On-Road Mobile Sources (Road Transport)

Data Processor & Emissions Calculator Tool

On Road Mobile Sources Workcrew, MRV Hub, GHGMI

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Agenda

1. Problem Statement in the Region

2. What are on-road mobile sources?

3. Technical background on on-road GHG emissions

4. Tool Demonstration

Problem Statement

Member countries of Caribbean Cooperative MRV Hub (MRV Hub) continue to face both *technical* and *institutional* challenges at each step of the GHG emission inventory process as well as tracking quantitatively NDC implementation at the sectoral and policy level.

Tool Developers: On-Road Mobile Sources Work Crew, MRV Hub

- A team of experts from the Hub member countries

- Work together to build a system to produce annual estimates for GHG emissions from on-road mobile sources for Hub member countries

- **Key category** and focus of NDC for all Caribbean countries

- To meet national data needs and UNFCC reporting requirements :
  - National environmental and energy policies
  - National Communications (NC)
  - Nationally determined contributions (NDCs)
  - Biennial Update Reports (BUR) and Biennial Transparency Reports (BTRs)

- Create national GHG inventory estimates and documentation with support of CCMRVH experts

Key Categories

- Passenger cars
- Light-duty trucks
- Heavy-duty vehicles (busses & tractor trailers)
- Motorcycles & mopeds

What are on-road mobile sources?

- Passenger cars

- Light-duty trucks

- Heavy-duty vehicles (busses & tractor trailers)

- Motorcycles & mopeds

- Excludes:
  - Rail
  - Waterborne
  - off-road

Mobile source emissions?

CO2 emissions are mainly determined by fuel carbon content from fuel consumption

CH_4 and N_2O also emitted from combustion

Comprise a small proportion of GHG emissions (~1%)

For old petrol vehicles can be larger (~5%) of GHG emissions

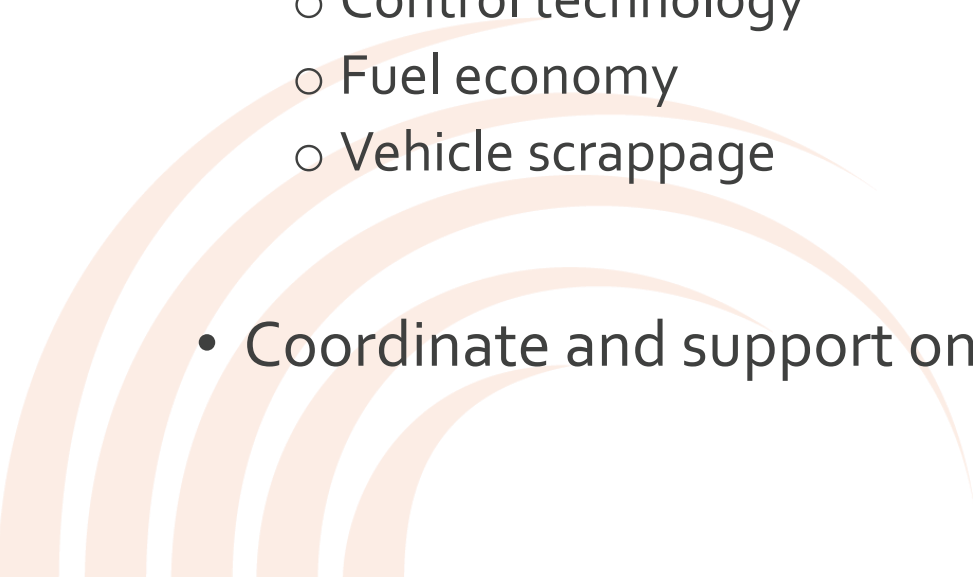Address biomass (non-fossil) fuels (e.g., ethanol, biodiesel)

Fuel Consumption

- Most accurate method for CO_2 emissions
- Use available import data along with any other fuel sales or tax records
- Combine with vehicle data (e.g., registration) to estimate annual consumption by vehicle class
- Use vehicle fleet data where available
- Potentially allocate "residual" consumption to off-road

CO$_2$ Methodology

- Assume full oxidation of carbon in fuel

- Seek data on carbon content from supplier fuel sampling and analysis

- Validate and/or allocate consumption to vehicle categories using kilometers traveled estimates

CH$_4$ & NO$_2$ Data

- CH$_4$ and N$_2$O emissions depend on combustion technology type and control technologies (e.g., catalytic converter)

- Calculated as a function of vehicle kilometers traveled

- Additional data
  - Model year
  - Control technology
  - Fuel economy
  - Vehicle scrappage

- Coordinate and support ongoing work on air pollution estimation

Regional Road Transport Data Processor & Emissions Calculator

Add input data for fuel and vehicles	Select year, assign IPCC Categories and fuel type estimates	Check Emission Factors	Save Data

This tool aims to provide users with a flexible way to aggregate vehicle and fuel data to make simple, documented assumptions about the total emissions from the vehicle population.

The *total* emissions from gasoline and diesel are dependent only on the fuel data. The breakdown of emissions by vehicle type is what this tool provides.

Assumptions Made by this Tool:

- Gasoline and diesel vehicles are the only ones counted. Vehicles without a fuel type are given a fuel type estimation based on their classification, and vehicles with a different fuel type are excluded from the count.

- All vehicles consume fuel equally (within the pools of diesel and gasoline vehicles)

- Any vehicle that does not have a manufacture year is assumed to be built after 1995.

2016	Consumption	EMISSIONS			EMISSIONS		
		CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
	(TJ)	(mt)			(mt CO2e)		
b. Road transportation[11]	1226.92	88334	7.18	6.89	88334	213.94	1882.09
Gasoline	970.11	69044	6.16	5.88	69044	183.69	1604.92
Diesel oil	256.80	19290	1.02	1.02	19290	30.26	277.17
i. Cars	531.68	38055	3.19	2.99	38055	95.02	815.62
Gasoline	420.09	29636	2.75	2.54	29636	81.82	694.65
Diesel oil	111.58	8419	0.44	0.44	8419	13.21	120.97
ii. Light duty trucks	196.67	14203	1.05	1.05	14203	31.24	286.63
Gasoline	132.16	9334	0.79	0.79	9334	23.60	216.66
Diesel oil	64.51	4869	0.26	0.26	4869	7.64	69.97
iii. Heavy duty trucks and buses	464.43	33446	2.65	2.63	33446	78.95	719.06
Gasoline	384.60	27486	2.34	2.32	27486	69.60	633.42
Diesel oil	79.82	5961	0.31	0.31	5961	9.35	85.64
iv. Motorcycles	7.38	588	0.07	0.05	588	2.17	13.66
Gasoline	7.12	578	0.07	0.05	578	2.16	13.51
Diesel oil	0.26	10	0.00	0.00	10	0.02	0.15
v. Offroad Vehicles	26.76	2042	0.22	0.17	2042	6.56	47.12
Gasoline	26.14	2012	0.22	0.17	2012	6.51	46.69
Diesel oil	0.63	30	0.00	0.00	30	0.05	0.44

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The user inputs two types of raw data.

Vehicle Registration Data

Weight Units:	kg			
2016	2016	2016	2016	2016
Vehicle Type	Gross Vehicle Weight	Manufacture year	Fuel Type	Count
SEDAN	2094	2006	Gasoline	
VAN	3197	2001	Diesel	3
SEDAN	2400	1994	Gasoline	2
UNKNOWN	4228	2001	Diesel	4
UNKNOWN	2514	2002	Gasoline	
SEDAN	3740	1997	Diesel	4
UNKNOWN	2000	1996	Gasoline	
SEDAN	1797	2004	Diesel	4
UNKNOWN	4400	1991	Gasoline	

Fuel Usage	Units	Calorific Value	2015	2016	2017	2018
Gasoline	TJ	NCV	900.04	970.11	1033.90	1054.27
Diesel Fuel	TJ	NCV	261.97	256.80	290.69	336.57

Converted Fuel Usage	Units		2015	2016	2017	2018
Total Fuel Usage	TJ		1162.009	1226.919	1324.591	1390.831
Gasoline	TJ	NCV	900.036	970.114	1033.904	1054.265
Diesel Fuel	TJ	NCV	261.974	256.805	290.687	336.565

Top-Down Fuel Consumption Data

Regional Road Transport Data Processor & Emissions Calculator

Add input data for fuel and vehicles

Select year, assign IPCC Categories and fuel type estimates

Check Emission Factors

Save Data

User selects the year to assess:

Data Year
2016

User sorts vehicle types into IPCC Categories:

			IPCC Vehicle Type, add 1 each row				
Vehicle Type Identifier	Vehicle Count	Average Weight	Car	Light Duty Truck	Heavy Duty Truck	Motorcycle	Off-Road
SEDAN	10253	2746	1				
VAN	1512	3626		1			

User Input

User sorts vehicle types into IPCC Categories:

		Estimating fuel type for entries without fuel data			
Vehicle Type Identifier	No Fuel Data	Gasoline	Diesel	Gasoline Estimate	Diesel Estimate
SEDAN	9903	50%	50%	4952	4952
VAN	1494	1%	99%	15	1479

Regional Road Transport Data Processor & Emissions Calculator

Add input data for fuel and vehicles → Select year, assign IPCC Categories and fuel type estimates → **Check Emission Factors** → Save Data

The user selects which IPCC Assessment Report GWP values to use.

		CO$_2$				CH$_4$				N$_2$O			
100-yr GWP Value	AR6, IPCC 2021	1				29.8				273			
		Pre-1975	1975-1995	Post-1995	No ManYr	Pre-1975	1975-1995	Post-1995	No ManYr	Pre-1975	1975-1995	Post-1995	No ManYr
Emission Factor, kg/TJ	Gasoline	69300	69300	69300	69300	33	25	3.8	3.8	3.2	8	5.7	5.7
Emission Factor, kg/TJ	Diesel	74100	74100	74100	74100	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9

The user has the option to change emission factors (kg/TJ)

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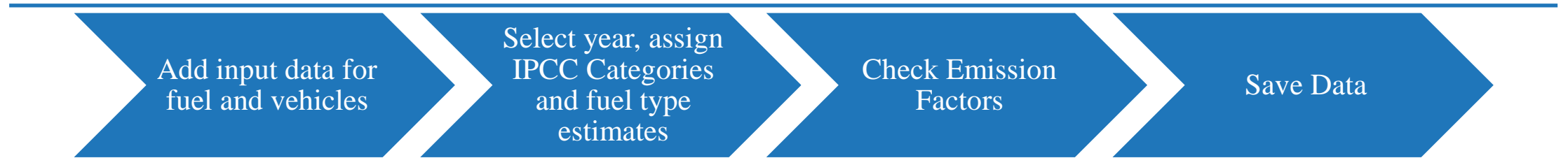
The tool produces a table of fuel consumption, total emissions, and emissions in CO2e, broken down by:

- Fuel type, diesel and gasoline
- IPCC Vehicle type
- CO2, CH4, and N2O

The user can then save the data in the same file, to be shown via shared screen.

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Screen Share Presentation and Questions

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