerstone of mechanisation and for the Indian agricultural growth story

TMA has been proactively working with government agencies on emission

TMA has been actively engaging with the Ministry of Road Transport, Highways and Shipping (MoRTH) in formulating roadmap and pro-actively developing farmer friendly technologies to control emissions in agricultural tractors. We, as tractor manufacturers have always been open to the latest technologies and have, where necessary, incorporated them into our products. We are the largest tractor exporters both to the developing world and to developed economies. The fact that we meet and export to the most stringent technology requirements for the state of California in the USA is proof of our technological advancement. We are rated as one among the best and gaining acceptance and market share.

India is the largest tractor exporter by volume and supplies to all the Developed countries. Technology is no constraint as we meet the world's most stringent California norms on emission.

2.1.2. However, Indian Agricultural fora follow radically different practices and applications and we are concerned that the same technologies used for the developed world cannot meet the usage, applications and conditions encountered in Indian farms. In the past, whenever we moved up the emission norms, we have proactively worked with the MoRTH and progressively and cautiously implemented on the ground needs. Despite our cautious approach, there are instances where we could not adopt Tier 1 components used and accepted in developed countries, directly on our tractors as they failed to deliver in our usage conditions, despite extensive testing, forcing us to develop India centric technology and components – at the cost of huge recalls. Technology that suited the Developed world cannot be directly adopted into India.

International technology needs to be proven in Indian conditions and we cannot assume what works in the west is good for India.

Over and above repetition of such experiences, another important hindrance we anticipate relates to the ability, preparedness and economic willingness of Indian farmers to

Cost to farmers will increase substantially, defeating the objective of doubling farmers' income.

accept agricultural tractor with upgraded emission-control standards – considering its impact on cost of purchase, cost of maintenance and it's zero tolerance to fuel contamination and the demanding practices required for its up-keep.

- 2.1.3. We would like to bring to your notice the following excerpt from the Report submitted by the Sub-Committee Chaired by Mr. G.R.M Rao to SCOE:

“As requested to SCOE in the 52nd meeting, and as suggested by Chairman (SCOE) & Joint Secretary (Transport), TMA has agreed to introduce TREM IV emission norms on 1st April 2022 in line with EU Stage 4 on the assumption that 10 ppm fuel will be available by April 2020 at tractor usage points across India. TMA has explained that tractors need to be tested and validated in actual field conditions and practices (such as storage of diesel in drums by farmers which is susceptible for contamination). This testing can only be done in seasons (unlike Automobiles), hence TMA needs 2 years duration for testing and validation from the date of availability of the required fuel all over India. TMA has also assumed that the MoP&NG notification on 10 ppm fuel availability will be released by April 2016 thereby providing 4 years’ time to develop the engines so that by 2020 pilot volumes will be ready to fit on tractors for field testing.”

GRM Rao Committee report delved into the reality and need to test and prove in Indian conditions before recommending time lines.

3. Indian Farming Practices and Consumer Demand Trend

3.1. This section intends to reiterate TMA’s stand that simply adopting standards developed in Europe and US regions will neither be prudent or practical as it will be insufficient to address the unique challenges imposed by the nature of the Indian agricultural landscape and practices. TMA has always suggested (and accepted by the committee headed by Mr. GRM Rao) that the proposed roadmap should always also look at India-specific conditions, usage pattern & practices, customer sentiments towards owning an agricultural tractor and the weak economic base of the farming community. Tier 1 suppliers who deal with fuel injection and after treatment and particulate filters need time to engineer, test and prove their products under Indian farming conditions.

Need to look at India specific solutions and not what is working in developed economies.

Following are certain points that need attention:

3.2. Indian Farming Conditions and realities

The proposed Bharat (TREM) IV & V emission standards are susceptible in Indian farming conditions. The farming practices and conditions mentioned below are India-specific and are not followed in European and/or other geographies that follow higher emission-control standards:

Indian farming conditions are different and Tier 1 products, Engines and Tractors are susceptible. There is a need for extensive testing during the season to customer proof Tier 1 products, Engines and tractors.

3.2.1. Wet-Land puddling¹

3.2.2. Rampant contamination of fuel²

3.2.3. Usage of tractors without hoods and the consequent dust/straw/mud contamination under actual field conditions, are detrimental to electronic systems.

3.3. TMA Submission

Due to complex electronics involved in the proposed Bharat (TREM) IV and V emission standards, adoption of Common Rail System (CRS) is further challenging in Indian context. Adequate time to be provided for tier I supplier of fuel and emission control system to develop product for Indian applications where abuse can be the normal use.

There need to be an India specific and proven solution from Tier1 suppliers. They need PAN India availability of fuel and time to establish this.

Hence, it requires time first for component manufacturer, then the engine & thereafter tractor manufacturers to test and validate products to ensure that emission control measures do not adversely impact farmers and Indian agriculture. The changes are undertaken after farmers’ acceptance in real time working conditions, and post the ready pan-India availability of fuel. Tier 1 suppliers may have to develop products to suit Indian agriculture needs and stand performance warranty under Indian conditions. This is yet to happen, unlike in automobiles, as there are no readymade, India tested solutions for emission related components.

¹ Puddling is ploughing the land with standing water so as to create an impervious layer below the surface to reduce deep percolation losses of water to provide soft seedbed for planting rice. Puddling operation consists of ploughing repeatedly in standing water until the soil becomes soft and muddy.

² This happens intentionally and / or due to the need of storing fuel. Unlike in developed countries fuel system components need to be abuse proof.

4. Indian Farmer

4.1. Indian farmer is presently going through a very difficult phase. He is already burdened by several factors, which are linked to either climatic and/or market conditions. In the current scenario he is majorly impacted by un-predictable climatic impacts and policy decisions of Governments (Central and State). While the industry is prepared to comply with the technological up-gradation, one should also look at the following circumstances adversely affecting the interest of the farming community:

Can Indian farmers be burdened with cost of technology which does not add any value in the farmers' perspective?

4.2. Socio-Economic Impact:

- Implementation of upgraded emission norms will increase the ownership and operating cost of agricultural tractors. This should not create any social upheaval and economic impact in agricultural sector.
- Proposed introduction of fuel efficiency criteria and ROPS will further substantially add to the owning & operating cost, further aggravating farmer distress.

4.3. TMA Submission

Agricultural tractors have rural sentiments attached to them and are sensitive in nature. Ministry of Agriculture and Farmers' Welfare (MoA&FW) must consider this matter while engaging in discussions with respect to implementing timelines for up-grading the emission-control norms. They also need to understand whether a farmer can afford all the costs, cumulated at one time, due to introduction of revised engine emission norms and ROPS. The tradeoff between emission and fuel efficiency in a draw bar vehicle – will eventually add additional cost to farmers. Having the highest fuel efficiency and stringent emission standards in tractors will push up technology levels, because of the introduction of electronics, sensors and controls. The attention needed for adherence of manufacturing routines, at such technology levels will increase operating costs substantially. Technological up-gradation will also lead to higher owning cost.

MoA &FW must ensure that farmers interest is protected and call for a IMG for discussions

We should also recollect our past experience of poor acceptability of Rotary pump and turbo charger in Indian context, wherein manufacturers were forced to switch back to INLINE pump & also the psychology of naturally aspirated engine and Inline Fuel Injection Pump being preferred by Farmers. Farmers are looking for products that can withstand Indian conditions (We may call it abuse or contamination of fuel _ Reality does not change) We cannot afford to have a situation, when, due to government pressure and lack of time to test by Tier 1 manufacturers, engine & tractor manufacturers and finally at the farm under real life situations by the farmers, we end up with broken down tractors in the

Farmers need a time tested product. Manufacturers need to be given time to test the product in real time farming conditions. We are asking for TIME to test, prove and provide a trouble free product.

field, leading to pandemonium among the farming community. As an agrarian community we cannot afford this – economically or politically.

Hence, a clearly defined roadmap with a timeline that will enable Tier 1, Engine and tractor manufacturers develop a fool-proof product after exhaustive testing in actual field conditions and usage by farmers is the need of the hour, which will ensure the farming community a lifetime trouble free product & a sigh of relief.

5. On the ground reality

5.1. Ability and Willingness:

As any other automobile consumer, Indian farmer will also be willing to embrace technological up-gradation. But he may not be able to embrace it if it is unproven, not offering tangible benefits and also at a higher cost, in the present state of distress he is going through. We as TMA cannot embark unprepared and not “India centric” proven implementation of new emission-control systems. We cannot afford to provide unproven products to farmers!

Farmers prefer tangible benefits and reliable products

5.2. TMA Submission

Hence, this calls for a proper customer and usage proofing and for farmers being fully involved in major product testing before we consider launching of products with international technologies – yet to be proven in India.

Members of TMA already have the best of technology the world possesses for Bharat TREM-IV or Bharat TREM-V and are willing to invest in volume production for domestic and imbibe the needed technology in the servicing networks. We are expecting TIER-1 manufacturers to establish PAN India customer support network to be close to the users. We, as well as the TIER-1 and engine manufacturers need to be sure if the current technology available for the developed world will work in India in a trouble free manner. Hence this calls for a Pan India testing and validation in different geographies and applications. We need to prove it to the farmers that it is good for him. This takes considerable time and there are ample case studies to show that though we are able to create standalone instances of excellence in Agri space – we are not able to institutionalize it even after 5 decades at it. It must also be noted that it is impossible for us to accept that Indian farmer will agree and accept new ways of usage & maintenance to adopt emission norms. Sad part is we propose to move this milestone again in 3 years (Bharat Tier IV and Tier V). This can be suicidal.

TMA has pressed upon MoRTH & SCOE in June and July 2015 for a joint meeting with TIER-1 manufacturers on this issue. The relevant papers are available in their records.

Can't create standalone success. The solution needs to work PAN India under current usage patterns.

5.3. Current Practices and Possible Impacts:

5.3.1. Storage practices in rural areas, leading to contamination of fuel

India is continuing to work hard to connect its last mile with the rest of the nation – as it lacks infrastructures (road/electricity etc.). Oil distribution is not an exception. Many re-fueling stations are miles away from the reach of farmers, forcing him to store the fuel in drums (a common practice followed in rural areas). It is anticipated that such practices will lead to contamination of fuel, and can be detrimental as the components that will be used for the future emissions are extremely sensitive to fuel quality.

Automobiles refuel at Fuel pumps; in the case of tractors fuel needs to go to the farmers.

5.3.2. TMA Submission

Contaminated fuel will damage the Fuel injection system and tractors will stop.

Setting up the infrastructure requirements along with ample re-fueling stations will need projects to be implemented on a war footing. Even today, there is no clarity as to how we can prevent the farmer from filling the diesel in drums for his use. Further the practice of adulterating fuel is rampant. We cannot wish away reality.

Alternatively, Tier 1 suppliers of fuel injection systems need to work and provide an “Abuse proof” product

We need to accept reality or build fool-proof solutions.

5.4. Anticipated impact on Higher HP Tractors.

5.4.1. Tractor market is highly price sensitive and yet quite brand conscious. Indian farmer is not much bothered about the technological/ regulatory norms. Industry anticipates that the tractors of 50 HP and above, may get eliminated from the market due to substantial increase in product / operating cost and maintenance demands. After a long struggle and efforts we have made inroads in higher HP tractors, which is the backbone of entire Post-harvest and productivity driven applications. This can suffer a major immediate setback, affecting farm mechanization.

Will have a major impact on higher HP tractors & mechanization solutions.

5.4.2. TMA Submission

All the above possibilities, will affect the overall Farm Mechanization Target by 2022 which is linked to Honorable Prime Ministers’ objective of Doubling Farmers’ Income by 2022.

We need to ensure that adequately tested and fool proof.....and with a very low cost is developed specially for Indian farmers.

We need to support PM’s mission of doubling farmers’ income.

6. Anticipated Impact on Indian Tractor Manufacturers

6.1. Impact on Indian Tractor Manufacturers

Members of TMA whole heartedly support Government's move to safeguard its environment and give a healthy life to its citizens and fauna and flora. But, there are certain points that with this document TMA would like to bring to the attention of readers:

6.1.1. Unlike other automobiles, for servicing, the tractor dealers' service team approaches the tractor owners in rural areas. This act requires proper infrastructural support with a well-established service network, which calls for huge investment in terms of travel and manpower to obtain PAN India penetration.

TMA needs to upgrade support services.

6.1.2. TMA Submission

This calls for a defined timeline, huge investment (financial, manpower and training using upgraded technologies).

TMA requires time to establish, once proven products are available.

6.1.3. The concern is not just about emission-control norms. It is also about Emission and Noise reduction to 86dB at OEL level from current 92 dB + ROPS+ EMI/ EMC + Safety and comfort which will hike the cost at least 60-70% for higher HP Products. The fuel efficiency criteria being talked about is a major concern. Cost of ROPs that is expected to cut in from 2018/19 is another.

What is the trade-off between product cost and farmers' distress?

6.1.4. TMA Submission

Technology providers and tractor manufacturers will have to incur higher costs and hence pass this on to the farmers. We cannot withstand a double whammy:

- *No time to test and prove*
- *And a product that can cost 60 to 70 % more !*

7. Comparative Approach (India Vs other Geographies)

Indian emission-control regulation approach is similar to EU approach starting with less stringent emission norms and progressively tightening the emission to stringent level depending on the availability of better technology / availability of fuel.

This similar approach of Indian emission-control regulation has drastically reduced the emission limits (Bharat (TREM) IV / V) than those when standards were introduced (Bharat (TREM) I), which convinced the Indian manufacturers to follow advanced technologies followed by EU in reducing emission. This stringent emission norms calls for not only advancement of technology but also after treatment requirements.

TMA is proactively engaging with the authorities to tighten up the emission based on the availability of fuel. With this clarity in fuel availability, we will be able to finalize the Road Map similar to EU.

TMA is committed to WP29 and align with EU – what we are asking is only time to test.

TMA wish to submit the following:

- *A 10 year roadmap must be developed to align/ harmonize the existing international regulations. The committee headed by Mr. G.R.M Rao, (Director, VRDE) has already done this with unanimous acceptance.*
- *Any implemented emission norm should last for minimum four (4) years to justify development costs. This is also incorporated into the committee's recommendation (Committee chaired by Mr. G.R.M Rao). Further, it is not advisable to assume that Indian farmers will change usage practices too frequently – especially when it increases the owning and operating cost.*
- *Availability of fuel with intended specifications should be available at the tractor usage areas (on a PAN India basis), at least two years in advance.*
- *Field testing can only be started after availability of low sulphur fuel across India and we would like to test the product for at least two seasons. (Min 1500 hrs durability in all climatic zones).*
- *Engines need 4 years of development time and tractors need a 2 year field testing in the season.*
- *Minimum validation period and correction time is required – At least 1500 hours in all climatic zones, and minimum 2 seasons for consistency (i.e. 2 to 3 years' timeframe is required for optimization).*
- *Considering technical complexity with CRS & exhaust after-treatment system (globally proven), thorough validation is a must.*
- *Field product service team needs to be trained & resourced (electronic tools), as they will have to handle the electronic FIE & after treatment system for the first time.*

- *Lead time for development as per FIE manufacturers and minimum 2 season testing (2 years at least) for taking corrective action at farmer's field.*
- *The TREM IV & V technology currently available is susceptible in Indian farming conditions like wet-land puddling / use of tractors without hoods and dust/straw/mud contamination in the actual field conditions (which does not happen in European countries). FIE and emission system manufacturer will have to establish a reliable product after extensive field test under Indian operating conditions. These conditions are unique to India and unless proved beyond doubt – will adversely affect the farmers and farming.*
- *As agreed in the report submitted by Mr. G.M.R. Rao, we would like to review the introduction of Bharat (TREM) V after implementing Bharat (TREM) IV emission norms, for any further actions that need corrections.*
- *Infrastructure facilities to be created by proprietary manufacturers (like FIE, Turbo chargers, after treatment) to service tractors from remote locations where tractors will be operating, which will take long lead time and cost. Current servicing policies (part replacement) followed by proprietary manufacturers for On-Highway application will not be suitable for farming community.*
- *General Time plan for Implementation of Trem IV - Emission Norms*

TIMEPLAN - HIGHER EMISSION-CONTROL STANDARDS FOR AGRICULTURAL TRACTORS IN INDIA																										
S. NO.	KEY - ENGINE DEVELOPMENT ACTIVITIES	MONTHS (approx)	2017				2018				2019				2020				2021				2022			
			Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4			
1	Engine design assessment and sign off with FIE supplier and vehicle intergration with vehicle	6																								
2	Prototype development	4 to 6																								
3	Combustion development/consistency/ Engine certification	18 to 24																								
4	Vehicle - Application calibration	9																								
5	Engine - Test bed validation (PVV) and sign-off with FIE and other system suppliers	12																								
6	Vehicle - Field validation and sign-off with FIE and other suppliers and vehicle OEM partners	18																								
7	Production readiness and final release/ dealer network development	12																								

Conclusion

We conclude by submitting the following:

- Agricultural tractors need a special status, and special attention while developing an emission-control roadmap.
- Introduction of Bharat (TREM) IV in April 2022.
- Introduction of Bharat (TREM) V to be scheduled for April 2026, after reviewing in 2020 the EU Stage-V cut in Europe scheduled to be introduced in 2019.
- There is also a need to formulate AIS 137 for Agricultural Tractor for TREM IV/ TREM V. This need to be taken up expeditiously by AIS.

Annexure - 1

- A. In the 28th meeting of SCOE held on 27th December 2006 under the chairmanship of Shri S K Dash, Joint Secretary (Transport), it was agreed and minuted as below.

“TMA expressed that they propose to take proactive steps to introduce TREM-V norms equivalent to Euro Stage IV norms, skipping Euro stage III B norms. For this purpose, 15 ppm sulphur fuel is necessary. MoP&NG was requested to examine aspect of 15 ppm sulphur fuel all over the country w.e.f. 1st April 2015, if TREM V norms are to be enforced. As mentioned above road map MoP&NG for fuel beyond 2010 will be available by end 2007.” *Note-1*

- B. Further, in the 30th meeting of SCOE dated 12th October 2007 it was further minuted as below.

“Future Emission norms for Agriculture Tractors w.e.f. 2015

It was decided that MoP&NG would communicate the availability of 10 ppm sulphur diesel fuel by 2010 *Note-1* for implementation of future tractor norms proposed to be effective from the year 2015.”

Note 1 - MoP&NG delayed making the 10 ppm fuel action by at least 10 years thereby derailing alignment of TMA with EU.

Despite the above, the notification from the MoP&NG is still awaited.