ECO STATISTICAL BULLETIN: *Transport* 2021

PMS

ECO SECRETARIAT

Contents

Executive summary

The present document presents a new release of statistical data and information relating to statistical subgroup XXVI: Transport and Communications of the ECO Statistical Compendium. It also presents ECO key analysis data from research carried out during 2020-2021.

The bulletin has been designed to address specific reader audience in the relevant authorities of the ECO Member States involved in analytical statistics.

The contents of the present document have been developed using new releases of statistical updates provided by the Member States in regard of Transport Statistics, key findings of the ECO analytical statistics and of staff assessments have been presented in the said document for statistical readership.

The methods used in preparing the present document are in harmony with current requirements of regional statistical methodology as well as with format of analytical statistics.

Although designed for specific audience, the design of the bulletin let alone its content are user friendly containing visual graphic charts and imaged figures (36), statistical tables (65), diagrams (3) and schemes (4). Visual indicators for the numerical values of analyses have dual labeling in line with international statistics standards.

Sources of data information are those of the ECO National Statistical Offices (NSO) wherever relates to the ECO Key Statistical Indicators (ECO-KSIs) and of data sharing sources of ECO's partner international organizations wherever it concerns the transport modes and ECO staff assessments.

Acknowledgments

In preparing the present statistical publication the contributions from the National Statistical Offices of the ECO Member States have been of especial cooperative value. Thus, the Statistical Year Books have been received by ECO Secretariat from the Islamic Republic of Afghanistan, Republic of Azerbaijan, Islamic Republic of Iran, Republic of Kazakhstan, Kyrgyz Republic, Islamic Republic of Pakistan, Republic of Tajikistan and Turkmenistan. These comprehensive publications of ECO Member States were contributed basing on Secretariat's request for statistical data & information via officially registered Note Verbales.

In the form of supplementive new Data & Information Releases and updates directly pertinent to the economic area of transport and communications, generous contributions have been received from the Republic of Turkey, Republic of Azerbaijan, Republic of Kazakhstan, the Kyrgyz Republic, Islamic Republic of Pakistan, Turkmenistan and Republic of Uzbekistan. In the above view, the Secretariat of the Economic Cooperation Organization thanks the esteemed Member States for support and cooperation in the development and dissemination of statistical publications.

Purpose of the ECO Statistical Bulletin

Purpose

In view of the fact that that the statistically observed period has been impacted by a sudden outbreak of coronavirus in 2019, which turned into the pandemic, a section of the statistical bulletin has specifically been dedicated to the effects from consequences of the said pandemic at the macroeconomic level and at sector level on transport and communications.

Background

The 31st Regional Planning Council Meeting held on 12-21 January 201 in the ECO Secretariat, Tehran (Iran) has instructed the Secretariat to ensure that the statistical publications be timely and provide evidence and data & information based groundwork for informed policy and decision making in the ECO.

Objectives

In line with the principles and approaches prescribed by international statistics for publications generated by international and regional organizations, the objectives of the present statistical bulletin is to provide the ECO Member States with a new release of statistical data & information and also the results of the research work carried out in the framework of the ECO projects as well as the ECO staff assessments.

Approach and Methodology

The methodologies used in the present reports include statistical analyses and Evaluations, Calculations and Analysis (ECA) by using Math Tab related applications and analysis tools.

Identification and Analysis of main methodologies and models in their application for ECA in regard of each transport mode in ECO countries has been deployed under the present statistical document.

Good practices in calculating transport related statistical data and information in the ECO countries involved in the ECO regional transport network have duely been accounted for in the present statistical bulletin.

Countries

The involvement of countries in Transport and Communications of ECO is closely aligned with the letter and spirit of the "ECO Vision 2025" (pl. see core documents available at: ww.eco.int), which has set realistic target objectives for the following subject economic areas:

A. Trade

B. **Transport and Connectivity**
C. Energy
D. Tourism
E. Economic Growth and Productivity
F. Social Welfare and Environment

The data collection has been from all of the ten ECO member countries, including the Islamic Republic of Afghanistan, Republic of Azerbaijan, Islamic Republic of Iran, Republic of Kazakhstan, Kyrgyz Republic, Islamic Republic of Pakistan, Republic of Tajikistan, Republic of Turkey, Turkmenistan and Republic of Uzbekistan. The processes of data collection and development have been through questionnaires disseminated to all member countries. These have been inputted under the ECO-KSIs, and also, in frameworks of the ECO projects that have been implemented during the recent period of 2019-2020 in the area of Transport and Communications. For reader friendly reflection of data labels indicating those of the member countries, the internationally recognized classification of county codes have been used and wherever pertinent the UN-registered three symbol country codes were used, accordingly. For statistical simplicity the name of the Republic of Kyrgyzstan has been indicated as Kyrgyzstan to align with data trends already reflected via time series starting from 1992 and onwards.

Questionnaires

The processes of primary input data-collecting, treatment, disseminating, and publishing the questionnaires have been in line with ECO practices as fully harmonious with UN-led practices of international harmonization of statistical data & information, compliant with the Fundamental Principles of Official Statistics.

The ECO-KSI data templates used as questionnaires have been approved by the 1st Meeting of the Heads of National Statistical Offices (NSOs) of the Member States on 28-19 September 2008 in Tehran, Iran. Since then, the template has been practiced as follows:

Table XVI. Transportation and Communications		
Explanatory notes	**Unit**	**Time Period**
16.1. Length of Asphalted Roads	Thousand Kilometers	
16.2. Number of Registered Motor Vehicles	Unit	
16.3. Number of Road Traffic Accidents	Number	
Suburban	Number	
Within Urban	Number	
16.4. Number of Commercial Vehicles	Unit	
16.5. Number of Passenger Cars	Unit	
16.6. Length of Railways	Kilometer	

16.7. Net Ton Kilometers Carried by Railways	Million Ton-Kilometers	
16.8. Gross Tonnage of Commercial Ships	Thousand Tons	
16.9. Airline Passengers Carried	Persons	
16.10. Total Number of Internet Users	% of population	
16.11 Number of Mobile Phone	Units	
16.12. Passengers carried by railway	Million passenger-km	
16.13. Container port traffic (TEU: 20 foot equivalent units)	Unit	

Questionnaires under typical frameworks of the ECO projects in transport and communications are normally designed by International Consultants and leading ECO Regional Expert/Specialists in the frameworks of relevant projects of which the concept proposals are endorsed by the ECO Regional Planning Council (RPC).

Questionnaires for transport modes (rail, road, maritime and civil aviation) have been designed in alignment with needs-based assessment needs of the ECO member States and the feedbacks have been collected through relevant Notes Verbal circulated to the Member States by the ECO Secretariat, accordingly.

Terminology

Terminology used in the present report has been disambiguated the contents of the acronyms and abbreviations. In instances where terminology defined under national legislations relating to transport and communications differs with the terminology used by official statistics, those selected terms have been explained in the content of the present document.

The statistical sub-groups used in the present project align with the categorization of the ECO activity area of Transport and Communications as envisaged in the ECO Transit Transport Framework Agreement (TTFA) as follows:

- Railways
- Roads
- Maritime
- Civil Aviation

Summary of Data Received

The statistical data and information relating to the ECO core activity area of transport and communications received from the Member States has been summarized as follows:

ECO Countries	Rail	Road	Inland Waterways	Intermodal Terminals	Sea Ports
Afghanistan	+	+			
Azerbaijan	+	+		+	+
Iran	+	+			+
Kazakhstan	+	+		+	+
Kyrgyz Republic	+	+			
Pakistan	+	+			+
Tajikistan	+	+			
Turkey	+	+		+	+
Turkmenistan	+	+			
Uzbekistan	+	+			+

Source: Staff recordings

Notes on Data Received

Questionnaires on Road were designed for ECO-KSIs as well as for transport related projects. The content of the filled in questionnaires have been sufficiently labeled and generally complied with the original design of the templates.

As per country-specific labeling, in selected countries of ECO the labels have been indicated in line with norms practiced in such countries but such labels did not affect the statistical value of the inputted data and information.

Data received in relation to Railway transport mode generally complies with classifications and definitions used by the International Railway Union (IRU) and Organization for Co-operation between Railways (OSJD) as stipulated in the TTFA (Article 24, Clause 5).

Likewise, data received on Road transport mode is compliant with classifications and definitions used by the International Road Union (IRU) in Part V and as prescribed in road-specific Annexes to the TTFA.

As per those for Maritime transport, classifications and definitions are aligned with provisions under Part IV of the TTFA.

In regard of Civil Aviation, the classification and definitions used in this air-borne mode of transport in ECO is aligned with relevant decisions and recommendations adopted by the Meetings of Heads of Maritime Reference Organizations (HMRO) of the ECO Member States.

Questionnaires relating to sea ports have had pertinence to only three countries that are internationally admitted as coastal sea countries. In terms of provision of the ports related data and information, the data on ports have also been provided in relation to sea ports located in Turkmenistan, Kazakhstan and Azerbaijan. The rest of the ECO countries are globally recognized as landlocked countries where specific sea port-overseeing agencies or government regulatory authorities are unavailable. These countries include such landlocked countries as Tajikistan, Afghanistan, Uzbekistan and Kyrgyz Republic. By the definition of the landlocked

developing countries (LLDCs) adhered by the United Nations Office of High Representative for Least Developed Countries, Landlocked Countries and Small Island Developing Countries (UN-OHRLLS), the seven ECO countries are recognized as the LLDCs.

As pertinent to inland waterways-related data, it is vested in most ECO countries with Ministries and executive agencies and central administrative authorizes that are not under the jurisdiction of Transport Ministries but rather under Ministries of Agriculture, Land, and Water Management/Use. In that regard, the subject data can be collected from above-stated authorities.

External factors influencing statistical trends reflecting ECO economic performance

During last quarter of 2019 and throughout 202o till present, the statistical trends shaping the economic performance of the ECO region have primarily been influenced by spillover effects caused by the coronavirus pandemic. These changes have necessitated the Coronavirus Statistics, which measures the span and scope of the pandemic causing global economic and financial and social crises.

Impact of coronavirus pandemic in transport

At macroeconomic level

According to the International Monetary Fund (IMF), major impacts have been such that 30% of value was lost in equity markets aggregating to US$6 billion dollars in monetary volume by March 2020. Similarly, the unprecedented capital outflows in decades have been observed in the aftermath of the coronavirus pandemic. The latter has led to the abrupt national currency devaluations in developing countries of the ECO region. The first quarter of 2020, which came to be the hardest in terms of the drastic effect of the coronavirus pandemic on people, 33 million applications have been registered worldwide as unemployed. The informal sector economy workers increased to 1.6 billion people in number.

At macroeconomic level, even the global economies have been hit to significant levels. Thus, China's economy fell by 6.8% during the first quarter of 2020 when the pandemic came down on countries most severely; the US economy shrank by 3.8%. The European regional economy temporarily went under by 3.8% whereas the estimates for the Asian and African regional economies are still differing in validated estimates.

Table 1: Comparative economic impact on world's international/regional organizations and global private research institutions in 2019 vs. 2020

Entities	Impact in 2020 vs. 2019	Time Interval

International Organizations		
OECD	-0.5 to -1.5 % GDP	March 2
OECD	-2pp per month of Confinement Policy	March 27
IMF	3.4%	October 2019
IMF	-3%	April 2020
WB	2.50%	January 2020
UNCTAD	-30% to -40% for FDI	March 26
ECB	-5.8% (3 Month) -2 % (1 Month) -10% (Months)	March 17
Private Global Research Institutions/Banks		
Morgan Stanley	-3%	March 25
Citigroup	0.5% - 1.3%	March 23
Oxford Economics	0% to -1.3%	End of March

Source: IMF

According to the World Bank development indicators, the impact on the countries, including those of ECO, has been considerable. Thus, the estimates for the dollar value of imports have ranged from the 10 to over 22 percent downfall in 2020 as the pandemic impact (under alternative analyses techniques). For details please see Table 2. The forecast for end 2021 is the bouncing back impact of 13.6% to 18.0% depending on which of the two analysis techniques will prove true.

Table 2: Impact on ECO imports in 2019-2020 and the 2021 forecast

			Estimate	**Forecast**	Estimate	**Forecast**
Importers	**Imported value in 2018 (In thous. USD)**	**Imported value in 2019 (In thous. USD)**	**2020**	**2021**	**2020**	**2021**
			-10%	13.6%	-22.6%	18%
ECO	404,242,894	351,206,355	316,085,720	359,073,377	271,833,719	320,763,788
Afghanistan	7,406,590	3,754,021	3,378,619	3,838,111	2,905,612	3,428,622
Azerbaijan	11,460,338	13,649,269	12,284,342	13,955,013	10,564,534	12,466,150
Iran	41,236,168	27,148,162	24,433,346	27,756,281	21,012,677	24,794,959
Kazakhstan	32,533,536	38,356,664	34,520,998	39,215,853	29,688,058	35,031,908

Kyrgyzstan	4,907,400	4,903,813	4,413,432	5,013,658	3,795,551	4,478,750
Pakistan	60,391,133	37,836,543	34,052,889	38,684,082	29,285,484	34,556,871
Tajikistan	3,144,346	3,327,744	2,994,970	3,402,285	2,575,674	3,039,295
Turkey	223,046,879	200,658,596	180,592,736	205,153,349	155,309,753	183,265,509
Turkmenistan	2,802,552	2,637,176	2,373,458	2,696,249	2,041,174	2,408,586
Uzbekistan	17,313,952	18,934,367	17,040,930	19,358,497	14,655,200	17,293,136

Sources: World Bank

By contract, according to the World Bank the estimates of the fall of the dollar value volumes of ECO countries exports have been pretty accurate at 8% in 2020 whereas the forecast for the certainty of growth dynamics in exports in 2021 has smaller margin of doubt between 8 and 9% depending on which of the two alternative analysis outcomes will prove authentic. For details please kindly see Table 3.

Table 3: Impact on ECO exports in 2020 and the 2021 forecast

			Estimate	**Forecast**	Estimate	**Forecast**
Exporters	**Exported value in 2018 (In thous. USD)**	**Exported value in 2019 (In thous. USD)**	**2020**	**2021**	**2020**	**2021**
			-8.0%	%8.6	-8%	%9.3
ECO	393,505,595	320,988,201	295,309,145	320,705,731	295,309,145	322,772,895
Afghanistan	884,504	708,680	651,986	708,056	651,986	712,620
Azerbaijan	19,489,068	19,635,580	18,064,734	19,618,301	18,064,734	19,744,754
Iran	96,617,521	26,987,767	24,828,746	26,964,018	24,828,746	27,137,819
Kazakhstan	60,956,233	57,722,942	53,105,107	57,672,146	53,105,107	58,043,882
Kyrgyzstan	1,764,613	1,965,502	1,808,262	1,963,772	1,808,262	1,976,430
Pakistan	23,778,621	20,745,921	19,086,247	20,727,665	19,086,247	20,861,268
Tajikistan	1,073,858	1,115,850	1,026,582	1,114,868	1,026,582	1,122,054
Turkey	167,923,862	171,098,411	157,410,538	170,947,844	157,410,538	172,049,718
Turkmenistan	10,098,303	9,921,778	9,128,036	9,913,047	9,128,036	9,976,943
Uzbekistan	10,919,012	11,085,770	10,198,908	11,076,015	10,198,908	11,147,407

Source: World Bank

With the greater impact on social strata, the pricing policies in the ECO countries have been impacted by the rise in inflation. Thus, in Iran, the annual inflation rate hit 35% while in other ECO countries it ranged between 5 and 15 percent rate. For graphic visuals please see figure 1.

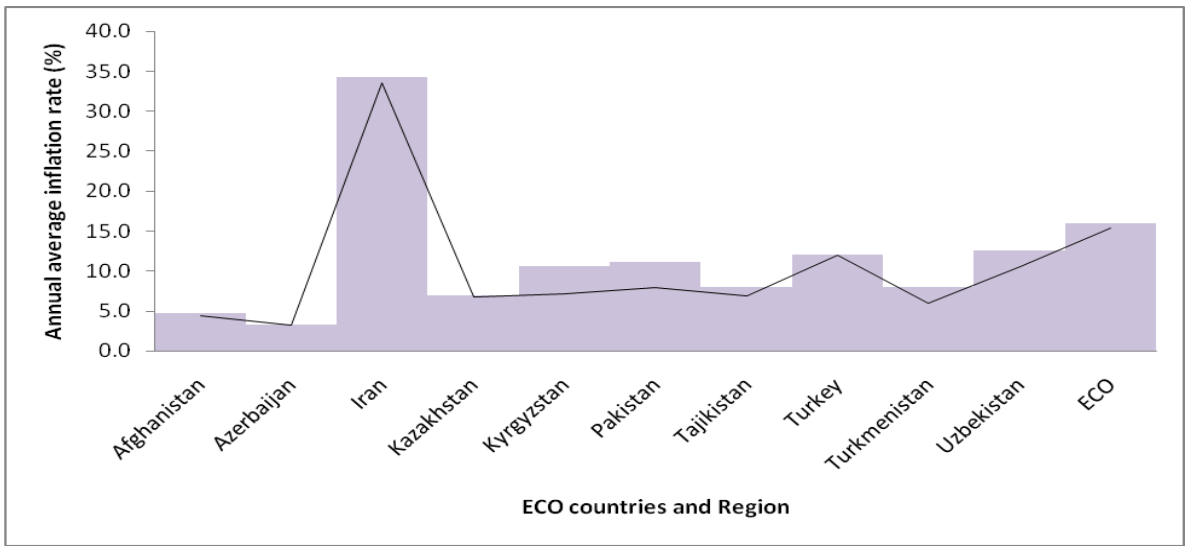


Figure 1: ECO Annual Inflation Rate (% change) 2020-est.2021, IMF

At ECO sector level

The impact on the ECO transport during the coronavirus pandemic has been limited.

Prior to outbreak of coronavirus, the share of transport in the combined GDP of ECO Member States during 2018 and 2019 has been observed as preliminarily assessed (below):

Transport Sector Share in GDP of the Member States, 2018-2019 (Local Currency Million) 2018-2019			
Member States	**2018**	**2019**	**%Change**
Afghanistan	140570	139295	-0.9
Azerbaijan	922.8	1066.3	13.5
Iran	29056	31525	7.8
Kazakhstan	2239739	3414175	34.4
Kyrgyz Republic	18214.3	20176	9.7
Pakistan	1590474	1643625	3.2
Tajikistan	6781	7435	8.8
Turkey	3875510	4095462	5.4
Turkmenistan	…	…	
Uzbekistan	…	…	

Source: Preliminarily staff assessments

The impact of COVID19 on the overall transport of ECO countries has resulted in a downward drop at an estimated 40%, which is in line with global trend in global transport in 2018-2019. According to International Road Union (IRU), major challenges associated with COVID19 have been most obviously demonstrated in road transport. Growth in road transportation is falling down by 40% whereas revenues from road transport operators are declining within the range from 50 to 100%, on average.

In view of the above, IRU has deployed active campaign at global level, advocating for free passage of goods, medicines and food supplies at border crossings encouraging the use of TIR Convention-generated tools and introducing "green lanes" under EPD as well as the IT related tools of TIR Convention. Cross border facilitation is one of the key targets of TTFA and takes lead in countering COVID-19 adverse effects via cross border facilitation.

ECO Secretariat released "ECO Guidelines on transit facilitation" in line with the provisions of TTFA, to counter the adverse effects of COVID-19, resultantly, most of the Member States allowed international traffic/freight traffic.
On the railway front, at global level, railways have been forecasted to earn 65% of the revenue from freight and 27% from passenger traffic during 2020-21, whereas only 2% loss in revenues from railway freight is predicted. Railway intends to re-gain the 10% share of its revenues that would have otherwise been generated by air transport through taking best use of opportunities generated by COVID-19.

In ECO region, Railway transport has been suppressed in some ECO countries but in others preserved its normal dynamics. COVID-19 impact was soft on rail transport, at around 12%, because although the passenger conveyance was completely halted, railway freight continued operating even during the pandemic peak.

On Civil Aviation, the worldwide impact of COVID-19 on this transport mode is expected to decline by 40% by the end of 2020 whereas in the month of March 2020 it was about 23%.

Due to suspension of passenger flights throughout the world since January 2020 only 20% passenger capacity has still been flying. Luckily, Air cargos remained operational and were kept flying during COVID19 outbreak as well as even succeeded in increasing their capacities during the period from February-April, 2020.

On the communication sub-sector, unlike in the overall transport sector, the communications sub-sector have benefited from COVID19 outbreak. That has occurred because of the increasing need for the digitalized communication during people's social distancing. In the near future, the needs for digitization of transport operations as well as digitalization of the transport sector may require widening of the present scope of communications.

Statistical Indicators on the Railway Transport Mode

Railway

The statistical indicators characterizing the ECO regional railway, at a recent glance, have shown higher values relative to other sub-sectors in the regional transport. The reason is that the ECO transport sector has been less impacted in terms of drastic spillover effects of global economic setback, caused by the coronavirus pandemic.

Visible expansion of railway lines within the ECO railway network (ERN) has been seen over the period 2000-2017. Thus, the overall railway length has been increasing at 0.9 percent, on average. In particular, the 3.9 percent increase of railway lines, compared to the previous year, was registered in 2017 whence the ECO's total length of railway lines reached 54,792 kilometers.

Table 4: Length of Railways (corresponds to Table 42 in the framework of the ECO Statistical Compendium

Length of Railways																		
ECO-KSI Table 42. Total Length of Railways (kilometer**)**																		
Country	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Afghanistan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	75
Azerbaijan	2,116	2,116	2,122	2,122	2,122	2,122	2,122	2,099	2,099	2,079	2,079	2,079	2,068	2,068	2,066	2,068	2,071	2,132
Iran	7,110	7,156	7,268	7,268	7,584	8,348	8,565	8,702	9,036	9,482	9,795	9,992	10,223	10,407	8,560	8,560	8,576	9,021
Kazakhstan	14,530	14,588	14,648	14,648	15,081	15,021	15,082	15,082	15,082	15,079	15,016	14,892	14,801	14,767	14,767	14,767	15,529	16,040
Kyrgyzstan	417	417	417	417	417	417	417	417	417	417	417	417	417	417	424	424	424	424
Pakistan	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791
Tajikistan	400	400	400	454	454	454	454	454	454	454	454	454	594	594	597	597	620	620
Turkey	8,671	8,671	8,671	8,697	8,697	8,697	8,697	8,697	8,699	9,080	9,594	9,642	9,642	9,718	10,087	10,131	10,131	10,207
Turkmenistan	2,500	2,500	2,500	2,500	2,500	2,529	2,529	3,069	3,181	3,095	3,115	3,115	3,115	3,115	3,115	3,115	3,230	3,840
Uzbekistan	3,645	3,911	4,126	4,126	4,126	4,014	4,014	4,005	4,230	4,230	4,227	4,227	4,227	4,227	4,227	4,238	4,304	4,642
ECO Region	*47180*	*47550*	*48,443*	*48023*	*49,272*	*49,893*	*50,171*	*50,816*	*51,489*	*52,210*	*52488*	*52609*	*52878.1*	*53104.1*	*51633.6*	*51690.6*	*52676*	*54792.3*

Source: ECOSTAT

Over the period 2000-2017, the positive dynamism in the volumes of net ton-kilometers carried by railways has been observed. Thus, the 2.6 percent increase, on average, has been recorded in ECO railway transport. In aggregate: 296, 382 million net ton-kilometers have been moved by end 2017, by rail. Those have shown an increase by 7.5 percent in 2017 compared to 2016.

Table 5: Net Kilometers carried by railways (corresponds to Table 43 of the ECO Statistical Compendium)

Net Ton-Kilometers Carried by Railways																		
ECO-KSI: Table 43. (Net Ton-Kilometers Carried by Railways (million ton-kilometer)																		
Country	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Afghanistan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Azerbaijan	5,770	6,141	6,980	7,719	7,536	9,628	11,059	10,375	10,021	7,592	8,250	7,845	8,212	7,958	7,371	6,210	5,192	4,633
Iran	14,179	14,613	15,842	18,048	18,182	19,127	20,542	20,229	20,540	20,247	21,779	21,008	22,604	22,400	22,511	25014	27243	30299
Kazakhstan	125,000	135,700	133,100	147,672	163,454	171,855	191,233	200,784	214,950	197,485	213,219	223,626	235,845	231,248	216,524	189,759	188,159	206,258
Kyrgyzstan	338	332	395	562	715	662	752	849	946	745	738	798	923	1,002	1,010	918	807	935
Pakistan	4,371	4,520	4,573	4,820	4,796	5,014	4,970	5,454	6,187	5,896	4,847	1,757	402	4,190	4,190	3,301	4,774	5,031
Tajikistan	1,326	1,250	1,086	1,086	1,118	1,066	1,220	1,274	1,282	1,282	808	703	555	402	390	317	228,3	165
Turkey	9,895	7,562	7,224	8,669	9,417	9,152	9,676	9,921	10,739	10,326	11,462	11,677	11,670	11,177	11,145	9,618	11,661	12,794
Turkmenistan	6,303	6,437	7,476	7,588	8,010	8,670	8,670	10,441	10,973	11,547	11,992	11,765	11,992	11,992	11992	11,992	13,327	13,327
Uzbekistan	15,021	15,732	18,428	18,887	18,007	18,090	18,100	19,281	21,594	24,238	22,200	22,533	22,686	22,711	22,932	22,935	22,937	22,940
ECO Region	182,186	192,239	195,092	245,223	245,223	245,223	266,221	278,608	297,181	279,373	*295 295*	*301 712*	*314 889*	*313 080*	*286 920*	*270 064*	*274 100*	*296 382*

Source: ECOSTAT

Passenger transportation by rail provided the services to 66.6 million people traveling by train in 2017. The growth trends in commutation and transportation of passengers by rail has been increasing steadily at 4 percent rate over the time series of 2000-2017. In the peak covid19 period and in its aftermath, the preference of passengers for transportation by rail versus road transportation has significantly increased. In pre-codid19 period, the increase was by 5 percent (end 2017) compared to 2016.

Table 6: Passengers carried by railways

Country	2000	2009	2010	2011	2012	2013	2014	2015	2016	2017
Afghanistan	0	0	0	0	0	0	0	0	0	0
Azerbaijan	493	1024	917.1	660.4	591.3	591.3	612	494.7	519.135	467
I.R. Iran	7119	16814	17611	17877	17172	17409	16272	14938	12982	13270
Kazakhstan	10215	14860	15447.88	16595.3	18498	19125	18317	17085	18165.1	19241.2
Pakistan	18495	18600	19111	20619	20788	18501	19779	20288	21201	22476
Tajikistan	73	45	32.8	31.5	24	22	18	16	18.4	28
Turkey	5832	5374	5491	5882	4598	3775	4393	4828	4325	4566

Turkmenistan	943	1725	1811	1811	1811	1600	1811	2326	2336	2340
Uzbekistan	2163	2632	2905	3025	3437.8	3211	3760	3758	3934	4294
ECO region	45333	61074	63326.78	66501.2	66920.1	64234.3	64962	63733.7	63480.64	66682.2

Source: World Bank

Highlights in railway transport (2019-2020)

During the recent period of 2019-2020, a breakthrough progress has been recorded in the area of Transport and Communications. The core highlights have been observed as below.

KTI Railway

At onset, the Kazakhstan-Turkmenistan-Iran Railway was constructed and put in operation in 2014. The commercialization of the railway started in 2017 under the joint ECO-IsDB-ESCAP project, which was successfully completed in December 2020 even under severe travel restrictions caused by the coronavirus pandemic.

Commercialization and activities relating to the post-project development of common corridor management mechanism (CMM) of the KTI Railway have resulted in adopting the Implementation Plan, which was unanimously accorded by all three enroute countries and thereupon taken for immediate action. According to the research study fulfilled for the purposes of full-scale commercialization along the KTI Railway, the structure of the currently trading goods and commodities along the KTI Railway has become well-diversified as reflected in figure 2. It is expected that under the planned increases in production volumes of the currently traded goods/commodities along the KTI Railway, the overall freight transported via KTI will double in the period till 2030 as reflected in chart below. For more details, please see the "*Study on Commercialization of the KTI Railway*" (available at: www.eco.int/research).

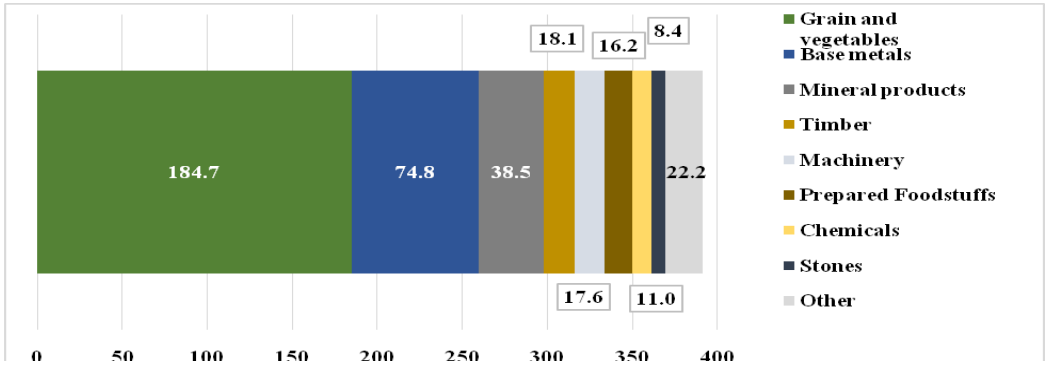


Figure 2: Structure of freight flows along KTI by types of commodities in tons (Excerpt from study on commercialization of the KTI railway performed in the ECO Transport and Communications)

The projections for freight increases on the KTI Railway have been calculated as in figure 3.

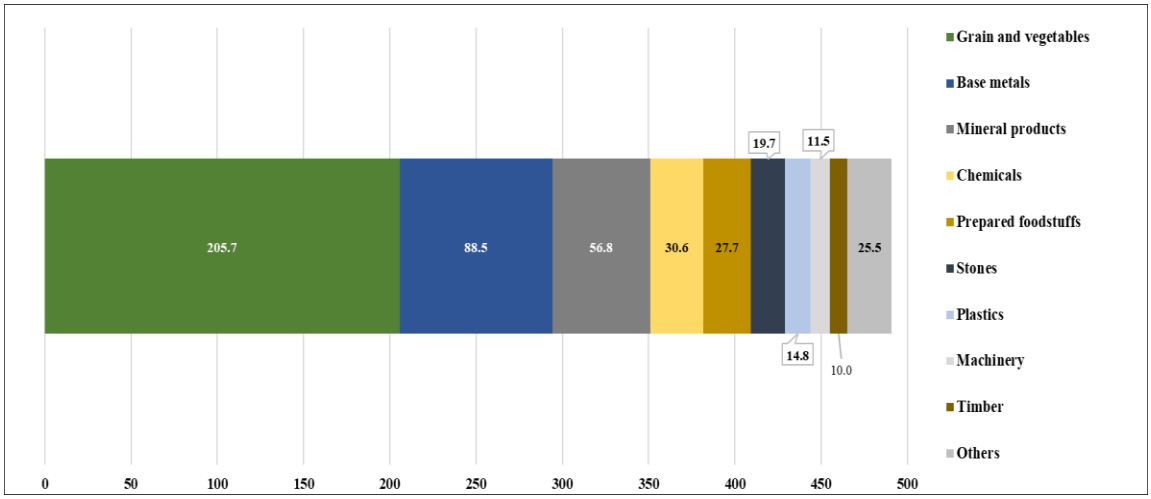


Figure 3: Forecasted freight flow increases till 2030 (Excerpt from study on commercialization of the KTI railway performed in the ECO Transport and Communications)

The commercialization effects of the KTI Railway are expected to be at the back of the 60.9 percent price reduction in train services and 31.8 percent increase in trade volumes. For details please consult figure 4 below.

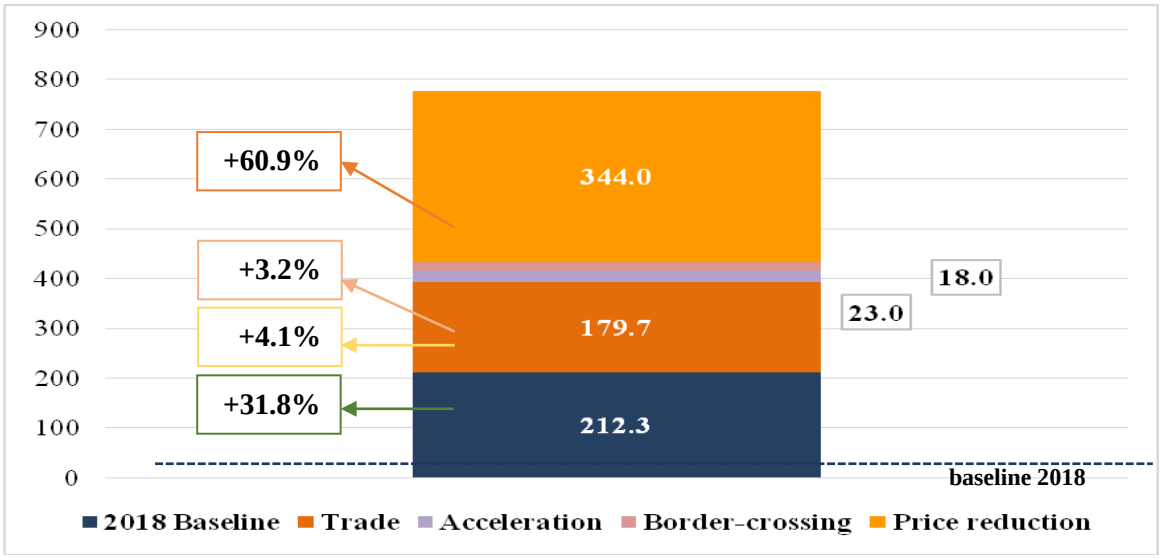


Figure 4: Commercialization effects of the KTI Railway (Excerpt from study on commercialization of the KTI railway performed in the ECO Transport and Communications)

Qazvin-Rasht-Astara (Azerbaijan)-Astara (Iran) Railway

Over the recent past (2019-2020), an impressive progress in the area of the ECO Transport and Communications has been realised through interconnecting the ECO regional transport network from within and with connectivities outside the region.

Thus, the construction of rail-based links along the Qazvin-Rasht section of the Qazvin-Rasht-Astara Railway has been completed. It marks a visible success. The total length of the Qazvin-Rasht-Astara Railway is 336km. It is to link the countries of ECO with the enroute countries of the International North-South Transport Corridor (INSTC). The latter corridor has originally been designed for the transportation of goods and commodities from countries of Europe through the Persian Gulf to the Indian Ocean. The Qazvin-Rasht-Astara (Iran)-Astara (Azerbaijan) is the integral part of the INSTC.

The construction of the first link, Astara (Azerbaijan)-Astara (Iran), was completed in 2018 whereas that of the second link (Qazvin-Rasht) in April 2018. The third link, which measures 163 kilometers of the Rasht-Astara line, is currently under construction.

The test run of loaded container train along the 164km Qazvin-Rasht railway line, which in its turn is a component of the Rasht-Astara project linking Azerbaijan and Iran, was fulfilled in November 2018. Commercial runs of container train along Rash-Astara were tested up until end February 2019. The tests have proven that 5 million tonnes will be transported on this railway section during 2020-2022; subsequently, the volumes will increase to over 10 million tonnes. Thus, the railway is prepared to carry 4 million passengers as per railway's designed capacity.

Figure 5: Commercial train test run on Qazvin-Rasht railway link

On 6th March 2019, the official inauguration of the Qazvin-Rasht railway line commissioned the full-fledged operation of the Qazvin-Rasht-Astara railway.

KTAI

On 10th December 2020, the Haforzan Railway link was opened for regular railway transportation and the "Integra Construction Company" of Kazakhstan involved in the 4th

phase of the construction of this railway link is set forth to build 43 kilometers of the Haforzan Railway link. Currently, the railway stretch, coming to its completion, originates from the railway station of Khaf (Iran) to that of Rozanak (Afghanistan).

Figure 6: Intensified construction works on the KTAI Railway

In the beginning of the current year 2021, the ECO Member States (that are enroute countries of the KTAI) confirmed their commitment to complete the construction of the KTAI Railway in observance of the 1435mm standard gauge size, based on Protocol agreed and signed among the en-route KTAI Member States, in 2015 in Bishkek in the Kyrgyz Republic (paragraph-25, B. Sector: Transport and Communications, Work Programme 2021; adopted by the 31st Regional Planning Council Meeting, 12-21 January 2021, ECO Secretariat).

In the direction from Turkmenistan, the 13km stretch of the KTAI Railway route has been built from railway station at Aqina. In its turn, Uzbekistan has recently initiated a complementary railway link toward the KTAI whereas Tajikistan has confirmed its involvement in this new railway link. Both, Uzbekistan and Tajikistan, have shown a keen interest in the advancement of the KTAI Railway construction.

Another important milestone in breakthrough developments in the area of the Transport and Communications of ECO has been the completion of pre-feasibility and feasibility studies on the construction of the KTAI Railway. This railway is a joint effort of the five enroute countries, including, Kyrgyz Republic, Tajikistan, Afghanistan and Iran (KTAI).

ITI

The Islamabad-Tehran–Istanbul (ITI) Container Train is expected to resume its operation in 2021. This task will be fulfilled following the recommendation of *Turkmenbashi Declaration* adopted by the 9th Meeting of Ministers of Transport of the ECO Member States (1-3 May 2018, Turkmenbashi (Turkmenistan)), which mandated the States for "early operationalization and commercialization of ECO's existing railway routes" (paragraph-3, ibid). Of those routes the ITI

Railway represents the main blood artery in ECO Transport Network. The *Declaration* distinctively called for ECO Member States "to speed up the process of rehabilitation of existing railway segments" along the existing routes (paraghraph-4, *Turkmenbashi Declaration*).

The resumption of regular operation of ITI Railway has become possible owing to collective efforts of Railways of Turkey, Iran and Pakistan. The 10th ECO High Level Working Group, which oversees the operations of the ITI Container Train, was held on 20-21 August 2019, in Ankara (Turkey). It adopted important decisions directly involving necessary preparations for the dispatch of the ITI Container Train. The National Focal Points, specifically designated for operational matters of the ITI, have made it possible that ITI Container Train (renamed into the transnational **ITI Cargo Train)** resume its operation, as planned. The latter was launched in March 2021 backed up with firm Governments support.

Figure 7: Testament of friendship and cooperation among the enroute countries of the ITI Cargo Train, 2021

The effects of the regular operation of the ITI Cargo Train are immense. As with the 6,543 kilometers' length of the ITI Railway corridor and trade exchange among the enroute countries to reach US$32 billion in near future, the transnational ITI Cargo Train has indeed become a life artery owing to the concerted endeavor of the three enroute countries, Turkey, Iran and Pakistan. The train schedule along the entire corridor is just 12 days at the operating capacity of 750 metric tons of commercial goods. The operation of the train is a good omen of long lasting friendship and cooperation in ECO.

Analytical statistics: New and innovative changes in ECO railway transport mode

Analytical statistics in the subject area helps identify the promising areas for future advancement in statistics. It also helps obtain the conceptualization, in a more detailed manner, of the emerging streams of cooperation and interaction that are justified by common interest of

the member countries. In this regard, the following instances of the analytical statistics are herewith presented. They deal with matters relating to technical interoperability among railway networks inside ECO region. While the study on commercialization of the KTI Railway (in previous section) focused on freight flows for commercialization of the KTI Railway corridor and advised on regulatory frameworks to be developed among KTI enroute countries, the below statistical analysis, by contrast, focuses on technicalities of the interoperability among enroute railways following the provisions of the ECO TTFA, COTIF/CIM, CIV and within frameworks of OSJD and UIC. It is fully aligned with the common management mechanism explored under the KTI Railway.

Technological Implications: Innovations and performance on transport infrastructure and logistics

In the context of new innovations in railway the notion of the 'innovations is an important part of transport infrastructure and logistics' (Ferrari, 2018). In that regard, this section deals with the description of where ECO countries stand in global performance on transport infrastructure and logistics. According to previous year's ranking, Turkey, Iran and Kazakhstan were amongst the top ECO countries by performance on infrastructure and logistics. The input data for ranking in ECO was derived from World Bank's Logistics Performance Index set for year 2018. In overall, the ECO's top ranking countries in transport infrastructure and logistics staged 60 out of 103 of the ECO regional average with the collective score of 2.6 for the region. Taken separately, Turkey came to be the highest performing country in this area holding the 47th rank, Iran 64th, and Kazakhstan 71st. Figure 1 of analysis (figure 7 of statistical bulletin) reflects the ECO countries' performance on infrastructure and logistics in 2018. Having identified the positioning of countries in the ECO region, the analysis focuses on how new innovations in railway, basing on the regional countries' performances in transport infrastructure and logistics, can influence the ECO Railway Network at the broader regional level.

Top ranks	Country	Year	LPI Rank	LPI Score	Customs	Customs	INFRA	INFRA	Int shipments	Int shipments	Logistics competence	Logistics competence	Tracking/Tracing	Tracking/Tracing	Timeliness	Timeliness
	Afghanistan	2018	160	1.95	158	1.73	158	1.81	152	2.1	158	1.92	159	1.7	153	2.38
	Azerbaijan	2018	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	**Iran**	2018	64	2.85	71	2.62	63	2.77	79	2.76	62	2.84	85	2.77	60	3.36
3	**Kazakhstan**	2018	71	2.81	65	2.66	81	2.55	84	2.73	90	2.58	83	2.78	50	3.53
	Kyrgyzstan	2018	108	2.55	55	2.75	103	2.38	138	2.22	114	2.36	99	2.64	106	2.94
	Pakistan	2018	122	2.42	139	2.12	121	2.2	97	2.63	89	2.59	136	2.27	136	2.66
	Tajikistan	2018	134	2.34	150	1.92	127	2.17	133	2.31	116	2.33	131	2.33	104	2.95
1	**Turkey**	2018	47	3.15	58	2.71	33	3.21	53	3.06	51	3.05	42	3.23	44	3.63
	Turkmenistan	2018	126	2.41	111	2.35	117	2.23	136	2.29	120	2.31	107	2.56	130	2.72
	Uzbekistan	2018	99	2.58	140	2.1	77	2.57	120	2.42	88	2.59	90	2.71	91	3.09

Table 7: Performance of ECO countries on transport infrastructure and logistics (statistical data of railway network)

Technological and technical implications of new innovations for railway

There exists an opinion that the new innovations in railway, including high speed rail (HSR), intelligent railway, and others, may not be needed in developing countries for the reason that they require heavy investment. The latter becomes a deadweight burden on the developing countries' public budgets. There were instances where some developing countries, Indonesia among others, took considerable time to eventually accept the loans under the large-scale HSR projects (Chew, 2015). Indeed, the innovations mostly come from advanced countries in their search for new expansive markets (Sergeeva, 2018). The quest for ways of minimizing the costs associated with bringing in new innovations to railway has remained acute, as ever. Even in advanced countries, HSR, along with some other innovative railway projects, may turn out to be complex in order to fully align the innovative transit plans with existing regulatory requirements, local stakeholder opposition, and a polarized political environment in the countries initiating such innovations (Rockwood, 2018). And yet, HSR is only one of much broader expanse of new innovations in railway. To that end, wouldn't it be reasonable to apply the new innovative products instead of comprehensive mega projects, such as HRS, which requires mass investment, new skill, and lengthy time to implement (Shunquan). As an alternative, which is less painful, the new innovative solutions (applications) may well serve the specifically-tailored needs of developing countries. Those could well-fit those countries that are currently undergoing their transition onto the mid-to-advanced level in their development paths. To that effect, this analysis, while recognizing the lasting need for comprehensive solid investments that bring in new innovations at much broader regional scale, in the form of the newly innovative mega-projects like HSR, suggests looking closer into specific innovative solutions for railway. The latters promise to work well, in the meantime, to address most urgent needs of developing countries. From that stance, today's needs for new innovative solutions in railway have been clearly specified by ECO's diverse stakeholders. Their prime focus is on the filling-in of the missing links in their currently available infrastructures, logistics and freight throughput to be moved by rail. Their forward-looking focus is eventually on sustainable transport networks (Yoan, 2017).

For practical reasons, the listing of railway-specific innovations solutions (applications) has been reflected in table 2 of analysis (corresponding to table 9 below of statistical bulletin). These highlight their close alignment with the present day needs of the ECO countries as strategized in their transport plans and programs.

The outstanding needs of national railway networks of the ECO countries have been multiply discussed at the regional level through high-level meetings of Heads of Railway Authorities of the ECO Member States. Thus, the ECO stakeholders' prime concerns are associated with low 'cargo mobilization'[1] on the key regional railway corridors (Ministerial, 2018). The need for the new innovations solutions to handle infrastructure inefficiencies is through the automated

[1] The ECO specific term - 'cargo mobilization' - has been construed in the present report as 'railway freight traffic flow'.

bogie change. The change of bogies is one of the most acute challenges for the regional railway. As such, it has especially been prioritized by stakeholders.

Table 8: Innovations solutions in railway

Types of innovations	Expected Change	Expected Benefits	Efficiency	No.
Green electricity stations	Increase in share of green traction system to 80% by 2025	Save up to 35,000 tons of CO_2 p/y	96 stations in ECO region are used y\y	1.
Hybrid Power Pack	Conversion of rail fleet to hybrid	Benefits of battery-powered and diesel-powered traction system merged into an electrical unit to function both as a motor and a generator	Noise reduction up to 75% and reduction of CO_2 emissions by 20%	2.
Freight wagons with modular frames enabling automated bogie change	Use of flexible flat steel shipment	Multimodality Flexibility Cost effectiveness	1-2% less energy consumption	**3.**
Natural gas powered train	Conversion of trains to methane	Carbone dioxide emissions by 20% by 2025	Replacement of 200 trains will saves up to US$3 mn in fuel costs.	4.
Low maintenance automation trains	Track machines to operate under weather conditions	Additional traffic volumes amount of 23.9 million tones p/y by 2025		5.
Weld traceability across supply chains in the rail sector	Facilitating the recording and transmission of data b/w welding parties	Saves time on Manuka form completion; Provides instant information on each weld	Industry 4. Visibility (via Pandrol Connect)	6.
Robotic installations	Bogie design and production			7.
Advanced truck systems (ATS)	2-pace bogies system	Increase payload; Reduce wheel and track wear	Predicts wheel set conditions; Planned maintenance;	8.
Hydrogen trains	Emits water only	Decarbonized railway	Generation of highly skilled engineering jobs	9.
On-board railway electrical system				10.
Dual system, electricity and diesel autonomous locomotives	Handles both, shunting and lining operations without changing the vehicle	Autonomous steering system controlled by artificial intelligence	Installation of system of sensors, cameras, gyroscopes	11.
On-line marketplace in the railway sector	Specialized platform for buy and sell mobility-related products and	Fluidity to supply chains of mobility; orders; delivery Covers trains infrastructure depots		12.

	services	and stations		
Rail Cube Software Solutions	Digital planning, ordering and dispatch.	Standardization across borders.	Comprehensive door-to-door logistics Connection to economic. areas	13.
Digital railway system				**14**

Source: Statistical data of ECO countries' railway networks

Based on the above explanations, this analysis singles out among the many new innovations solutions, the following ones: No. 3: Freight wagons with modular frames enabling automated bogie change and No.14: Digital railway system out of 14 reflected in Table 2. The choices have entailed from the first priority issues that have been specified by stakeholders at high level for the ECO.

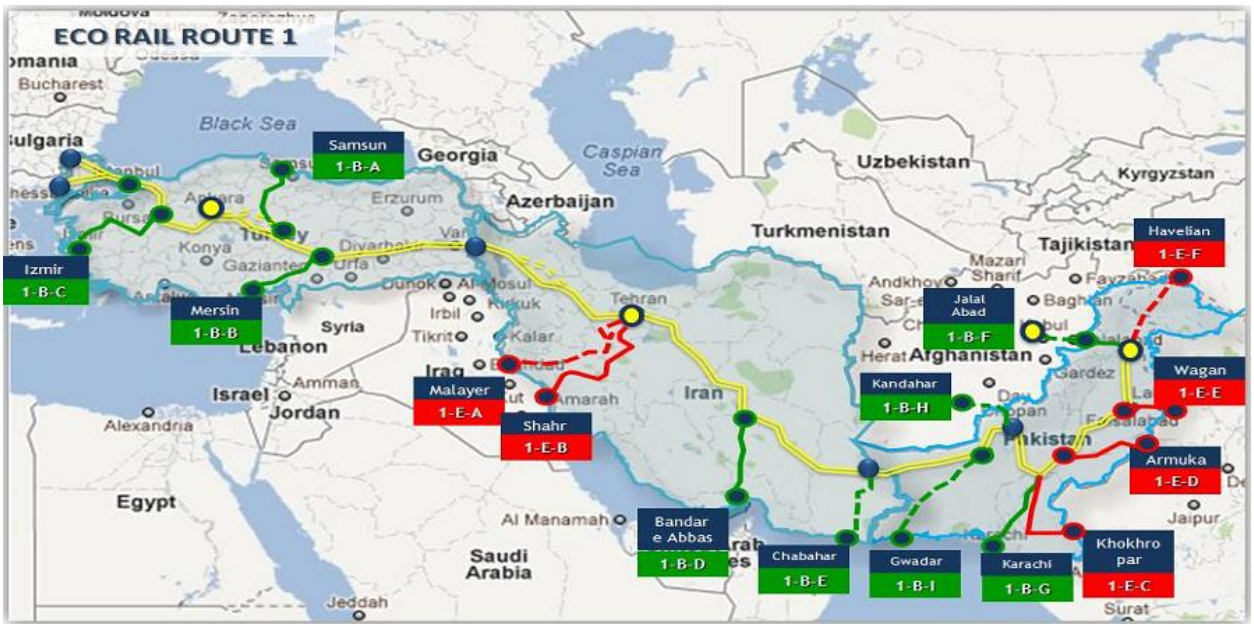
As with the acknowledging of ever acute need for new innovations solutions in railway, the analysis saw it reasonable to define the 'operational efficiency' in individual railway networks of the ECO countries. That would help identify how the efficiency changes with the introduction of new innovations solutions in the regional railway. In so doing, the analysis, at onset, developed clear measurements to identify how established are the operational capacities in the individual railway networks of the ECO countries, under the present observation.

Defining of ECO railway network's operational efficiency

The ECO Railway Network (ERN) was established in 2012 (Tsamboulas, 2012). It has five key railway corridors that have, in the ECO context, been named as 'routes'. Those are, as follows:

Route No.1 (6543km)

Turkey
(Bulgaria border)-Kapikule/(Greece border)-Uzunkopru-Istanbul
(European side)-Ferry segment (tunnel under construction)-Istanbul (Asian side)-Izmit-Bilecik-Eskisehir-Ankara-Kayseri-Bostankaya-MalatyaElazig-Mus-Tatvan-Ferry Lake Van (new alignment planned)-Van Kapikoy-(border with Iran)
Iran
(border with Turkey)-Razi-Sufiyan- Tabriz-(Maraqeh)-Miyaneh (under construction)-Zanjan-Qazvin – Aprin (near Tehran)-Mohammadiyeh Kashan-Yazd-Bafq-Kerman-Bam-Zahedan-(gauge change to 1676
mm)-Mirjaveh-(border with Pakistan)
Pakistan
(border with Iran)-Taftan – Nok Kundi-Dalbandin-Ahmad Wal-SpezandKolpur-Abi Gum-Sibi-Jacob Abad-Rohri-Samasatta-Multan-KhawalFaisal Abad-Wazirabad-Lalamusa-Rawalpindi-Islamabad

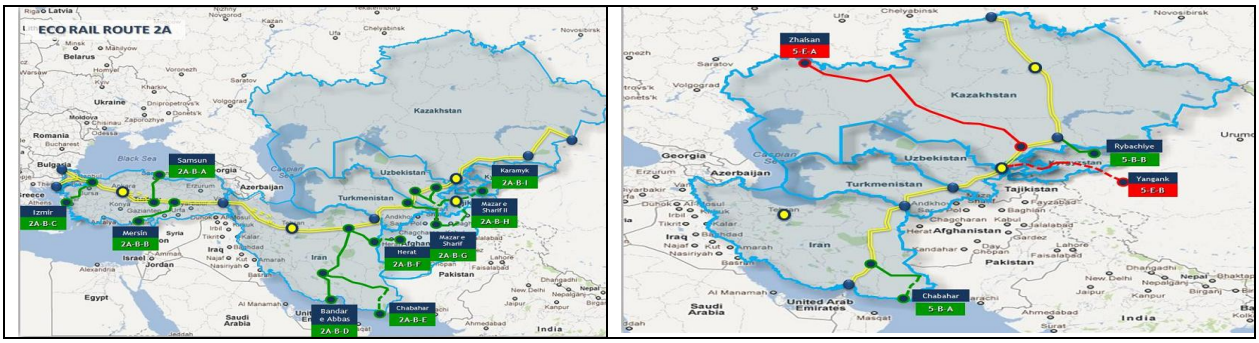


Map 1: Map of Route 1

Route No 2 (5626km)

Turkey
(Bulgaria border)-Kapikule/(Greece border)-Uzunkopru-Istanbul
(European side)-Ferry segment (tunnel under construction)-Istanbul (Asian side)-Izmit-Bilecik-Eskisehir-Ankara-Kayseri-Bostankaya-MalatyaElazig-Mus-Tatvan-Ferry Lake Van (new alignment planned)-Van Kapikoy-(border with Iran)
Iran
(border with Turkey)-Razi-Sufiyan- Tabriz-(Maraqeh)-Miyaneh (under construction)-Zanjan-Qazvin-Aprin (near Tehran)-Semnan-Neyshabur-Sarakhs-(border with Turkmenistan)
Turkmenistan
(border with Iran)-(gauge change to 1520mm)-Serakhs-Yoloten-Mary-Turkmenabad-Farab- (border with Uzbekistan)
Uzbekistan
(border with Turkmenistan)-Khojadavlet-(Bukhara)-Navoi-SamarkandJizzakh-Khavast-Tashkent-(border with Kazakhstan)
Kazakhstan
(border with Uzbekistan)-Saryagash-Arys-Shymkent-Lugovaya-BirlikAlmaty-Aktogai-Dostyk-(border with China**)** towards
Alashankou/Urumchi

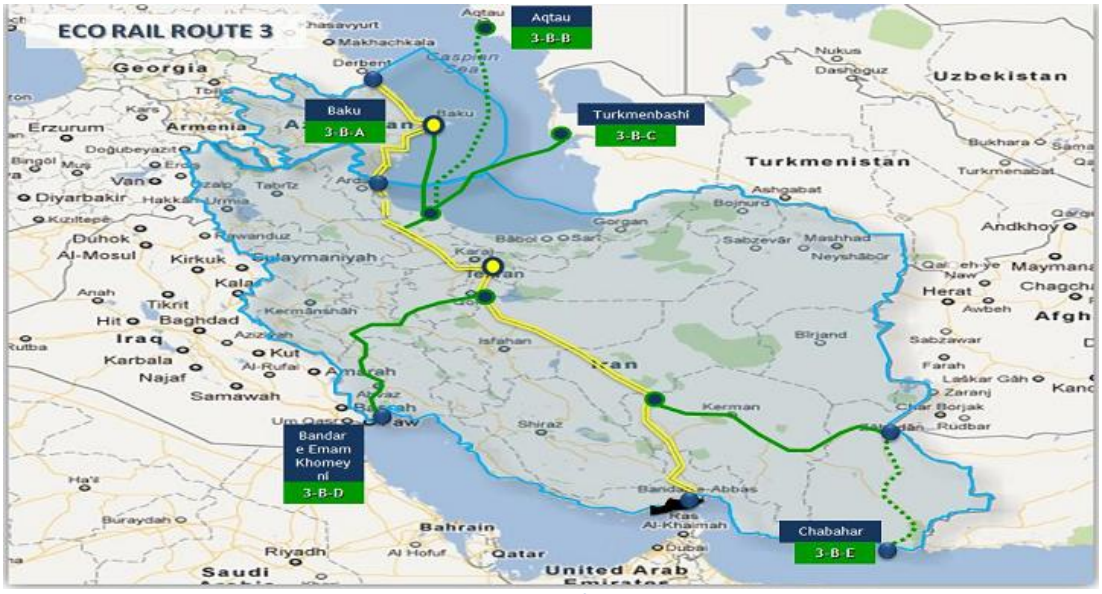
Istanbul-Almaty (ECORail2A)	**Bandar Abbas – Almaty** (ECORail5B)



Map 2: Map of Route 2

Route No. 3 (338km)

Main route connected to branches	Branches
Azerbaijan [railway gauge 1520mm] (border with Russia)-[standard gauge]-Yalama-Sumgait-Baku-Astara-(border with Iran) **Iran** (border with Azerbaijan)-Astara-(under construction)-Qazvin-Karaj-Tehran-Qom-Yazd-Bafq-Sirjan-Bandar e Abbas **Branches: ECO RAIL 3-B-A (CASPIAN SEA, AZERBAIJAN, IRAN)** [Construction completed: Qazvin-Rasht and Bandar e Anzali]-ferry segment to Baku exists. (Azerbaijan) **ECO RAIL 3-B-B** **(CASPIAN SEA,** **KAZAKHSTAN,** **IRAN)** [under construction: Rasht-Astara and Bandar e Anzali]-missing ferry segment to Aktau (Kazakhstan)	**ECO RAIL 3-B-C** **(CASPIAN SEA,** **TURKMENISTAN,** **IRAN)** [under development: Qazvin-Rasht-Bandar e Anzali]-ferry segment to Turkmenbashi (Turkmenistan) **ECO RAIL 3-B-D** **(IRAN)** Qom-Arak-Ahvaz-Bandar e Emam Khomeini **ECO RAIL 3-B-E** **(IRAN)** Bafq-Kerman-Zahedan-(under construction) Chabahar



Map 3: Map of Route 3

Route No. 4 (924km)

Kazakhstan

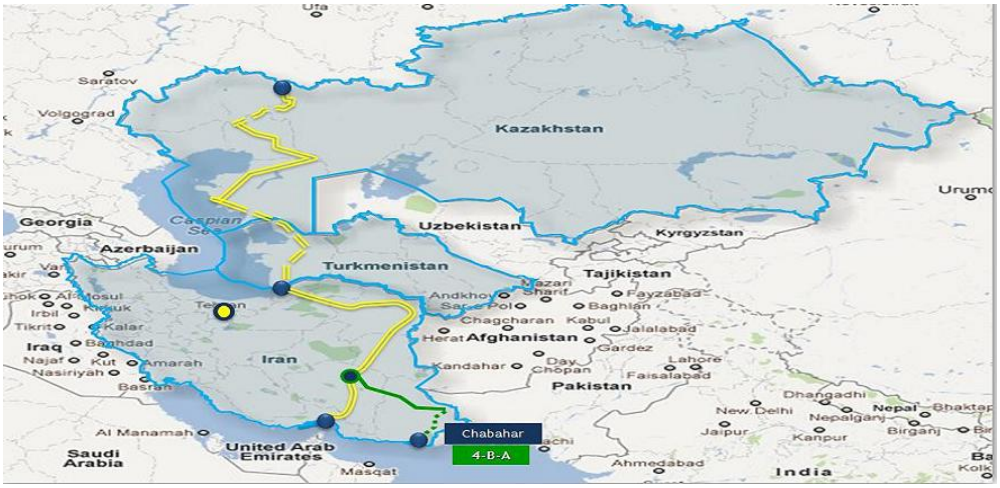
(border with Russia)-Zaisan-Aktobe-Kandagach-(under construction)-Makat-Beineu-Aktau-Uzen (under construction)-(border with Turkmenistan).

Turkmenistan

Under construction: (border with Kazakhstan)-Bereket-Godurolum-(border with Iran).

Iran

(under construction)-(border with Turkmenistan)- [railway gauge 1536mm]-new line to Incheh-Boroon-Gorgan-new line Shahrud-Neyshabur-Torbat e Heydarieh-Bafq-Sirjan-Bandar e Abbas.



Map 4: Map of Route 4

Route No 5. (est. 1,200km)

Kyrgyzstan

New line: (border with Tajikistan)-Sary Tash-Irkeshtam-(border with China) towards Kashgar (Kashi)

Tajikistan

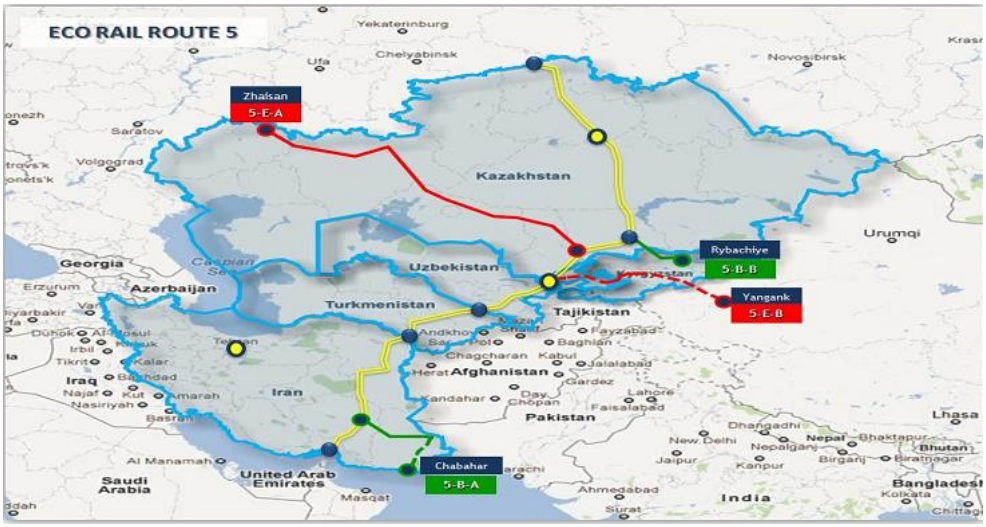
[under construction: (border with Afghanistan)-Nijnii Pyanj-DustiKalkhaz Abad]-Kurgan Tube-Kulyab-(new line)-Yavan-(under construction)-Vahdat-(new line)-Karamyk-(border with Kyrgyzstan).

Afghanistan

(border with Iran)-under construction until Herat-[new line: Kusk-Kalainau-Meymaneh-Andkoy-Sheberghan-Mazar e Sharif]-[under construction: Baghlan-Kunduz-Sherkhan Bandar- (border with Tajikistan).

Iran

(border with Turkey)-Razi-Sufiyan- Tabriz-(Maraqeh)-Miyaneh (under construction)-Zanjan-Qazvin-Aprin (near Tehran)-Semnan-Neyshabur-Sarakhs-(border with Turkmenistan)-Ma'dan-e Sangan (under construction until border with Afghanistan).



Map 5: Map of Route 5

The above-described five key railway routes of ECO are in ownership of the key nodes in each (ECO, 17-18 May 2017). The following table illustrates the number of nodes within each of the five of ECO's key railway routes, dubbed after the names of the country they belong to.

Table 9: ERN key routes, nodes, rail-based segments, innovations-paired segments

No.	Nodes	ECO Railway Routes	ECO-specific names of railway routes	Indication of railway segments that are connected to nodes
1	Zahedan-Taftan	No. 1	ITI	z
2	Serakhs	No. 2	ECORail2A-5B	s
3	Astara	No. 3	Qazvin-Rasht-Astara	a
4	Incheh-Borun	No. 4	KTI	i
5	Turgundi	No. 5	KTAI	t

The following definitions in the analysis have been used to employ the key measurements for the analyses to describe major parameters of such indicators:

Table 10: Definitions used in statistical analysis

ETNE – ECO Transport Network Efficiency ERNE- ECO Railway Network Efficiency ETNE, T=(N, A); ERNE = ε; I – Innovations meaning the new innovations solutions such as applications that are specific for ECO; N – set of the ERN's nodes consisting of I_n elements;	A – set of the ERN railway lines with n_a elements; W – set of Origin-Destination (OD) pairs of the ERN nodes with n_w elements; K_n – set of patterns connecting the OD pairs; q_w – demand for the OD pairs.

In each node the number of stations varies: the KTI (Map 4: Route 4.) has only 12 stations along the entire corridor whereas the Istanbul-Almaty & Almaty-Bandar Abbas railway corridor has 37 stations and ITI railway corridor has 48 stations. The analysis under this analysis focuses on the consideration of railway freight traffic flow (x_z), which in the context of the present analysis stands for 'cargo mobilization': (x_z). The analysis also focuses on the new innovations solutions termed under the present analysis as the 'Innovations': ($I_z(x_z)$. The latter has been examined from the point of view of how it may impact railway freight traffic flow i.e. 'cargo mobilization' (Report of the 13th Meeting of Heads of Railway Authorities of the ECO Member States, 17-18 April, 2017). As mentioned earlier in the analysis, the ECO stakeholders have particularly been deeply concerned about 'cargo mobilization' by rail, which, in their opinion, has been low (The 9th Meeting on ITI Container Train, 12 July 2017). Likewise, (x) has been examined through the prism of how it be impacted by (I), both being one of the major components of the ERN, under this report. The term−'Innovations'−has been used in the analysis to indicate a set of the new innovations solutions (applications) that are specific for ECO (for details pl. see table 4 of analysis corresponding to table 11 of statistical bulletin).

With the objective of exploring how the new innovations solutions will impact the functioning of the ERN, the analysis has deployed the two component non-parametric analysis (Sarmento, Renneboog, & Verga Matos, 2017) by using formula of defining the efficiency of the railway network: $\varepsilon = \varepsilon(R, q) = \frac{1}{n_A} \sum_{z \in A} \frac{x_z}{m_z}$; . In the context of the ECO, *R* indicates the regional railway network. Thus, the analysis method admitted that the function of the Innovations is, in fact, its cost value. The latter has been admitted under the assumption that prior to implementing any new innovation into practical life of any given railway network in the ECO region, the stakeholders in the member countries will first look into how feasible the innovation may turn out to be, in terms of its cost. Thus, the Innovations I_z (x_z) in this analysis has been reflected through the following equation:

$$I_z = \left[1 + \alpha \frac{x^z}{c^z} \beta\right]; \quad (1)$$

In equation (1), c_z- capacity of railway segment z;
α and β – the Innovations cost's parameters that were set as constant at: α=0.15; β=4;
The latter parameters evolved from the regional average score on infrastructure and logistics, which when adjusted to the realities of the ERN resulted in the above numeric values that have been taken as constant for computations under the present analysis.
The conditions for indicator variable σ_k^a have been set as: $\sigma_k^a = \begin{cases} 1 \text{ if segment } \alpha \text{ is on the path } K; \\ 0 \text{ otherwise;} \end{cases}$
In equation (5) *m* stands for railway cargo mobilization cost, which has been admitted by stakeholders to be low on rail-based segments (RPC, 14-15 Deecember 2017);

Railway cargo mobilization pattern on a given rail-based segment has been set at:

$$\text{Min} \sum(x) = \sum_{\alpha \in A} \int_0^{x_a} I_a\ (y)dy; \quad (2)$$

s.t.d. $\sum_{mk}^{w} = qW, \forall\, W \in W;$ (3)

$$x_a = \sum_{w \in W} \sum_{k \in K} mk\, \sigma_k^a, Y_q \in A; \quad (4)$$

$$m_k^w \geq 0, \ \forall w \in W, \ Y_k \in K_w; \quad (5)$$

Defining the role of the innovations in the ERT and ERN

The analysis recognizes the need for the new innovations solutions as seen in this analysis to minimize its cost in order to be feasible for the ECO stakeholders to implement innovations in their respective railway networks. For that, the analysis finds the efficiency of the overall ECO Transport Network (ERTE), indicated as 'E'. Such step is needed because the ECO Railway Network (ERN) is, in fact, part of the ECO Transport Network (ETN) (Shimoya, 2016). The formula deployed for computing ERTE has been, as follows:

$$E = E(T) = \frac{1}{n(n-1)} \sum_{c \neq s,z} \frac{1}{d_{s,z}}; \quad (6)$$

In formula (6) E is the efficiency of ETN;
n – number of elements in ETN;
d – demand for cargo mobilization in ETN;
z, s – railway segments within ERN.
The analysis first identifies the levels of prominence of the ERTE components' values. The latters are to be used to then define the impact of the innovations on the railway traffic flow i.e. cargo mobilization. In the formulaic context, ERTE is 'T' Thus, T and t∈T have been presented, as follows:

$$p_t(t) = \frac{\Delta \varepsilon}{\varepsilon} = \frac{\varepsilon\,(T,d) - t(T-t,d)}{t\,(t,d)}; \quad (7)$$

In equation (7) $p_{\varepsilon\,(t)}$ is the prominence value of component t based on the ERN's efficiency ε;

T-t represents the status of the ETNE indicating instances when it functions without the innovations solutions embedded in component *g* of ETN (T);
The ranking of prominence values has been fulfilled in the descending order with the upper bound having been set at '1' following the WDI indexing.
The prominence value of the ERN's component t∈T, basing on the ETN's overall efficiency E, has been formulaically employed, as follows:

$$p_E(t) = \frac{\Delta E}{E} = \frac{E\,(T,d) - E(T-t,d)}{E\,(T,d)}; (8)$$

The analysis while assuming that the rail-based segment marked as 'with the innovations solutions introduced', presented the cost function of the new innovations solutions, as follows:

$$p1_{a\,(x_z)} = 10[(1 + 0.15\left(\frac{x_z}{4}\right)^4; (11)$$

$$p1_{s\,(x_s)} = 15[(1 + 0.15\left(\frac{x_s}{6}\right)^4; (12)$$

$$p1_{a\,(x_a)} = 12[(1 + 0.15\left(\frac{x_a}{3}\right)^4 ; (13)$$

$$p1_{d\,(x_i)} = 15[(1 + 0.15\left(\frac{x_i}{10}\right)^4 ; (14)$$

$$p1_{t\,(x_t)} = 20[(1 + 0.15\left(\frac{x_t}{8}\right)^4 ; (15)$$

In the above equations, p1 (x_t) is the cost value prominence of component *t* based on the ERN's efficiency ε;

By using the generalized gradient projection method, which is commonly applied in analyses when it concerns the differing levels of items under an observation, the analysis computed the following numeric values:

$\bar{x} = \bar{x}_z, \bar{x}_s, \bar{x}_a, \bar{x}_i, \bar{x}_t \}$ = {5.7728, 4.2272, 6.1893, 5.4165};

Based on the above-described equations and *x*, the analysis computed the ETN's efficiency i.e. ERTE, as follows: E =0.0195. It also computed the ERN's efficiency (ERNE), as follows: ε=0.2688. Based on the resulting numeric values, the total cost value of new innovations solutions has equaled to: 120.5456.

Stemming from the structuring of the ECO Railway Network (ERN), the below table illustrates the ERN's railway nodes and rail segments.

Table 11: The ERN nodes and ERN rail-based segments

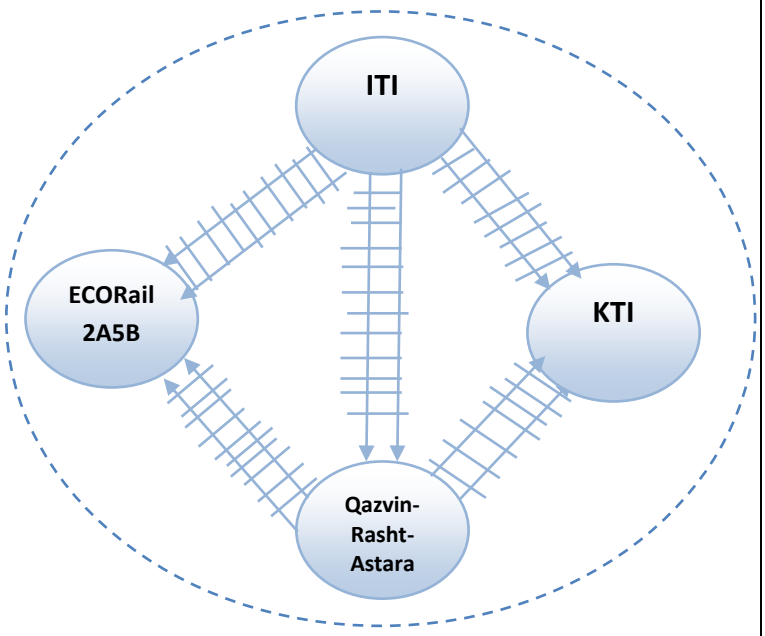
No.	ECO Railway Network nodes	ECO Railway Network routes' segments	Numbering of rail-based nodes in scheme 1
1	Zahedan-Taftan	Z	No. 1
2	Serakhs	S	No.2
3	Astara	A	No.3
4	Incheh-Borun	I	No.4
5	Turgundi	T	No.5

The analysis also observed the dynamics in the changes in the ERNE depending on whether its rail-based segments were paired within the corresponding the OD pairs connecting the latters to the following conditions: (i) 'with' or (ii) 'without' the innovations solutions, to be observed under this analysis. For better clarity, the analysis makes a reference to the assumed act of the pairing of the new innovations solutions via the OD pairs. In this the term: "with" has been applied. In other works, the role of the OD pairs in this observation is that they indicate the paring of a given rail-based segment's link 'with' the new innovations and those instances when the same rail-based segment's link is 'without' the innovations.

The assumption taken in relation to the above-described pairing stems from the theory that the efficiency of any given transport network is computed based on a relative drop of network efficiency value after it is completely blocked or failed within the network (Dalmo, Feb 2019). Thus, the analysis refers to the assumed absence of the paring of new innovations solutions on a

given railway segment of the ERN. In this, the absence of new innovations solutions was indicated by term: "without". Graphically, the ERN's railway nodes and their corresponding rail-based segments as linked to the OD pairs following succession of their vector directions on which demand *q* was ensured along the pairs (diagram 1 and scheme 1).

Diagram 1.



Scheme 1.

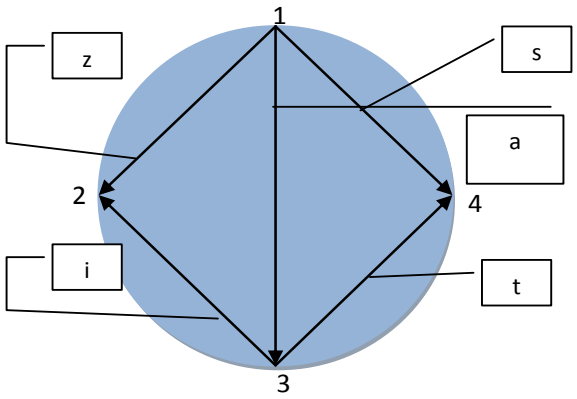
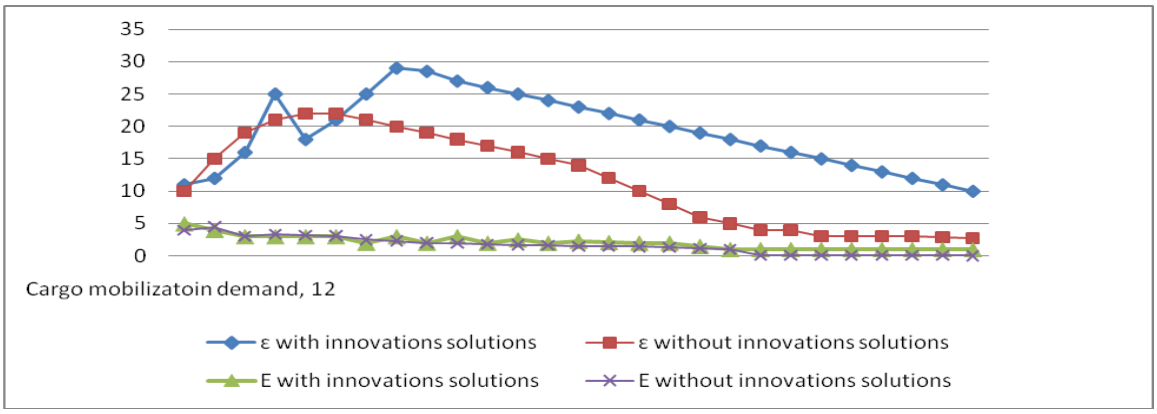


Figure 8: ECO railway nodes and rail-based segments within ERN. Source: Analysis assessments

In exploring the efficiency changes, figure 1 of analysis (figure 8 of statistical bulletin) illustrates that the ETN's efficiency (*E)* and the ERN's efficiency (ε) do change given the railway cargo mobilization at demand q_{12} depending on whether the railway segment z is 'with' or is 'without' the innovations solutions.

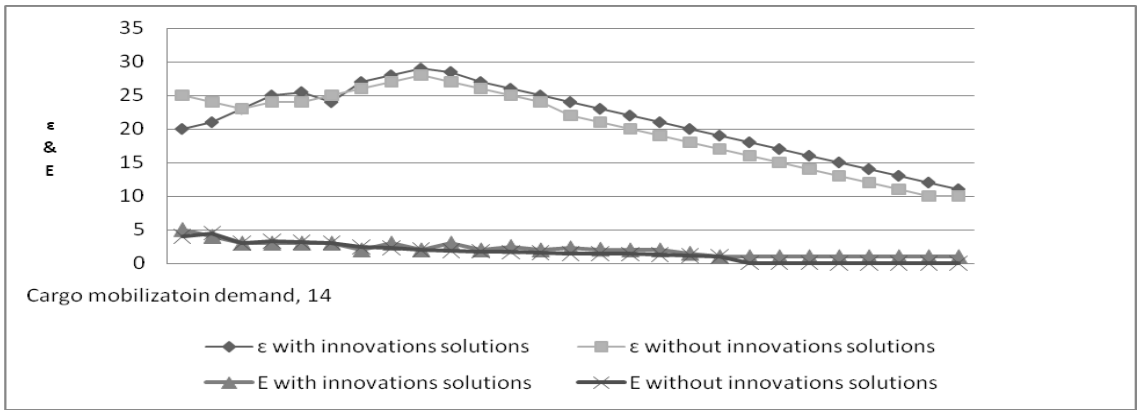
Figure 8: Change in efficiency of ERT and ERN 'with' and 'without' innovations solutions at a lower demand



Source: **Analysis assessments**

Figure 2 of analysis, which corresponds to figure 9 of statistical bulletin, reveals that the changes in efficiency ε of the ERN and *E* of the ETN stem from the pairing of the rail-based segment *s* with the new innovations solutions through the OD pairs. The latters also occur in their dependence on the conditions of 'with' and 'without' the pairing of the new innovations solutions to the corresponding rail-based segments at a given cargo mobilization demand: q_{14}.

Figure 9: Efficiency of ETN and ERN under conditions of paring 'with' and 'without' innovations solutions at higher demand



Source: **Analysis assessments**

Based on the above observations, efficiency *E* of the ERN decreases regardless of whether it has been paired 'with' or 'without' the new innovations solutions on rail-based segments *z* and *s*. The value of *E* 'with' the innovations solutions on rail-based segments turned out to be always larger compared to when it is 'without' the innovations solution on the corresponding rail-based segments.

Findings

Being supported by the above-described observations, the analysis sums up the two key findings:

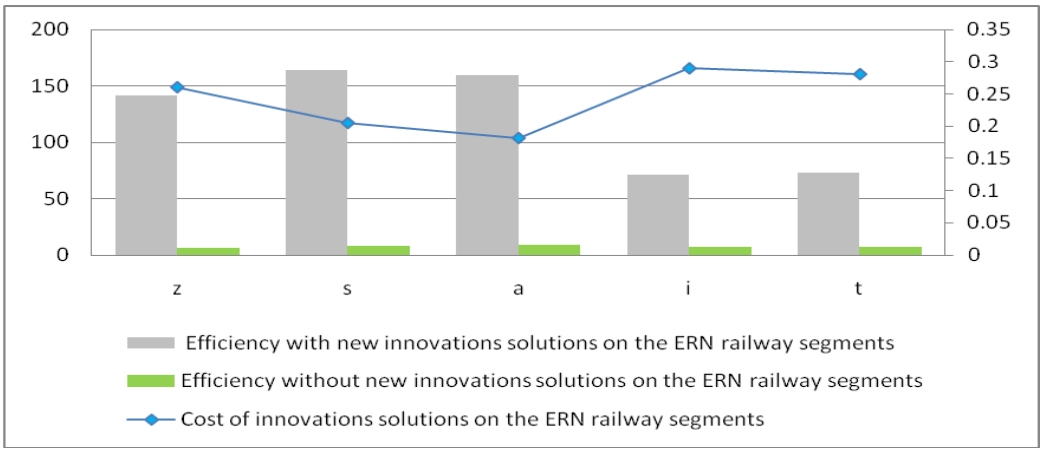
(1) The change in the ERN's efficiency i.e. ERNE describes the status of the function of the ERN's infrastructure and cargo mobilization.

(2) When the overall ETN does change, basing such changes on its railway cargo mobilization, in the ERN's real-time infrastructure, there is more than one prominent spot of which the quantity directly relates to the number of railway paths ensuring installation of new railway innovations solutions on the rail-based segments between the changing OD pairs as identified in scheme 1 and diagram 1.

Innovations and efficiency of railway segments 'with' and 'without the innovations solutions'

Figure 3 of analysis (corresponding to figure 10 below of statistical bulletin) reflects the efficiency on the ERN's rail-based segments 'with' and 'without' new innovations solutions. It also shows the cost function of the innovations when paired 'with' new innovations solutions, which is not high, compared to when it was to incur in the framework of the mega projects requiring massively huge capital investments.

Figure 10: Innovations cost and efficiency of ERN 'with' and 'without' innovations solutions



Source: Analysis assessments

In overall, the figure above reflects the cost function of the innovations. It also shows how efficiency of the ERN changes with the introducing of the new innovations solutions compared to the efficiency but without its pairing with the new innovations solutions in instances when the latters fail to be introduced.

The critical components of the ERN's efficiency i.e. ERNE can be seen based on the prominence of values of ERNE's major components. In this visibility, the component indicating the prominence of a value, in the descending order, may be admitted as the first one in the ranking (Lorenzo, 2013). If to follow the analysis under the A, B, and C categorization, the highest 20% of ERNE's components can be recognized as 'critical' and those falling within the range of 20%-50% as 'important'. The rest may be viewed as 'common' values.

The findings of this section are such that ERNE's components like ERN's nodes and its rail-based segments, even under conditions of a non-integrated network, could be used to further identify critical components that require the attention of stakeholders in any given railway network. Under *ceteris paribus* in the context of this analysis, the fixed-demand has been set at

moderate as the characteristic of the comprehensive transportation network. That has been assumed as constant.

Conclusions on technological implications of new innovations

The analysis, when considering the technological implications for the regional railway, has revealed the operational efficiency of the ECO Railway Network (ERN). Not only that the analysis computed the impact of the innovations on railway efficiency but also showed how demand in cargo mobilization changes upon introducing the new innovations solutions in railway networks of ECO countries. It also revealed that the new innovations solutions and cargo mobilization are the most prominent critical components of the ERN's efficiency. For more, the new innovations solutions and cargo mobilization are the functions of the ECO Transport Network (ETN). Efficiency and ERN's components' prominence values are, in turn, the functions of 'cargo infrastructure' and infrastructure and, for that matter, it is universally admitted that new innovations are part of the infrastructure in transport.

Building further on the latter observations, future research may describe how railway cargo mobilization, new innovations, innovations-focused skill and railway infrastructure would affect progressive railway operations. Most importantly, this analysis revealed that the new innovations are one of critical components of the ERN's functioning because it brings the increasing efficiency into the ECO's regional railway performance. Such findings are important for the effective coordination amongst countries at regional level. The latter could be used in guidelining for the purposes of: (i) cargo mobilization on any given railway network; (ii) infrastructure reconstruction/rehabilitation, (iii) maintenance, and (iv) informed planning and decision-making. The analysis also points at productivity of the ERN from the point of view of performance in individual countries' railway modes of the ECO transport.

Technical Implications: Interoperability

Interoperability is critical for success of railway operations. Most often than not, the interoperability comes into the strong alignment with new innovations in railway. Technical implications entail managerial efficiency. For the betterment of the latter, new innovations coordination and effective guidelining would be needed (Edquist, 2019). Stemming from the operational efficiency described in earlier sections of this analysis, the interoperability will be examined in this section in relation to how it could work in the context of the ERN. For this, the analysis deploys the operational criterion.

Operational criterion

It is not unusual in ECO for one railroad's locomotives to operate on one another's tracks. In such practices, the tenant locomotives are linked to the host railway control systems. Over the past, container trains along ECO's rail corridors were granted 'green light' for pass-through in test-utilizing the formal channels of communication. As with the introduction of commercialization on regional railway corridors and new technology proposed by ECO's Regional ICT Development Strategy (ICT Ministerial, 2017), which was adopted in December 2017 in Baku during the 2nd Ministerial Meeting on ICT, the model of interoperability has to change. The change has also been necessitated by the inter-regional developments, which followed the concept of the interoperability to embrace a wider perspective "not just technical specifications but an intra-and-inter-regional policy to enhance ICT-related industries while serving as a prerequisite for fully functioning of the Information Society" (Branislav Zladko Boskovic, Concept of Interoperability in the Railway System of Europe, 2018); (EU, 2004) p.7. Based on the above, the model will be structured to meet the following targets: (i) to interoperate across distributed networks; (ii) to accommodate multiple communication system designs; (iii) to support radio interchangeability on board and locomotive, (iv) to support varying deployment timelines, and (v) integrate the above-indicated targets under the comprehensive work plan of the CME on every of ECO's railway corridor.

As required under this model of interoperability on ECO's railway corridors, each railway segment will have to install the train control system (TCS) wayside, back office, locomotive hardware and ensure comprehensive capacity building training. The installation of TCS and wayside location stations has been envisaged in Article 9 (f) of the ECO's Transit Transport Framework Agreement (TTFA) whereas the installation of back offices and related hardware/software are aligned with Article 8 as well as Article 11 of the TTFA.

Given the new challenges reflected in ECO's strategy on ICT, immediate steps to initiate the model of interoperability on railway corridors will include the following practical actions/measures:

(1) Undertake inspections of the current status of installations along the distance of a selected railway corridor;
(2) Install the train control system equipment on the locomotives and railroad facilities;
(3) Develop, produce, and deploy radio system designed for data transmission of train control system messages at all base stations and trackside locations and on locomotives;
(4) Complete signal replacement, including upgrades to train control systems at all stations along the ECO railway corridors in compliance with ECO Map of Railways;
(5) Develop back office systems and upgrade and integrate dispatching software to include the data required for the train control systems.
(6) Test the integration of all components the system through test runs of container trains.
(7) Test interoperability amongst en-route countries railway networks in utilizing the system.

The path to achieving interoperable sustainable operations on the regional railway corridors have been defined to be through optimization (ECO-ITU Joint Study on ICT, 2017); (ECO Vision

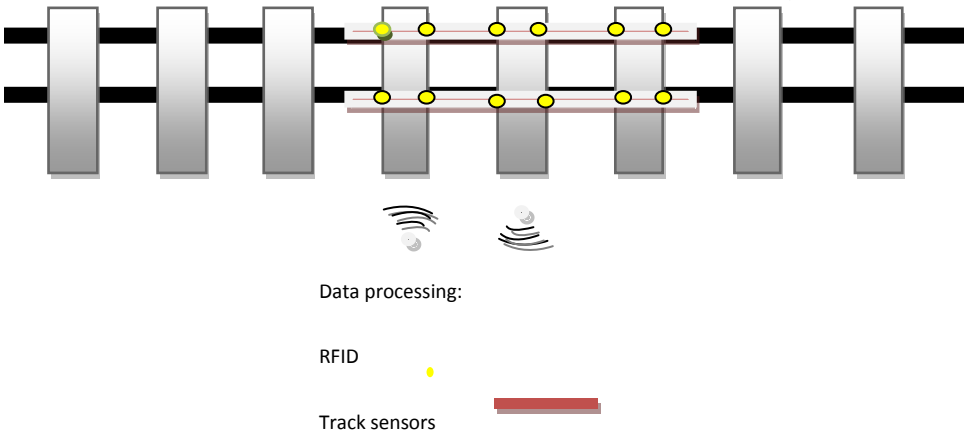
2025). By optimization in railway, this analysis implies the method of making the system as perfect, cost-effective, and qualified as possible considering the existing operational constrains and conditions (Hayat, 2017); (Ali Zamani, 2011) p.7. The optimization will require installment of the automated supervisory control and data acquisition system (ASCADA). In some of the en-route countries along ECO's key railway corridors, the prototype ASCADA system has already been installed (para-76, Report of the 9th Ministerial); (Meetings, 2018); in some others, notably, Turkmenistan ASYCUDA is being installed, in others, including Tajikistan, Kyrgyzstan and Afghanistan it is under consideration. Bearing in mind that the existing railway corridors run through territories of the en-route countries that have been equipped with ASCADA or its prototypes, the following steps have been identified as first immediate for the development of the interoperability model. Most of en-route countries have equipped their locomotive trains with the automated train control systems (TCS) since the serial production of those follow the new technology standards in wagon and loco production. Providing for the central dispatch system of railway corridors will be the core issue to be resolved by the CME, which has been envisaged on the KTI railway corridor as a point of a single window and a single contract (as described in the introduction section).

Based on the above-described arrangements, the following summary of the actions/measures towards the optimization –for-operability–and-sustainability have been identified by the analysis in the following order of sequence:

1) Automated supervisory control and data acquisition system
2) Automated train control system
3) Central dispatch system

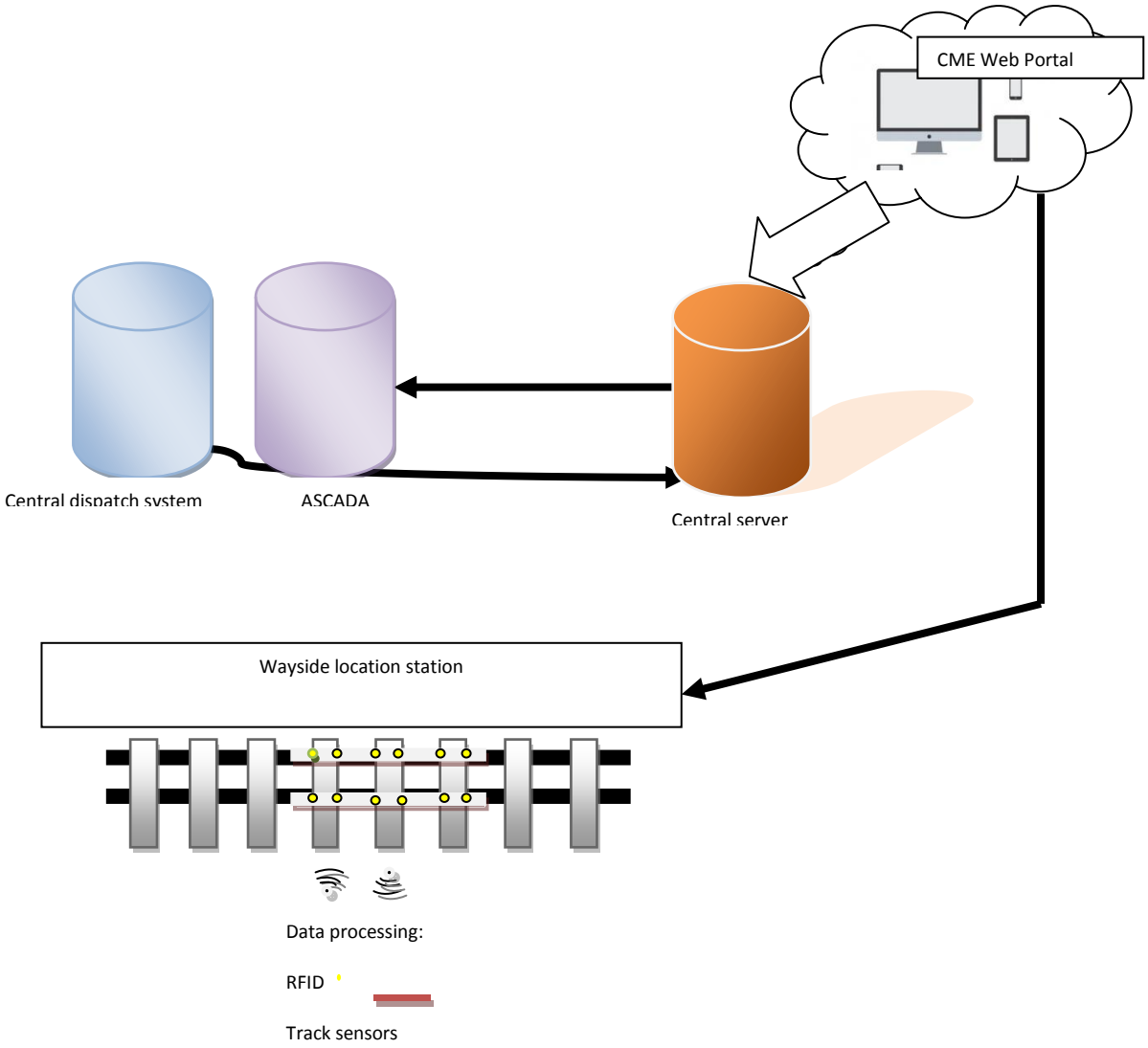
The scheme of optimization with the objective of achieving sustainable and interoperable railway operations is presented below, as follows:

Scheme 2: **Optimization scheme to achieve sustainable/interoperable railway operations in ECO**



The actions/measures embedded in the optimization scheme have to be integrated under the ECO railway corridors' management. In that regard, the common CME portal will be linked through central server to: (i) automated supervisory control and data acquisition system, (ii)

central dispatch system, (iii) wayside location station to read the data of the automated train control systems. The KTI (Map 4: Route 4.) has only 12 stations along the entire corridor whereas the Istanbul-Almaty & Almaty-Bandar Abbas railway corridor has 37 stations and ITI railway corridor has 48 stations. Therefore, the installation of wayside location stations will be on 97 stations at the regional level. The train-based control systems will have to be installed on the ITI railway route, in Pakistan's segment as the locomotives in this segment are largely outdated. The configuration of the monitoring platform within the interface of the CME's web portal to be set up may be discussed and defined by the CME's participating parties depending on the design propensities of the involved en-route countries. The platform will function as a SIMobility tool of business-to-business communications enabling the integration of mobility services of various providers (such as road trucks connecting their freight to rail) into a "one window, one-stop portfolio" for the users in railway transport mode (Jarasueniene, 2017); (Pieriegud, 2018) p.39. In the meantime, the holistic scheme of the integration of the CME internal control system with the components of the optimization scheme may be presented as in **Scheme 3: Integration of internal systems of CME with the optimization scheme components** (reflected below).



Systemic criterion

Under this section, the systemic criterion accounts for frame-working the structure of systems involved in railway operation to realize the desired interoperability from the regulatory perspective (Jayani R.P., 2018). Interoperability in railways does not only require technical, operational, and digital interoperability but it "also requires interoperability of physical and rules-based layers across vast geographies" (WB, 2010); (WEF, 2018) p.14. In this regard, the ECO's legal guidelining framework –TTFA– defines rail transport, primarily, from the point of view of transit railway transport. The TTFA in its Part VI, Article 23 designates the central role to the railway interchange stations in railway transit. The legal framework envisages the inter-railway agreements where the rules and norms for railway transit could be specified for railway corridor operations. Based on this regulation, the interoperability model should be embedded in

the inter-railway agreements, including all type agreements and project contracts amongst en-route countries. The practices of such arrangements may include memoranda of understanding, letters of intent or as in the case with the KTI project – memorandum of agreement where the task of creating the CME has been reflected in the work plan of project activities. Based on ECO's legal regulatory system's norms, the targets in developing the model of interoperability for railway corridors will be as follows: (i) to incorporate the interoperability model in the work plan of the project on the railway corridor; (ii) define its characteristics in the description of project activities, and (iii) ensure for the inter-railway arrangement. The technical norms and regulations in this process will be aligned with those of the (iv) Agreement on International Passenger Traffic by Rail (SMPS), (v) Agreement on International Carriage of Goods (SMGS), (vi) COTIF/CIM, and (vii) CIV, and also, within the framework of (viii) CAREC and (ix) UIC. Such norms have been prescribed in Article 23 paras-4 and 5 of the TTFA. Table 6 of analysis corresponding to table 12 (below) of statistical bulletin reflects the 12 actions in regulatory space to achieve sustainable interoperability.

Table 12: Regulatory actions needed to comply with in achieving the interoperability on ECO railway

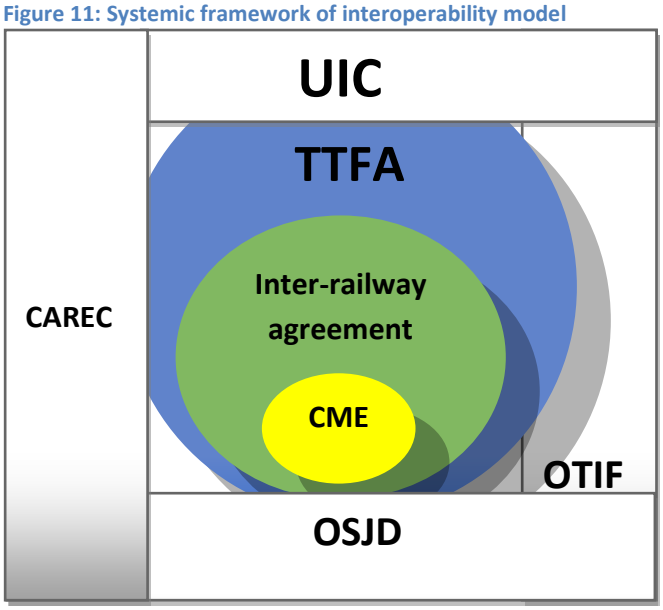
No	Regulation-based actions	Article	Responsible	Specified
1	To grant the TTFA member the necessary transport facilities through its territory	No. 4	Contracting Party	TTFA, Annexes
	To facilitate movement of goods through respective territories of the Contracting Parties and provide all necessary facilities for transit transport.	No.2		
	To adopt the prescribed railway transit route.			Annexure-I.
2	To notify the TTCC about additional routes and their characteristics	No. 6	Railway Authority	Annexes II, III
3	To provide adequate facilities and related installations for road, rail and inland navigation and multimodal transport.	No. 8	Contracting Parties	
4	• To establish posts at designated frontier points with control areas. • To ensure adequate manpower resources be available for speedy completion of frontier formalities. • To coordinate working hours of adjacent frontier posts. • To provide reliable mail and telecommunication services. • To facilitate speedy and efficient transit of goods. • To adopt a uniform set of consignment notes/way bills.	No. 9	Contracting Parties	
5	To ensure safety of traffic & ecological protection along ECO's transit routes.	No. 10	Institutional	
6	To establish relevant offices in accordance with domestic legislation.	No. 11	Ministry of transport	
7	To ensure conformity to technical requirements on a transport vehicle dimensions, maximum total weight/axle load and other parameters.	No.17	Contracting Party	Annex IV.
8	To establish border stations and interchange stations for transit transport.	No. 23	Contracting Party	Annex-I
9	To arrange inter-railway agreements between the TTFA members.	No. 24	Railway Authorities	
10	To establish a Customs Transit System for cargo & means of transport to facilitate the movement of goods in the TTFA members' territories.	No. 28		

11	To notify the TTFA members of any additional requirement or modification in the prescribed documentation/procedures to be introduced in regard to traffic in transit.	No. 31		
12	Institute a basic documentation agreement with the TTFA members to facilitate transit.	No. 33	Railway Authority	Annexure VII

Source: Staff assessments

The systemic interoperability framework reflecting the interoperability on normative regulations amongst the ECO and international organizations specializing in railways envisages the CME to be in the framework of inter-railway agreements amongst the en-route countries of the regional railway corridors. Those legal instruments may be in the forms of memoranda, memoranda of agreements, letters of intent, contracts, project agreements as practices-based empirical evidences revealed in the ECO region (pl. see figure 4 of analysis which corresponds to figure 11 of statistical bulletin below).

Figure 11: Systemic framework of interoperability model



The systemic normative ground of actions designed to support the implementation of the interoperability model on railway operations on ECO's key rail-based corridors from the regulatory perspective may be sourced from Table above, which reflects the main regulatory prescriptions relating to railway operations in ECO.

Capacities-driven criterion

This criterion defines the expected capacities of participating railway networks and their measurable performances required to achieve the defined targets of the interoperability within ERN. The railway networks' performances of en-route countries are varied. That is because the share of rail transport in the respective transport sectors varies. Performances largely depend on

the operating length of railways in the en-route countries where that of Kazakhstan is currently 15,529km and, by contrast, those of Kyrgyzstan and Tajikistan are 420km and 651km. At country level, the 2018 logistics performance, including by rail, has been modest. According to the UN logistics performance index, Turkey and Iran have been ranked 47th and 64th amongst world's top 50 of the overall 160 countries rated in 2018 as in table 7 of analysis corresponding to table 13 of statistical bulletin below.

Table 13: The 2018 ECO countries' logistics performance ranking according to UN index

Country	Year	LPI Rank	Customs	Infrastructure	Int. shipments	Logistics competence	Tracking/Tracing	Timeliness
Turkey	2018	47	58	33	53	51	42	44
Iran	2018	64	71	63	79	62	85	60
Kazakhstan	2018	71	65	81	84	90	83	50
Uzbekistan	2018	99	140	77	120	88	90	91
Kyrgyzstan	2018	108	55	103	138	114	99	106
Pakistan	2018	122	139	121	97	89	136	136
Turkmenistan	2018	126	111	117	136	120	107	130
Tajikistan	2018	134	150	127	133	116	131	104
Afghanistan	2018	160	158	158	152	158	159	153

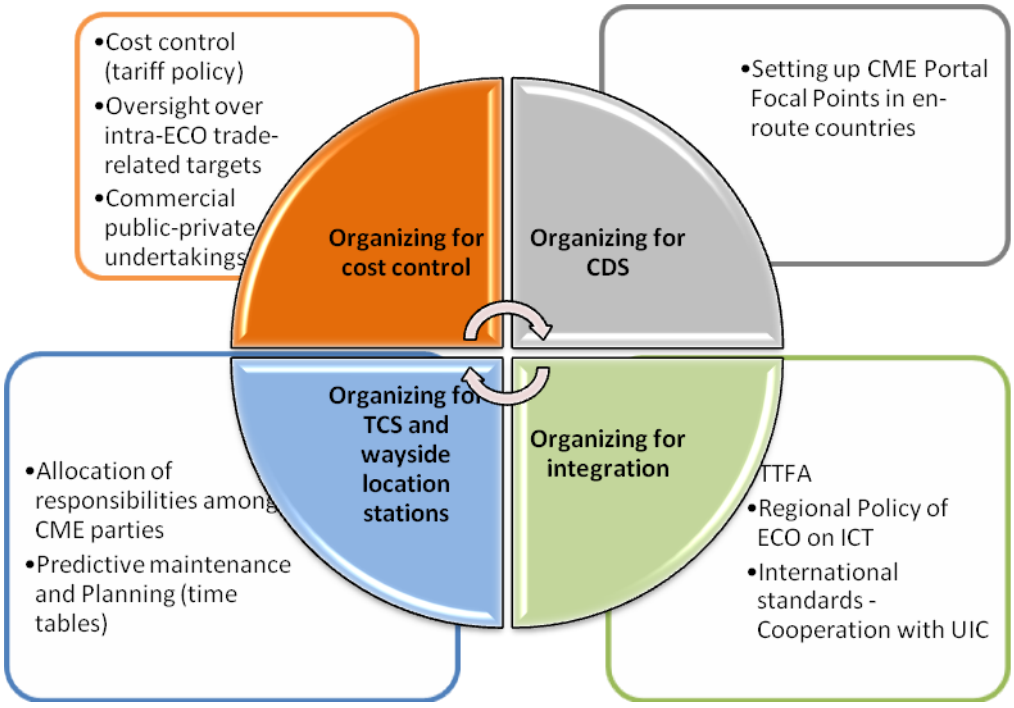
Source: UNDS

The deployment of human resources in railway transport in ECO countries depends on the efficiency in this sub-sector. While involvement of high technology in it brings in higher efficiency in railway operations, professional maturity of railway involved personnel depends on the various cognitive approaches that the countries take in this regard (PMI, 2013), p.143. Thus, in Kazakhstan the maturity management model has been introduced at national, regional, and local administration levels based on one of the three principles of public service, which is meritocracy (ACSAA, 2017). Therefore, professional excellence, including in railway subsector is handled at all-country level thereby enabling a comprehensive cognitive approach. Railway proficiency in Turkey is being handled at corporate level within the corporate management maturity structure of mega projects on rail transport. A simple solution in this area could be the unified organizational maturity model (Sohail, 2005), p. 3. However, not all ECO countries have installed the similar railway management maturity models. In this regard, the space for prospective improvements in the interoperability model under this analysis turns out to be significant. The targets to pursue along this path may include the following seven actions/measures: (1) introducing the railway management maturity model in ECO countries; (2) organizing a series of short-term[2] comprehensive training programs/courses on the railway management maturity model; (3) establishing the ECO region-specific set of criteria of

[2] Short-term period in the context of this report spans for up to 3 years from 2018.

excellence in the area of railway transport performance; (4) organizing for cost control for interoperability; (5) organizing for the central dispatch center; (6) organizing for the train control systems in en-route countries; (7) organizing for the integration on ECO's railway corridors. At the back of the seven targets for a comprehensive short-term capacity building in en-route countries' railways, the capacities-driven criterion of the cognitive dimension in the interoperability model of ECO's railway corridors is suggesting the following nine actions/measures, as structured in figure 5 of analysis, which corresponds to figure 12 of statistical bulletin below:

Figure 12: Capacity building targets and comprehensive short-term actions/measures to achieve interoperable sustainability



Participatory

The participatory criterion requires public-private participation in ensuring sustainable nature of the interoperability in railway operations. The existing practices in the ECO countries point that the work models of the public-private partnerships (PPP) are currently operating in Pakistan (Tillmann Sachs, 2007), p.76, Turkey, Kazakhstan, Azerbaijan and Iran. As an example, the memorandum of understanding on the ITI railway route has been so drafted as to embed the PPPs in processes of rehabilitation and upgradation of the main railway lines; the construction on the Qazvin-Rasht-Astara railway link (Map 3: Route 3) is on the concessions basis; the operations of Nomad Express train on segments of the Istanbul-Almaty & Almaty-Bandar Abbas railway corridor (Map 2: Route 2) and on Baku-Tbilisi-Kars railway line are private. To that effect, railway operations on ECO's railway routes opt to be inclusive of PPP

patterns through the CME. From the point of the operational efficiency, the PPPs have been reported to entail up to 40 percent as Asian practices indicate (Guariano, 2014). In that context, the targets in achieving the sustainable nature of railway operations while, at the same time, maintaining operational interoperability amongst parties involved in ECO's railway corridors may include the following three targets: (1) involving financially sound partners to improve and upgrade ECO's railway operations; (2) ensuring operational efficiency and cost effectiveness within ERN; (3) instituting auxiliary legal modalities for enabling PPP participation in regional rail transport operations. These targets would need to be met by implementing the following four actions/measures to: (i) design and develop PPP operational patterns for ERN-specific operations; (ii) ensure facilitative legal instruments to involve PPP participation in CME's functioning; (iii) organize the regional forum for cooperation on regional infrastructure projects with participation of third parties in project co-financing; (iv) test operational patterns of PPP in practice. The PPP structures will undoubtedly add complexity in the multi-dimensional and multi-level operating structure of railway regional projects (Mazouz, 2008) but they will ensure green and brown field projects with numerous interfaces "to be managed and integrated for operational efficiency" (IRSE, 2018).

Statistical analysis

In this section, with the objective of examining the technical implications of new technologies in railway and thus developing the model of interoperability, the stewardship of the five criteria has been deployed. Those criteria enabled the sourcing of the input data for the model. The quantity and designation of the input data have been aligned with their descriptions in the previous sub-sections of this analysis. Accordingly, the set of 30 targets and the set of 40 required actions/measures have been identified and developed under the objective of exploring whether those will produce the sustainable level of the interoperability in railway operations in ECO. In the analysis, the methodology of linear regression analysis has been applied, as follows:

Table 14: Inputs to calculations of the least squares equation

	Targets	Actions			
	X	Y	X2	XY	Y2
Capacities	7	9	49	63	81
Systemic	9	12	81	108	144
Economic	6	8	36	48	64
Operational	5	7	25	35	49
Participatory	3	4	9	12	16
	30	40	200	266	354

Formulas (1) and (2) has been formed to calculate values of *a* and *b*:

$$b = \frac{n(\sum XY) - (\sum X)(\sum Y)}{n(\sum X^2) - (\sum X)^2};$$ Formula (1)

$$a = \frac{\sum Y}{n} - b\frac{\sum X}{n} \text{ or } \overline{Y - b\bar{X}};$$ Formula (2)

$$a = \bar{Y} - b\bar{X};$$ Formula (3)

By substituting numeric values in formula (1) we obtain the numerical value of *b* and then *a*:

$$= \frac{5(266) - (30)(40)}{5(200) - (30)^2};$$

$$= \frac{1,330 - 1,200}{1,000 - 900};$$

$$= \frac{130}{100};$$

$$= 1.3$$

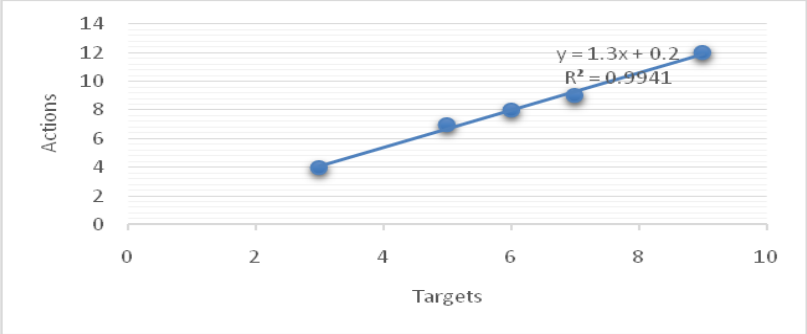
$$= \frac{40}{5} - 1.3\left(\frac{30}{5}\right);$$

$$= 8 - 7.8;$$

$$= 0.2$$

Graphically, the computations have resulted as in Figure 6 of analysis corresponding to figure 13 of statistical bulletin below:

Figure 13: Targets and actions to meet the interoperability sustainability



Source: Analysis assessments

The computations showed that the slope is positive, 1.3 indicating that the targets of the interoperability meet the adequate levels of sustainability. If the proposed model of the interoperability be maintained matching the actions/measures to be undertaken against the targets identified by the sets of the criteria chosen under each of the five dimensions, the model will ensure the sustainability levels in proportions of 1:1.3. The coefficient of determination R^2 equals 0.999 indicating that 99.9 percent of variation in the total of the forty actions/measures to be implemented by the member countries' railway networks in order to achieve sustainability of the proposed interoperability model has been explained by the five sets of the targets identified under each of the criteria specified for that purpose.

Statistical analysis results

The objective of this section of the analysis was to reveal the technical implications of the new technologies in regional railway. For that, this section explored the operational interoperability on ECO's railway routes as one of the technical managerial efficiencies evolving from the advent of new technologies. Thus, the ECO region consisting of the ten member countries has been explored as the area of observation for the operational interoperability. The area has been structured into diverse dimensions in line with the key orientation and types of activities of the ECO region. For each of these dimensions, the steering criterion has been specified though analyzing the critical components within each dimension in order to identify key targets in each dimension to match those with interoperable actions/measures so that the latters be capable of ensuring sustainability through the interoperability model. The assumptions made in the

investigations were such that: if the results turn out to be positive then the constructed interoperable model will ensure the desired sustainability.

Based on the outcomes of the analyses, the model has proven to ensure the required sustainable interoperability on railway corridors of the region. Specifically, the model integrated the multiple dimensions that were built on the guiding criterion in each of the five dimensions. It also presented the structured multi-dimensional railway operations that have proven interoperable and sustainable through the model, if the actions/measures envisaged in the model be implemented as designed.

In sum, the model's technical dimension proves that it enables sustainable track life by prolonged renewal cycles, therefore supporting the sustainable rail transport. The model ensures predictive maintenance as it provides key data concerning technical conditions of the train operation, including on the status of wheels, axle loads, cumulative operating load and travelling speed. All these features have been envisaged in the work plan under the technical dimension. In its cognitive dimension, the model ensures comprehensive short-term capacity building on all dimensions of the interoperability model. The detailed activities have been formulated in the work plan under the cognitive dimension. In its regulatory dimension, the model arranges for harmonizing the regulations, norms, standards in line with the guidelines of the TTFA.

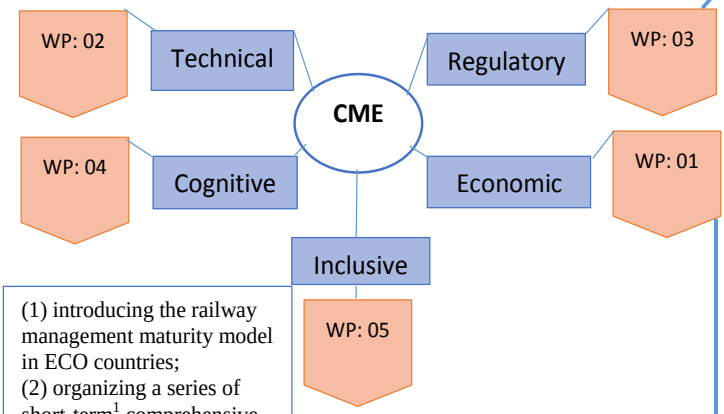
Cooperation within regulatory frameworks of the UIC and CAREC specializing on railway transport has been envisaged in the work plan under the cognitive dimension. In its economic dimension, the model accounts for commercialization of railway operations in the ERN. It also accounts for trade to interact with sustainable transport in the same respect as it envisages interaction with customs sub-sector and tourism sector. It advocates for establishment of measurable railway performance indicators to enable the performance-based rating of the en-route railway networks, including on railway interoperability. In its inclusive dimension, the model ensures participation-for-sustainable financing and efficiency.

The inclusive nature of railway operations will be ensured at the back of the social responsibility in public-private partnership operations. The model formulated specific actions/measures to be taken in this regard. The model streamlined its content with the input data (critical components, criteria, dimensions, targets, practical actions/measures etc.) and the resulting outcome provides the following characteristics of the model:

- ✓ Single window operation;
- ✓ Simplified and common operating rule set;
- ✓ Smooth transition from one system to another;
- ✓ Common data structure;
- ✓ Monitors full range of operating conditions, infrastructure and trains;
- ✓ Provides for enforced authorities (speed along the entire corridor).

Result: Interoperability Model of Railway Corridors in the ECO region

(1) Undertake inspections of the current status of installations along the distance of a selected railway corridor;
(2) Install the train control system equipment on the locomotives and railroad facilities;
(3) Develop, produce, and deploy radio system designed for data transmission of train control system messages at all base stations and trackside locations and on locomotives;
(4) Complete signal replacement, including upgrades to train control systems at all stations along the ECO railway corridors in compliance with ECO Map of Railways;
(5) Develop back office systems and upgrade and integrate dispatching software to include the data required for the train control systems.
(6) Test the integration of all components the system through test runs of container trains.
(7) Test interoperability amongst en-route countries railway networks in utilizing the system.



(1) introducing the railway management maturity model in ECO countries;
(2) organizing a series of short-term[1] comprehensive training programs/courses on the railway management maturity model;
(3) establishing the ECO region-specific set of criteria of excellence in the area of railway transport performance;
(4) organizing for cost control for interoperability;
(5) organizing for the central dispatch center;
(6) organizing for the train control systems in en-route countries;
(7) organizing for the integration on ECO's railway corridors.

(i) design and develop PPP operational patterns for ERN-specific operations;
(ii) ensure facilitative legal instruments to involve PPP participation in CME's functioning;
(iii) organize the regional forum for cooperation on regional infrastructure projects with participation of third parties in project co-financing;
(iv) test operational patterns of PPP in practice.

(i) Increase intra-ECO trade twofold by 2025;
(ii) expand from the existing 4.3 percent of rail modal share to 5.3 percent by 2025;
(iii) increase contribution of rail transport services in commercial transport services by introducing new private railway undertakings on ECO's railway corridors;
(iv) introduce the region-specific rating system of ECO's regional railway networks on railway logistics/performance/professional excellence;
(v) intensify interoperability with the trade sector through joint projects on the implementation of the customs component of ECO Trade Agreement;
(vi) establish effective linkages with the tourism sector through cooperation on tourism transport and civil aviation;
(vii) work on opportunities openings in the region to ensure the region-specific supplies of standardized rolling stock, especially, in view of the existing incompliances in standards for gauges, tracks, and axle loads.

1. To grant the TTFA member the necessary transport facilities through its territory.
2. To facilitate movement of goods through respective territories of the Contracting Parties and provide all necessary facilities for transit transport.
3. To adopt the prescribed railway transit route.
4. To notify the TTCC about additional routes and their characteristics.
5. To provide adequate facilities and related installations for road, rail and inland navigation and multimodal transport.
    a. To establish posts at designated frontier points with control areas.
    b. To ensure adequate manpower resources be available for speedy completion of frontier formalities.
    c. To coordinate working hours of adjacent frontier posts.
    d. To provide reliable mail and telecommunication services.
    e. To facilitate speedy and efficient transit of goods.
    f. To adopt a uniform set of consignment notes/way bills.
    g. To ensure safety of traffic & ecological protection along ECO's transit routes.
6. To establish relevant offices in accordance with domestic legislation.
7. To ensure conformity to technical requirements on a transport vehicle dimensions, maximum total weight/axle load and other parameters.
8. To establish border stations and interchange stations for transit transport.
9. To arrange inter-railway agreements between the TTFA members.
10. To establish a Customs Transit System for cargo & means of transport to facilitate the movement of goods in the TTFA members' territories.

11. To notify the TTFA members of any additional requirement or modification in the prescribed documentation/procedures to be introduced in regard to traffic in transit.
12. Institute a basic documentation agreement with the TTFA members to facilitate transit.

Figure 14: Interoperability model of railway routes in the ECO region. Source: Analysis Assessments

Recommended Interoperability model

The recommendations entailing from the interoperability model developed under this analysis include the following:

I. Set the total of 30 Targets in the five dimensions/work areas:
   (i) Capacity building: 7 targets
   (ii) Regulatory: 9 targets
   (iii) Economic: 6 targets
   (iv) Operational (railways): 5 targets
   (v) Participatory: 3 targets

II. Develop the work plan to include the total of 40 concrete practical actions/measures:
   (i) Capacity building: 9 work plan activities
   (ii) Regulatory: 12 work plan activities
   (iii) Economic: 8 work plan activities
   (iv) Operational (railways): 7 work plan activities
   (v) Participatory: 4 work plan activities

III. Set up the CME for ECO's railway corridors

IV. Organize for participation and funding, inclusive of the PPP

V. Test the interoperability model in practice

The implementation period has been identified to be from 2019 till 2025.

Interoperability in practice

In view of the above, the model of the interoperability of railway routes in the ECO region is expected to positively impact sustainability of the regional ECO Transport Network (ETN). That is being asserted on the ground of clear targets emerged, under this section of the analysis, in the five instrumental dimensions of the ECO Railway Network (ERN). Deriving from the critical elements in each of the five dimensions of the ERN while, at the same time, equipped with the three core development principles, the specified 30 targets will be met by 40 concrete activities of 5 work plans under the proposed interoperability model. The latter proved to comfortably match the interoperability targets with practice-oriented actions which, through the functionalities of the interoperability model, will ensure sustainability of the ETN.

The model will bring in greater efficiency owing to the involvement of new railway operator undertakings via public-private partnerships at the back of their sustainable financing of regional infrastructure projects. The technical and operational functionalities of interoperability will be handled by the CME, ECO-specific corridor management entity. Cooperation within the common regulatory space on the interoperability amongst the ECO, UIC and CAREC has been envisaged in the region's transit transport framework agreement, TTFA.

The resulting model, if successful, will be replicated across the 480 million people region. The impact is expected to have spillover effects onto the inter-regional scale as the technical

standards have been derived from the larger scale regional international partner organizations such as the UIC.

Road

Statistical Indicators on the Road Transport Mode

The overall length of asphalted roads has not been quantified due to differing labeling in data inputs provided. Therefore, by the statistical item - total length of asphalted roads - insufficient data inputs have been available to record the overall picture.

Expansion of asphalted roads in the region has also been explored under ECO project, which specifically looked in matters relating to road transport. From statistical perspective, it is noteworthy that definitions and concepts particularly relating to road transport indicators may be reviewed for the ECO region. Such need has been necessitated by diverse approaches when it comes to categorization of roads, which therefore impacts generation of road-specific data indicators.

The number of vehicles per 1000 population in the ECO region has been registered at 950 in 2017.

Table 15: Length of Asphalted Roads (corresponds to Table 44 of the ECO Statistical Compendium)

ECO-KSI Table 44. **Total Length of Asphalted Roads** (Thousand kilometers)																		
Country	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Afghanistan	...	...	...	0.8	1.8	3.8	5.6	6.7	7.7	7.9	8.7	9	9	...				
Azerbaijan	18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.9	18.9	19	19	19	19	19	19	19	19
Iran	99.5	108.4	113.3	115.9	118	123.6	125.7	128.3	138	150.2	160.4	171	177.1	199	215.2	217.9	214.6	215.1
Kazakhstan	81.3	82.6	83	83.6	84.1	82.8	83.7	84	84.1	85.7	86	86.2	87	88.2	90.2	92.1	93.2	95.4
Kyrgyzstan	17.2	17.2	17.2	17.2	17.2	...	...	...	...	...	...	...	...	...	...	...	...	...
Pakistan	138.2	144.6	148.9	151	158.5	162.8	167.5	172.8	174.3	176.6	180.9	261.5	261.5	...	...	...	...	...
Tajikistan	12.6	13	12.2	12	11.9	11.9	11.9	...	....	...	...	...	...	...	...	...	...	...
Turkey	277	278	282	285	284	292	293	310	313	323	330	338	352	354	...	...	...	...
Turkmenistan	12.2	12.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Uzbekistan	42.1	42.2	42.3	42.3	42.3	42.6	...	...	...	...	...	...	...	...	...	...	...	...

Source: ECOSTAT

In the nomination for the length of roads, the ECO member countries have been rated by the IRU, at global level, for performance in the road transport mode. Thus, the 2021 IRU rating have assigned ranking 19 after Turkey, followed by Pakistan (21) and Iran (27), accordingly (Table 16).

Table 16: Length of roads and global ranking for 2012

Rank	Country	Total	per Capita	per sq. km	Year
(total)		(km)	(m)	(m)	
19	Turkey	385,754	4.84	501.2	2012
21	Pakistan	263,942	1.35	342.4	2012
27	Iran	198,866	2.97	129.8	2012
48	Kazakhstan	97,418	5.56	36.1	2012
54	Uzbekistan	86,496	3.49	203.3	2012
72	Turkmenistan	58,592	12.5	124.7	2012
76	Azerbaijan	52,942	6.65	640.7	2012
86	Afghanistan	42,150	1.36	64.6	2012
94	Kyrgyzstan	34,000	6.43	177.3	2012
97	Tajikistan	27,767	4.31	196.2	2012
	World	*64,285,009*	*9.06*	*431.6*	*2012*
	ECO	*1,247,927*	*49*	*2,416*	

Source: IRU

Table 17: Number of Vehicles per 1000 population (corresponds to Table 45 of the ECO Statistical Compendium)

ECO-KSI Table 45. Number of Vehicles per 1000 Population

Country	AFG			AZE			IRN			KAZ			KGM		
Period	Motor vehicles	Per capita	Population	Motor vehicles	Per capita	Population	Motor vehicles	Per capita	Population	Motor vehicles	Per capita	Population	Motor vehicles	Per capita	Population
2014	28	1838.9602	33371000	101	16715.11	9506000	200	16924.2	77466000	219	23587.34	17303000	59	3181.642	5845000
2002		1063.6356	22601000		5338.076	8277000		13812.83	67285000		12422.53	14976000		2144.121	4991000
2003		1099.1945	23681000		5891.137	8361000		14838.3	68123000		13532.23	15100000		2270.925	5014000
2004		1062.2494	24727000		6435.448	8449000		15308.45	68951000		14728.62	15250000		2401.265	5039000
2005		1136.1232	25654000		8051.675	8539000		15616.25	69762000		16014.31	15403000		2370.166	5075000
2006		1161.1249	26433000		10711.18	8630000		16211.47	70555000		17541.33	15551000		2417.579	5124000
2007		1284.7752	27101000		13243.21	8724000		17338.13	71336000		18885.24	15702000		2599.206	5184000
2008		1298.1432	27722000		14364.99	8822000		17187.29	72121000		19272.21	15862000		2790.935	5255000
2009		1531.174	28395000		15393.89	8924000		17162.05	72925000		18995.89	16043000		2837.031	5335000
2010		1614.255	29186000		15950.26	9032000		17942.83	73763000		20096.56	16252000		2790.171	5422000
2011		1660.7399	30117000		15754.15	9146000		18192.11	74635000		21276.93	16491000		2920.603	5518000
2012		1839.2736	31161000		15888.22	9265000		16625.92	75540000		21986.32	16752000		2869.839	5622000
2013		1848.7	32270000		16593.19	9385000		16383.26	76482000		22972.43	17026000		3120.542	5731000
2015		1809.0165	34414000		16698.86	9623000		16500.9	78492000		23524.06	17572000		3237.603	5959000
2016		1802.6956	35383000		16001.32	9736000		18497.67	79564000		23447.02	17831000		3309.86	6074000
2017		1803.9875	36296000		15847.42	9845000		19082.62	80674000		24055.59	18080000		3393.474	6190000
	PAK			TAJ			TUR		19082.6196	TKM			UZB		
Period	Motor vehicles	Per capita	Population	Motor vehicles	Per capita	Population	Motor vehicles	Per capita	Population	Motor vehicles	Per capita	Population	Motor vehicles	Per capita	Population
2014	18	4576	19530499 2	38	2547	8253000	144	22402	77229000	106	14332	5466000	37	5371	3042600

2002		3523	149550000		1388.917	6427000		13468.5	65145000		5465	4610000		2646	25431000
2003		3618	153092992		1511.415	6542000		14020.94	66089000		5589	4656000		2726	25749000
2004		3805	156664992		1633.325	6662000		15161.62	67011000		5809	4703000		2902	26078000
2005		4013	160304000		1706.821	6789000		16309.68	67903000		6495	4755000		3069	26428000
2006		4175	164023008		1788.111	6923000		17250.77	68757000		7125	4810000		3253	26804000
2007		4288	167808000		1886.666	7063000		17901.48	69582000		7815	4870000		3525	27205000
2008		4273	171648992		1991.893	7210000		17836.81	70419000		8845	4936000		3782	27627000
2009		4304	175526000		2022.461	7365000		16783.44	71321000		9249	5008000		4019	28065000
2010		4284	179424992		2106.339	7527000		17959.26	72327000		9942	5087000		4240	28516000
2011		4310	183340000		2211.754	7698000		19660.89	73443000		11213	5174000		4470	28977000
2012		4367	187280000		2324.369	7875000		20282.03	74651000		12235	5268000		4766	29449000
2013		4464	191260992		2440.587	8060000		21650.76	75925000		13236	5366000		5067	29933000
2015		4696	199427008		2640.59	8454000		23388.48	78529000		14992	5565000		5700	30930000
2016		4857	203631008		2762.585	8664000		23756.48	79828000		15648	5662000		6039	31442000
2017		5035	207906000		2896.913	8880000		25129.34	81116000		16389	5758000		6253	31960000

Source: ECOSTAT

As with pertinence of mobile subscriptions to broad road users (among others), such subscriptions have increased, by numbers, to reach 422 million over the period 2009-2017 thereby staging an increase at 5.3 percent rate, on average.

As per the number of internet users, their quantity has been increasing intensively at 12.7 percent, on average, over the period of 2009-2017. The total number of internet users in the ECO region stood at 44.3 percent of the total regional population in 2017. Compared to 2016, the total quantity of internet users in 2017, increased by 8.1 percent in number. For details pl. see table below.

Table 18: Number of Mobile cellular subscriptions (corresponds to modified Table 43 of the ECO Statistical Compendium)

ECO-KSI Table 46: **Mobile cellular subscriptions**									
Country Name	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Aruba	128000	131800	131800	135000	138800	139700	141000	141000	141000
Afghanistan	10500000	10215840	13797879	15340115	16807156	18407168	19709038	21602982	23929713
Azerbaijan	7757120	9100113	10120105	10125200	10130102	10552520	10697132	10189000	10127000
Iran, Islamic Rep.	52555000	54051764	56043006	58157539	65246219	68891151	74218815	80520249	87046953
Kazakhstan	17063200	19402600	25240800	30235400	30364900	28595600	26309300	25534800	26693300
Kyrgyz Republic	4487123	5275477	6277108	6797852	6737487	7563444	7579439	7613528	8467966
Pakistan	94342030	99185844	108894518	120151237	127737286	135762031	125899638	136489014	144525637
Tajikistan	4900000	5940842	6324000	6528000	7537100	7999100	8489000	9400000	9904000
Turkmenistan	2132890	3197624	5300000	5900000	6125300	7206100	7842000	8575000	9377000
Turkey	62779554	61769635	65321745	67680547	69661108	71888416	73639261	75061699	77800170
Uzbekistan	16417914	20952000	25441789	20274090	21500000	21639200	21783300	23265389	24265460

ECO	273062831	289223539	322892750	341324980	361985458	378644430	376307923	398392661	422278199

Source: ECOSTAT

Table 19: Number of Individuals using the Internet (corresponds to modified Table 43 of the ECO Statistical Compendium)

ECO-KSI Table 46: **Individuals using the Internet (% of population)**									
Country Name	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Afghanistan	3.6	4.0	5.0	5.5	5.9	7.0	8.3		11.4
Azerbaijan	27.4	46.0	50.0	54.2	73.0	75.0	77.0	78.2	79.0
Iran	13.8	15.9	19.0	22.7	30.0	39.4	45.3	53.2	64.0
Kazakhstan	18.2	31.6	50.6	61.9	63.3	66.0	70.8	74.6	76.4
Kyrgyzstan	16.0	16.3	17.5	19.8	23.0	28.3	30.2	37.0	38.2
Pakistan	7.5	8.0	9.0	10.0	10.9	12.0	14.0	12.4	17.1
Tajikistan	10.1	11.6	13.0	14.5	16.0	17.5	19.0	20.5	22.0
Turkmenistan	2.0	3.0	5.0	7.2	9.6	12.2	15.0	18.0	21.3
Turkey	36.4	39.8	43.1	45.1	46.3	51.0	53.7	58.3	64.7
Uzbekistan	11.9	15.9	18.6	23.6	26.8	35.5	42.8	46.8	48.7
ECO	14.7	19.2	23.1	26.4	30.5	34.4	37.6	44.3	44.3
% change		23.6	16.8	12.7	13.2	11.4	8.6	15.1	-0.1

Source: ECOSTAT

Highlights in road transport (2019-2020)

The two ECO Road Corridors: (1) Kyrgyz Republic-Tajikistan-Afghanistan-Iran (KTAI) and (2) Islamabad-Tehran-Istanbul (ITI) were initiated by the decision of the 8th Ministerial Meeting on Transport and Communications (28-29 June 2011, Ashgabat).

The roads have been plotted on ECO Road Map. Following the successful outcome of the pilot transportation under TIR consignments from the sea port of Bandar Abbas (Iran) to Tajikistan via Afghanistan in November 2019, a test run of the ECO KTAI Road Corridor was launched from Iranian border crossing (Dogharoon) on Sunday 26 July 2020.

The test run of loaded trucks under TIR Carnets have been realised by transport operation of seven trucks carrying the loaded cargo. During an official ceremony, the trucks started their journey from mid point at Dogharoon forward along the two trajectories: (a) city of Osh (Kyrgyz Republic) and (b) capital city of Dushanbe (Tajikistan).

After launching the on-road journey from Iranian Border (Dogharoon) to Islam Qala (Afghanistan) and traveling to Shirr Khan Bandar in Afghanistan, the five trucks reached their

final destination at Dushanbe on Friday, August 11 2020 whereas the other trucks reached Osh on Friday, August 14 2020.

The successful realization of the test runs of loaded trucks are in effect a manifestation of effective cooperation among the ECO Member States.

Figure 15: Test Run of Loaded Trucks along the KTAI Road Corridor, 26 July 2020

Source: ECO

The ECO's long term partner organization, the International Road Transport Union (IRU), shouldered TIR-consignments of the test run wherever it related to regulatory provisions under the framework of the TIR Convention.

The impact of the two test runs which succeeded towards their full realization even under severe coronavirus travel restrictions, are tangible. They thus open up new trade routes in the ECO region towards its external inter-regional borders for smooth movement of trade flows and on-road freight.

These successes have also enabled freight forwarders and transport operators to benefit from significant cost and time savings when transporting goods. In terms of access to operating trading routes, the test runs do benefit to over 128 million people residing in the enroute countries of the KTAI and ITI Road Corridors.

As the shortest possible route between Iran and Kyrgyzstan, the launch of the KTAI Road Corridor now taps into the growing markets of the ECO region.

Given the route's starting point from ECO ports in the Persian Gulf and Oman Sea, traders and transport operators can now opt taking the advantages of the intermodal functions of TIR along the KTAI Road Corridor thereby optimizing trade flows and driving growth into ECO region.

Analytical statistics: Road corridors along railway corridors

In this section, ECO analytical statistics rather refers to the explored findings of the study completed in 2019/20 ("*Development of the KTAI and ITI Road Corridors*" now available at: www.eco.int), which was conducted on the research matter of road development in the ECO region. Below, are the key findings of the said study:

I. Road safety on KTAI and ITI Road Corridors is one of the pressing issues of the ECO regional road transport.

II. On partnering in fulfilling of UN SDGs for road ECO focuses on target 11.2, that is, 'Access to safe affordable, accessible and sustainable transport systems for all.' The said target has been envisaged in the ECO Vision 2025 as one of the major targets of the Organization. The Vision currently focuses on 'enabling affordable and accessible transit transport' as well.

III. Policy support to ECO Regional Road Network is provided through the *UN Global Plan for the Decade of Action*; so is by the *Almaty Plan of Action of ECO* (1993) originated from the "UN Decade of Action". To that end, ECO is in perfect sync on policy approaches with the United Nations.

IV. The near future steps to be fulfilled in close partnership with the UN may include:

1. Improved safety of road infrastructure and transport networks
2. Enhanced safety of vehicles
3. Improved behavior of road users
4. Improved post-crash care

The KTAI Road Corridor has five enroute countries of ECO involved in its development. Below is generalized information explored by the aforementioned study titled "*Development of the KTAI and ITI Road Corridors*" (available at: www.eco.int/research).

Table 20: ECO Road Corridors' enroute countries road networks at a glance

	TAJIKISTAN		PAKISTAN		AFGHANISTAN	
Categories of roads	Length of road, km	percentage of total road, %	Length of road, km	percentage of total road, %	Length of road, km	percentage of total road, %
TOTAL ROADS:	14446	100%	261595	100%	42256	100%
including of International significance	*3346*	*23,16%*	*10302*	*3,94%*		
motorways	67	0,46%	713	0,27%		
expressways			100	0,04%		

ordinary	3279	22,70%	9489	3,63%	3363	7,96%
including of national significance	***5298***	***36,67%***	***12134***	***4,64%***		
motorways			713	0,27%		
expressways			100	0,04%		
ordinary	5298	36,67%	11321	4,33%	4884	11,56%
including others	***5802***	***40,16%***	***239159***	***91,42%***		
including of category E					***34009***	***80,48%***
	TURKEY				IRAN	
Categories of roads	Length of road, km	percentage of total road, %	Categories of roads		Length of road, km	percentage of total road, %
TOTAL ROADS:	67119	100%	TOTAL ROADS:		232535	100%
including of International significance	**23932**	**35,66%**	*including of International significance*			
motorways	20793	30,98%	*freeways*		2401	1,03%
expressways	2157	3,21%	*expressways*		16627	7,15%
ordinary	982	1,46%	*main roads*		25538	10,98%
including of national significance			*motorways*		34633	14,89%
motorways			*transit roads*		24942	10,73%
expressways			*rural roads*		128394	55,21%
ordinary						
including others	2722	4,06%				
including of category E						

Source: ECO Study on Development of KTAI and ITI Road Corridors, 2020 (available at: www. eco.int)

Table 21: Import/Export freight (million US$) transported by KTAI and ITI Road Corridors in 2012-2016

mln. $US	AFGHANISTAN										IRAN									
Country, indicators	Export					Import					Export					Import				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
AFG											27	43	33	29	19	499	715	1497	1808	1265
% to previous year												61%	-22%	-13%	-35%		43%	109%	21%	-30%
% for all countries											6,2%	8,3%	5,8%	5,1%	3,2%	8,0%	8,4%	19,4%	23,4%	19,4%
IRN	5513	7458	9389		8370	2	35	15		22										
% to previous year		35%	26%		-11%		1306%	-57%		46%										
% for all countries	4,2%	8,1%	10,4%		10,1%	0,0%	0,1%	0,0%		0,1%										
KGZ	26	12	23	9	8	0,3	1,1	2,5	0,1	0,1	10	8	7	4	8	13	14	14	5	7
% to previous year		-52%	89%	-62%	-8%		312%	122%	-97%	-96%		-20%	-15%	-45%	124%		5%	1%	-68%	46%
% for all countries	1,5%	0,7%	1,2%	0,6%	0,6%	0,0%	0,0%	0,1%	0,0%	0,0%	0,6%	0,4%	0,3%	0,3%	0,6%	0,2%	0,2%	0,3%	0,1%	0,2%
PAK	2099	1998	1879	1722	1370	235	308	392	390	370	142	63	43	32	36	120	168	186	261	323
% to previous year		-5%	-6%	-8%	-20%		31%	27%	0%	-5%		-56%	-31%	-25%	10%		39%	11%	40%	24%
% for all countries	8,5%	8,0%	7,6%	7,8%	6,7%	0,5%	0,7%	0,8%	0,9%	0,8%	0,6%	0,2%	0,2%	0,1%	0,2%	0,3%	0,4%	0,4%	0,6%	0,7%

TJK			52	56	75			2	1	0			66	60	39			144	110	75
% to previous year				8%	35 %				-55 %	-61 %				-9%	-35 %				-23 %	-32 %
% for all countries			6,4 %	6,2 %	8,3 %			0,0 %	0,0 %	0,0 %			8,1 %	6,7 %	4,3 %			2,9 %	3,1 %	2,3 %
TUR	224	228	186	162	146	4	11	16	12	9	2833	4193	3886	3664	4966	4307	10383	9833	6096	4700
% to previous year		2%	-18 %	-13 %	-10 %		154 %	54 %	-28 %	-21 %		48 %	-7%	-6%	36 %		141 %	-5%	-38 %	-23 %
% for all countries	0,1 %	0,2 %	0,1 %	0,1 %	0,1 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	1,9 %	2,8 %	2,5 %	2,5 %	3,5 %	1,8 %	4,1 %	4,1 %	2,9 %	2,4 %

	KYRGYZSTAN										**PAKISTAN**									
	Export					**Import**					**Export**					**Import**				
Country, indicators	**2012**	**2013**	**2014**	**2015**	**2016**	**2012**	**2013**	**2014**	**2015**	**2016**	**2012**	**2013**	**2014**	**2015**	**2016**	**2012**	**2013**	**2014**	**2015**	**2016**
AFG	0	0	0	0	0	0	0	0	3	0	201	198	188	227	283	883	889	1328	1346	1199
% to previous year												-2%	-5%	20 %	25 %		1%	49 %	1%	-11 %
% for all countries											10,0%	9,9 %	9,4 %	11,2%	14,1%	43,9%	44,2%	65,9%	66,8%	59,5%
IRN	6337	6028	6485		6131	6	4	4		3	3530	3582	4064		7417	186	326	269		364
% to previous year		-5%	8%		-5%		-29 %	-6%		-10 %		1%	13 %		83 %		75 %	-17 %		35 %
% for all countries	4,8 %	6,5 %	7,2 %		7,4 %	0,0 %	0,0 %	0,0 %		0,0 %	2,7 %	3,9 %	4,5 %		8,9 %	0,4 %	0,7 %	0,5 %		0,9 %
KGZ											0,0	2,5	0,5	0,1	0,3	2,5	3,1	2,2	2,6	3,3
% to previous year																	26 %	-29 %	19 %	26 %
% for all countries											0,0 %	0,1 %	0,0 %	0,0 %	0,0 %	0,0 %	0,1 %	0,1 %	0,1 %	0,1 %
PAK	0,8	0,8	1,0	0,9	1,2	0,0	0,1	0,1	0,1	0,1										
% to previous year		-1%	28 %	-14 %	40 %		4250%	70 %	-57 %	86 %										
% for all countries	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %										
TJK			9	9	9			26	19	17			19	23	30			118	86	25
% to previous year				2%	-4%				-27 %	-10 %				21 %	30 %				-27 %	-71 %
% for all countries			1,1 %	1,0 %	1,0 %			0,5 %	0,5 %	0,5 %			2,4 %	2,6 %	3,4 %			2,3 %	2,4 %	0,8 %
TUR	274	388	421	295	309	113	37	66	77	101	264	286	259	289	347	416	437	436	311	263
% to previous year		41 %	9%	-30 %	5%		-67 %	78 %	17 %	31 %		8%	-9%	12 %	20 %		5%	0%	-29 %	-15 %
% for all countries	0,2 %	0,3 %	0,3 %	0,2 %	0,2 %	0,0 %	0,0 %	0,0 %	0,0 %	0,1 %	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	0,1 %	0,1 %

Source: ECO Study on KTI Railway, p.80 (available at: www.eco.int/research)

Maritime

The data and information reflecting the recent developments in the maritime transport mode have mainly centered around maritime complementarity for the ECO's landlocked countries.

The ECO Member States are set to avail of the effective use of ECO's existing cargo handling capacities, at maximum, as well as of transit freight throughput capacities. That goes in line with core principles laid down in the **ECO Vision 2025**: (a) sustainability, (b) integration, and (c) policy supporting environment. This will further be supplemented with the relevant information relating to project-involved ECO countries, which derives from the inputs to questionnaires collected from Member States. All that is in pursuance of decisions of the 5th Meeting of Heads of Reference Organizations of ECO Member States held on 6 March 2019 at ECO Headquarters.

In view of the above-stated, the following analytical statistics has been prepared capturing the main concerns and aspirations of the landlocked countries of ECO.

Statistical indicators on maritime transport mode

There are no statistical indicators in the statistical group, which otherwise be for "Maritime". It is because only three countries in ECO have maritime fleet therefore record their respective maritime performance indicators. The remaining seven do not generate maritime statistical indicators as they are admitted as landlocked countries.

From the statistical point of view, the near future solution may be to develop statistical indicators within this required statistical group by focusing on such numerically quantifiable parameters as: the linkages between maritime Sea ports and landlocked countries' Dry ports.

Highlights in maritime (2019-2020)

During 2019-2020, important decisions were adopted in regard of *complementary linkages amongst ECO countries* in the area of maritime cooperation in ECO. Thus, in March 2019, the Heads of Transport Logistics Centers of the Member States met with the Heads of Maritime Reference Organizations of ECO to discuss while pinpoint commonalities of interests and to resolve for the complementarity in maritime.

The concept of Logistics Clustering which taps into the existing capacities of special trade and industrial zones for complimentary sharing by all ECO economies was floated. In 2020, the ECO Regional Planning Council, at its 30th Meeting on 14-16 January 2020, adopted the unanimously accorded decision that logistics clustering be fulfilled on ECO economic space so that businesses

may advance through effective interlinkages amongst sea ports and transport logistics infrastructures of ECO member economies at their dry ports.

Analytical statistics: Maritime for ECO's landlocked countries' benefits

Analytical statistics presents the key findings of the needs based assessment study, which was carried out in the implementation of Recommendation (9) of the Turkmenbashi Declaration adopted by the ECO Ministerial on Transport (1-3 May 2018, Turkmenbashi (Turkmenistan)). The ECO Ministerial, in particular, granted the mandate "to explore ways and means" of linking ECO's sea ports to its landlocked countries' dry ports (Turkmenbashi Declaration-2018).

Further to the above, deriving from questionnaires disseminated to ECO Member States, the Secretariat has rendered analytical statistics to assess the needs of the landlocked countries in their accessing deep sea international market outlets.

Those analyses, derived for the purposes of this statistical bulletin, had duely been let known to ECO Member States via formal channels of communication and their respective feedbacks were timely received via questionnaires whereupon are being reflected herewith as follows:

Landlocked Dry Ports transit transport prerequisites:

The international programs, such as, *Almaty Plan of Action* in progress from 1998 till 2007 and the UNESCAP Trans-Asian Railway (TAR) as well as the Asia Highway (AH) had at times been put into action, to support ECO Member States in their transport needs. Seven ECO member countries constitute significant part of world's 36 landlocked developing countries.

The international measures although successful however turned out to be one size for all. Therefore, the need for region-specific assessment of the needs of ECO landlocked countries focused on integration of self-functioning maritime and rail/road infrastructures in the region. It therefore acquires its down to earth acuteness, driven by basic needs of ECO regional communities in transporting their goods to global markets.

The cargo handling potential of the ECO Member States have been looked through from perspectives of landlocked countries (LLCs) via their dry ports. Likewise, the perspectives of coastal countries of the ECO region have been analyzed through the prism of their sea ports capacities. Thus, in **KAZAKHSTAN**, one of ECO's landlocked countries, the **t**ransit potential mainly attributes to the developments in the transport industry. Impressive output in the latter has, in effect, accounted to 7.8% of the country's GDP in 2016. In overall, transport volumes increased by 3.8% adding up even more to the 2016-level volumes while the increases, during 2017 and 2018, have registered the additional 4.9% and 6% increments, accordingly.

In such growth, the key driver is the transit potential of the entire transport industry. Rapid developments in transit traffic on Europe-China route record huge progress. The main transit routes for freight transport by road are: from China to Europe, Asia and Eurasian Economic Union. Currently, nearly 300 transport companies are involved in the delivery of freight and transport services along the direction from China to Kazakhstan.

International Agreements signed amongst ECO countries provide solid groundwork for transit operations. Similar arrangements were concluded by Kazakhstan within Shanghai Cooperation Organization (SCO) on 12 September 2014 and Intergovernmental Organization of Railways (OSJD) in 2003. The common purpose of those has been to develop international transit between countries of common membership and to establish a mutually beneficial transport market. In that regard, ECO has identified five key railway routes of which the two cross Kazakhstan's territory.

Likewise, the coverage by the four (4) SCO-led agreements, (out of the total six (6)) spreads across Kazakhstan's territory. Similarly, the Action Plans for implementing transport policies within OSJD railway routes were developed by end December 2017. Those were aligned with the Eurasian Economic Union (EEU) guidelines. The combined result of international agreements is expected to remove the existing restrictions for freight movement by all type transport within the EEU, by 2025.

On roads, Kazakhstan implements the TIR Convention to which it acceded in 1995. The Convention helps simplify border crossing procedures. That is attained via a uniform procedure, such as, a single standard document (TIR Carnet) enabling removal of inspections at borders and recognition of international guarantees covering payments and charges from point of departure to destination. It also provides necessary security for customs authorities Although the trajectory of ECO's two road corridors (KTAI and ITI) does not come anywhere near Kazakhstan's borders, the processes of harmonization of TIR standards are all the more important for Kazakhstan as it is the ECO Member State.

To streamline transit fright volumes passing through territory of Kazakhstan to China, dry ports have been set up. Amongst those, the largest is Khorgos Eastern Gate. The latter represents a Special Economic Zone (SEZ) project, which triggers the development of Kazakhstan's transit potential. In 2015, Kazakhstan Railways operationalized its dry port in Khorgos Eastern Gate SEZ at Kazakh-Chinese border under the project costing EUR 347 million. The dry port's cargo handling capacity exceeds 200,000 containers. According to Kazakhstan Temir Zholy (KTZ), the country's railway operator, Kazakhstan sees it as a gateway for increasing trade turnover between ECO countries and connecting China to the Caspian Sea. The First President of the Republic of Kazakhstan H.E. Nursultan A. Nazarbayev was quoted stating that "Khorgos will be further developed as 'an Inter-State Center' and that a large Kazakh city will emerge there in the near future". According to KTZ, the Khorgos Eastern Gate SEZ along with the Zhetygen-Khorgos and Zhezgazgan-Beineu railway lines, the Western Europe-Western China motor road corridor, and Port of Aktau on Caspian coasts represent a huge **Logistics and**

Distribution Center to provide for Kazakhstan's further integration into international trade and transportation (Railwaypro.com. Kazakhstan launches the dry port at Khorgos. January 22, 2015).

Figure 16: Dry Port in Kazakhstan

UZBEKISTAN, a landlocked ECO country, is amongst ECO's top countries that admitted a critical importance of developing dry ports. The significance of the **Kyrgyzstan-Tajikistan-Afghanistan-Iran (KTAI) Railway** currently under construction is of critical importance to Uzbekistan.

When constructed the KTAI railway corridor will enable continuous flows of railway freight combined with the on-road mode to/from Uzbekistan to the ECO countries. On its part, Uzbekistan contributed to the construction of the KTAI by supplementing the rail-based link connecting the dry port of Termez with the links to Mazar-e-Sharif.

As an example, Uzbekistan's Navoi Dry Port and the International Logistics Centre underwent considerable modernization. Today, the dry port provides facilities and services most needed for an increase of trade and international railway transportation, such as, along the Afghanistan-Central-Asia-Europe route. Currently, a new railway line links the Navoi Dry Port to railway cargoes, being shifted, north-westward, via Uchkuduk-Nukus-Volgograd and, eastward, via Samarqand-Tashkent-Dostyk as well as, southward, via Bukhara-Turkmenistan-Bandar Abbas to outlets in the Persian Gulf. In addition, the Termez dry port has ever been critical for freight between Uzbekistan and neighbouring countries.

Figure 17: Termez dry port

From policy support stance, the Cabinet of Ministers of Republic of Uzbekistan approved the concept of developing dry ports. Thus, in January 2011, a new dry port of Angren was opened. The transportation volumes increased by 50%, since then. To further increase the movement of trade inflows to the Angren dry port, the Government of Uzbekistan has cut the tariffs on cargoes down.

In addition, Uzbekistan Railways, Uzbekiston Temir Yollari (UTY) jointly with Kazakhstan Railways, Kazakhstan Temir Zholdary (KTZ) agreed to increase freight transport, bilaterally. For that, they committed to strengthening cooperation on transit transport and logistics. Measures are currently taken on to ensure smooth transport of Kazakh grain and flour freight through Uzbek-Afghan borders. The two ECO countries also agreed on elimination of seasonal congestions and the timely return of railway rolling stock to point of dispatch. According to KTZ, until 1st July 2018, the countries have already worked out constructive proposals for the joint construction of cargo terminals for transshipment of grain and flour in territories of Uzbekistan and Afghanistan. The parties agreed to intensely cooperate on deliveries of railway products for which a joint venture is among "Format Match Company", "UzZhelDorRemMash" and Foundry Mechanical Plant.

The two neigbouring countries have committed to develop the Transport Logistic Centers in the territory of Uzbekistan and Afghanistan. Since the start of 2018, cargo transport volumes by rail between Kazakhstan and Uzbekistan increased by 24% compared to the same period in 2017 reaching 7,763,000 tonnes of cargo. Exports from Kazakhstan to Uzbekistan increased by 36% while imports to Kazakhstan from Uzbekistan by 17%. Transit traffic through Kazakhstan to/from/through Uzbekistan increased by 15% to 3,627,000 tonnes.

TAJIKISTAN, an ECO landlocked country, identified its existing dry port terminals at Tursunzade, Dushanbe, and Nijnii Panj. Those serve the purposes of establishing the country's key dry ports in near future. The significance and economic value of the **KTAI Railway**, currently under construction, is of crucial importance for Tajikistan. On its part, Tajikistan, being an enroute country has completed the pre-feasibility and feasibility studies for the construction of the railway link on its territory.

Among the internationally admitted dry ports that currently exist in Tajikistan are: Khudzhand, Kulob, Penjikend, Qurghonteppa, Shaartuz, Garm, Vahdat, Chkalovsk, Isfara, Khirmanak and Khujand. The customs offices installed at dry ports in Tajikistan are designed to minimize the wide range of the risks associated with shipping of containers. The expansion of the scope of operations of various infrastructures at dry ports is achieved through, among others, intensive training of the dry ports' personnel who are part of the new Port Control Units that are fully operational at Khujand dry port and the Khorogo dry port.

The operations customs offices of the dry ports cover a wide range of multifaceted tasks, including the risk analysis of possibility of traffic of harmful goods and commodities. The

profiling techniques, cargo inspection, information exchange mechanisms, post seizure investigations and trade facilitation: those are also among the set of the currently ongoing functionalities of the dry ports.

The dry ports of Tajikistan are in search of connectivities leading them to such ports as Chabahar (Iran). Tajikistan has a long lasting intent to be connected to the port of Chabahar because of low cost services that are provided at Chabahar for Tajikistan cargo. However, the crossing of carriers is to go through the territory of Turkmenistan for ultimately reaching the borders of the Chabahar port.

Periodically, Tajikistan's trucks, road cars and container trains face the need to wait at cross borders with Turkmenistan. The plans are to arrange the framework of Tajik-Iranian cooperation to be able to avail of services of container handing at Chabahar port. The latter port offers lucrative opportunities for Tajikistan to raise its economic and foreign trade status if, the dry ports of Tajikistan be connected to the Chabahar sea port. Reversely, Iranian seaport will surely benefit economically from such dry port-sea port connectivities.

In **TURKMENISTAN**, an ECO landlocked country, works to expand railway facilities at Aqina at border between Turkmenistan and Afghanistan that were officially launched on 21 November 2018. The role of the Kazakhstan-Turkmenistan-Iran (KTI) Railway is critical for Turkmenistan. The KTI Railway enables the throughput of railway freight originating from Kazakhstan through Turkmenistan to Iran and further to the coasts of the Persian Gulf.

In addition, the country launched its Turkmenbashi International Sea Port on 2 May 2018 to which ECO Transport Ministers who gathered for their 9th Meeting in Turkmenbashi were high-level witnesses. The Sea Port has current plans to interlink its seaport facilities with relevant services with its dry ports' fright. Turkmenistan exerts a fair amount of efforts to expand its dry ports. Such efforts are mainly along the Eurasian Silk Road logistic corridor. The related associated infrastructures include the provision of services by the logistics centers of dry ports. These also encompass the complimentary services like warehousing and provision of storage facilities on 7/24 basis.

Turkmenistan's dry ports are geared toward developing the combined and door-to-door transportation. That serves to improve the containerized transport and dry ports' infrastructures, interaction with road and sea transport organizations, to make a complete transport chain inside the country and the ECO region.

Thus, the dry ports of Turkmenistan in practice have been established through activating the private public partnerships (PPPs). These help ensure regular operations of the technologically advanced container carriers via the long-term joint ventures. Such entities are from the private

sector. Thus, the Commercial Management of the ECO Container Train is planned to acquire an organizational shape of a body set up under the stock exchanges of Pakistan, Iran and Turkey. Moreover, the PPPs have the intention to introduce the operation of regular container trains under the PPP modes. As in the neighbouring countries of Turkmenistan within the region of ECO, the maintenance and rehabilitation of locomotives has been give out to the private parties. The restructuring of the organizational management of such joint venturing has been prescribed in national transport policy of Turkmenistan.

KYRGYZSTAN, an ECO landlocked country, may fairly resist severe competition for vast dry port infrastructure and massive bulk trade flows originating from Kazakhstan and inflowing to Kazakhstan's Khorgos dry port. Therefore, Kyrgyzstan may reportedly start constructing future dry ports along CPEC[3] which expects to generate prospectively huge trade flows along its lengthy stretch. Kyrgyzstan can eventually profit in more predictable and realistic way from CPEC.

Among the registered dry ports of the Kyrgyz Republic are: Alamedin, Balykchi, Bishkek, Jalal Abad, Osh, dry port at Manas international Airport, Rybachje and Naryn.

The relevant authorities in the Kyrgyz Republic are considering various ways of installing effective dry ports to sea ports links in the ECO region. One of such ways is the utilization of the road corridor, which connects Andijan inland highway to Osh dry port and leads to the dry port at Kashgar. This road corridor connects the Kyrgyz Republic to the transcontinental transport corridor Central Asia-Indian Ocean. It passes through dry ports at Almaty, Bishkek, Naryn, and Kashgar, and the Karakorum highway to reach dry ports at Islamabad and at the Karachi sea port.

Of paramount importance for the Kyrgyz Republic is the **KTAI Railway**, currently under construction, because this railway enables livelihood connections to China on one side and to countries of the ECO region on the other. Once completed, the KTAI Railway will be able to provide increasing employment for the population residing in the adjacent areas to this regional railway.

In AFGHANISTAN, an ECO landlocked country, the Hairatan dry port is handling goods whilst transportation/load of goods from trains onto trucks for a journey via Afghanistan's northern mountain roads. The dry port of Hairatan is a busy spot where bulk cargo is flowing from inside the country. Uzbekistan Railways built a new railway link from Mazar-e-Sharif to

[3] CPEC-China-Pakistan Economic Corridor

Andkoy in western part of Afghanistan. This link forms an integral part of the **KTAI Railway** route. The railway segment, which connects Afghanistan with Iran through the KTAI Railway, notably, **Khaf-Herat** railway line has been completed in its construction leaving behind only a tiny railway stretch to conclude. The dry ports at **Dogharun** with significance to road trucks as well as the installing of viable infrastructures along the **Rozanak** rail track are of vital importance for Afghanistan's road truck containers in terms of multimodal transportation to/from Afghanistan. Also, this link is part of project, which contributes to the construction of a long railway line in Afghanistan along 2,000 km from Mazar-e-Sharif through Kabul and Kandahar. Memorandum of Understanding for the Aqina freight terminal (Afghan-Turkmenistan border), was signed by Afghanistan Railway Authority (AFRA) and Turkmenistan's Ministry of Railways in Ashgabat. The MoU also includes the construction of the 10 kilometer track along the main railway line.

Figure 18: Aqina dry port

The MoU is a vehicle between ECO's two neighboring countries for strengthening co-operation on transit traffic and trade. The construction of the 90 kilometer railway connecting Kerki, Imamnazar (Turkmenistan) and Aqina (Afghanistan) was funded by Turkmenistan as with the construction launched by Presidents of Turkmenistan, Afghanistan and Tajikistan in June 2013. Operationalization of this railway was inaugurated in November 2016. Early in 2017, the Cabinet of Ministers of I.R. Afghanistan approved the construction of the additional 10 km track at Aquina terminal. Works are being finalized on the 35km extension of the railway line to Andkoy in Afghanistan. Turkmenistan funded upgradation of a cross-border line connecting Serhetabat and Torghundi freight terminal in Afghanistan. KTZ of Kazakhstan and UTY of Uzbekistan have jointly evaluated freight facilities at Termez in Uzbekistan and Hairatan in Afghanistan. They met with shippers and local officials to discuss opportunities for freight traffic to/from Afghanistan.

AZERBAIJAN, a coastal transit ECO country, has the Baku International Trade Seaport, launched in 2014. The latter has been linked to the Alat International Logistics Center, which currently services the Euro-Asian Supply Chain. Azerbaijan's Free Trade Zone (FTZ) includes Truck Parking, International Logistics Centre and Domestic Logistic Centre. It is located within

the area of the new sea port covering 100 hectares of land. The FTZ has the potential to be a major consolidation and distribution centre in Central Eurasia, Caucasus, Iran, Southern Russia, and Turkey.

The dry port located at Astara terminal plays its significant role in providing services to the container trains of the enroute countries, Iran and Azerbaijan. The dry port services the railway freight flows originating from northern countries of the International North South transport Corridor (INSTC). In the INSTC, the ECO railway corridor i.e. **Qazvin-Rasht-Astara (Iran)-Astara (Azerbaijan)** represents an integral part.

Among the dry ports that Azerbaijan has the intention to develop in the framework of international frameworks envisaging the developments of dry ports are:

- Baku dry port at International Heydar Alyiev Airport;
- Balakan dry port terminal;
- Bilasuvar dry port terminal;
- Dry port at Gable International Airport;
- Dry port at Heydar Alyiev Ganja International Airport;
- Jolfa dry port;
- Dry port at Lenkoran International Airport;
- Silk Road dry port;
- Dry port at Baku Airport at Zagatala;
- Dry port at Khirdalan;
- Dry port at Sinig-Korpu,
- Dry port at Alyat International Logistics Center;
- Dry port at Keshla;
- Southern dry port terminal at Sumgait.

Coastal countries transit transport prerequisites, including dry ports:

PAKISTAN, an ECO coastal country, has a number of existing dry ports, among which are the following:

Lahore Dry Port
Distribution is made via a link between dry ports and sea ports by using high-capacity rail link at lower unit costs. Pakistan sees this rail link as a method of distribution between a dry port and a sea port for this tool is more efficient by rail than by road. The key features of the dry port in Pakistan are: transfer of containers and increase in international trade by linking trade cargoes in the dry ports with the logistics facilities and services at sea ports. These characteristics differentiate a dry port in Pakistan from a container depot or a transport hub.

Faisalabad Dry Port
Faisalabad Dry Port was built jointly with DP World (leading enabler of global trade and an integral part of the supply chain) that provides rail freight transport from the dry-port to Port Qasim. The dry port is responsible for textile exports.
Lahore Dry Port
Lahore Dry Port is a dry port in Prem Nagar, Punjab Province. This dry port is adjacent to the Prem Nagar railway station on the Karachi Peshawar Railway Line.
Sialkot Dry Port
Sialkot Dry Port is located in Sambrial, Punjab, Pakistan, 15 km west of Sialkot and 4 km south of Sialkot International Airport. The port is a joint venture between business communities in Sialkot who on 16 May 1984 formed the "Sialkot Dry Port Trust". The dry port was launched in 1986.

IRAN, an ECO coastal country, has identified 9 potential dry port sites to be rail-served and to promote a modal shift from the currently 88% of road cargo transportation to the future 30%, by rail. The existing rail station at Aprin (20km of Tehran) offers 3-days long connectivity to the port of Bandar Abbas (1,400 km). In addition to dry ports that are located at Aprin, Markazi, Mashhad, Isfahan, Iran is planning to set up dry ports in the regions of Baluchistan, Azerbaijan-e-Sharghi, Kukhestan, Kerman, Khorasan-e-Razavi, Fars, and Khuzestan. A new railway line (in Iran's current plans) will connect the dry port at Gonobad to Chabahar Sea Port.

Iran is involved in expansion of the Incheh-Boroon Dry Port, which is on the **Kazakhstan-Turkmenistan-Iran Railway** (KTI) route (pl. see the details in figure below). The total length of the latter railway is 910 with 120km in Kazakhstan, 700km in Turkmenistan and 8km in Iran with the remaining km length for expanding this Dry Port.

Figure 19: Incheh Boroon dry port in Iran

The projection of wheat and grains transit along this railway is 1 million tons, the same tonnage of iron and steel.

Adjacent to Incheh-Boroon Dry Port is Amir Abad Sea Port, located at seashore of the Caspian Sea. It has existing links to nearby railway lines and is well-equipped with loading facilities as the Ro-Ro project is nearing its completion. Thus, Amir Abad avails of dry port facilities for transit of railway freight, which is being delivered by rail and road to its sea port.

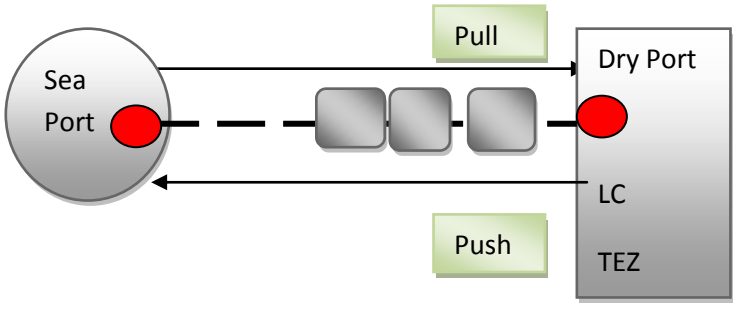
Figure 20: Amir Abad Sea Port with adjacent dry port facilities, Iran

The dry port at Dogharun provides livelihood in the form of employment to the local population residing in the areas adjacent to the Dogharun. Iran and Afghanistan are connected through this dry port by road. In this regard, the KTAI Road Corridor which was tested during summer of 2020 represents a lively on-road main transport artery for Iran and Afghanistan thereby connecting them to other enroute countries of the KTAI Road Corridor like Tajikistan and Kyrgyzstan.

Among the dry ports of Iran are:

1. Dry port at Imam Khomeini International Airport;
2. Dry Port at Motakhari;
3. Dry port at Mashhad;
4. Dry port at Salafchegan Special Economic Zone;
5. Dry port at Sirjan Special Economic Zone;
6. Dry port at Special Economic Zone Arvand;
7. Dry port at Sahlan,
8. Dry port at Tabriz;
9. Dry port at Sarakhs Special Economic Zone;
10. Dry port at Shahid Dashtgheib International Airport;
11. Sarakhs Special Economic Zone;
12. Dry port at Zahedan Logistical Center.

TURKEY, an ECO coastal country, sees core objectives of its dry ports as ones to enhance maritime business. The definition of the dry port followed in Turkey is of "an inland intermodal terminal, which is directly connected to the seaport with high transport capacity, where customers can leave or collect their standardized units as if directly to the seaport." The dry port is, primarily, maritime-centric. The idea behind the dry port is to increase the share of rail transport services dedicated to seaports. Turkey has current plans to increase the share of its rail mode from 4% up to 10% by 2030. In 2016, the total cargo transported via rail amounted to 29 million tons of which 10 million tons were hauled in containers. Turkey's 2023 targets have been set to hit 76 million tons of cargoes to be shifted by rail. From Turkey's perspective, dry ports must be connected by rail to sea ports. Below is a clear capture of the push-and-pull concept of the linkages between a dry port and a sea port where pull-and-push links logistics centers (LC), Trade Economic Zone (TEZ) in dry ports with sea ports facilities/logistics.



Scheme 4: Seaport2Dryport pull-push type of interaction

Current focus in building Turkish dry ports is Turkoglu/K.maraş is 250km segment from Port of Mersin and 190km from Halep. The dry port areas are located in almost every Turkey's large sea ports.

In summary, the landlocked countries have essential transit transport prerequisites making them eligible and fit to execute the present project. Also, coastal countries have dry ports in pre-coastal and remote areas. Both, the dry ports of landlocked countries that are available in the region to be counterparts to the region's sea ports prepared to provide maritime logistics and services, and also, coastal countries' dry ports in pre-coastal area and peripheries, have been captured in table below.

Table 22: Dry Ports in the ECO region (registered as international)

Country	*Dry Port*	
Afghanistan	Torkham	1
	Shir-Khan	2
	Keyrabad	3
Azerbaijan	Alat	4
Iran	Aprin Dry Port	5
	Motakhari Dry Port	6
	Ahlan SEZ	7
	Zahedan LC	8
	Shiraz LC	9
	Markazi LC	10
	Isfahan LC	11
	Kerman LC	12
	Khorasan-e-Razavi	13
Kazakhstan	Khorgos	14
	Pavlodar	15
	Semey	16
	Ozkemen	17
Kyrgyzstan	Osh	18
Pakistan	Faisalabad Dry Port	19
	Lahore Dry Port	20
	Lahore NLC Dry Port	21
	Multan Dry Port	22
	Rawalpindi Dry Port	23
	Sialkot Dry Port	24
	Larkana Dry Port	25

	Quetta Dry Port	26
	Quetta NLC Dry Port	27
	Hyderabad Dry Port	28
	Gilgit Dry Port	29
	Sost Dry Port	30
	Azakhel Dry Port	31
	Havelian Dry Port	32
	Peshawar Dry Port	33
	Jamrud Dry Port	34
	Karachi Dry Port	35
	Karachi NLC Dry Port	36
	Muzaffarabad Dry Port	37
Tajikistan	Nijnii Panj	38
	Tursunzade	39
	Dushanbe	40
Turkmenistan	Torghundi	41
Uzbekistan	Angren	42
	Navoi	43
	Termez	44

Existing Capacities/Facilities at ECO Regional Sea Ports

The existing capacities and facilities available in the ECO region for fulfilling the present project have been well-explored. In 2011, ECO undertook a study on ECO's six regional sea ports with the objective of linking them via logistics centers in seaports, notably, Trabzon, Mersin, Bandar-Abbas, Chabahar, Gwadar and Qasim.

The needs assessment study identified the existing port handling capacities for bulk, general cargo and containers within the range of 2.1 million TEUs at Karachi Port and Port Qasim, among others. In order to help ECO's landlocked countries (LLCs) in accessing sea outlets, the study pointed out the need to establish dry ports logistics centers in both, the LLCs and coastal countries, to serve as nodes of regional transport connectivity. As per the study findings, Iran is utilizing the existing capacities of Bandar Abbas Port infrastructure efficiently by providing effective servicing to the landlocked countries, including Afghanistan, Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan and Kyrgyz Republic. The benefits of receiving such services largely owe to the functioning of excellent logistics facilities at Bandar Abbas Port. Likewise, Turkey has significantly improved port infrastructure in Trabzon Port to serve the Black Sea basin and in Port of Mersin in the Mediterranean region to serve the Turkish mainland, Syria, and to feeder the cargo transportation under the Belt and Road Initiative (BRI).

During the ECO meeting on transport in September 2011, hosted by the Federation of Pakistan Chambers of Commerce and Industry (FPCCI), Pakistan stated that Gwadar Port may also serve as transit port for the landlocked countries. Moreover, Pakistan offered land on Northern bypass and Eastern Zone of Port Qasim for ECO's trade zones.

Since then, four meetings of Heads of Reference Maritime Organizations of ECO Member States were held at various times. The 9th ECO Ministerial Meeting on Transport (1-3 May 2018, Turkmenbashi) that culminated in the opening of the Turkmenbashi International Seaport adopted the decisions−to install effective mutually complementary networking amongst ECO Regional Sea Ports (paragraph-4, Turkmenbashi Declaration) to connect those to the LLCs. Upon request of some of ECO countries, an assessment report was then prepared to present the overview of existing facilities/capacities of ECO's seaports available for the landlocked countries. That served a background foundation to initiate the project using linkages in logistics centers between seaports in coastal countries and dry ports in the LLCs. Further, the project proposal built on the following initiatives of ECO countries regarding assistance to the landlocked countries:

- Kazakhstan – "Almaty Plan of Action" that originated using ECO as a common platform.
- Turkey –"push-and pull concept where dry ports must be connected to seaport by rail" that relates to directly connecting seaports with the LLCs.
- Pakistan – "Annex IX of the 4th HRMO Meeting" detailing the offerings of Pakistan for the LLCs at its ports.
- Proposal of Heads of Maritime Reference Organizations of ECO Member States embedded in the Draft Memorandum of Understanding on Cooperation on Maritime.

Based on the above background necessitating execution of the present project in regard to the potential of ECO countries to create the complementary networking between seaports of coastal countries and dry ports of landlocked countries, the comprehensive information below is in witness of such the existing operational capacities inside the ECO to successfully execute the present project.

The ECO coastal countries are, in effect, in ownership of significant transit cargo handling and transit throughput capacities. Such feature is a must in executing the present project. Over nearly a decade, they have been observing steady throughputs at their seaports, as reflected in table below:

Table 23: Throughput capacity of ECO seaports in TEU (units)

Country	Time series							
	2010	2011	2012	2013	2014	2015	2016	2017

Turkey	6 603 579	7 392 584	8 168 693	9 428 746	9 341 316	8 832 076	8 580 942	9 927 385
Iran	3 045 500	3 426 000	2 656 000	2 129 000	2 270 000	2 165 250	2 555 063	3 091 000
Pakistan	2 149 000	2 278 000	2 222 000	2 262 000	2 534 600	2 755 600	2 755 600	2 985 600

Source: Statistical data of ECO countries' Port Authorities

Ports in Turkey

Based on the existing potential of Turkey's port facilities and logistics services (as below), the ECO Member States are being offered a rare opportunity of utilizing those existing facilities and transit transport services within the framework of the project, which primarily focuses on establishing effective linkages between logistics of seaports in ECO region and those in dry ports of the LLCs. In that regard, Mersin seaport's facilities can offer swift services of its modern high tech logistics center. That may be needed for railway containers to run on Islamabad-Tehran-Istanbul (ITI) and Istanbul-Almaty-Istanbul railway routes as feeders of rail fright cargo. Feeder fright may be mutually complementary between the ITI and Istanbul-Almaty-Istanbul and Baku-Tbilisi-Kars (BTK). Moreover, the construction of the railway logistics centers at Mersin (Yenice), Kars, Konya (Kayacik) and Erzurum (Palandoken) was already completed. To date, these logistics centers are fully operational. The construction/modernization of Turkey's remaining 22 logistics centers is currently in progress. The ECO countries may wish to invest and create joint capital venturing in construction/modernization of those logistics centers as they are currently open for public-private partnerships. In this regard, most of Turkish seaport facilities are privately owned thus open for commercial interaction.

Turkey with its 58 seaports maintains its status as a major global sea freight hub. It is interested in multiple port expansions as the incoming volumes of cargoes are rapidly expanding.

According to the 2023-Vision of Turkey's Goals on Maritime Transport Development, the estimated increase in annual volumes of container traffic in the ports, notably, Izmir, Istanbul and Mersin for the period 2016 - 2023 will be, as follows:

- **60%** for Izmir seaport.
- **67%** for Mersin seaport.
- **95%** for Istanbul seaport.

Map 1 of maritime analysis: Dry Port areas near Mersin Port

- **Mersin Port** currently avails of 550m four rail tracks for shift of freight to place of embankment/dismemberment.
- 33 RTG.
- 14 Reach stackers.

- **Iskenderun Port** avails of 550m three rail tracks.
- 16 RTG.
- 6 Reach stackers.

The estimations of container traffic growth were based on official figures relating to GDP growth, increase in consumption, population, trade volumes, and also, additional predictor variables representing Turkey's economic status for corresponding hinterlands of the seaports.

In addition, the massive increase in the number of mega ships augments the scope of Turkey's seaports transport and logistics services potential. The mega ships are capable of handling cargo vessels of 400 meters in length and of up to 19,200TEUs per trip. By contrast, the largest ship in 2005 could transport only 6,600TEUs. The seaport, which is currently capable of servicing mega ship carrying 19,200TEUs, is Asyaport in the Tekirdag North-Western Province.

Asyaport became operational in July 2015. Its facilities cover 300,000m^2.

Marport at Istanbul has the specifically-tailored facilities that have been adapted for handling ships containing up to 16,000TEUs.

In the ranking of the Turkish seaports, Marport (Istanbul) has recorded the highest number of containers handled in 2017 at 1.7 million TEUs in spite of the 7.3% contraction in their quantity compared to 2016.

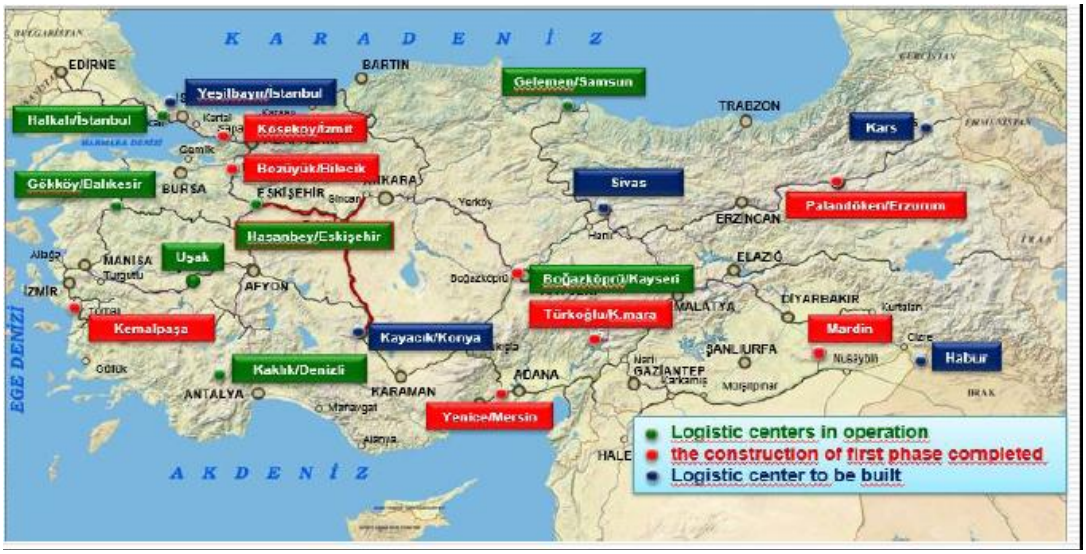
Table 24: Ranking of Turkey's seaports in cargo handling amongst world's top best performers, 2017

Ranking	Port	TEU	% change
1	Marport	1711357	-7.34
2	MIP	1591983	9.56
3	Kumport	1063246	59.94
4	Asya Port	1002133	44.38
5	Yilport	499283	26.05
6	Gemport	474019	32.98
7	DP World	437047	747.76
8	Evyap	369659	-46.31
9	Mardas	357264	22.71
10	Nemport	313596	15.4

Source: IMO

There are also facilities/equipments available for handling ancillary vessels of smaller sizes because those factor in the increasing benefits for ECO's landlocked countries in their reach out to open seas. Such feeder ships collect containers from different ports and move them to central spacious container terminals where those are loaded to much bigger vessels as part of the multimodal transport scheme. The services provided by such ancillary vessels may be of interest to lower-volume cargoes from such landlocked countries as Tajikistan, Kyrgyzstan and Afghanistan.

Following the principle of economies of scale the above-noted mega ships offer their services at lower costs against the requirements of minimal load volumes. The broad and well-diversified spread of the logistics centers in Turkey's seaports makes Turkey a major destination for ECO's landlocked countries.



Map 2 of maritime analysis: Logistics centers in operation\construction\planning

Statistically, 73.4% of cargo transportation in Turkey has been moved by sea in 2017-2018 (H-1). Moreover, in the coming five years, the sea vessels will provide services for 20,000TEUs as an average capacity.

The loading/discharging services provided by Turkey's seaports for loading of transit cargoes is 7% for discharging of transit cargoes and 6% for transit imports:

Table 25: Share of container handling in Turkey's seaports

Container handling services	% of total
Export loading	40
Cabotage loading	3
Transit loading	7
Import discharging	3
Cabotage discharging	3
Transit discharging	6

Source: IMO

The Marmara region followed by the Mediterranean region is leading in the volumes of container handling services at 63.4% and 19.6% of total, as follows:

Table 26: Container handling in Turkey's ports by region of location

Container handling by regions	Share of regional distribution in container handling	Containers (TEU)
	% of total	Million TEUs
Marmara region	63.4	4.2
Mediterranean region	19.6	1.3
Aegean region	16.5	1.1
Black Sea region	0.5	0.4

Distribution of dry bulk cargo and general cargo handling in Turkish ports over the five-year period (2007-2011) amounted to 163 million tons. The ports of Izdemir, Erdemir, and Icdas led in dry bulk and general cargo handling during the continual period.

Table 27: Dry Bulk and General Cargo Handling at Turkish Ports (Top 10 Ports and Total Cargo Handling in Million Tons)

Turkey's cargo handling ports	2007	2008	2009	2010	2011
Izdemir	10.3	11.5	9	10.8	11.7
Erdemir	11.2	12.3	10.5	10.4	10.4
Icdas	3.4	4.1	6.1	7.3	7.7
MIP	4.1	4.8	5.7	6.7	6.4
MMK-Atakas				6.7	6.4

Gulluk	4.6	4.7	3.2	4.2	4.4
Akcansa-Canakalle	2.3	3.7	4.1	4.7	4.3
Toros Tanm (Ceylan)	3.6	3.3	3.6	3.8	3.6
Celebi Bandrima	2.8	2.9	2.2	3.5	3.6
Diler	4.3	3.7	3	3.5	3
POAT Total	93.1	99.6	90.1	104.9	100.2
Turkey Total	134.3	140.6	130.1	153	163
% POAT of Turkey's total	69	71	69	69	61

Source: Port Authorities, Turkey

For those LLCs in the ECO region that may be interested in shipping their export cargoes in liquid form, the handling of liquid bulk cargo at Turkish ports accounted to 36% of overall forms of cargoes handled during 2012. In the same year, the total of 133 million tonnes were handled in liquid cargo of which 45 million tonnes contributed to the transit handling whereas 69 million tonnes to the exports handling and 45 for the imports handling.

Table 28: Liquid bulk cargo handling at Turkish Ports (Million Tonnes)

	Liquid bulk cargo handling at Turkish Ports	Total cargo handling
2004	72	213
2005	69	213
2006	81	244
2007	109	292
2008	122	315
2009	133	309
2010	134	349
2011	130	363
2012	133	387

The composition of cargoes being transported by ECO's LLCs over the past and now consists of prevailing chemicals products. As an example, Turkmenistan, Uzbekistan and Kazakhstan transport the above-mentioned types of commodities in huge amounts. For them, the services of Turkish ports on handling liquid chemicals may be of practical interest.

Table 29: Liquid chemical cargo handling at Turkey's ports (million tonnes)

	Turkish Ports handling specialized cargo	2008	2009	2010	2011
1	Petkin	1.70	2.20	2.30	2.30
2	Limak Iskenderun	0.80	0.90	0.80	0.70
3	Vilport	0.50	0.60	0.70	0.70
4	Solventas	1.00	1.40	2.00	0.70

5	Evyap	0.50	0.60	0.50	0.60
6	Poliport	0.60	0.70	0.70	0.50
7	Limas	0.30	0.30	0.40	0.50
8	Toros-Ceylan	0.80	1.00	1.00	0.40
9	Aksa			0.30	0.30
10	Ege Gunre	0.20	0.30	0.30	0.20
	Total	6.40	8.00	9.00	6.90

Source: Port Authorities, Turkey

Turkey's major ports specializing in handling the Ro-Ro mode of transportation are: Gemport (234.000 automobiles), Ford Otosan (232,000 vehicles), Evyap (161,000 vehicles) and Borusan (154,000 vehicles).

Table 30: Automobile handling at Turkey's ports (by unit)

Ports	**2010**		**2011**		**2012**	
	Exports	Imports	Exports	Imports	Exports	Imports
Autoport					425	1.377
Borusan	135.385	6.765	155.334	8.777	149.964	4.343
Evyap Port	37.101	104.433	26.433	133.811	22.551	139.412
Ford Otosan	167.478	59.652	200.386	61.463	186.821	45.703
Gemport	240.729	45.321	214.021	56.914	199.886	34.93
MIP	939	572	378	411	567	330
Samsun port			136	47	67	24
Total	581.632	216.743	596.406	261.423	560.281	226.119

Source: Port Authorities, Turkey

International truck and trailer handling ports in Turkey accounted to over 400,000 units during the five-year period up until year 2012. In this, Haydarpasha-Trieste Ro-Ro was leading at 30% of total cargo handled. It was followed by Çeme -Trieste (11%) and Mersin-Trieste (10%).

Table 31: International truck and trailer handling ports volumes

Ro-Ro lines	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Haydarpasha-Trieste	160.203	149.062	114.401	116.815	139.27	121.742
Ambarli-Trieste	41.085	39.998	30.372	27.179	18.017	15.618
Cesme-Trieste	36.717	30.039	24.808	37.627	43.058	44.106
Samsun-Novorossyisk	29.598	21.148	9.28	15.145	10.742	7.67

Zonguldak-Skodovsk	27.099	23.632	20.476	90.036	8.722	4.447
Trabzon-Sochi	0	0	0	5.078	637	533
Tasucu-Girne	7.18	10.15	7.066	36.071	36.316	34.596
Mersin-Trieste	33.393	32.305	31.032	19.107	18.275	18.126
Tekrdag-Toulen	0	0	12.019	9.269	0	0
Mersin-Iskenderiye	0	0	0	889	253	791
Haydarpasha-Marsilya	0	0	0	7.48	2.13	0
Samsun-Kavkaz	0	0	0	6	1.383	1.236
Tekrdag-Trieste	0	0	0	1.039	0	0
Ambarli-Toulen	0	0	0	0	25.063	37.505

Source: Port Authorities, Turkey

The current trends in Turkish ports indicate at 22 million TEU capacity is reachable by 2024. Container traffic has been forecasted to grow to 30 million TEU by 2030. The estimations for the regional cargo handling capacity by type have been – 24 million TEU for 2024 and 29.3 million TEU by 2030. The breakdown by regions has been presented as below:

Table 32: Demand-based cargo handling by regions of location of Turkey's ports

Cargo handling regions	Demand	Demand of the regional port based on cargo type (million tonnes)		
Marmara region		**Forecast for 2030**	**Existing capacity**	**Capacity difference**
	Container (TEU)	13.1	5.2	-7.9
	General and dry bulk cargo (ton)	201	118.2	-82.8
	Liquid chemical cargo (tons)	63.3	49.3	-14
	Ro-Ro foreign trade (units)	0.5	1.1	0.6
	Ro-Ro cabotage (units)	1.7	0.3	-1.4
	Automobiles transport (units)	5.7	1.8	-3.9
Aegean region				
	Container (TEU)	4.5	1.7	-2.8
	General and dry bulk cargo (ton)	77.8	42.9	-34.9
	Liquid chemical cargo (tons)	47	36.4	-10.6
	Ro-Ro foreign trade (units)	0.1	0.1	0
	Automobiles transport (units)	0.3	0.2	-0.1
Mediterranean region				
	Container (TEU)	10	1.9	-8.1
	General and dry bulk cargo (ton)	139.7	54.6	-85.1
	Liquid chemical cargo (tons)		63.8	63.8
	Ro-Ro foreign trade (units)	0.2	0.1	-0.1

Black sea region				
	Container (TEU)	2.2	0.5	-1.7
	General and dry bulk cargo (ton)	65.7	53.7	-12
	Liquid chemical cargo (tons)	5.4	2.9	-2.5
	Ro-Ro foreign trade (units)	0.3	0.4	0.1
Total (Turkey)				
	Container (TEU)	29.8	9.4	-20.4
	General and dry bulk cargo (ton)	484.2	269.4	-214.8
	Liquid chemical cargo (tons)	179.4	143	-36.4
	Ro-Ro foreign trade (units)	1.1	1.7	0.6
	Ro-Ro cabotage (units)	1.7	0.3	-1.4
	Automobiles transport (units)	5.9	2	-3.9

Source: Port Authorities, Turkey

Most of the Turkish ports have been developed over the relatively recent past. Some are undergoing intensive modernization. For joint venturing in investment project, the involvement in the modernization projects in Turkey through ECO might attract the lively interest of the region's landlocked countries. In that regard, the details of the privatization process of the ports could be referred as below.

Table 33: Port development and expansion

Port Development Projects	Existing Port Capacity (Million TEU)	Project Port Capacity (million TEU)	Realization of port development
Borusan	0.4	0.7	2015
TCE Ege Port	0.4	1	2013
Evyap	0.6	1.2	2015
Gemport	0.4	0.6	2013
Mardas	0.6	1.3	2013
MIP	0.9	1.7	2012
Mersin New Cont. Port		11.4	5 phases
Limak Iskenderun	0.4	3	2016
Yliport	0.5	2.5	2015
Asya Port		1.9	2013
DP World		1.3	Ongoing
Nemport	0.4	0.4	Ongoing
Petlim		1.5	2016
Baticim		0.3	2015
Derince		1	Modernization
Port of ismir	0.8	2.5	2015

Roda Port		0.2	2012
Candarli Port		0.4	Modernization
Filyos Port		0.7	Modernization

Source: Port Authorities, Turkey

Table 34: Investor information on trends in PPP development at Ports of Turkey

Ports	Tenders occurred	Transfer	Period (years)	Concession	Sales (US$ million)	Outcomes
Mersin	**2005**	2007	36	PSA-Akfen Joint Venture Group	755	Transferred
Izmir	**2007**		49	Global-Hutchison Aegean Exporters Assembly JV	1.275	Cancelled
Derince	**2007**		36	Tukerler JV Group	195	Cancelled
Bandirma	**2008**	2010	36	Celebi JV Group	175	Transferred
Samsun	**2008**	2010	36	Ceynak Logistics Inc	125	Transferred
Iskenderun	**2010**	2011	36	Limak investment and Energy Inc	372	Transferred

Source: World Bank PPP Knowledge Lab

Ports in AZERBAIJAN

The potential of the international seaports of Azerbaijan may best be reflected through the country's swift maritime performance. In 2017, the overall volume of goods transported by sea increased by 30% compared to 2016.

Table 35: Volumes of goods transported by sea (2013-2017)

	2013	2014	2015	2016	2017
Goods transported (thous. tonnes)	11,509.7	9,934.1	6,625.9	5,807.3	8,344.5
External link	11,499.6	9,934.1	6,573.9	5,783.5	8,312.3
import	1,595.8	554.9	200.1	316.1	218.2
export	1,114.0	715.1	319.0	510.0	369.0
transit	8,241.5	8,296.3	5,567.4	4,208.3	6,871.7
between foreign ports	548.3	367.8	487.4	749.1	853.4
Coasting	10.1	-	52.0	23.8	32.2
Freight turnover (million tonne-km)	4,632.4	4,123.7	2,937.4	3,002.0	4,417.9
External link	4,631.8	4,123.7	2,933.9	3,001.8	4,413.7
Coasting	0.6	-	3.5	0.2	4.2

Source: Port Authority, Azerbaijan

The fright cargo turnover has increased dramatically in 2017 at a whopping 30.2% versus 2016 where it increased only by 2.2% against the preceding year, 2015. The overall freight cargo turnover by sea reached 4,413 million tonne/kilometers.

Table 36: Maritime freight turnover (2013-2017)

	2013	2014	2015	2016	2017
Freight turnover (million tonne-km)	4,632.4	4,123.7	2,937.4	3,002.0	4,417.9
External link	4,631.8	4,123.7	2,933.9	3,001.8	4,413.7
Coasting	0.6	-	3.5	0.2	4.2

Source: Port Authority, Azerbaijan

The size of the maritime fleet at Azerbaijan's seaports has significantly increased in 2016 by 7.4%. It however contracted by 34.0% in 2017 in part due to the modernization that caused write-offs of salvage valued fleet.

Table 37: Maritime fleet (2013-2017)

	2013	2014	2015	2016	2017
Number of ships (unit)	81	62	62	67	50

Source: Port Authority, Azerbaijan

Performance of seaports in Azerbaijan is currently operated by 6,577 personnel who bring in maximum efficiency through automation, robotisation and digitization of cargo handling operations. Thus, manual operations have been increasingly replaced by automated streamlining of operations resulting in the decrease of manpower by 0.9% in 2016 and 3.2% in 2017. Over the past five-year period, the 10% decrease in manpower, on average, has resulted in the reverse 10% increase in operational efficiency.

Table 38: Maritime personnel (2013-2017)

	2013	2014	2015	2016	2017
Number of annual employees (persons)	9667	8291	6846	6787	6577

Source: Port Authority, Azerbaijan

Rapid growth in Azerbaijan's seaports performance has brought tangible social benefits for public-at-large. Thus, the average transportation distance by sea per passenger reached 403km over the past five-year period. The level of income gained from transportation by sea brought the 121.5% increase in income level in 2016 compared to the preceding year, 2015. On average, this indicator has been increasing at 11.9% rate over the past five years (2013-2017).

Table 39: Transportation distance per passenger (2013-2017)

	2013	2014	2015	2016	2017
Average transportation distance per passenger (km)	350.4	353.7	400	459.2	456.1
Income from transportation (thous. Manats)	97901	102339.6	93989.7	160095.9	179724.5
from goods transportation	97901	102339.6	93177.4	159397.8	178792.6
External link	96642	101329.2	93133.6	158930.4	178211.9
Coasting	96642	101329.2	43.8	467.4	580.7
from passengers transportation	-	-	812.3	698.1	931.9
external link	1259	1010.4	812.3	698.1	931.9
Coasting	1259	1010.4	-	-	-

Source: AZSTAT

As seen from the above-reflected performance of Azerbaijan's maritime sub-sector, it builds on the dynamism in its seaports. In this regard, the Baku International Seaport with terminals (Ferry and Ro-Ro) has a handling capacity of 15 million tons of cargo, including 100,000 containers. It will further increase its cargo handling capacity to 25 million tons and up to 500,000 containers per year. To date, 15,000-17,000 TEU are passing through the port.

There is a Free Economic Zone (FEZ) established in Alat, which is capable of generating new jobs within the Baku International Sea Trade Port Complex, which provides a wide range of facilities and services entailing from effective transport infrastructure. The FTZ located on 100 hectares has been designed to generate up to US$1billion of revenues in the coming few years. Specifically-tailored tax and customs policies are being applied within the FTZ area. It has an access to railway lines. The FTZ serves as a multimodal transit logistics hub with the major consolidation and distribution centre in Central Eurasia.

The cargo handling services are being provided by the fleet consisting of 260 ships, the largest fleet in the Caspian Sea. In that regard, the port can manufacture all types of vessels to meet the demand of the ECO landlocked countries for marmite vessels.

The Baku International Seaport, through its terminal in Alat in Garadagh region is linked to the new rail route: Shikhezi-Dostyk-Aktau-Alat-Keshla. The latter reduces to a matter of just six days the travel from 25-40 days that were previously spent by container trains via Bandar Abbas (Iran) and Poti (Georgia).

Image 1: Inauguration by President of Republic of Azerbaijan of Baku International Trade Seaport in Alat

In addition, the railway line – BTK – that was operationalized on 29 October 2017 resulted in substantial increases in the volume of transport of railway freight cargo.
As seen from table below, the freight cargoes transported in wagons on Baku-Kuryk-Baku and Baku-Turkmenbashi-Baku came to be weightier than ones on BTK increasing by 45.1% and 41.8% whereas on BTK the increase was by 13.1% versus 2016.

Table 40: Transportation of railway wagons through Baku International Seaport, 2017

	Direction	Units	Increase/Decrease (%) vs. 2016
Wagons transported	Baku-Aktau-Baku	6124	13.1
	Baku-Kuryk-Baku	21062	45.1
	Baku-Turkmenbashi-Baku	19493	41.8

Source: Baku International Seaport (information portal)

The ferry terminal at Alat increased its throughput of traded wheeled vehicles. Thus, transportation of this type of cargo, under TIR terms, through ferry terminal increased by 26.4% in 2017 reaching 46,679 units in number. Such dynamics may be beneficial for ECO's landlocked countries as they maintain membership in the TIR Convention and as such could test their TIR practices through the opportunities provided by the Baku International Seaport on the multimodal transport scheme.

For another, the rate of utilization of port facilitates by wheeled vehicles for passage of the Baku International Seaport increased by 21.4% to handle the total of 28,584 units, of which 18,840 units, i.e., 65.9% were operated on the Baku-Turkmenbashi-Baku direction.

The terminals at Alat are within 200km from Iran, and 250km from Russia, and 300–400km from Central Asia and 3,000km from China. That makes Alat not only the terminals center but also an important cross-border point with its variety of logistics centers, FEZ, and customs offices. As such, Alat is becoming a transport hub connecting Middle Corridor, South-West, BTK, Baku-Aktau-China, Baku-Turkmenbashi-Afghanistan railway lines for trade with China. In terms of

statistics of wheeled vehicle and the rate of utilization of services and facilities at the Baku International Seaport, their total quantity increased by 24.1% in 2017 compared to 2016.

Table 41: Number of wheeled vehicles that utilized facilities/services of Baku International Seaport

	2016	2017	% change
Number of wheeled vehicles that utilized facilities/services at Baku Int. Seaport	6117	28584.11	21.4
Baku-Turkmenbashi-Baku			65.9
Baku-Aktau-Baku			34.0
Baku-Kuryk-Baku			10.0

Source: Baku International Seaport (information portal)

Ports in IRAN

Currently, the overall cargo handling capacity of the Iranian ports equals 230 million tons per annum. Such capacity enables Iran to offer cargo handling services of about 50 million tons to the neighbouring and far-located countries of the ECO region. As with the significant tonnage being available for the landlocked countries in servicing their rail-and-road moved freight, only 50 percent of the above-referred tonnage has been realized till present thereby indicating at huge capacities at ports remaining non-utilized. There is ample opportunity at Iranian ports for the landlocked countries of the region to avail in their accessing to the global market outlets for sales of their goods and commodities. The operating facilities at Iran's seaports spread vast. Earlier, in the current year of 2019, Iran has adopted its Chabahar Development Plan to expand port facilities to promote multimodal transport mode. The Caspian Sea can be linked to international waters through Iran's strategic port of Chabahar in south of Iran. The Chabahar port could open an essential transport corridor to ECO's landlocked countries via Shahid Beheshti port at Chabahar, which is connected to the International North-South Transport Corridor (INSTC) and Trans-Caspian Railway (TCR). The ECO countries are currently handling construction of their relevant segments of INSTC to connect INSTC via Qazvin-Rasht-Astara railway line to both, the Caspian Sea and deep international waters via the Chabahar port. In overall, Iran has the following eight major ports: Port of Amirabad, Port of Bandar Abbas, Port of Bushehr, Port of Chabahar, Imam Khomeini Port, Port of Khorramshahr, Port of Nowshahr, and Port of Shahid Rajaee.

Anzali port, in the Pre-Caspian, has sufficient capacity of serving a solid anchor of multimodal transport scheme for ECO's landlocked countries. In that regard, it was able to service passage of the container train that arrived on 26 July 2018 from China to Aktau (Kazakhstan) and through Anzali (Iran) to Tehran.

Image 2: Inauguration of multimodal container train at Anzali port

The northern port Amirabad with its FTZ is in Mazandaran Province. The key role of FTZs in improving transit transport volumes and increasing efficiency of port infrastructures in order to prepare the ground for international multimodal logistics companies for active trade exchange amongst ECO countries has long been proven. Amirabad port provides railway link to Kazakhstan-Turkmenistan-Iran railway line thereby enabling ECO's landlocked countries, notably, Kazakhstan, Turkmenistan, Uzbekistan and, indirectly, Afghanistan to feed this railway route with their on-rail and on-road cargo. During the first four months of 2018, Iran's seaports contributed to the 10% increase in exports compared to the same period in 2016. Although import contracted by 15%, the balance was restored by increases in monetary value of export so that net trade at all of Iran's ports remained positive. Moreover, cargo frequency by arrivals and departures by rail at Iran's ports rose by 12%. Given current trade restrictions (tariff, para-tariffs, non-physical and physical barriers), the number of incentives/support packages has been developed with the aim of reducing adverse impacts of limitations on trade at ports. The forecast of the 30% increase in rail transport share is expected to materialize in the near five years to come. With due regard to its strategically important role in enabling transit to ECO's landlocked countries, Iran offers mutually beneficial and opportune incentives to transporters of the landlocked countries in the region. Below are the transit cargo handling capacities and performance indicators at Iranian ports as well as guides for tariff incentives for rail operators and road forwarders of ECO's landlocked countries.

Table 42: Transit of goods by marine vessels

Petroleum/Non-petroleum cargo	Type of vessels	Content of goods	Discount (%)
Non-petroleum	Commercial	Transit	**50**
Non-petroleum	Commercial	Transit/Imported	**50**

Source: PMO, Iran

Table 43: Transit of re-exported goods

	Description	Exempted volume (tons)	Size of Discount (%)	Remarks
1	Bilge maintenance	Up to 75,000	50	Exc. traffic and bulky goods
	Shipping	75,000-100,000	60	Per forwarder, per port, if services (loading/unloading) provided during a year
	Warehousing	100,000 and over	70	
	Loading/unloading	100,000 and over	70	
2	Bilge maintenance and shipping of vehicles		25	
	Port duties on goods		100	
	Port phytosanitary duties		100	
	Loading/Discharging charges on Jetty		100	
	Demand charges		55	
	General services and infrastructure charges	50,000	55%	In Special Economic Zone (SEZ): per forwarder, per port, if services provided during a year
	Exemption of warehousing fees for goods in transit			5 days

Source: PMO, Iran

Table 44: Transit of containers transporting goods (loaded/unloaded)

Container type	Capacity of container	Port (Southern/Northern)	Discount (%)/ Exemption (days)	Remarks
THC Container	20′	Southern (incl. Chabahar)	27	
THC Container	40′	Southern (incl. Chabahar)	39	
THC Container		Northern	49	
Warehousing of a container	from 20,000TEU	Southern	50	
	from 20,001 -50,000 TEU	Southern	55	
	Over 50,000TEU	Southern	65	
Warehousing of a container		Northern	85	
Warehousing of a container		Chabahar	87	
General	20,000TEU		55	In the SEZ: per forwarder, per port, services/ loading/unloading provided during a year
	20,001-50,000TEU		75	
	Over 50,000TEU		100	
Demand charge			50%	

Warehousing of goods		CFS	54	
Port duties, phytosanitary fees, loading/unloading charges			100	
Exemption from warehousing fees			5 days	Upon expiration of the deadline, warehousing fees will accrue from day 1st of discharge and by last day of warehousing.
Exemption from warehousing fees		CFS	5 days	

Source: PMO, Iran

Table 45: Exemptions/discounts for liner ships at Shahid Port in Chabahar

No.	Duties/Charges/Fees	Duration of validity of discount (%)/Exemption (month)		
		1st – 3rd months	4th - 6th month	7th month till end
1	Duties/Charges	80	60	40
2	Harboring charges	80	65	50
3	Pilotage/towage/dredging charges	60	40	30
4	THC charges	90	50	30
5	Empty container warehousing	75	75	75
6	Customs procedures incl. imports	30		
7	Loading	30		
8	Warehousing	30		

Source: PMO, Iran

As the cargoes to seaports are delivered mainly by rail and road, the transit incentives for forwarders that deliver freight by road would also need to be accounted for.

Table 46: National transit fees by a country that is being transited along the ITI road corridor

Customs tariff code								**Cargo value: 100,000**
No.	**Customs authority**	**Duty (%)**	**Tax (VAT) %**	**WHT (%)**	**CIF (%)**	**Amount payable (US$)**	**Transit fees (US$)**	**Amount payable by transporter (US$)**
1		25	14	0	0	39,000	100	100
2		25	15	0	0	40,000	130	130
			16	0	0	42,000	120	120
			16	0	0	42,000	Duty and taxes due on entry	
Total								**350**

Table 47: Road tanker carrying commodity (diesel fuel) - cost of national transit fee

Product: Commodity (diesel oil fuel) **Customs tariff code:** **Cargo value: US$30,000**

Customs tariff								**Cargo value: 100,000**
No.	**Customs authority**	**Duty (%)**	**Tax (VAT) %**	**WHT (%)**	**CIF (%)**	**Amount payable (US$)**	**Transit fees (US$)**	**Amount payable by transporter (US$)**
1		25	14	0	0	42000	100	100
2		25	15	0	0	4,500	130	130
			16	0	0	4,800	120	120
			16	0	0	4,800	Duty and taxes due on entry	
Total								**350**

Source: PMO, Iran

Table 48: Containerized load (radial truck tyres) – cost of a single transit fee package available on the ITI corridor

Product: (radial truck tires)	**Customs tariff code:**	**Cargo value: US$30,000**
		0.5%% of FOB value; USD150

During 2018, Iran has re-confirmed its tariff incentives that it offers for all type transporters/forwarders for all modes of transport, including on maritime. Thus, the confirmed List of Tariff Incentives for Foreign Transit and Investment at Iran's seaports includes the following:

2018: Tariff-related incentives. Marine vessels carrying transit goods		
No.	Description	Discount
1	Non-petroleum commercial vessels carrying **ONLY** foreign transit goods, entering northern Iranian port to unload	50%
2	Non-petroleum commercial vessels carrying a combination of imported and foreign transit goods, proportional to their foreign transit goods to the total amount of cargo in northern ports	50%

Foreign transit goods (to a third country)

No.	Description		Discount/ Exemption
1	Stevedoring, cargo handling (except for traffic and bulky goods) and warehousing (by each forwarder in one port for one year of services such as unloading and loading)	Up to 75,000 tons	50%
		From 75000 to 100,000 tons	60%
		More than 100,000 tons	70%

2	Stevedoring Bilge Maintenance and Shipping of vehicles		25%
3	Port duties on goods		100%
4	Port Hygiene Duties		100%
5	Loading/Unloading Charges on Birch Jetty		100%
6	Demand Charges		50%
7	General Services and Infrastructural Charges in Special Economic Zones (by each forwarder in one port for one year of services such as unloading and loading)	Up to 50,000 tons	55%
		From 75001 to 100,000 tons	75%
		More than 100,000 tons	100%
8	Warehousing exemption for foreign transit goods (except for vehicles)		5 days

Containers with foreign transit goods and empty transit containers

No.	Description		Discount
1	THC Containers for Foreign Transit in Southern Ports (Including Chabahar)	20′	27%
		40′	39%
2	THC Containers for Foreign Transit in Northern Ports		49%
3	Container Warehousing in Southern Ports (by each forwarder in one port for one year of services such as unloading and loading)	Up to 20,000 TEU	50%
		From 20,001 to 50,000 TEU	55%
		More than 50,000 TEU	65%
4	Container Warehousing in Northern Ports		85%
5	Container Warehousing in Chabahar Port		87%
6	General Services and Infrastructural Charges in Special Economic Zones (by each forwarder in one port for one year of services such as unloading and loading)	From 20,000 TEU	55%
		From 20,001 to 50,000 TEU	75%
		More than 50,000 TEU	100%
7	Demand Charges		50%
8	Goods Warehousing in CFS Warehouses		54%
9	Port Duties, Hygiene Duties, and Loading/Unloading Charges		100%
10	Warehousing Exemption Duration: Note: When exemption deadline is over, warehousing charges will be calculated from the first day of unloading and according to the last day of warehousing		5 days
11	Warehousing Exemption Duration in CFS Warehouses: Note: When exemption deadline is over, warehousing charges will be calculated from the first day of unloading and according to the last day of warehousing		5 days

Discounts in Shahid Beheshti Port in Chabahar

Chabahar Port Discounts include all customs procedures (including import) in comparison to other southern ports for loading and warehousing	30%

No.	Types of Incentives	Incentives for Liner Ships[4]		
		1	2	3
		Discount for first 3 months (after	Discount for from 4th to 6th months	Discount for from 7th to the end of the first

[4]Liner ships are the ships defined in the tariff guidelines and subject to conducting contracts or MoUs with the port and undertaking the container transport to Shahid Beheshti Port in Chabahar

		launching the shipping services)	(after launching the shipping services)	year (after launching the shipping services)[5]
1	Duties and Charges	80%	60%	40%
2	Harboring Charges	80%	65%	50%
3	Pilotage, towage and dredging charges	60%	40%	30%
4	THC Charges	90%	50%	30%
5	Empty Container Warehousing	75%	75%	75%

Terms and conditions for investing

No.	
1	Allocation of facilities from funds specified for non-governmental sectors for purchasing passenger and vehicle vessels, construction of oil tanks, warehouses, silos, and other compounds for storage of goods in Shahid Beheshti
2	Calculation of the internal return rate of 30% for investment contracts in Shahid Beheshti Port in financial models
3	Offering joint investment conditions with Iranian parties with noteworthy prices in all Iranian ports
4	Offering conditions to receive lands and creation of terminals for goods storage and transit with an Iranian party in all Iranian ports
5	Offering conditions for receiving lands and creation of centers for production or generation of added value for export and transit of goods in all Iranian ports
6	Offering conditions to receive lands for the establishment of logistic centers in all Iranian ports

Source: PMO, Iran

Ports in PAKISTAN

Today, Gwadar is potentially world's largest transit and transshipment cargo facility. It is already operating 19 ports in 11 different countries. The development of Gwadar Port is part of the China-Pakistan Economic Corridor (CPEC). Upon completion of construction works, Gwadar port will provide the shortest route to landlocked countries to global trade via open seas. It will handle an estimated 1 million tons of cargo, annually. The port will become South Asia's largest shipping center within the next five years, with the annual capacity of handling 13 million tons of cargo. By 2030, it will be capable of handling up to 400 million tons of cargo annually. To date, out of 39 projects under CPEC, 19 have been completed. Gwadar, as the epicenter of the CPEC project, has an unbeatable in-country employment generating capacity. Thus, nearly 65% of the labor force involved in construction and other works at Gwadar is from Pakistan.

[5] If contractual liabilities are met within one year by shipping lines, the discount set forth in the 3rd column shall be offered for the 2nd year.

Figure 21: Gwadar Port (courtesy of Reuters)

Port Qasim caters 40% of shipping requirements of Pakistan. In 2007, the port staged the record volume of 24.3 million tons cargo indicating the 13% growth. The current cargo handling capacity of the port is 34 million tons per annum. The nine projects currently running at port are expected to materialize in 150% increase in cargo handling capacity up to 85million tons per annum.

Pakistan's National Shipping Corporation's shipyard consists of 17 vessels with the overall capacity of 536,821 deadweight. It consists of 10 multi-purpose cargo vessels, 3 Aframax crude oil tankers and on Panamax bulk carrier vessel. The share of lifting cargo increased from 17% in 2007 to 20% in 2017.

Handling capacity of Karachi port is 26 million tons of cargo per annum. That includes 14 million tons of liquid cargo, 12 dry cargo and 650,000 TEUs per annum. Nearly 1,600 ships arrive and depart from Karachi Port. Berth occupancy is 45% indicating that port is open for more cargo arrivals. It has 30 dry cargo and 3 liquid cargo handling berths. In overall, it has 33 berths (30 dry cargo berths, 13 berths on West Wharves, 17 berths on East Wharves and 3 liquid cargo berths for POL & Non-POL products). The port has two container terminals: Karachi International Container Terminal (KICT) and Pakistan International Container Terminal (PICT). The port provides safe navigation for all vessels including with up to 75,000 of deadweight. The port has an open cargo storage area of 450,824 m^2 of plinth and covered cargo storage area of 101,403m^2. The 100,000m^2 coal yard was established. The 329,753m^2 area is available at the Thule Produce Yard (TPX) - to facilitate transit cargo handling.

In sum, owing to potentially extensive utilization of the facilities and capacities of the seaports in ECO by its landlocked countries, the present project will improve the regional transit transport connectivity. The existing and planned connections and connectivities will be assessed under the present project to match with available links to infrastructure of port facilities. The

information in table below reflects the connecting railway routes in the ECO region to connect to the existing regional seaports.

Table 49: Ports connecting railway routes

Port	ECO Rail routes linked		ECO Rail route linked	Port	ECO Rail route linked	Port	ECO Rail route links
Amirabad	KTI	Derince	ITI	Port of Bartin		Port of Gorele	
Anzali	KTI	Mersin	BTK	Port of Bodrum		Port of Gulluk	
Aktau	KTI/BTK	Port of Aliaga*		Bosphorus (Istanbul) Strait		Port of Haydarpasa *	
Atrau	KTI	Port of Ambarli*		Dardanelles Strait*		Port of Hopa	
Bandar Abbas	Almaty-Bandar Abbas	Dardanelles Strait*		Port of Cesme		Icdas Jetty	
Bandar Imam	INSTC	Port of Ordu		Botas (Ceyhan) Oil Terminal		Port of Inebolu	
Bushehr		Port of Gemlik*		Port of Mudanya		Port of Iskenderun	
Chabahar	INSTC/KTAI	Port of Haydarpasa *	ITI/Istanbul-Almaty	Port of Dikili		Port of Izmit	
Imam Khomeini Port		Port of Istanbul*	ITI/Istanbul-Almaty	Port of Poliport*		Port of Karabiga	
Port of Khorramshahr		Port of Izmir*		Port of Eregli		Port of Kusadasi	
Port of Nowshahr		Port of Nemrut Bay		Port of Fatsa			
Port of Shahid Rajaee		Port of Akdeniz		Port of Fethiye			
Baku Int. Seaport	BTK/South-West	Port of Alanya		Port of Finike			
Gwadar	KTAI	Port of Alemdar		Port of Gelibolu			
Post Qasym		Port of Aliaga*		Port of Giresun			
Karachi				Port of Gocek			
Turkmenbashi	BTK/Middle Corridor	Port of Ayvalik		Port of Marmaris			

Source: IMO

Civil Aviation

Civil aviation is one of the four transport modes of the ECO regional transport. It accounts to 2 percent share in the structure of the ECO transport sector.

Statistical indicators on Civil Aviation

The statistical indicators for civil aviation are embedded within statistical group 26. The statistical item is represented by the measurement of airlines passengers carried for the reported period.

The number of airline passengers carried in the ECO region reached 45.6 million in 2017. The general dynamics in growth of passengers traveling elsewhere in the world has a tendency to a decrease in view of coronavirus travel restrictions. In 2018, (pre-pandemic year) the passengers transported by air increased by 1.2 percent compared to the same period in 2017. In the subsequent year, 2019, owing to the coronavirus breakout, the quantities of air passengers fell by nearly 42%.

Table 50: Airlines passengers carried

ECO-KSI Table 26 (item 16.9) **Airline passengers carried**						
Country	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Afghanistan	2209428	1929907	1917924	1647425	1125367	1066747
Azerbaijan	1787800	1818000	1979900	2358700	2399100	2703500
Iran	16825261	13873256	17084581	26858179	23029380	21641449
Kazakhstan	4918608	5081632	5007869	6903190	5920110	6800111
Kyrgyzstan	1238	1200	1112	1485	1360	1095
Pakistan	7670348	8467827	9628354	7260769	6880637	7420378
Tajikistan	1238	1200	1112	1485	1360	1095
Turkey	84574844	96604665	174153	193577	210948	208911
Turkmenistan	579716	897079	1318350	2136219	2457474	2081424
Uzbekistan	2545935	2486673	2383631	2581865	3056558	3685192
ECO	121114416	131161440	39496987	49942893	45082294	45609903

Source: ECOSTAT

Highlights in civil aviation (2019-2020)

During 2019-2020, an important game changer event occurred in the area of cooperation among the ECO member countries on civil aviation. In particular, a Working Group for Civil Aviation (WGCA) was established to advance the cooperative efforts among the ECO member countries in the transport mode of civil aviation.

During its first Meeting held on 23 November 2020 (ECO Secretariat), the ECO-WGCA reached a consensus among the participating countries' to work along the following main activities:

1. Liberalization of airlines passenger services (3rd, 4th and 5th freedom) within ECO region.
2. Civil aviation support services (aircraft ground handling, catering, aircraft maintenance).
3. Pure cargo operations within ECO region.

As with the aforementioned objectives-setting Meeting held, the development of statistical indicators may now be mainstreamed along the above-anchored three statistical items.

Analytical statistics: regional civil aviation hub

During much of 2019 and throughout 2020, with the aim to revitalize the activities in the civil aviation transport mode, the ECO Member States have identified a need to revitalize activities by establishing ECO regional civil aviation hub, central for coordination of regional cooperative efforts.

Thus, during the 9th ECO Ministerial Meeting on Transport (1-2 May 2018, Turkmenbashi (Turkmenistan)), the host county expressed a desire that such regional civil aviation hub be in Turkmenistan. The matter has then been followed up at the 1st Meeting of the ECO WGCA (as mentioned earlier in this section).

For putting this idea into practice a reasonable groundwork is to be set up for informed decision making as regards the span, scope and substance of the proposed hub.

The area of civil aviation forms an integral part of any given transport sector. In ECO, civil aviation is one of the four transport modes under Transport and Communications, which, in turn, is one of the six "core areas of cooperation" of the Organization (ECO, 2017). Within Transport and Communications, civil aviation is the most revenue intensive among the four aforementioned transport modes.

Contribution of civil aviation to the structure of the ECO' regional transport sector has been estimated at 1.2 percent in 2018.

In spite of a miniscule share attributed to the civil aviation transport mode, it nevertheless holds an unbeatable niche in developing people-to-people interaction across the region. (ECO Chronicle, 2017). Thus, the development of regional tourism, which embraces all type tourist travel among regional countries, is directly dependent on capacities of member countries in civil aviation. Peoples' connections by air in-between the remote locations can be ensured by civil aviation, only. Remote locations have a limited to no access at all to transport routes due to complex terrain landscape. Moreover, the role of 'complementary' services provided by civil aviation to other transport modes like rail, road, and maritime is unquestionable owing to the synergic effects of civil aviation within tightly intertwined comprehensive transport system.

Given such realities, the present statistical bulletin provides an insight on civil aviation as it stands in the ECO region. As statistical diversity of measurements of civil aviation stand thin which otherwise will enable introducing quantifiable and measurable statistical indicators to flag progress in this transport subsector, the present bulletin throws a light on the data that would be most needed in terms of progressive statistical processes of generation, collection and treatment.

Key recommendations

Over the relatively recent past ECO policy and decision makers adopted a basket of useful recommendations and proposals aiming at advancement of cooperation in civil aviation. Following expert discussions of Senior Officials, which preceded the 9th Meeting of Ministers of Transport of the ECO Member States (1-3 May 2018, Turkmenbashi), the proposal on establishing the ECO regional civil aviation hub has officially been posted (Report of the 9th ECO Ministerial on Transport, 2018).

Moreover, the proposal was marked by member countries as one having a regional value given that Turkmenistan's Ashgabat International Airport was ranked by the Asian Civil Aviation Ranking Agency as world's most comfort-friendly airport in 2018.

The region may only benefit at maximum from prospective exchanges of good airport governance practices and management and air terminal maintenance up to the level of regional customer needs[6].

When analyzing the prospect of a regional civil aviation hub in ECO at the global scale, Turkey has attained cornerstone achievements in civil aviation in 2019. To that effect, world's largest New Istanbul Airport was put into operation in January 2019. From that stance, the ECO countries may directly benefit by learning from Turkey's experiences in its gaining civil aviation excellence, worldwide. Turkey is thus being favored be the ECO countries for to share its civil aviation practices and expertise with ECO member countries.

In the meantime, people in regional countries do immensely benefit from the New Istanbul Airport's potential. Such enormous benefit has particularly been pointed out by the 29th ECO Meeting of Regional Planning Council (17-20 December 2019, Tehran) (pl. see paragraph-62, 29th RPC Report).

Yet, low cost and therefore affordable small air craft flights with short distance itineraries between smaller cities are increasingly in demand in the region. The more basic such need is the more stringent it becomes for remote locations where people have a limited or no access at all to major international civil aviation services.

Having acknowledged real time needs and aspirations of regional consumers, the ECO decision making bodies have recommended unlocking the potential of civil aviation so that the latter deliver on specific needs of regional users. As mentioned earlier, the 9th ECO Ministerial Meeting on Transport adopted the decision that prospective benefits from civil aviation for people-at-large in areas with complex access to transport be unlocked. In the statement as reflected in the report of the 9th ECO Transport Ministerial, the then Minister of Transport, Maritime Affairs and Communications of Republic of Turkey, among other key transport

[6] The justification of Turkmenistan's proposal has been the focus of the section of bulletin dedicated to civil aviation.

issues, "called for expanding cooperation on civil aviation and maritime" (paragraph-9). On the dynamics in the area of civil aviation, the Minister of Transport of Republic of Tajikistan informed about the construction of six new passenger terminals at Dushanbe International Airport in the framework of ongoing investment projects (paragraph-9). The Minister of Industry and Investments of Republic of Kazakhstan informed about the reconstruction of 15 airports during 2008-2018 (paragraph-13).

In practical terms, Pakistan proposed setting up a Working Group on Civil Aviation of ECO, to discuss the issues of: (i) liberalization of passenger cooperation freedom based on the 3rd, 4th and 5th freedom basic points within ECO region; (ii) liberal treatment in the aviation support services like in the areas of ground handling, catering, aircraft maintenance; (iii) liberalization of pure cargo operations within ECO region; (iv) cooperation on the provision of training facilities among ECO countries in civil aviation fields e.g. Passenger Safety, Security Services, Air Traffic Services, Airport Management and (v) liberalization of visa regimes (paragraph-105).

The Kyrgyz Republic suggested collaborating toward results-based outcomes in the area of civil aviation thereby focusing on future benefits from such collaboration to ordinary people residing in the ECO countries. Specifically, it was pointed out that inter-country air routes are thin on the ground. In some countries those do not exist at all. To remedy such situation, the Kyrgyz Republic expressed its interest for initiating direct flights among regional countries (paragraph-61, Report of the 29th RPC).

Information on recent developments in the civil aviation transport mode

Recent developments on civil aviation in the ECO member countries have been varied to a certain degree. Thus, according to the global ranking of the International Civil Aviation Organization (ICAO) of world countries in the area civil aviation, Turkey led as the 7th top performing country in terms of per ton kilometer revenues earned in 2017 (ICAO 2017 International Total RTK). The somewhat mid-level ranking (between 46 and 67) attributed to Pakistan, Iran, Azerbaijan, Kazakhstan and Uzbekistan. The remaining ECO countries were marked between 67 to 102 ranks in their performance.

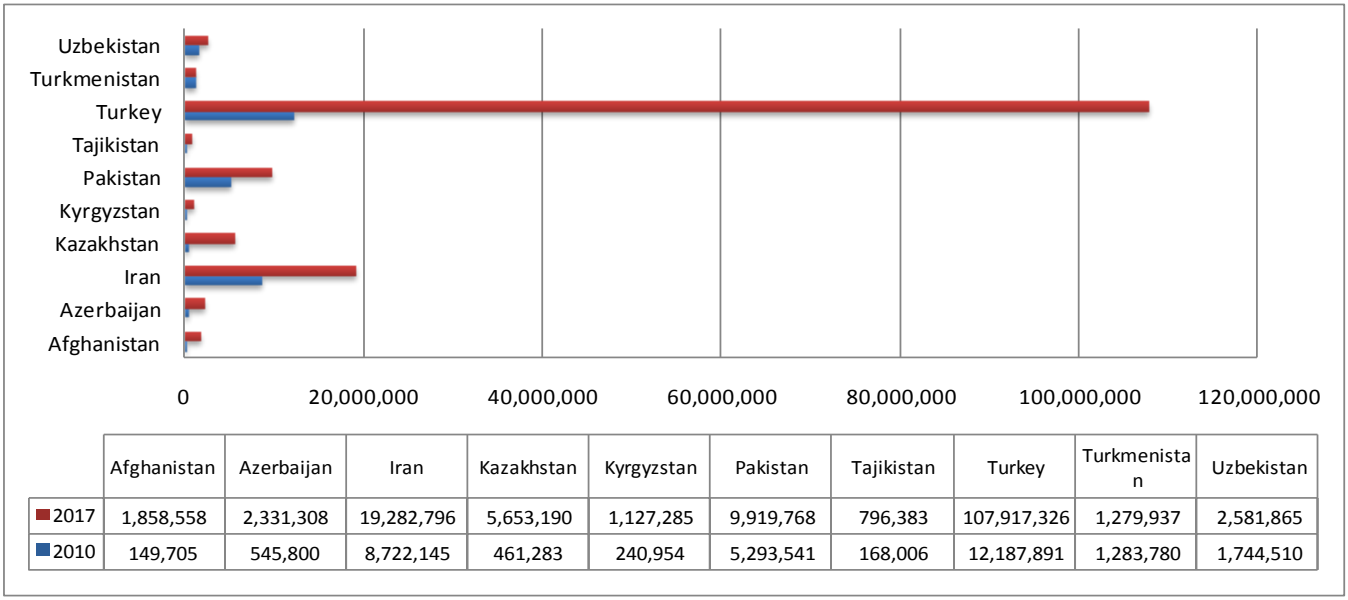
Table 51: Global Ranking of ECO Member States in Civil Aviation

Global ranking based on revenue ton-kilometer (RTK) in 2017			
Global ranking		**RTK (mn)**	**Share (%)**
7	Turkey	21209.1	3.06
46	Pakistan	2260.7	0.33
56	Iran	1284.4	0.19
60	Azerbaijan	1104.5	0.16

66	Kazakhstan	837.7	0.12
67	Uzbekistan	806.7	0.12
87	Kyrgyzstan	193	0.03
90	Tajikistan	187.5	0.03
93	Turkmenistan	160.6	0.02
102	Afghanistan	101.8	0.01

Source: ICAO

Performance of the ECO countries in terms of the overall air freight volumes transported during 2010 and 2017 revealed the lead position of Turkey performing at 107,9217,326 ton-kilometers during year 2017 (ICAO Monthly Transport Monitor). In the same period, Iran carried 19,282,796 ton-kilometers while Pakistan 9,919,769 ton-kilometers by air.



	Afghanistan	Azerbaijan	Iran	Kazakhstan	Kyrgyzstan	Pakistan	Tajikistan	Turkey	Turkmenistan	Uzbekistan
2017	1,858,558	2,331,308	19,282,796	5,653,190	1,127,285	9,919,768	796,383	107,917,326	1,279,937	2,581,865
2010	149,705	545,800	8,722,145	461,283	240,954	5,293,541	168,006	12,187,891	1,283,780	1,744,510

Figure 22: Air freight carried (mn ton-km) by ECO Member States, 2010 and 2017
Source: ICAO

When looking into the growth potentials of ECO countries, Afghanistan's performance has been impressive. In terms of the acceleration in dynamics of air freight transportation, Afghanistan showed 91.9% increase in year 2017 compared to 2010. In the same period, Kazakhstan demonstrated the 91.8% growth rate, Azerbaijan 76.6% and Iran 54.8%.

Table 52: Growth in air freight transportation (% change) in ECO Member States in 2017 vs. 2010

ECO member countries	% change in 2017 vs. 2010
Afghanistan	91.9
Azerbaijan	76.6
Iran	54.8
Kazakhstan	91.8

Kyrgyzstan	78.6
Pakistan	46.6
Tajikistan	78.9
Turkey	88.7
Turkmenistan	-0.3
Uzbekistan	32.4

Source: ICAO

In recent years, new air flights have been launched in some ECO member countries. Thus, table below illustrates the number of air flights launched during 2017-2018 in member states' civil aviation. Frequencies of flights have been observed more between Turkey and Kazakhstan, Kazakhstan and Tajikistan.

Table 53: Newly launched air flights in ECO Member States in 2017-2018

New flights	Frequency	Type	Flight schedule	Carrier
Baku-Tashkent	2	regular	June-18	Azerbaijan Airlines
Baku-Jeddah	1	regular	June-18	Azerbaijan Airlines
Baku-Jeddah	3	regular	June-18	FlyNas
Baku-Riyadh	1	regular	June-18	Azerbaijan Airlines
Baku-Riyadh	3	regular	June-18	FlyNas
Baku-Damman	3	regular	June-18	FlyNas
Baku-Bahrain	2	regular	June-18	Gulf Air
Baku-Oman	2	regular	June-18	Oman Air
Baku-Kuwait	2	regular	June-17	Jazeera Airways
Baku-Kuwait	2	regular	June-18	Azerbaijan Airlines

Source: ICAO

On airport management and maintenance, the works on reconstruction and rehabilitation have intensively continued in some ECO countries. In overall, the number of all type airports in the ECO member countries reached 321 during 2016 (German Online Portal for Statistics). The largest number of international and large airports was registered in Turkey 35 followed by Iran and Pakistan 12 each.

Table 54: Number of all type airports in ECO countries, 2016

ECO countries	International and large airports	Airports all type (total)

Afghanistan	4	26
Azerbaijan	6	14
Iran	12	100
Kazakhstan	3	27
Kyrgyzstan	2	19
Pakistan	12	46
Tajikistan	2	9
Turkey	35	57
Turkmenistan	1	7
Uzbekistan	6	16
Total	83	321

Source: Statista

At the back of continuous and coherent work along the path of improvements and perfection of airport services and capacities and the level of air crews' proficiency, the ECO countries have been able to upgrade the current statuses of their airports. Below is the list of airports accredited for international flight operations in the ECO countries during 2018. The overall number of airports accredited for international flight operations in ECO has reached 75 for year 2018.

Table 55: List of airports accredited for international flight operations in ECO Member States, 2018

List of Airports in ECO									
	Location	**Airport**		**IATA Code**		**Passengers, 2015**			**No.**
	KAZAKHSTAN								
1	Aktau	Aktau Airport		SCO					1
2	Almaty	Almaty International Airport		ALA					2
3	Nur-Sultan	Nur-Sultan International Airport		TSE		3,366,560			3
4	Atyrau	Atyrau Airport		GUW					4
5	Karaganda	Karaganda Airport		KGF					5
6	Kostanai	Kostanai Airport		KSN					6
7	Shymkent	Shymkent Airport		CIT					7
8	Oral	Oral Ak Zhol Airport		URA					8
	KYRGYZSTAN								
1	Bishkek	Manas Airport		FRU					10
2	Osh	Osh Airport		OSS					11
	TAJIKISTAN								
1	Dushanbe	Dushanbe Airport		DYU					13
2	Khodjand	Khodjand Airport		LBD					14
	TURKMENISTAN								
1	Ashgabat	Ashgabat Airport		ASB					16
2	Mary	Mary International Airport		MYP					17
3	Turkmenbashi	Turkmenbashi International Airport		KRW					18
	UZBEKISTAN								

1	Namangan	Namangan Airport		NMA					20
2	Tashkent	Tashkent International Airport		TAS					21
	PAKISTAN								
1	Bahawalpur	Bahawalpur Airport		BHV					23
2	Dera Ghazi Khan	Dera Ghazi Khan International Airport		DEA					24
3	Faisalabad	Faisalabad International Airport		LYP					25
4	Gwadar	Gwadar International Airport		GWD					26
5	Islamabad	Benazir Bhutto International Airport		ISB					27
6	Karachi	Jinnah International Airport		KHI					28
7	Lahore	Alama Iqbal International Airport		LHE					29
8	Multan	Multan International Airport		MUX					30
9	Peshawar	Bacha Khan International Airport		PEW					31
10	Quetta	Quetta International Airport		UET					32
11	Rahim Yar Khan	Sheikh Zayed International Airport		RYK					33
12	Sialkot	Sialkot International Airport		SKT					34
13	Torbat	Torbat International Airport		TUK					35
	IRAN								
1	Bandar Abbas	Bandar Abbas International Airport							37
2	Birjand	Birjand International Airport							38
3	Isfahan	Isfahan International Airport							39
4	Kish	Kish Island – Kish Airport							40
5	Mashhad	Mashhad International Airport							41
6	Dayerestan	Dayrestan Airport							42
7	Shiraz	Shiraz International Airport							43
8	Tabriz	Tabriz International Airport							44
9	Tehran	Tehran Imam Khomeini International Airport							45
	TURKEY								
1	Adana	Adana – Şakirpaşa Airport							47
2	Ankara	Ankara – Esenboğa International Airport							48
3	Antalya	Antalya Airport							49
4	Bodrum	Bodrum – Milas-Bodrum Airport							50
5	Bursa	Bursa – Yenişehir Airport							51
6	Dalaman	Dalaman Airport							52
7	Gaziantep	Gaziantep – Oğuzeli Airport							53
8	Istanbul-Ataturk	Istanbul – Ataturk International Airport							54
9	Istanbul-Sabina	Istanbul – Sabiha Gökçen International Airport							55
10	Kayseri	Kayseri – Erkilet Airport							56
11	Izmir	Izmir – Adnan Menderes Airport							57
12	Konya	Konya Airport							58
13	Kütahya	Kütahya - Zafer Airport							59

14	Malatya	Malatya – Erhaç Airport							60
15	Nevshehir	Nevşehir – Kapadokya Airport							61
16	Samsun	Samsun-Çarşamba Airport							62
17	Trabzon	Trabzon Airport							63
18	Zonguldak	Zonguldak Airport							64
	AZERBAIJAN								
1	Baku	Heydar Aliyev International Airport (GYD							66
2	Ganja	Ganja International Airport (KVD)							67
3	Nakhchivan	Nakhchivan International Airport (NAJ)							68
4	Lenkoran	Lenkoran International Airport (LLK)							69
5.	Zagatala	Zagatala International Airport (ZTU)							70
6.	Gabatala	Gabala International Airport (GBB)							71
	AFGHANISTAN								
1	Kabul	Kabul International Airport							72
2	Kandahar	Kandahar International Airport							73
3	Herat	Herat International Airport							74
4	Mazar-e-Sharif	Mazar-e Sharif International Airport							75

Source: ECOSTAT

In the ECO countries' performances in air freight transportation, during 2018, as measured in million ton-kilometers, Turkey (top country) staged 5,949 million ton-kilometers (ICAO Data PLus). Such performance was followed by that by Iran at 291 million ton-kilometers and Pakistan at 218 million ton-kilometers.

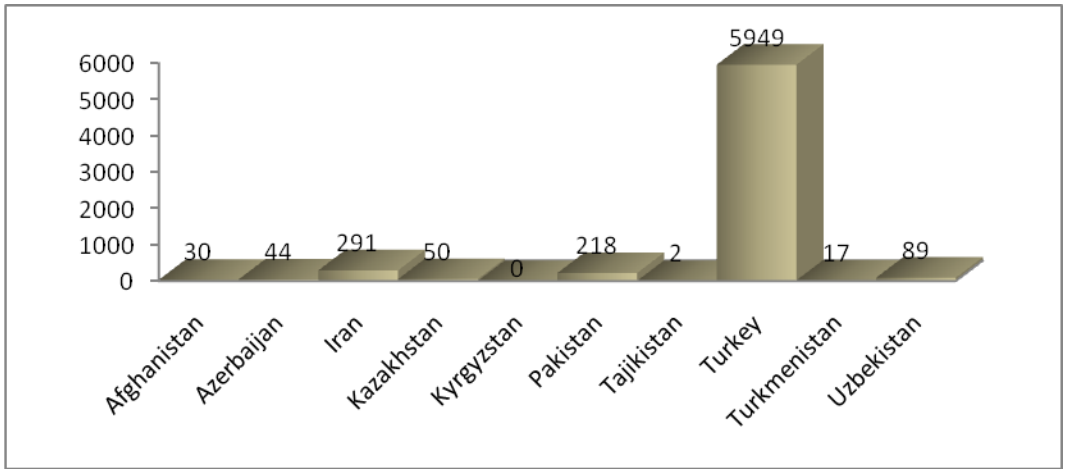


Figure 23: Air freight of ECO countries in 2018 (million ton-kilometers). ***Source: ICAO***

Deliveries of new aircraft in the ECO countries have been observed, especially, of widebody aircraft. At world regions' level, the countries of ECO were accounted, with reference to their performance on acquisition of new aircrafts, under the Asia-Pacific. Thus, according to ICAO,

the number of widebody aircraft deliveries was highest in the Asia-Pacific numbering 173 units of new aircraft during 2018 whereas, in the subsequent 2019, the aforementioned number decreased by 13 units. As per narrowbody aircraft deliveries, those have reduced, by large, from 571 units of new aircrafts (peak) in 2018 to 352 units in 2019.

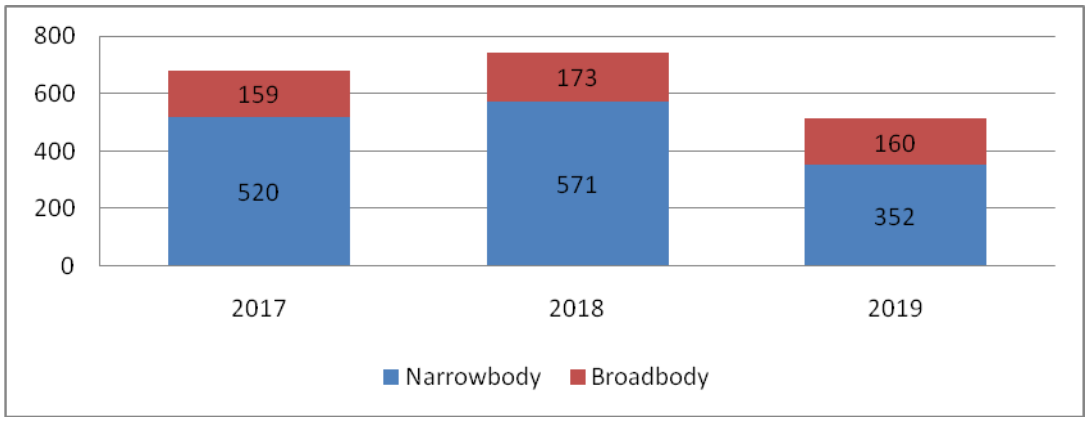


Figure 24: Aircraft deliveries (units) in countries of Asia Pacific, including countries of ECO, 2017-2019
Source: ICAO

Special mentioning needs to be made to ECO countries that stepped up a new level of civil aviation development. Thus, on 5 November 2019, the International Manas Airport marked the arrival of a new aircraft, Airbus A300-B4. Until that date, the aircraft of such model has not been in service in the country. The first instance of a new air cargo aircraft is now expected to spur the development of commercial air transport in the Kyrgyz Republic. In the meantime, the aircraft waits for an air cargo transportation company to be set up so that new air cargo operations be commenved (Civil Aviation Agency, 2019).

Figure 25: Arrival of air cargo aircraft at International Manas Airport.
Source: Civil Aviation Agency of Kyrgyz Republic

Performance of ECO countries on passenger transportation by air has been worthwhile. Passengers carried in the ECO countries during 2018 reached the cumulative 165 million of which number 115 million has been contributed by Turkey (ICAO, 2019).

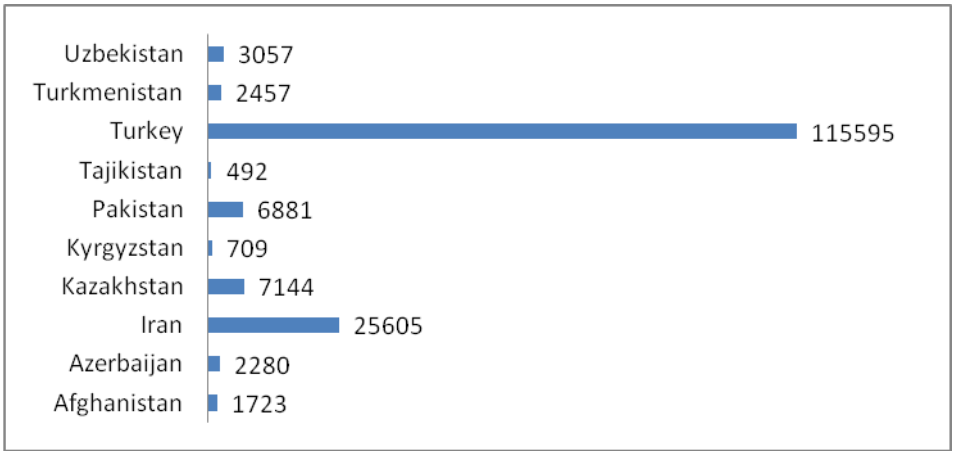


Figure 26: Passengers carried by air in ECO countries (thousand) 2018
Source: ICAO

The number of registered air carrier departures in ECO countries worldwide in 2018 has cumulated to 1.2 million. Of this number, Turkey accounted to 773 thousand while Iran 229 thousand and Kazakhstan 83 thousand of total.

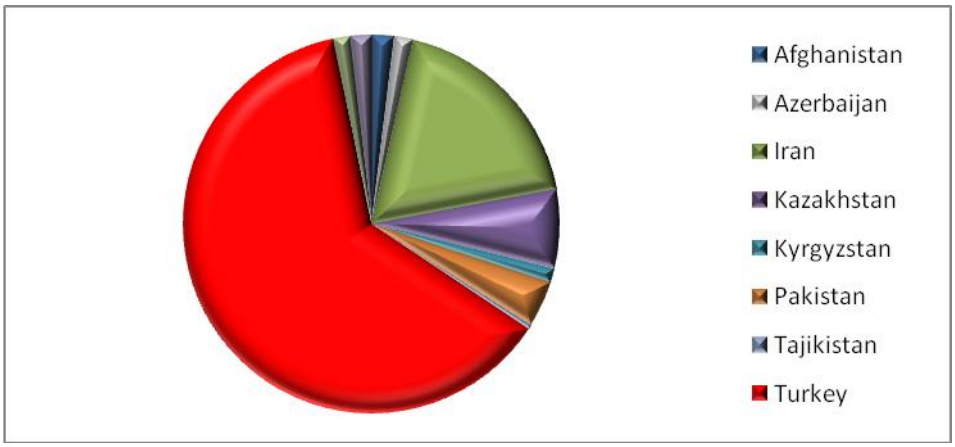


Figure 27: Registered carrier departures worldwide (thous.) in ECO countries, 2018
Source: ECOSTAT

In some ECO countries commercial airlines have been recorded as numerous while in others these have been small both, in number of airline companies and in aircrafts. The overall number of airline companies in the ECO member countries has recorded 86 in 2018. The aggregate number of aircrafts being operated by these airline companies recorded 1,191.

Table 56: Airlines of ECO countries and aircrafts, 2018

ECO country	Airlines	Aircrafts	ECO country	Airlines	Aircrafts	ECO country	Airlines	Aircrafts
Afghanistan	Ariana Afghan Airlines	6	**Kazakhstan**	Air Astana	39	**Tajikistan**	Somon Air	7
	Afghan Jet International	12		Bek Air	12		East Air	2
	Kam Air	17		Avia Jaynar	2		Khatlon Air*	
	Pamir Airways*			Scat Airlines	23	**Turkey**	Turkish Airlines	304
	Safi Airways*			Caspiy	4		AtlasGlobal	4
Azerbaijan	Azerbaijan Airways	25		Euro-Asia Air	3		Corondon Airlines	7
	Buta Airways	8		Berkut Air	3		Freebird Airlines	9
	Silk Way West Airlines	10		Sunkar Air	2		Onur Air	24
	Silk Way Airlines*	7		Qazaq Air	5		Tailwind Airlines	5
	SW Business*	5		Comlux KZ	7		Anadolu Jet	35
Iran	ATA Airlines Iran	13		Kaz Jet Airlines	1		SunExpress	53
	Caspian Airlines	44		FlyJet.kz	1		Pegasus Airlines	87
	Fars Air Qeshm	2		Sunday Almaty	5		MNG Airlines	6
	Iran Air	53	**Kyrgyzstan**	Air Kyrgyzstan	1		MNG Jet	1
	Arian Air Tour	8		Kyrgyzstan Air Company	1		Turkish Cargo	
	Iran Aseman Airlines	25		Air Manas	7		ULS Airlines Cargo	3
	Karun Airlines	9		Avia Traffic Company	7		Air ACT	5
	Kish Airlines	11		Tez Jet Company	2	**Turkmenistan**	Turkmenistan Arline	19
	Mahan Air	39	**Pakistan**	Pakistan International Airlines	33	**Uzbekistan**	Uzbekistan Airways	33
	Meraj Airlines	9		Shaheen Air	2		Qanot Sharq*	
	Geshm Air	46		Askari Air Pakistan			Samarkand Airways*	
	Saha Airlines	6		Serene Airlines	3		Simurg Uzbekistan*	
	Sepehran Airlines	5		Airblue	10		Aivialeasing*	
	Taban Air	9		ASSL			Silk Road Cargo Business*	
	Taftan Air	8		Vision Air	4			
	Varesh Airlines	5		Air Sial*				
	Zagros Airlines	19		Hajvairy Airlines*				
	Atrak airlines	2		Princely Jets*				
	Payam Air	5		Star Air Aviation*				
	Pouya Cargo air	14		Bhoja Air*				
	Dena Airlways	1		Orient Airways*				

Sources: ICAO, IATA, Air Cargo Review 2018
*Explanatory Note: *Airlines companies non-registered at ICAO and IATA but operating.*

Assessment of developments in ECO Member Countries in civil aviation

Global highlights

The overview of global civil aviation helps to pinpoint where ECO countries are positioned in the area of civil aviation; where their strong points are; and where they would yet need to exert more efforts to be in line with the rest of the world.

The share of global civil aviation in world's transport has accounted to an estimated 1%, of total, in 2018. However, in value of transported goods, the civil aviation accounted to 33% amounting to US$6.7 trillion of the total value of transported goods in 2018 (IATA).

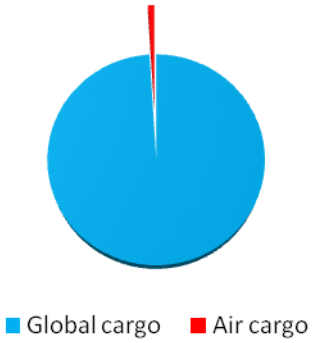


Figure 28: Global cargo, Air cargo (% of total) 2018
Source: IATA

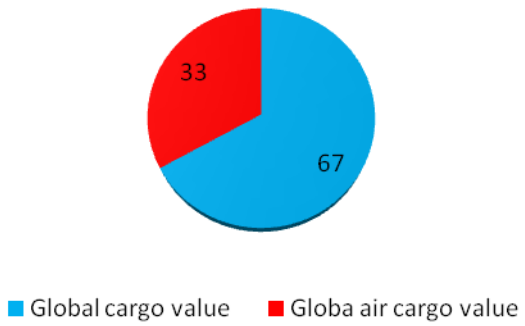


Figure 29: Global cargo value, Global Air cargo value (% of total) 2018
Source: IATA

However, growth in the demand for global air freight transportation has slowed down during 2018 compared to 2017. By contrast, in the latter year of 2017, the global volumes of freight tonne kilometers increased by 9.7%. Sadly, during 2018, the increase in volumes of freight tonne kilometers contracted to 3.4% versus 2017. Such setback was commensurate to the leveling of global trade volumes, which expanded in the first part of 2018 but suddenly shrank in the fourth quarter of the year.

By composition, air cargo mainly consisted of livestock, valuable cargo, perishables, electronics, just-in-time (urgent for assembly lines), unique cargo and project cargo.

When measured in metric tons, global air freight traffic has contracted by 0.03% during 2019.

Figure 30: Global air freight traffic (million tons) 2004-2019. Source: ICAO

During 2018, passenger access (including multiple) to air travel increased worldwide. The number of air passengers thus increased. Such trend has revealed itself in 4.3 billion journeys of air passengers in that particular year. However, air ticket price levels for passengers still remained high versus passenger tickets offered by other transport modes. That said, the frequency of air travels by passengers rose. Thus, an average citizen undertook one air flight journey in every 44 months during year 2000 whereas, during 2018, once in 21 months (ICAO, 2019).

Based on the aforementioned frequency of passenger travel, during the same year of 2018, passenger load factor hit its record high 81.9%. Increase in the demand for air travel seats exceeded the capacity of available seat kilometers. That, in turn, increased by 6.9%, globally. At the back of such excesses, the available freight tonne kilometers capacity increased by 4.5%, during 2018. That, in turn, has exceeded the 3.4% rate growth observed in the fright tonne-kilometers.

World's busiest airlines in February 2018-February 2019 have been recorded as reflected in table below:

Table 57: World's busiest airlines, February 2018-February 2019

No.	Airline routes	Number of flights
1.	Kuala Lumpur – Singapore	30,187
2.	Hong Kong – Taipei	28,447
3.	Jakarta – Singapore	27,046
4.	Hong Kong – Shanghai	20,678
5.	Jakarta – Kuala Lumpur	19,741
6.	Seoul Incheon – Osaka	19,711
7.	New York LaGuardia – Toronto	17,038
8.	Hong Kong – Seoul Incheon	15,770
9.	Bangkok – Singapore	14,698
10.	Dubai – Kuwait	14,581

Source: OAG

According to the Official Airline Guide (OAG), by frequency of international routes during February 2018 to February 2019, flights up to 1,500 kilometers were designated as short hauls, those between 1,500-4,000 kilometers were considered medium hauls, and flights over 4,000 kilometers were listed as long hauls. Thus, among Europe's top ten medium-haul airlines routes, as recorded during February 2018 - February 2019, the airlines route between Turkey and Iran, IKA-IST, has been recorded among Europe's top five (OAG, March 2019).

Table 58: Ranking-2019, Top 10 Europe, Medium-Haul Routes as of February 2019.

Medium-Haul Routes				
Nomination: "Top 10 Europe"				
Rank	**Route**	**Flights**	**Route OTP**	**Carriers**
1	**LAP-MAD**	9036	86.1	4
2	**MAD-TFN**	8563	85.7	4
3	**IKA-IST**	6904	-	5
4	**AGP-LGW**	6734	76.1	3
5	**CDG-SVO**	6519	71.3	2
6	**PRG-SVO**	6457	77.7	3
7	**LHR-LIS**	6161	63.9	2
8	**FRA-LIS**	5849	62.4	3
9	**AMS-LIS**	5546	64.4	4
10	**EVN-SVO**	5467	90.1	2

Source: OAG

Among the top ten medium-haul air routes of the Middle East and Africa, the IKA-IST airlines route operating between Turkey and Iran has been one of the top four.

Table 59: Ranking-2019, Top 10 Middle East, Medium-Haul Routes as of Feb 2018-Feb 2019

Medium-Haul Routes				
Nomination "Top 10 Middle East and Africa"				
Rank	**Route**	**Flights**	**Route OTP**	**Carriers**
1	**BOM-DXB**	9036	76.4	7
2	**DXB-JED**	8563	79.2	4
3	**DEL-DXB**	10491	78.8	7
4	**IKA-IST**	6904	-	5
5	**CAI-RUH**	6519	61.5	3
6	**CAI-KWI**	6457	66.8	3
7	**AMM-DXB**	6161	86.9	3
8	**BEY-DXB**	5849	78.4	3
9	**BEY-DOH**	5546	83	2
10	**JED-MCT**	5467	-	2

Source: OAG

In terms of a per passenger profit, the global civil aviation yielded a tiny $6.85 per passenger during 2018. Among world's regions staging their relevant performances in civil aviation, air carriers of world's region, such as, North America, were recorded as best performers in 2018. They were able to earn $14.66 profit per passenger. By comparison, the air carriers of world's other regions like Africa and Latin America saw an average profit loss of $1.09 and $1.65, respectively, for every passenger carried.

By transport mode, growth in the transport of exports by air fell dramatically by 7% in 2015. In the subsequent year 2016, the decline moderated to 2%, which was then followed by an upward leap of 10% in 2017, to follow.

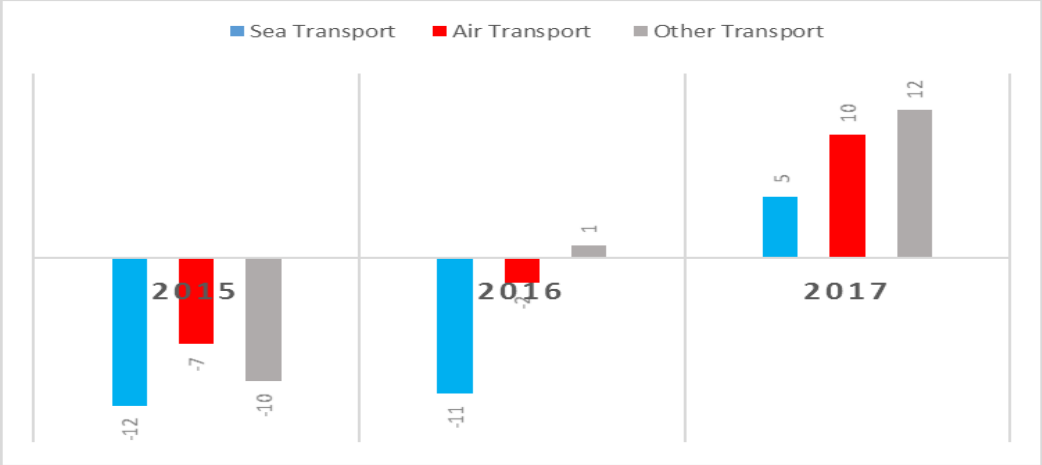


Figure 31: Global transport exports by mode (% change) 2017. Source: IATA

At the same time, commercial operations in civil aviation have seen somewhat more vibrant dynamics. Thus, during the period of 2005-2010, growth in commercial transport services recorded the highest 16% increase in the Middle East, including Iran and Turkey. During 2017, growth reached its high in world' other region, such as, the CIS at 13%, including ECO countries − Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, and Kyrgyz Republic. In Azerbaijan, the flow of passengers increased by 23.8%.

Table 60: Commercial transport services (% change) 2005-2019\0, 2016-2017 (export by region)

	World	North America	South and Central America	Europe	CIS	Africa	Middle East	Asia
2005-2010	8	12	-10	5	11	16	19	14
2016	4	9	-3	0	14	6	1	9
2017	7	1	-3	10	13	4	10	5

Source: IATA

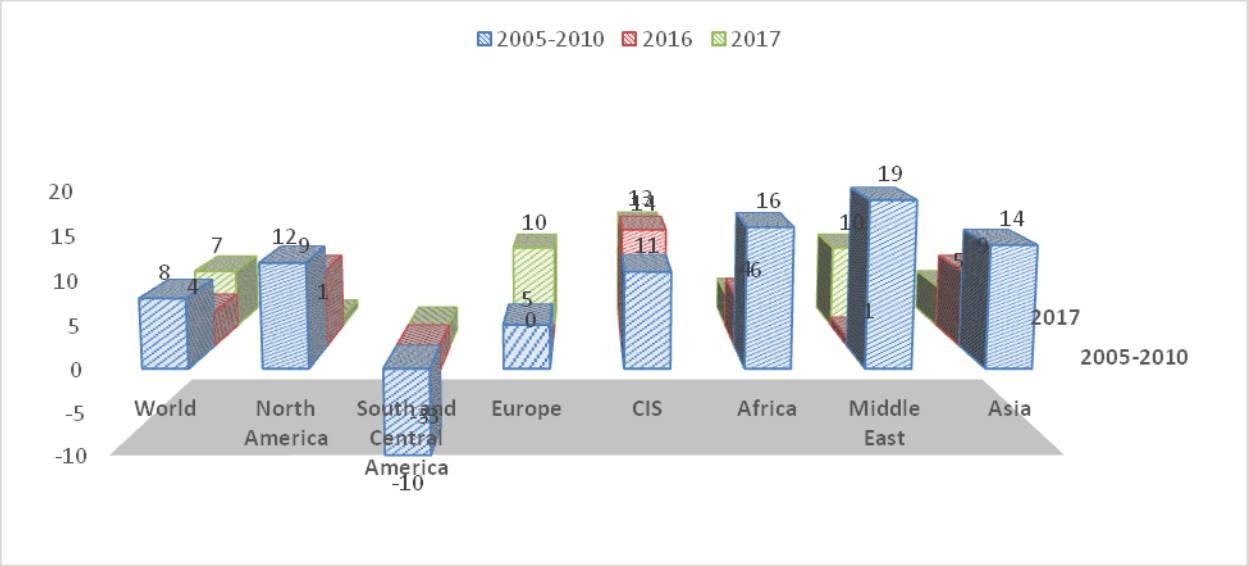


Figure 32: Transport commercial services (% change) 2005-2010, 2016 and 2017. Source: IATA

Information on regional civil aviation hub

As noted earlier in this document, the proposal stated by the Republic of Turkmenistan during the 9th Ministerial Meeting of ECO Member States (1-3 May 2019, Turkmenbashi) was related to establishing a regional civil aviation hub in the region. To that end, regional and sub-regional air hubs located in the ECO countries have been reflected in table below for the attention of the member countries, as pertinent to the proposal.

Table 61: Regional and Sub-regional air hubs

No.	Country destination air hub	Air hub		Number of airline operators operating the hub	No.
	AFGHANISTAN				
1.	Kabul	Kabul International Airport		Airana Afghan Airlines Co. Ltd.	1.
				Kam Air	2.
2.	Kandahar	Kandahar International Airport		Airana Afghan Airlines Co. Ltd.	3.
	AZERBAIJAN				
3.	Baku	Baku Heydar Alyiev International Airport		Azerbaijan Airlines	4.
4.		Buta Airways			
5.		Silk Way West Airlines			
6.		Silk Way Airlines			
7.		Silk Way Business Aviation			
	IRAN				
8.	Tehran	Tehran Imam		Iran Air	5.

		Khomeini International Airport			
				Mahan Air	6.
				Kish Air	7.
				Caspian Airlines	8.
9.		Mehrabad International Airport		Iran Air	9.
				Iran Asseman Airlines	10.
				Mahan Air	11.
				Caspian Airlines	12.
				Saha Airlines	13.
				Taban Airlines	14.
				Aria Air	15.
10.	Mashhad	Shahid Hasheminejad International Airport		Iran Airtour	16.
11.	Shiraz	Shahid Dashtgheib International Airport		Iran Air	17.
				Iran Asseman Airlines	18.
12.	Kish Island	Kish International Airport		Kish Airlines	19.
	KAZAKHSTAN				
13.	Nur-Sultan	Nazarbayev International Airport		Air Astana (KC, Air Astana)	20.
14.	Almaty	Almaty International Airport		Air Astana (KC, Air Astana)	21.
				SCAT	22.
15.	Aktau	Aktau International Airport		SCAT	23.
	KYRGYZSTAN				
16.	Bishkek	Bishkek International Airport		Air Kyrgyzstan	24.
	PAKISTAN				
17	Karachi	Jinnah International Airport		Pakistan International Airlines	25.
				Aero Asia International Airlines	26.
				AirBlue Limited	27.
				Shaheen Air	28.
18.	Lahore	Allama Iqbal International Airport		Pakistan International Airlines	29.
19.	Islamabad	Benazir Bhutto International Airport		Pakistan International Airlines	30.
	TAJIKISTAN				
19.	Dushanbe	Dushanbe International Airport		Somon Air	31.
				Tajik Air	32.
	TURKEY				
20.	Istanbul	New Istanbul Airport		Turkish Airlines	33.
				Onur Airlines	34.

21.		Istanbul Sabiha Gökçen International Airport		Pegasus Airlines	35.
				Sun Express Güneş Ekspress Havicilik A.Ş.	36.
22.	Ankara	Ankara Esenboğa Airport		AnadoluJet	37.
23.	Ismir	Izmir Adnan Menderes Airport		Pegasus Airlines	38.
24.	Antalya	Antalya Airport		Turkish Airlines	39.
				Sun Express Güneş Ekspress Havicilik A.Ş.	40.
	TURKMENISTAN				
25.	Ashgabat	Ashgabat International Airport		Turkmenistan Airlines	41.
	UZBEKISTAN				
26.	Tashkent	Tashkent International Airport		Uzbekistan Airways	42.

Sources: National Airlines of ECO countries

The number of air hubs located in the ECO region is 21. Of this number, 3 are regional air hubs located in Turkey, Iran and Pakistan. The remaining hubs are sub-regional. The number of air hub airports is 26. Those air hubs are being operated by airlines companies that are 42 in number.

Building on the proposal of Turkmenistan for a regional civil aviation hub, there may also be sub-regional hubs that are especially suitable for city pair routing. Such may be selected by the Member States for the purposes of mutually beneficial cooperation on civil aviation.

Passenger safety, security services

The content of the proposal of Pakistan stated at the 9th Senior Officials Meeting of the 9th ECO Ministerial on Transport (1 May 2019, Turkmenbashi) was about cooperation among the ECO Member States along the path of strengthening passenger safety, security services, air traffic services and cargo operations' liberalization by addressing such challenges through comprehensive regional training on civil aviation (paragraph-105, Report of SOM of the 9th ECO Transport Ministerial).

To enable practical steps in this direction, Pakistan proposed establishing a Working Group on Civil Aviation of ECO, which could discuss and develop a work plan focusing on the following issues:

- Cooperation on the provision of training facilities among ECO States in the civil aviation fields e.g. **Security Services, Passenger Safety, Air Traffic Services and Airport Management**.
- Liberal treatment in aviation support services in areas of ground handling, catering, and aircraft maintenance.

- Liberalization of exclusive cargo operations within ECO region.
- Liberalization of cargo operations and of visa regimes.

For the proposed Working Group to discuss the afore-proposed issues to be handled through cooperation, the present document provides the background material for prospective group discussion. It is for that very purpose that the present report contains an overview of civil aviation from global and regional perspectives.

At global level, over the period 2008-2018, global civil aviation improved its safety and security performance by 54% when measured by the all-accident occurrence rate. The 78% improvement was observed in jet hull loss accident. In particular, during 2018, global civil aviation recorded the total of 4.4 billion passengers who safely reached their destinations on the total of 46.1 million non-accident flights. Yet, during the same year, there were 11 fatal accidents resulting in 523 fatalities of passengers and of crew. The average fatality rate globally was registered at 8.8 fatal accidents in 2018.

In the areas of passenger safety and security, global civil aviation looks to aircraft manufacturers to cooperate on safety regulations in developing a safe and comprehensive solution to fit all. Safety is the prime priority in civil aviation. Lessons learnt on safety and security are therefore of paramount importance. In the context of ICAO, safety and security have the following vector directions in their currently ongoing development and improvements:

Figure 33: Safety/Security Strategy Components

1) Audits
2) Safety Data Management and Analysis
3) Safety Management Systems
4) Cabin Safety
5) Drones
6) Health and Safety
7) Runway Safety
8) Loss of Control in-flight (LOC-I)
9) Controlled Flight into Terrain (CFIT)
10) Fatigue
11) Mid-air Collision
12) Operational Notices

The main strategies of global civil aviation have primary focus on the following key points: (i) reducing operational risk, (ii) enhancing quality and compliance, (iii) advocating for improved aviation infrastructure, (iv) supporting the implementation of safety management system, (v) supporting the comprehensive training of personnel, and (vi) identifying and addressing emergency safety issues, including remotely piloted aircraft systems.

To implement the above universally specified safety and safety points in practice, the Global Aviation Data Management (GADM) program helps identify and monitor emerging safety and security issues. It provides most needed information from over 470 different civil aviation organizations and functions as a gateway to high-tech aircraft operations.

Data & Information exchange

Air cargo transportation is a well-captured performance indicator in the overall transport performance of countries. It helps identify gaps and inefficiencies of performance in the area of civil aviation. In spite of the fact that the demand for global air transport slumped during 2018, growing at only 3.4% rate compared with the 9.7% rate growth in 2017 (as mentioned earlier in this report), air cargo still maintains its key position in the global goods' supply chain in terms of its centralized, regularly updated information base on cargoes. Sadly, in the current year (2019), the decreasing trend for air cargo is likely to fall even further to an estimated 2.0% growth rate in freight tonne kilometers.

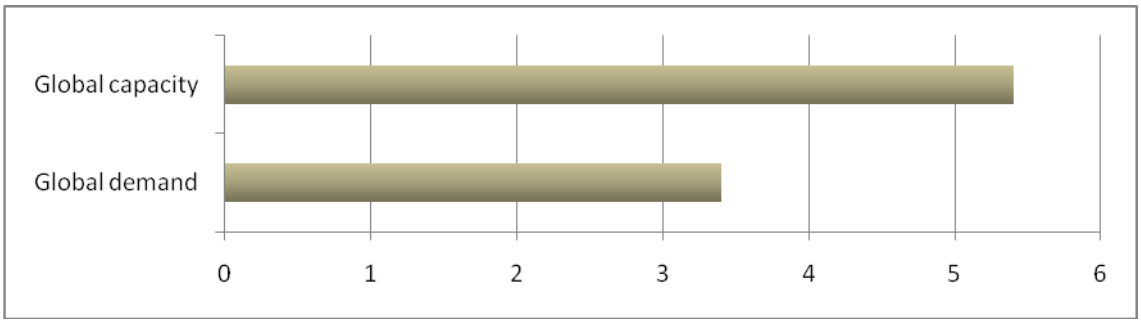


Figure 34: Global air cargo demand (%) and capacity to handle, 2018. Source: ICAO

That said, new rising opportunities relating to air cargo have been discovered. Those are in e-commerce and in special needs cargo, like time- and temperature-sensitive shipments. In this opportunity space, air cargo faces a need to modernize its processes to be able to encounter such a newly rising demand[7].

[7] The demand has been revealed based on the global market while it has been shaped up with compliance with the ICAO Policy Guidance on the Economic Regulation of International Air Transport (Doc 9587).

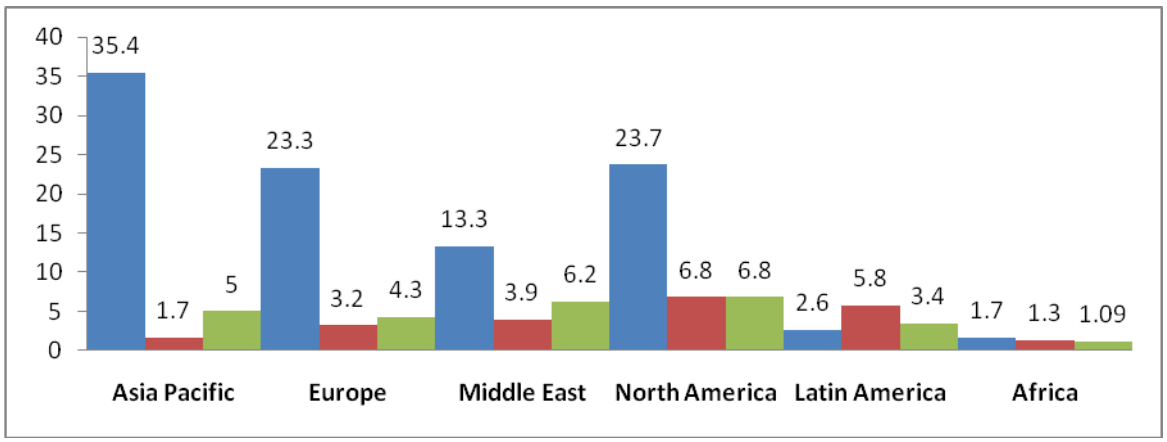


Figure 35: Air cargo demand (% of total) vs. capacity to handle it in world's regions, 2018. Source: ICAO

In the global air transport performance, notably, on air cargo, in the course of 2018, the global demand of 3.4% for air cargo superseded the global sir transport's capacity of 5.4% (as pointed out earlier in this document).

In the global air cargo structure when examined from the perspectives of world's regions, the Asia-Pacific contributed to the 35.4% share in the overall global air cargo market against the demand of 1.7% met by the capacity to handle such demand at 5.0%. At the same time, Europe's market share contributed to 23.3% of the total global air cargo while its demand for air cargo stood at only 3.2% and its capacity to meet such demand was at 4.3%. Accordingly, the related market shares of Latin America were recorded at 2.6%, the Middle East 13.3%, North America 23.7%, and Africa 1.7%. Their demand for regional air cargo and capacity to handle it were: Latin America at 5.8% and 3.4%, accordingly, the Middle East 3.9% and 6.2%, North America 6.8% 6.8%, and Africa 1.3% and 1.0%.

The special needs air cargo initiative promises to gradually benefit from global standards. Those include, particular, the special needs cargo handling standards. From this side of the spectrum, critical are the universal ratification and implementation of Montreal Convention 1999, revised Kyoto Convention, and World Trade Organization Trade Facilitation Agreement. Thus, in this new opportunities' emerging space, harmonization and alignment of international standards and norms relating to special needs air cargo may be needed, as the first step measure.

Safety and Security

When exploring passenger safety and security services[8] in their direct pertinence to civil aviation one cannot but look at these issues from the point of view of global air cargo along with passenger traffic operations. Thus, the Global Air Cargo works in close interaction with the World Customs Organization through the Safety Framework of Standards to Secure and Facilitate Global Trade. Global standards for dangerous goods are especially vital for the safety and security of transport systems for dangerous goods. In this regard, the ECO's Transit Transport Coordination Council (TTCC) has adopted the decision that the ECO member countries adhere to 19 major international transport conventions/agreements including on perishable and dangerous goods transport.

Global interaction on the process of harmonizing of standards and norms on air cargo operations does help to improve transparency, traceability, and data quality. Likewise, passenger awareness should match shippers' adherence to the common regulations, norms, and standards. The needs of today's air cargo shippers require a sector-oriented modernization. The organizations governing innovations in global air cargo and those regulating the civil aviation have joined hands on the improvement of sector-oriented modernization. The ECO may opt for aligning its transport-related activities with the sector-oriented modernization.

Special needs cargo handling standards have globally already been integrated in the two universal customs systems, such as, Cargo Targeting System presented by the World Customs Organization and the Automated System for Customs Data (ASYCUDA) - a system being in current use by 90 countries. Such automation enables supply- chain- stakeholders a direct access to shipment data, using modern web standards. The civil aviation's first standards designed for the end-to-end supply chains data connectivity were agreed upon in the month of March in the current year. From the ECO's perspective, the linking of ASYCUDA and ASCADA-based systems in Transport & Communications to customs and trade-related data and information system in the Trade & Investment sector may be useful.

The smart data portal of the aforementioned systems, already in practice, provides the much needed analytics on shipment performance thereby enabling member countries to compare their performances against those of others on air cargo. Such capabilities will be increasingly relevant as e-commerce unravels and the shippers' demand will catch up with ever-higher service standards. The global initiative in special needs cargo operations continues to ensure airlines' compliance with the latest regulatory requirements and with shippers' growing demands. In this, the ECO through its civil aviation may opt for building stronger links with shippers to be able to register their demands.

[8] The present assessment report has not analyzed passenger safety and security services-related aspects as it has not dwelled on liberalization of air cargo operations as the aforementioned have been proposed by the member states for cooperation in the area of civil aviation and thus have been construed as sufficiently justified.

Capacity

As regional training has been named as critical for the ECO's civil aviation development, the training of related personnel employed in civil aviation has so been structured to answer the increasing needs in most challenging fields of civil aviation. Thus, training is currently required for civil aviation personnel of ECO countries who specialize in the fields of traffic of perishables, food, and sensitive animal stock. At global level, the Center of Excellence for Independent Validators for Live Animals Logistics (CEIV Live Animals) is dealing with improvements of safety and health of animals transported by air. Specific time -and - temperature requirements for food, animals, and sensitive plant products present a challenge for air cargo. In training, the target audiences of future intensive regional training on air cargo's entire supply chains may include, along with safety and security-related personnel, airlines crews, general sales agents, freight forwarders, ground handlers, and airports multiple level management. If the proposed training programs/courses be arranged within ECO, such training may be structured to embrace the following topics: (i) training on passenger safety and security services; (ii) airport management; (iii) handling cargo operations and liberalization of cargo services, including visa regime liberalization; (iv) air traffic services, (v) others. To be in line with global civil aviation's currently prevailing trends on training, which mainly focus on the handling of perishables, food, sensitive plants and livestock transported by air, ECO may establish collaborative interaction with the Center of Excellence for Independent Validators for Live Animals Logistics (as pointed out earlier in the analysis). The multifaceted training program, in this regard, may be developed under the Transport & Communications Department of the ECO Secretariat to incorporate cross-functional needs in the training materials of, let us say, Agriculture & Industry & Tourism Department.

Unmanned aircraft systems

Linked to the issue of passenger safety and security services are the unmanned aircraft systems[9]. To resolve passenger safety and handle security services while ignoring the threat of unmanned aircraft systems is deemed imprudent by lead international organizations specializing in civil aviation. During 2018, unmanned aircraft systems have seen an increase in the number of reported occurrences of small drone aircraft. The latters have been defined as unmanned aircraft systems, or UAS. These have been universally acknowledged as operating irresponsibly in areas in close proximity to airports and aircrafts. One of such instances

[9] ICAO, UAS Manual, https://www.icao.int/safety/UA/UASToolkit/Pages/default.aspx

occurred at London's Gatwick and Heathrow Airports during 2018. The UAS flying at Gatwick Airport entailed cancellations of 1,000 flights.

To avoid dreadful incidents, the global civil aviation supports the exploring of such incidents in order to develop adequate measures to safeguard against illegal interferences by UAS in the areas surrounding airports. In 2018, global civil aviation availed of a technical guideline document specifying key measures designed for implementing the technologies, in this regard. Discussions during 2019, at global level, on irresponsible use of UAS near airports have resulted in the intensifying of the global focus on raising safety awareness among UAS users, especially in regard of irresponsible use of UAS in proximity to airports and aircraft. The work on UAS integration into airspace in collaboration with UAS industry innovators is currently on. In the ECO perspective, effective interactions may be established with UNESCAP. The latter has engaged itself in the project exploring specific areas that require normative regulation where countries of the region, under the UN umbrella, may have common interests for cooperation.

Data on civil aviation exposure for tourism transport

According to United Nations WTO, the tourism transportation, by mode, has been during 2018, as follows: Air 58%, Road 37%, Water 4%, and Rail 2%. Relevance of the tourism transport to civil aviation is direct as the latter is one of key transporters of the increasing flows of international tourists. When tourists travel they cannot but spend (Berta Fererr-Rossel, 2016). Thus, during 2018, the spending by tourists who availed of civil aviation services was recorded at US$860 billion, according to IATA. This showed the 10% increase in tourists' spending compared to the same period in 2017.

To incite more tourism spending in the ECO region, issues related to a more liberal visa regime and else would have to be addressed. Thus, an Unlimited Territorial Validity ECO Tourist Visa like for Schengen, which could be valid for territories of all ECO member countries upon entry into one, may be suitable for ECO as well as non-ECO countries' tourists. Visa duration might be specified by Member States for each tourist batch on a case-by-case basis. Currently, the Agriculture, Industries and Tourism Directorate of the ECO Secretariat is working on these issues in joint consultations with Member States.

As per servicing the touristic inflows inward/outward of the region, ECO regional Tour Operators' network could include 10 large regional tour operators that will specify 3 main tourist routes to focus in the ECO region. As an example, three such routes may be: (1) Karachi-Baku, Lahore-Baku, Tabriz-Baku-Istanbul, Mashhad-Ashgabat, (3) Herat-Mashhad. Exerting a collective regional effort of 10 large regional tour operators on those three potentially selected routes may help develop advantageous tour packages, to fit interest of all: (i) tourists, (ii) tour operators, (iii) airline operators, and (iv) city pairs.

On the subject of connecting the regional tourist destinations by means of civil aviation transport, the connections have been prudent to be reckoned at global and inter-regional levels. Thus, each of the ECO countries avails of tourist destinations of world significance. Some have destinations of inter-regional value. That said, the time may be right for the member countries to reflect about tourist destinations of ECO-specific value. Examples, in this regard may be: environmental, medical, religious, industrial tourism, healing-by-nature, business tours, and suchlike. In the meantime, UNESCO offers the tourist routes to destinations in ECO countries as reflected in table below.

Table 62: List of tourist routes of World Heritage List and List of the Council of Europe routes

No.	Cultural routes	No.	Historical routes	No.	Spiritual routes	No.	Natural geography routes
	AFGHANISTAN						
1.	Cultural Landscape and Archaeological Remains of the Bamyan Valley			1.	Minaret and Archaeological Remains of Jam		
	AZERBAIJAN						
2.	Iter Vitis Route*	1.	Historic Centre of Sheki with the Khan's Palace				
3.	European Route of Historic Thermal Towns*						
4.	Prehistoric Rock Art Trails*						
5.	Gobustan Rock Art Cultural Landscape						
6.	European route of Jewish Heritage*						
	IRAN						
7.	Meidan Emam, Esfahan	2.	Persepolis	2.	Sheikh Safi al-din Khānegāh and Shrine Ensemble in Ardabil	1.	Lut Desert
8.	Tchogha Zanbil	3.	Tabriz Historic Bazaar Complex	3.	Masjed-e Jāmé of Isfahan	2.	The Persian Garden
9.	Takht-e Soleyman	4.	Golestan Palace			3.	The Persian Qanat
10.	Bam and its Cultural Landscape	5.	Historic City of Yazd			4.	Hyrcanian Forests
11.	Pasargadae	6.	Sassanid Archaeological Landscape of Fars Region				
12.	Soltaniyeh	7.	Armenian Monastic Ensembles of Iran				
13.	Bisotun	8.	Shushtar				

			Historical Hydraulic System				
14.	Gonbad-e Qābus						
15.	Shahr-i Sokhta						
16.	Cultural Landscape of Maymand						
17.	Susa						
	KAZAKHSTAN						
18.	Routes Network of Chang'an-Tianshan Corridor	9.	Petroglyphs within Archaeological Landscape of Tamgaly	4.	Mausoleum of Khoja Ahmed Yasawi	5.	Saryarka – Steppe and Lakes of Northern Kazakhstan
						6.	Western Tien-Shan
	KYRGYZSTAN						
19.	Silk Road: Routes of Chang'an-Tianshan Corridor					7.	Sulaiman-Too Sacred Mountain
						8.	Western Tien-Shan
	PAKISTAN						
20.	Fort and Shalamar Gardens in Lahore	10.	Archaeological Ruins at Moenjodaro	5.	Buddhist Ruins of Takht-i-Bahi and Neighbouring City Remains at Sahr-i-Bahlol		
21.	Taxila						
22.	Historical Monuments at Makli, Thatta						
23.	Rohtas Fort						
	TAJIKISTAN						
24.	Proto-urban Site of Sarazm					9.	Tajik National Park (Mountains of the Pamirs)
	TURKEY						
25.	Routes of the Olive Tree*	11.	Historic sites of Istanbul	6.	Great Mosque and Hospital of Divriği	10.	Göreme National Park and the Rock Sites of Cappadocia
26.	European Route of Historic Thermal Towns*	12.	Hierapolis-Pamukkale	7.	Selimiye Mosque and its Social Complex	11.	Nemrut Dağ
27.	European Route of Industrial Heritage*	13.	Archaeological Site of Troy			12.	Xanthos-Letoon
28.	Iron Curtain Trail*	14.	Bursa and Cumalıkızık: the Birth of the Ottoman Empire			13.	Neolithic Site of Çatalhöyük
29.	European route of ceramics*	15.	Diyarbakır Fortress and Hevsel Gardens Cultural Landscape			14.	Pergamon and its Multi-Layered Cultural Landscape
30.	Hattusha: the Hittite Capital					15.	Göbekli Tepe

31.	City of Safranbolu	16.	Ephesus				
		17.	Archaeological Site of Ani				
		18.	Aphrodisias				
	TURKMENISTAN						
32.		19.	State Historical and Cultural Park "Ancient Merv"			16.	Konya-Urgench
33.		20.	Parthian Fortresses of Nisa				
	UZBEKISTAN						
34.	Itchan Kala	21.	Historic Centre of Bukhara			17.	Western Tien-Shan
35.		22.	Historic Centre of Shakhrisyabz				
		23.	Samarkand – Crossroad of Cultures				

Source: UNESCO

In sum, World Heritage enlisted in ECO countries: 27 historical sites, 23 cultural sites/routes, 7 spiritual sanctities, and 17 natural geography sites. The Council of Europe enlisted in ECO countries: 8 cultural routes.

These are the tourist routes that have been made universal, under UNESCO, and their list is being mandatorily accounted for by world's airlines in route planning. The same is true for the European Union countries and partnership members whose tourist routes have been specified by the Council of Europe for Europe's airlines.

As per the ECO region-inherent air connections to the above-mentioned tourist routes, the Working Group on Civil Aviation may consider supplementing the aforementioned Lists with those tourist routes that are of value not only for World and Europe but also for the ECO regional community. If such 'complementary' step be undertaken, city pairs routing for the ECO region may be configured by the Working Group in order to have those mapped and present for consideration of ECO decision makers.

When transport tourism is holistically looked at from world's regional perspective, growth in international tourist arrivals during 2017 marked highest 12.6% rate in Africa versus 2016. With relevance to ECO countries, in which growth in international tourist arrivals has been observed, under such world's regions as the CIS, the Middle East, and Asia, have been recorded within 3.6%, 0.7% and 5.9% growth rates in 2017 compared to 2016.

From word's regional perspective in travel exports, the growth in travel exports in Africa staged 25% increase in 2017 while that in the CIS recorded 3.6% rate, the Middle East 11% and Asia 7% compared to 2018 (IATA, 2019). The ECO countries' travel exports have been reflected within the latter three regions, as stated above.

Table 63: Global travel exports and international tourist arrivals (% change) 2017 by region

	World	Africa	CIS	Europe	Middle East	Asia	South and Central America and the Caribbean	North America
International tourist arrivals	6.8	12.6	3.6	8.6	0.7	5.9	6	1.7
Travel exports	8	25		16	11	7	6	1

Source: World Tourism Organization

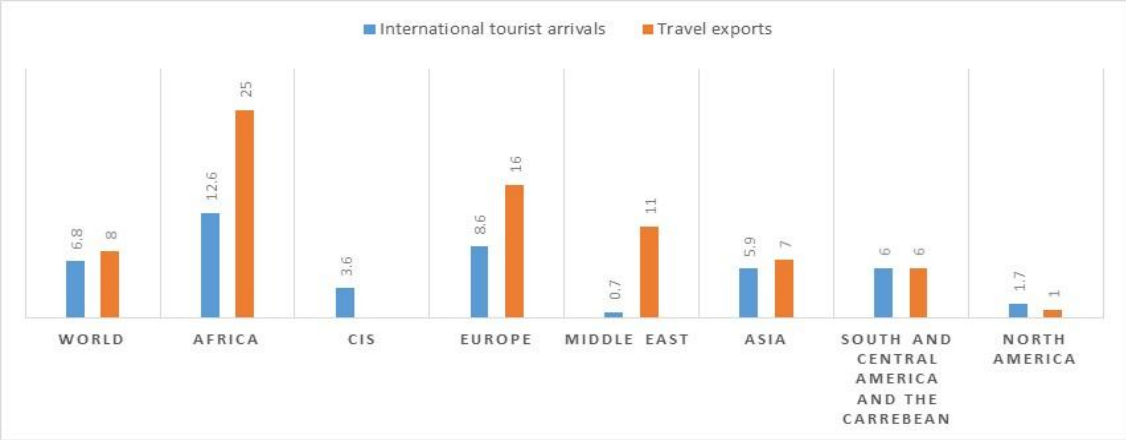


Figure 36: Global travel exports and international tourist arrivals (% change) 2017. Source: IATA

Building on the healthy standing in global travel exports of world's regions like the Middle East, CIS and Asia, of which ECO countries are part, cooperation in this field may focus on travel imports by those ECO countries in which remote areas have none or just a limited access to international airlines.

Data on inner strengths and external constraints

In looking closer at inner forces in ECO countries that help resist the pressure of external constraints (challenges) in the area of civil aviation, the present report sought for ways of how these two counterbalancing forces could be brought to a common denomination[10]. The preliminary assessment of inner forces in ECO countries' civil aviation has been carried out based on the common understanding admitted by the ICAO and IATA in regard of the most conspicuous challenges faced by global civil aviation, as reflected in table below (IATA, 2018).

Table 64: Inner Forces and External Constraints in Civil Aviation

No. 1	Inner forces	Score 1	Constraints	Score 2	No. 3	No. 4
1	Widebody freighters, and lower holds	0.4				0.4

[10] The matrix has been compiled by ICAO in line with provisions of the ICAO Manual on the Regulation of International Air Transport (Doc 9626)

			Direction imbalances	1	1	1
2	Airline research and development	0.2				0.2
						0
3	Airlines marketing and shipper education	0.5				0.5
			Surface competition	2.5	2	2
						0
4	Shipper utilization	0.2				0.2
			Airport curfews	5	3	3
5	Proliferation of points serviced	0.5	Terrorism/armed conflicts	0.49	4	2
						0
						0
6	Just-in-time delivery	0.3	Oil/fuel prices and availability	4	5	1.5
7	Express market	0.2	Air and surface labor stoppages	4	6	1.2
					7	7
8	Deregulation	0.2				0.2
9	Open Skies and air services agreements	0.5	Lack of airport access	5	8	4
10	National development programs/policies on civil aviation	0.5				0.5
						0
			Environmental regulations	1	9	9
11	New trade relationships	0.3	Currency re-evaluations	3	10	3
						0
12	Export promotion	0.5				0.5
13	New commodities	0.3	Civil aviation relocation		11	3.3

Source: Staff assessments

Having kept the above perception of the ICAO and IATA as the basing ground, the present report has undertaken the analysis of ECO-specific challenges faced in its civil aviation with the objective to find out practical ways of countering such challenges.

Table 65: Matrix of strong and weak points on civil aviation in ECO countries

Strengths	Technology	Interoperability	Policy work/sub	Licensing/Vis regimes	Sourcing	Logistics	Subtotal	Environment	Pricing	Accountability	Macros, inc. transport	Forwarders	Skills	Subtotal	Total
Commercial operations	0	11	6	3	10	27	57	11	20	7	3	5	20	66	123
Sufficient air fleet	0	13	11	11	12	7	54	20	5	0	5	12	13	55	109
Freight tonne kilometers	11	20	8	1	2	10	52	9	3	13	2	11	13	51	103
Air transport in metric tons	0	2	5	13	6	1	27	15	23	3	0	8	2	51	78
International tourist arrivals	8	7	10	0	2	4	31	0	1	11	1	0	1	14	45
Regulatory frameworks (national)	0	0	0	2	5	0	7	0	19	0	0	12	1	32	39

Subtotal S	19	53	40	30	37	49	228	55	71	34	11	48	50	269	497
Weaknesses	13	8	5	0	1	8	35	5	2	10	13	3	0	33	68
Safety	7	0	12	12	10	8	49	3	3	5	14	6	6	37	86
Security	8	18	14	21	0	0	61	4	6	2	5	6	7	30	91
Insufficient training	10	7	10	4	9	27	67	2	2	5	1	4	13	28	95
Low level of city pair air routing	20	13	9	20	16	3	81	8	4	11	26	9	18	76	157
Low tourism imports	22	0	9	12	26	4	73	22	10	32	29	23	5	121	194
Subtotal W	80	46	59	69	62	50	366	44	28	65	88	51	49	325	691
Total	99	99	99	99	99	99	594	99	99	99	99	99	99	594	1188

Source: Staff assessments

The challenges reflected in the matrix (above) have derived key factors from proposals posted by the member countries at meetings of the ECO decision making bodies. The assumption admitted by matrix was that aforementioned key factors had been selected and their reasoning had been justified by member countries themselves before putting those up for common consideration. Potential ways/means of how to counter the aforementioned challenges (factors), given present realities, have entailed from the analysis of performances of ECO countries where their strengths and weaknesses have been revealed through analytical tables, charts in the content of the present document, as pertinent to civil aviation. Specifically, the ECO challenges have been admitted as being: (i) passenger safety and security services, (ii) low proficiency level of personnel involved in civil aviation, (iii) still non-liberalized air cargo transport operations, (iv) airport management and maintenance with currently little involvement of high-tech processes, (v) in-access of remote locations in the region to international airlines. These challenges have been reflected against strengths of the ECO countries to counter them. Their capacities enabling to mitigate the negative impact of challenges have been identified to be through: (i) comprehensive regional training; (ii) liberalization of air cargo operations, including liberal visa regimes; (iii) exchange of expertise, technology and experiences by establishing regional aviation hub, and (iv) initiating and developing city pair air routes.

Cooperation among ECO countries on civil aviation is thus needed to coordinate the resolution of currently outstanding challenges. This could be fulfilled by countering the challenges by the capacities/strengths enabling the countries to improve their civil aviation performances through cooperation.

Concluding analytical remarks on civil aviation transport mode

Civil aviation is conventionally represented by commercial air transport in the overall transport structure. As has been indicated in the present report, global air transport accounts to 1% share in the share of transport's contribution to the global GDP. Within this one percent share, commercial air transport has its proportional input, which is enhanced, not in physical volume, but in growth dynamics. On the side of the spectrum, global air transport contributes to 33% in value of the overall structure of goods transported by all mode transport i.e. US$6.7 billion.

From this stance, commercial air transport needs to be further developed through cooperation of member countries to attain both, higher value added at the cost of lower proportional inputs. In the ECO context, its civil aviation accounted to 1.2 % share in the structure of overall transport in the region in 2018.

Growth in air transport services indicates at the unraveling potential of the ECO countries in handling general and commercial transport. The performance indicators favor upward swing in ECO countries' performances as described, in detail, in the present report, based on growth in the number of aircrafts, airlines' accreditations to operate international flights, and acquisition of new aircrafts are evidences of such growth dynamics. With the total of 321 all type airports, 70 airline companies eligible to operate international flights, 1,191 aircrafts, the ECO regional civil aviation has all at hand to unravel its potential, especially, in commercial air cargo and tourism transport at the back of 165 million passengers carried by air; 1.2 million registered carrier departures worldwide; and 6576 million ton-kilometers transported by air in 2018.

In view of the aforementioned performance of ECO countries in civil aviation the need for establishing a regional hub has been agreed on by the member states. The scope of issues to be overseen by such regional hub may be excerpted from the findings of the present report.

Thus, being guided by the ECO Member States' proposals to cooperate on civil aviation in their preferred areas, the present report suggests that the regional civil aviation hub look at the following issues as: passenger safety, security of civil aviation services, and liberalization of commercial air cargo operations. In regard of these needs of the region, the present assessment report has revealed the member countries' current standings in their ability to counter the present day civil aviation challenges. The assessment also indicated that there is an array of fields in which ECO countries, through cooperation, may collectively resolve persisting irregularities. Moreover, all ECO countries are members of both, ICAO and IATA where the harmonization of civil aviation passenger safety and security services' standards is work-in-progress. If the ECO region, jointly with ICAO and IATA, would opt to narrow down its focus by paying more attention to passenger safety and security services amongst the diverse agenda priorities of the latter organizations, such course may be advantageous for all ECO countries. In support of this notion, the common understanding of current challenges faced by global civil aviation (as per IATA and ICAO, Table:10) revealed that any given country, involved in civil aviation, is capable of countering safety and security challenges by mobilizing its inherently generated inner forces. Should such inner forces be integrated, they will be certain to amplify the spill-over impact of the cooperative integration on a much greater regional scale.

In the above regard, the analysis has pointed out ECO-specific set of member countries' needs requiring a regionally concerted action. Those include the needs for: (i) comprehensive training of civil aviation personnel jointly with ICAO, (ii) development of city pair airline routes (including non-stop or one stop direct flights), (iii) exchange of air transport-relevant information/data by collaborating with WCO, (iv) improvement of commercial air cargo

transportation via liberalization jointly with Global Air Cargo, (v) unraveling of the tourism transport, (vi) improvement of airport management and maintenance via a regional aviation hub, (vii) for cross-functionality, the need to unlock the special needs air cargo transport is urgent to be addressed.

International tourism transport aspect of civil aviation has also been analyzed mainly for travel exports. The lack of access to international airlines by people in remote locations in the ECO region has been pointed out as one of weak points ECO and, in that regard, the development of city pair air routes has been suggested to address such deficiency.

As with Turkey being world's top 6th airline operator among 160 comparable countries in operating the highest number of airline destinations, Turkey may steer the ECO region toward opening up new city pair air routes to reach out to remote locations with constrained access of people to international airlines.

As a matter of a generalized observation, it was suggested to also develop cooperation among ECO countries on data and information exchange and regional training by joining hands with the WCO's Safety Framework of Standards to Secure and Facilitate Global Trade. Such step has been intended to help set up ECO-specific performance indicators for: (i) measuring progress in civil aviation, (ii) formulating comprehensive regional strategy and (iii) developing work plans with set time series for short, medium and long terms.

On cross-sector functionality matters, prospective interaction has been suggested to be set up on special needs air cargo, such as, air transport of perishables, food, sensitive plants and animal live stock. The cross-sector interaction may be set among the Transport and Communications and Agriculture, Industries and Tourism Directorates of the ECO Secretariat. The issues of visa facilitation, tour operators' network and thus development of city pairs routing could also be handled within the same cross-functionality.

The report may be of practical value as it may serve the groundwork for developing work plan to be discussed by the Working Group on Civil Aviation of ECO.

Acronyms and Abbreviations

ASYCUDA – Automated System for Customs Data
CTS – Cargo Targeting System
MC99 – Montreal Convention 1999
WCO – World Customs Organization
TFA – Trade Facilitation Agreement
ECO – Economic Cooperation Organization
RPC – Regional Planning Council

COM- Council of Ministers
FTK– freight tonne kilometers
PLF – passenger load factor
ASK – available seat kilometers
GSA – general sales agents
AFTK – available freight tonne kilometers
LOC-I – Loss of Control in-flight
CFOT – Controlled Flight into Terrain
ICAO – International Civil Aviation Organization
IATA – International Air Traffic Agency
OAG – Official Air Guide
GADM - Global Aviation Data Management
ME – Middle East
CIS – Commonwealth of Independent States
WTO – World Trade Organization
LPA-MAD: Las Palmas –Madrid
MAD-TFN: Madrid-Tenerife
IKA-IST: Tehran (IKA) – Istanbul
AGP-LWG: Malaga-London
CDG-SVO: Paris-Moscow
LHR-LIS: London-Lisbon
FRA-LIS: Frankfurt-Lisbon
AMS-LIS: Amsterdam-Lisbon
EVN-SVO: Yerevan-Moscow
BOM-DXB: Mumbai-Dubai
DXB-JED: Dubai-Jeddah
DEL-DXB: Deli-Dubai
CAI-RUH: Cairo-Riyadh
CAI-KWI: Cairo-Kuwait
AMM-DXB: Amman-Cairo
BEY-DXB: Beijing-Dubai
BEY-DOH: Beijing-Doha
JED-MCT: Jeddah-Muscat
UNESCAP – United Nations Economic and Social Commission for Asia and the Pacific

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