National-Level Emissions Fact Sheet Methodology
October 2015

To capture a more comprehensive picture of transport sector emissions at a global scale, there is a need to expand this knowledge base to a representative set of countries over the period 1990 to 2030 (and, where applicable, up to 2050).

One of the main outputs of this data compilation and analysis is the National-Level Transport Emissions Factsheet. For countries that have already submitted an INDC, national factsheets could identify how mitigation targets could be improved, and for those that have yet to make a submission, national factsheets could be used to strengthen the discussion of the transport sector during INDC development, based on ranges determined by historic and projected BAU trends and assessed mitigation potential. These factsheets could be also used for MRV of progress toward post-2020 targets.

National-level factsheets include the following components:

- Historical and future BAU growth trajectories in the transport sector, based on NCs and BURs;
- Available transport sector mitigation potential studies derived from modeling efforts by government agencies, development banks, and other research organizations; and
- A graphical representation of alternate emissions scenarios in the transport sector, which can help in determining an appropriate degree of mitigation ambition

Sample information contained in the national transport emissions 'Tier I' fact sheets is illustrated in the below summary graph of key transport trends for Japan. **Figure** 1 shows that official transport emission target for 2030[1] could be easily reached under a set of low carbon transport scenarios (i.e. with additional implementation of low carbon transport policies and projects). However, under the business-as-usual scenario, there could be a significant gap between the baseline and INDC transport target.

[1] based on its INDC submission

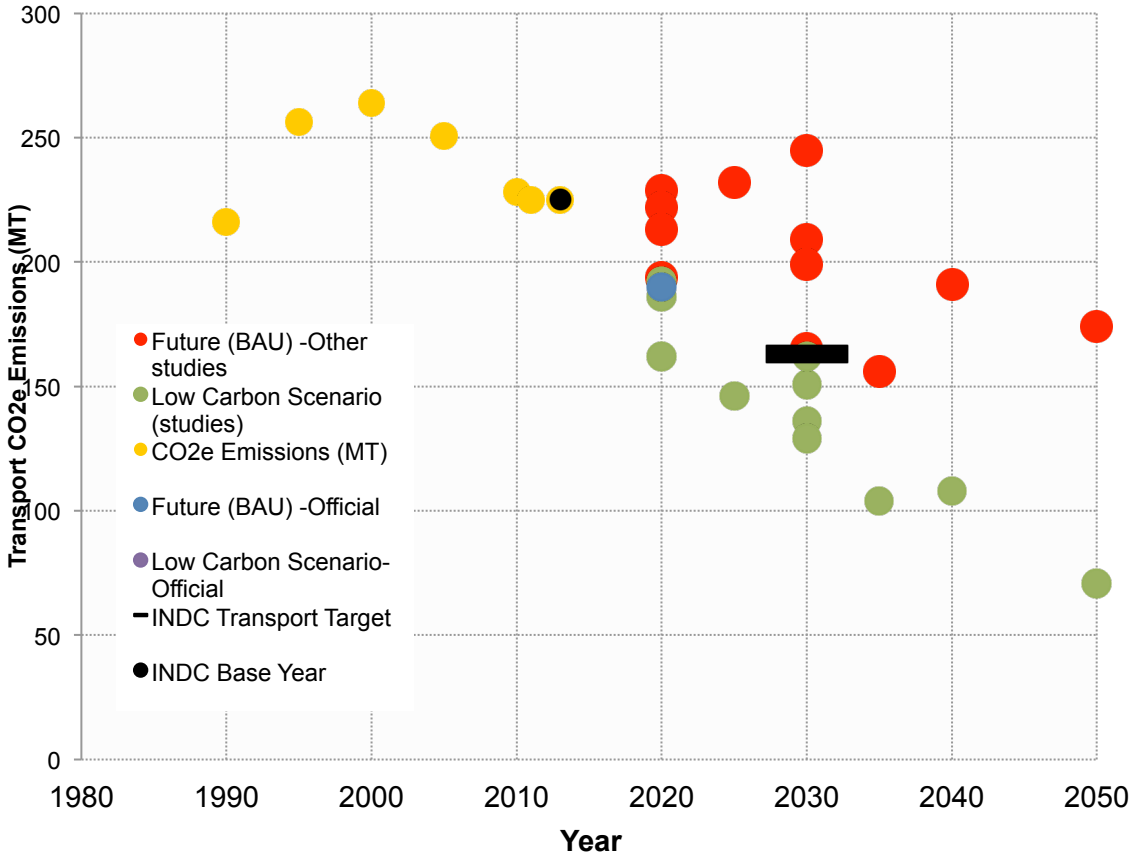

Figure 1 Japan Transport GHG Emissions (BAU and Low Carbon Estimates)

The first phase of the analysis involves creating Tier I fact sheets for an initial mix of nearly 70 developed and developing countries for which detailed targets and projection data are available (e.g. United States, China, the European Union, Japan, India, Russia, Mexico, among others) that would account for a combined total of about 76% of global transport sector emissions in 2010.

However, business-as-usual (BAU) forecasting and mitigation potential analyses required to support development of these national fact sheets are not available for all countries across the globe. Thus, this initial set of Tier I country fact sheets has been scaled up by creating more simplified 'Tier II' fact sheets for those countries for which detailed targets and projection data are not available, and therefore must be **estimated based on detailed data from other countries**. In order to provide indicative estimates to fill these data gaps, we can use insights from countries with existing estimates of BAU projections and low carbon scenarios for 2020 and 2030 to interpolate this growth using sketch calculations for countries lacking such estimates. A Tier II fact sheet for Afghanistan is shown in Figure 2:

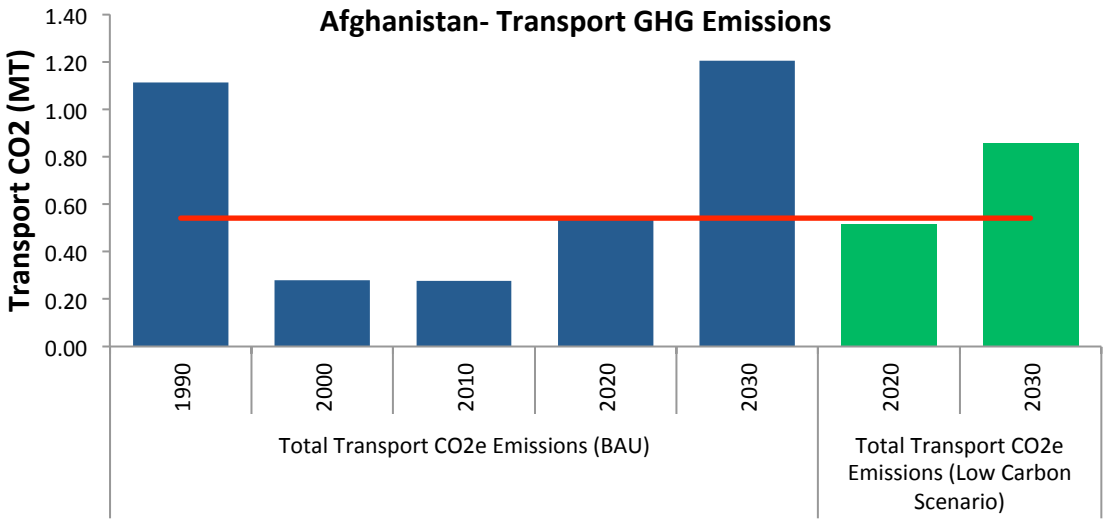

Figure 2: Afghanistan Transport GHG Emissions (BAU and Low Carbon Estimates)

These sketch projections for BAU and low carbon scenarios are carried out using the following approaches:

1. *BAU projections* for countries without emission estimates are carried out using two different approaches as described below:

    - The first approach is to use a regression of transport CO2/capita and GDP/capita for all countries in 2012, which would allow calculation of transport CO2/capita for 2020 and 2030 using existing GDP/capita projections for these years using IMF data (see **Figure** 3). The premise behind this regression is that economic growth has been accompanied by rising per-capita CO2 emissions from transport activity. But, this regression analysis does not consider the potential decoupling of emissions which has been observed especially over last few years in some OECD countries. Recent research has showed that in the case of Annex I countries, the decoupling effect grew stronger from 1990 to 2012, while in the case of non-Annex I countries, the decoupling effect became weaker over time, to the point at which it was virtually non-existent for 2008-2012. Thus, in the non-Annex I countries, the prevailing trend is toward a coupling of transport emissions with economic growth under a business-as-usual scenario, which is indicative of**Figure** 3. Since the majority of countries where the projections and mitigation estimates are required are non-Annex I countries, in the absence of reliable estimates, these sketch projections can provide a reasonable approximation and could be further improved over time.

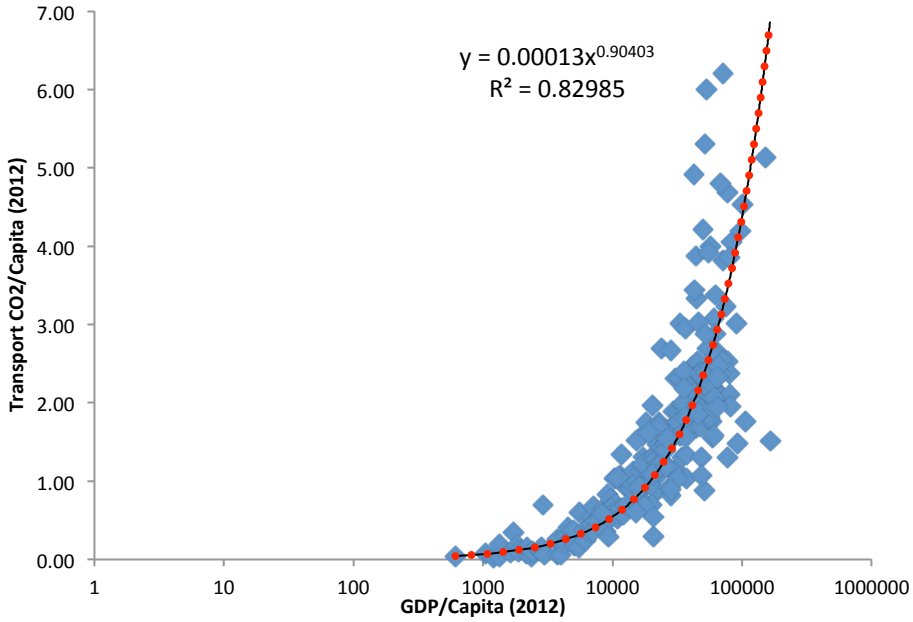

Figure 3 Correlation between GDP/Capita and Transport CO2/Capita

- The second approach is to *extend historic annual growth rates of transport CO2e emissions between 2000 and 2012 to the years 2020 and 2030*[2]. Some of the countries (particularly low and middle income countries such as Angola, Benin, Congo, Kyrgyzstan etc.) have double digit annual growth rates. Thus, in order to avoid overestimation, maximum transport annual emission growth rates are restricted to 6% which reflects the maximum growth scenario over 2010 to 2030[3].

Using these two projections, simple average BAU estimates for 2020 and 2030 are determined. Annex I summarizes projections using the first two approaches for countries with detailed data, with the results showing that a majority of estimates are within an acceptable range (i.e. for 2020 and 2030, we get weighted average variation of about 0% and 16% between the average estimates and the BAU projections from different countries[4]). We consider this variation acceptable, as BAU projections from different studies and sources for a particular country can vary significantly due to a number of factors (e.g. definition of BAU, projection methodology, socio-economic projections, type and source of data, and differing intensity, timeline and magnitude of policies modeled).

2. Average *low carbon scenarios* for countries without detailed data are estimated based on average mitigation potential for 2020 and 2030 for countries with detailed data. An average mitigation share can be calculated for countries with detailed data by categorizing them into Annex I and non-Annex I countries, and then low carbon transport scenario emissions in 2020 and 2030 can be computed for countries without detailed data. Average mitigation values for 2020 and 2030 are shown in the

[2] SLoCaT Analysis of Transport Emission Trends

[3] This figure is based on a review of global transport CO2 assessment for different developing regions such as ASEAN, Non-OECD Asia, Latin American and Caribbean countries and Africa. The models considered were IEA projections WEO 2012, WEO 2015, ITPS-ASEAN, ICCT-Roadmap, GCAM, IMAGE, TIAM-ECN & AIM databases

[4] In terms of simple average, the variation in 2020 and 2030 is 6% and -8%

following table, based on the initial analysis of 67 countries.

Table 1 Average Mitigation in Low Carbon Scenario in Transport Sector (relative to BAU)

Country Type	Mitigation at 2020	Mitigation at 2030
Annex I	-9.01%	-22.96%
Non-Annex I	-11.66%	-26.22%

These average mitigation values are uniformly applied to all countries to determine the cumulative bottom-up mitigation potential. Since each country will consider a different mix of policies, strategies and intensity of implementation considering its local priorities and costs based on its socio-economic characteristics and growth, transport development and current policies, it is acknowledged that assuming a single constant mitigation potential across several countries is a methodological limitation. This limitation could be addressed in the future as more countries carry out detailed projections and mitigation studies, and as data quality improves from individual Parties.

Based the methodological assumptions described above, the SLoCaT Partnership has produced Tier I and Tier II fact sheets for 140+ countries, as previously described. These individual fact sheets will be synthesized into a summary analysis of pre- and post-2020 mitigation potential that will allow an at-a-glance comparison of key trends among countries and regions, to help individual Parties define and assess mitigation targets in a broader context. Thus, these fact sheets can be used to raise ambition in subsequent reevaluation periods for both transport-specific and economy-wide INDC targets.

Ultimately, this summary analysis will serve to quantify aggregate contributions from the transport sector relative to aggregate emissions required to maintain global average temperatures within a 2 degree Celsius scenario (2DS). Thus, at a global scale, this analysis will play an important role in determining required increases in ambition from the transport sector which will be needed to fill the emissions gap and achieve a 2DS.

Annex: Transport CO2 Projections for BAU Scenario and Its Comparison with Existing Studies (Million Tons)

	Using Econometric Projection (A)		Using 2000-2012 Growth Rates (B)		Average (A & B)		Average BAU Projections from Existing Studies		Variation between Average and Studies	
	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030
Total/Avg					**6349**	**9757**	**6209**	**7693**	**6%**	**-8%**
Argentina	52	62	55	64	**54**	**63**	54	72	0.7%	14.7%
Australia	67	104	102	119	**84**	**111**	101	115	20.0%	3.2%
Austria	21	29	23	26	**22**	**28**	23	23	2.5%	-18.0%
Bangladesh	51	111	14	25	**32**	**68**	12	26	-62.5%	-62.1%
Belarus	10	11	17	28	**13**	**20**	10		-25.5%	
Belgium	26	35	24	24	**25**	**30**	24	24	-3.8%	-18.8%
Brazil	203	288	272	403	**238**	**346**	204	265	-14.4%	-23.4%
Bulgaria	8	11	11	15	**9**	**13**	12	14	26.1%	4.5%
Cambodia	5	11	3	5	**4**	**8**	6	9	43.2%	18.0%
Canada	92	130	188	212	**140**	**171**	223	252	59.4%	47.3%
Chile	27	43	27	34	**27**	**38**	35	60	30.5%	56.3%
China	1418	2591	1120	2006	**1269**	**2299**	967	1501	-23.8%	-34.7%
Colombia	48	80	36	51	**42**	**65**	36	47	-14.8%	-28.2%
Costa Rica	5	9	6	10	**6**	**9**	5	6	-14.8%	-35.9%
Côte d'Ivoire	6	13	4	6	**5**	**10**	4	6	-25.9%	-33.3%
Croatia	5	7	7	8	**6**	**8**	6	6	-0.4%	-17.2%
Cyprus	2	3	2	2	**2**	**3**	3	3	36.2%	14.9%
Czech republic	20	29	20	25	**20**	**27**	18	19	-7.5%	-28.3%
Denmark	15	21	11	10	**13**	**16**	14	14	7.3%	-10.1%
Estonia	2	4	3	4	**3**	**4**	3	3	-1.9%	-21.4%
Ethiopia	16	42	5	9	**10**	**26**	10	26	-1.0%	1.9%
Finland	12	17	12	12	**12**	**14**	13	11	8.0%	-22.2%
France	149	179	117	111	**133**	**145**	132	126	-0.7%	-13.2%
Gabon	3	6	1	1	**2**	**4**	1	3	-19.7%	-21.3%
Germany	206	234	133	117	**170**	**175**	196	186	15.5%	5.8%

	Using Econometric Projection (A)		Using 2000-2012 Growth Rates (B)		Average (A & B)		Average BAU Projections from Existing Studies		Variation between Average and Studies	
Greece	19	29	15	13	**17**	**21**	23	25	35.6%	17.1%
Hungary	15	22	12	14	**14**	**18**	17	18	24.5%	-0.2%
Iceland	1	1	1	1	**1**	**1**	1	1	52.3%	17.9%
India	711	1554	345	617	**528**	**1086**	400	794	-24.2%	-26.9%
Indonesia	209	409	203	358	**206**	**383**	158	261	-23.3%	-31.9%
Ireland	14	21	10	10	**12**	**16**	14	16	17.5%	2.2%
Israel	16	23	15	19	**16**	**21**	19	23	20.7%	8.1%
Italy	119	133	94	84	**106**	**108**	120	114	12.7%	5.2%
Japan	262	271	192	166	**227**	**219**	210	204	-7.6%	-6.8%
Kazakhstan	27	42	20	29	**23**	**35**	20	24	-11.5%	-31.7%
Kenya	14	30	7	11	**10**	**21**	10	19	-3.3%	-7.8%
Laos	3	7			**3**	**7**	4	5	16.1%	-31.5%
Latvia	3	5	3	4	**3**	**5**	3	4	2.8%	-20.5%
Lithuania	6	9	5	7	**6**	**8**	6	7	7.6%	-15.1%
Luxembourg	3	3	8	10	**5**	**7**	7	8	37.9%	13.4%
Malaysia	53	94	53	70	**53**	**82**	63	61	18.3%	-25.7%
Malta	1	1	0	0	**1**	**1**	1	1	36.5%	21.3%
Mexico	145	245	196	268	**171**	**256**	220	286	28.9%	11.6%
Myanmar	23	58	3	3	**13**	**30**	8	15	-41.8%	-49.2%
Nepal	7	10	3	6	**5**	**8**	3	5	-42.0%	-42.4%
Netherlands	45	62	33	33	**39**	**48**	38	36	-3.3%	-23.4%
New Zealand	10	15	14	16	**12**	**15**	17	18	36.3%	14.5%
Nigeria	89	179	28	32	**58**	**106**	55	101	-6.4%	-4.3%
Norway	18	26	14	15	**16**	**21**	25	27	51.7%	28.6%
Philippines	59	116	24	24	**42**	**70**	44	77	6.5%	10.2%
Poland	64	102	65	100	**64**	**101**	50	58	-22.1%	-42.2%
Portugal	17	22	15	13	**16**	**18**	20	21	27.6%	17.2%
Republic of Korea	110	183	96	106	**103**	**145**	116	132	12.5%	-8.7%
Romania	28	46	20	29	**24**	**38**	19	22	-20.0%	-42.2%

	Using Econometric Projection (A)		Using 2000-2012 Growth Rates (B)		Average (A & B)		Average BAU Projections from Existing Studies		Variation between Average and Studies	
Russia	193	235	274	330	**233**	**283**	223	243	-4.5%	-14.1%
Singapore	26	45	8	11	**17**	**28**	10	10	-42.5%	-64.3%
Slovakia	10	15	9	13	**9**	**14**	7	9	-20.8%	-38.8%
Slovenia	4	5	7	11	**6**	**8**	6	6	10.5%	-24.3%
South Africa	42	60	60	79	**51**	**70**	80	114	56.2%	63.2%
Spain	98	137	77	71	**88**	**104**	106	126	20.5%	20.6%
Sweden	26	39	19	18	**23**	**29**	22	21	-4.7%	-26.9%
Switzerland	25	38	17	18	**21**	**28**	17	14	-20.5%	-50.3%
Thailand	73	115	76	100	**75**	**107**	77	106	3.1%	-1.1%
Tunisia	9	16	9	13	**9**	**14**	14	25	57.6%	71.2%
Ukraine	25	39	33	36	**29**	**38**	45	64	54.7%	71.2%
United Kingdom	149	194	107	100	**128**	**147**	127	142	-1.2%	-3.7%
US	1037	1551	1641	1608	**1339**	**1580**	1619	1521	20.9%	-3.7%
Vietnam	45	86	54	96	**49**	**91**	56	93	13.8%	2.0%