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## **Economic Commission for Europe**

### **Inland Transport Committee**

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Item 4 (e) (ii) of the provisional agenda

**Strategic questions of a horizontal policy or regulatory nature:**

**Environment, climate change and transport:**

**Inland Transport Committee acting on Climate Change and  
the Paris agreement: Decarbonisation and adaptation requirements**

### **Application of ForFITS in Uzbekistan and future outlook**

#### **Note by the secretariat**

## **I. 2019 ForFITS application in Uzbekistan**

### **A. Current Situation**

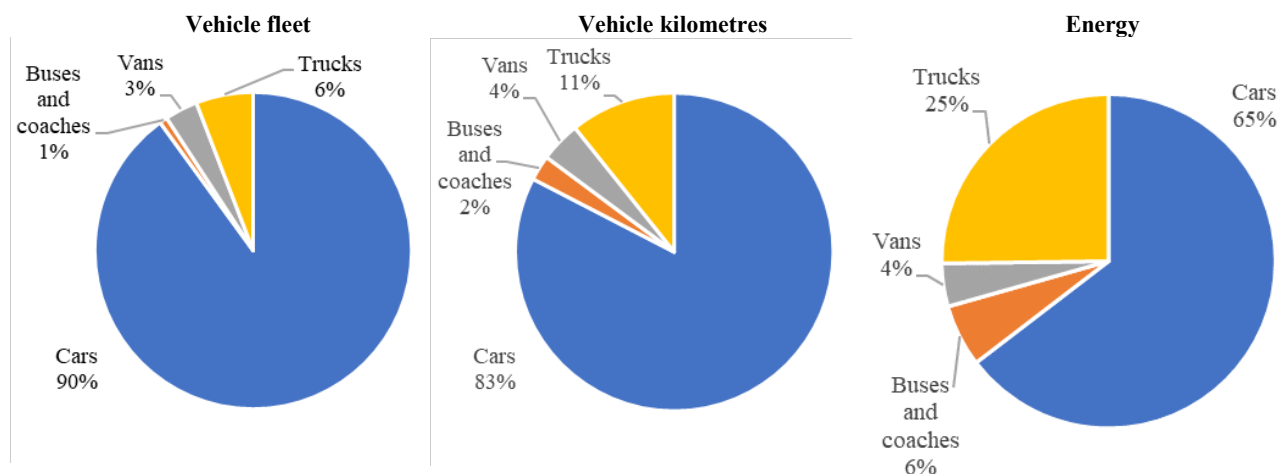
1. The Environment Division of UNECE has initiated in 2019 an update of the Environment Performance Review (EPR) for Uzbekistan that was last reviewed in 2001 and 2010. The transport sector has a prominent role in this review initiated in 2019 and a ForFITS analysis for Uzbekistan has been performed as part of the transport chapter. ITC Informal Document No. 2 details a highlight of the scenario analysis and main recommendations as part of the EPR to be release in the course of 2020.

2. Data were collected from official national sources as well as from the local experts. In some cases, data were adjusted when the scope of data provided did not match the required input definitions or if data were not internally consistent.

3. Sources for road transport data include the Ministry of Transport and the State Committee on Statistics. The primary sources for railway and aircraft transport data were Uzbekistan Railways and Uzbekistan Airways respectively. In all cases, data from these sources were adjusted or supplemented with estimations based on expert judgement, and are the sole responsibility of the ECE.

4. Uzbekistan has a motorized vehicle fleet for road transport of more than 2.2 million vehicles, dominated by light duty vehicles. Despite heavy duty vehicles only representing about 7 per cent of the fleet, they represent almost 25 per cent of the energy used by road motorized vehicles. This is due to the fact that heavy vehicles are driven more and consume more energy per distance (figure 1).

Figure 1  
**Motorized road vehicles distribution by vehicle type**



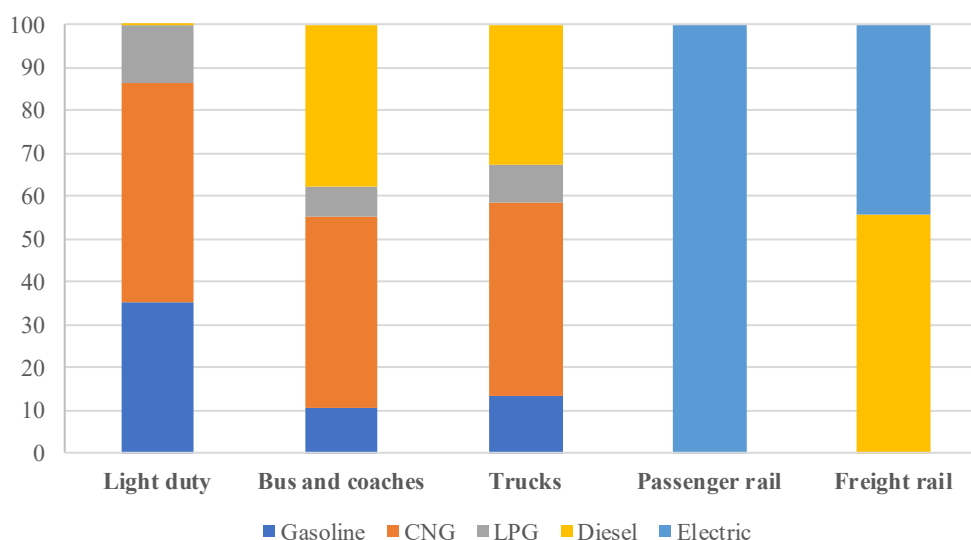
5. As input data for historical fuel consumption and annual distances for most vehicle categories have not been identified, proxies have been used taking the technical specifications of the most popular cars sold in Uzbekistan, along with data for other countries of similar characteristics. Due to local fuel resource availability, and the fiscal incentives provided for those fuels, many vehicles run on natural gas or LPG in Uzbekistan. Though such a high share is difficult to quantify precisely, as many of CNG/LPG retrofit fuel systems are fitted to vehicles originally operating on gasoline (for light duty vehicles) or diesel – (for heavy duty vehicles). The quality, reliability and emissions from such retrofit systems can, in some cases, be problematic, unless the right provisions are put in place to make sure they operate appropriately. Retrofit systems are not part of the original equipment featured in vehicles and are subject to a separate approval rule to make sure such systems also deliver acceptable environmental performance.

6. The 1958 Agreement on Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations<sup>1</sup> (The 1958 Agreement) facilitates the mutual recognition of vehicle approval for the contracting parties of this multi-lateral agreement. UN Regulation No. 115 under the 1958 Agreement provides a harmonized procedure specifying how CNG/LPG retrofit systems should be tested and what are the acceptable emissions limits for such systems once fitted to vehicles. However, Uzbekistan is not a contracting party of the 1958 Agreement that would allow to have access to state-of-the-art test procedure to ensure the environmental performance of CNG/LPG retrofit systems.

7. The breakdown of powertrains in each vehicle type is also a required input for ForFITS and data for Uzbekistan are shown in figure 2. Data for historical powertrain breakdowns were unavailable or unaligned with vehicle stock data. Consequently, current vehicle stock data were used.

<sup>1</sup> The text of the 1958 Agreement can be found in:  
<http://www.unece.org/trans/main/wp29/wp29regs.html>

Figure 2  
**Energy sources of the vehicle fleet, 2018, per cent**



## B. Future Projections

8. Four scenarios projections of transport sector CO<sub>2</sub> emissions taking the potential evolutions of the mobility sector in the country were considered:

- **Reference Scenario:** it accounts for the expected evolution of socio-economic parameters such as population and GDP. It includes default data in ForFITS on the expected evolution of fuel consumption characteristics by powertrain to reflect future improvements in vehicle technology and their associated costs. Other characteristics defining the transport system in the base year (e.g. fuel taxation schemes, road pricing, passenger/freight transport system structure, fuel characteristics, powertrain technology shares, behavioural aspects) remain unchanged in projections.
- **Shift to mass transport for passenger and freight Scenario (Shift Scenario):** Given the significant investment in infrastructure in the country in recent years, and the population distribution concentrated on the east of the country, the scaling up of passenger and freight traffic using mass transport modes would reduce the reliance on individual modes and enable significant energy savings.
- **Improved fuel economy Scenario (Improve Scenario):** Energy use is evenly distributed between passenger and freight transport. Ambitious and cost effective vehicle technology deployment to save energy would deliver significant GHG emissions reduction at low or negative costs to the vehicle users. Both light and heavy duty vehicles are included in this scenario.
- **Combined Shift and Improved Scenario (Combined Scenario):** Shift and Improved are two pillars of the Avoid-Shift-Improved approach to sustainable mobility. Though not entirely additional, combining both Shift and Improved scenarios bring additional benefits to energy and emission reductions by combining the best vehicle technologies with the mode adequate mode of transportation.

9. Socio-economic data and data on final fuel price were also collected. Population projections are taken from the United Nations World Population Prospects. GDP data were collected from the World Bank database. GDP projections are based on those available from OECD and the World Development Index (WDI) of the World Bank and assume an annual growth between 3 and 5 per cent by 2045. These figures show GDP growing by more than fourfold between 2016 and 2045 (table 1).

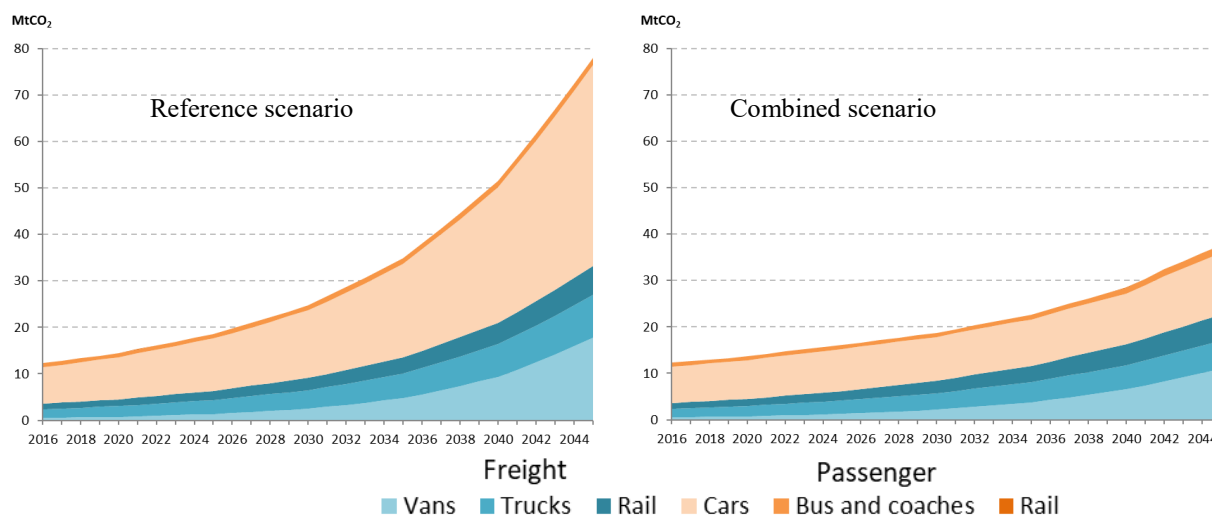
Table 1  
**Socio-economic data and projections with fuel price data, 2016, 2020, 2025, 2030, 2035, 2040, 2045**

	2016	2020	2025	2030	2035	2040	2045
Population (million)	31	33	35	36	38	39	40
GDP (2014, constant PPP US\$, billion)	126	154	206	276	369	494	662
Fuel price after taxation (US\$/lge)							
Gasoline	0.50						
Methane	0.25						
Diesel	0.50						
Electricity	0.03						

Notes: lge = litres of gasoline equivalent.

10. Figure 3 shows the projected WTW CO<sub>2</sub> emissions from Uzbekistan's transport sector to 2045 for the reference and combined scenarios. This reference scenario also includes default data in ForFITS on the expected evolution of fuel consumption characteristics by powertrain in order to reflect future improvements in vehicle technology and their associated costs. The other characteristics defining the transport system in the base year (e.g. fuel taxation schemes, road pricing, passenger/freight transport system structure, fuel characteristics, powertrain technology shares, behavioural aspects) remain unchanged in projections.

Figure 3  
**WTW CO<sub>2</sub> emissions by mode under reference and combined scenario, 2016–2045, Mt CO<sub>2</sub>**



11. The Combined Scenario, combining the Shift and Improve Scenarios, enables significant energy and GHG savings from the Reference, Shift and Improve Scenarios (Table 2). The per capita CO<sub>2</sub> emissions from transport in Uzbekistan is set to drastically increase nevertheless, as individual modes of transport is expected to drive up mobility and energy demand. Only the Combine Scenario is able to decrease the carbon intensity (CO<sub>2</sub>/GDP) by 2045, signalling a decoupling of economic growth and CO<sub>2</sub> emissions from transport.

Table 2  
Main outputs for all scenarios, 2045

	Unit	2016	2045			
			Reference Scenario	Shift Scenario	Improve Scenario	Combined Scenario
Total pkm	billion pkm	81	364	227	366	226
Total tkm	billion tkm	50	286	282	292	292
Total energy use	million toe	4	24	16	17	12
Total WTW CO <sub>2</sub> emissions	billion kg CO <sub>2</sub>	12	78	54	53	38
Total WTW CO <sub>2</sub> emissions per capita	kg CO <sub>2</sub> /person	387	2000	1385	1359	974
Total WTW CO <sub>2</sub> emissions intensity	kg CO <sub>2</sub> /GDP <sup>1</sup> *1000	95	158	109	107	77

12. Activity in the rail sector traffic increases faster than any other mode due to the assumed mode shift away from road transport. The mode shift reducing the growth in car traffic is the largest contributor to the emission reductions, followed by the energy efficiency gains in cars and trucks. The mode shift from trucks to rail does not bring a significant reduction as today's energy efficiency and CO<sub>2</sub> intensity are similar. Forward looking projections also show that the CO<sub>2</sub> intensity of trucks and trains will remain on the same level.

13. The switch to electric freight trains coupled with the consumption of lower-carbon electricity matches the energy efficiency gains of trucks. Many countries have now implemented fuel economy standards for trucks, requiring continuous and technological innovations to improve energy efficiency of long haul trucks. Such improvements are also likely to benefit countries where no standards are available, as fuel efficient technology are expected to be cheaper and widespread, as assumed in the Improve Scenario.

### C. Conclusions

14. The transport sector is expected to drastically grow in the coming decades as the economy further develops in Uzbekistan. GDP and GDP per capita is expected to significantly increase in the years and decades to come, leading to higher mobility needs and further development of individual mobility. Traffic activity in the Reference scenario, using GDP growth as the main driver, is expected to increase by more than six-fold between 2016 and 2045. All CO<sub>2</sub> mitigation scenarios slow down the expected CO<sub>2</sub> emission growth, and are not likely to revert it during the time horizon studied in this annex. However, The Combine Scenario enables a decoupling of the CO<sub>2</sub> emissions from the economic growth. Reducing the carbon intensity of Uzbek's economy is an important achievement that Uzbekistan should embrace in order to meet their (I)NDC target submitted as part of the Paris Agreement of the UNFCCC. The Combine Scenario is the only scenario that allows to reduce the carbon intensity of the transport sector compared with today (Table 2).

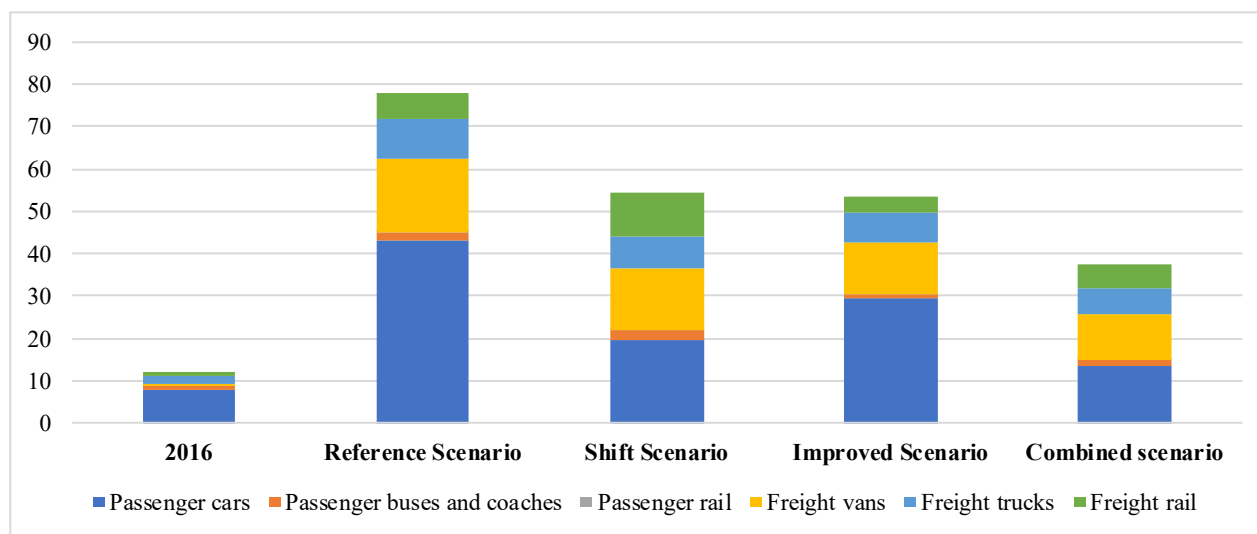
15. The Shift scenario, using modal shift from individual modes of transportation to mass transport modes for passenger and freight has the medium- to long-term potential to deliver on significant CO<sub>2</sub> savings with limited impacts on overall traffic activity of passengers and goods. Modal Shift policies nevertheless require time to deliver on CO<sub>2</sub> emissions savings, and so require higher levels of strategic planning and anticipation from policy makers.

16. The Improve Scenario relies on vehicle technology deployment that can quickly deliver CO<sub>2</sub> savings, especially in a dynamic vehicle market as is the case on Uzbekistan, with expected sharp increase of new vehicle registrations expected in the near future. Policy incentives to promote the deployment of low-CO<sub>2</sub> fuel-efficient vehicles are fundamental to steer the market towards vehicle with lower rates of fuel consumption. Fiscal policies on fuels and CO<sub>2</sub>- or fuel economy-based vehicle taxation are string tools to deploy.

17. Both shorter- and longer-terms solutions assumed in the Improve and Shift Scenarios respectively to sustainably mitigate CO<sub>2</sub> emissions from the transport sector in Uzbekistan,

as shown in The Combined scenarios that half the CO<sub>2</sub> emissions of the Reference Scenario in 2045 (Figure 4).

Figure 4  
WTW CO<sub>2</sub> emissions by mode, all scenarios in 2045, MtCO<sub>2</sub>



#### D. Recommendation for Uzbekistan

18. To reach the ambitious CO<sub>2</sub> emissions reduction targets set in the Combined Scenario, UNECE recommends Uzbekistan to:

*Recommendation 1: Reduce fossil fuel subsidies*

Fossil fuels prices at the pump in Uzbekistan are regulated and subsidized and do not provide an incentive to adopt more fuel efficient vehicles and modes of transportation.

*Recommendation 2: Further develop passenger mass transportation network*

Continue the expansion of reliable, safe secure and affordable public transport networks in major cities.

Pursue the development of intercity train network, with higher speeds, increased frequencies and affordable prices.

*Recommendation 3: Develop electric mobility along with renewable electricity production capacity*

Electric mobility for all modes (cars, trains, 2-wheelers) require low carbon electricity to deliver CO<sub>2</sub> reductions. Both electric mobility deployment and lower carbon electricity should be developed simultaneously in Uzbekistan to maximize the CO<sub>2</sub> mitigation potential. Both e-mobility and low carbon electricity can be developed simultaneously to ensure long term CO<sub>2</sub> benefits of low carbon e-mobility once the e-mobility market is mature.

*Recommendation 4: Join ECE vehicle multi lateral agreements*

The ECE develops harmonized technical regulations for all inland transport modes offering off-the-shelf legal texts on energy and emissions measurement and mitigation. Vehicle safety features are also covered in this multilateral agreements.

19. Default data are a key component of ForFITS for users who have limited access to mobility data in their respective countries. Providing a centralized, transparent platform where harmonized emission factors from road transport would add significant value to the

model for stakeholders, as such data is usually used in scattered and inconsistent ways by institutions performing emission inventories, projections or impact assessments.

20. Upgrading the model to include local pollutants would require further assessment and would be subjected to new funding. Indeed, a substantial addition to the model's input and modelling framework would be needed to accommodate emission standards into the vehicle classes. Such distinctions are not necessary with the existing version of ForFITS focusing on energy and CO<sub>2</sub> emissions.

## **II. ForFITS Project evaluation as part of UNECE governance activities**

21. The United Nations has worked to strengthen its accountability system, which rests on internal controls and oversight mechanisms, and tools to promote transparency and integrity. All information on the governance, implementation and reporting of programme resources in UNECE can be accessed through the open UNECE webpage.

22. From September 2018 to February 2019, an independent evaluator reviewed ForFITS as a tool to support governments in climate change mitigation, in the period post-UNDA funding, from 2014 to 2018. The evaluation contained twelve recommendations<sup>2</sup> for ForFITS that the secretariat is implementing from 2019 to the end of 2021, if resources are available for the activities needing substantial amount of time.

23. To date, an on-line survey prior to the download of ForFITS has been deployed to create a community of ForFITS users, and to better understanding gender balance in ForFITS users. The survey has shown that about 40% of ForFITS users providing an answer are females, and that there is a limited interest in creating a specific community of users, and current mode of user information, such as the ForFITS webpage, will be used to share latest information about the tool and its use.

## **III. Partnership with other transport, energy and environment modelling initiatives**

### **A. Participation to iTEM's activities**

24. The International Transport and Energy Models (iTEM) partnership aims at enhancing exchange and collaboration between transport and energy modellers around the world. ForFITS has become a member of iTEM in 2018. It has since then provided inputs to two of the main activities of the partnership.

25. In 2019, iTEM has initiated the third and fourth model inter-comparison projects (MIPs) to which ForFITS participated by providing the modelling outputs from the study performed in 2016 on "Implementation for UNECE member States" (Informal Document ITC (2016) No. 13). The MIPs are aiming at looking at the modelling response of the various transport and energy modelling tools that are part of iTEM in order to better understand the similarities and discrepancies in modelling approaches<sup>3</sup>.

26. the secretariat submitted historical datasets to the iTEM-KAPSARC (IK) Open Data project. In 2017, iTEM called for a common, public, "best available" database for baseline calibration of models, provided through a transparent, scientific process. Access to UNECE's transport data collected as part of the Working Party on Transport Statistics (WP.6) activities has been shared with the iTEM community to strengthen the availability and reliability of the data that is being collected as part of the IK Open Data project.

<sup>2</sup> The evaluation report can be found at: [http://www.unece.org/fileadmin/DAM/OPEN\\_UNECE/03\\_Evaluation\\_and\\_Audit/Evaluation\\_Report\\_s-with\\_SPs/02-Transport/Forfits\\_Review\\_Final\\_report\\_25.02.2019.pdf](http://www.unece.org/fileadmin/DAM/OPEN_UNECE/03_Evaluation_and_Audit/Evaluation_Report_s-with_SPs/02-Transport/Forfits_Review_Final_report_25.02.2019.pdf)

<sup>3</sup> More information about iTEM's 3rd and 4th MIP can be found at: <https://transportenergy.org/mip/3/>

**B. Towards an agreement with the International Energy Agency on research partnership on transport and energy modelling**

27. The International Energy Agency (IEA), an intergovernmental body founded in 1974 as an autonomous agency from the OECD, is at the heart of global dialogue on energy, providing authoritative analysis through a wide range of publications, including the flagship World Energy Outlook and the IEA Market Reports; data and statistics such as Key World Energy Statistics and the Monthly Oil Data Service; and a series of training and capacity building workshops.

28. One of the key products developed for the transport sector is the IEA Mobility Model (MoMo), the centrepiece of a partnership of 23 organizations sharing knowledge and expertise on transport and energy modelling. Currently, there is an annual fee to become a MoMo member and gain access to data and analyses developed by the IEA transport team.

29. UNECE and ForFITS have been invited to join the IEA's Mobility Model (MoMo) as a research partner. The IEA MoMo team has recently agreed to offer selected partners the opportunity to join the MoMo partnership free of charge provided they participate to the development of the tool through their expertise and knowledge.

30. Discussions are being held between both parties to find common terms and conditions to make such agreement between both institution a reality. An outcome is expected in 2020.

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