



**15TH NATIONAL
CONVENTION
ON STATISTICS**

03-05 OCTOBER 2022

*Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority*



Regional Energy Flow and Solid Waste Accounts: Data Assessment

Jonathan Jet G. Ruiz

Statistical Analyst
Philippine Statistics Authority

Session on Environment and Ecosystem Accounts
Crowne Plaza Galleria Manila
05 October 2022, 10:30 AM – 12 PM



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



Introduction

Energy Flow & Solid Waste Accounts

– 5th and 6th environmental accounts of
Cordillera Administrative Region (CAR)

System of Environmental-Economic Accounting for Energy (SEEA-Energy)

– framework for energy accounts

System of Environmental-Economic Accounting-Central Framework (SEEA- CF) – framework for solid waste accounts

This paper presents:

1. Data available from various local, regional and national agencies, and private institutions
2. Proxy indicators
3. Ways in addressing data gaps



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



Coordination Mechanisms

1. Regional Statistics Committee (RSC)
2. CAR ENRA Steering Committee
3. Task Force on Energy Flow and Solid Waste Accounts

Activities Undertaken

1. Preparatory Meeting on the Training on Energy Flow and Solid Waste Accounts | 07 February 2022
2. Training on Energy Flow and Solid Waste Accounts | 22-23 February 2022

3. Data Validation in PENRO Apayao | 30 March 2022
4. Data Request Sent to Multiple Agencies | 08 April 2022
5. Technical Meeting on the Creation of a Task Force on Energy Flow and Solid Waste Accounts | 31 May 2022
6. Site Visit to Metro Clark Waste Management Corporation | 29 June 2022
7. Approval of RSC Resolution (Task Force on Energy & Solid Waste Accounts) | 26 September 2022

15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



Sample Physical Supply and Use Tables: Energy Flow Accts

| PHYSICAL SUPPLY TABLE (unit: PJ) | | Production (incl. household own account) and generation of residuals | | | | | | | Accumulation | Flows from the rest of the World (Imports) | Flows from the environment | TOTAL |
|---|--|--|----------------------|---------------|---|----------------------------|------------------|----------------|--------------|--|----------------------------|---------|
| | | Industries (by ISIC) | | | | | | Households | | | | |
| | | Agriculture, Forestry and Fishery | Mining and Quarrying | Manufacturing | Electricity, gas, steam and air conditioning supply | Transportation and storage | Other industries | Total Industry | | | | |
| | | ISIC | A | B | C | D | H | Other | HH | Acc | RoW | Env |
| 1 Energy from natural inputs: | | | | | | | | | | | | |
| Natural resource inputs | | | | | | | | | | | | 600.0 |
| Inputs of energy from renewable sources | | | | | | | | | | | | 385.7 |
| Other natural inputs | | | | | | | | | | | | 0.0 |
| 2 Energy products: | | | | | | | | | | | | |
| <i>Production of energy products by SIEC class:</i> | | | | | | | | | | | | |
| Coal | | 0.0 | 147.0 | 2.2 | 0.0 | 0.0 | 0.0 | 149.1 | | | 267.5 | 416.6 |
| Peat and peat products | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | 0.0 | 0.0 |
| Oil shale / oil sands | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | 0.0 | 0.0 |
| Natural gas | | 0.0 | 127.7 | 0.0 | 0.0 | 0.0 | 0.0 | 127.7 | | | 0.0 | 127.7 |
| Oil | | 0.0 | 41.1 | 351.2 | 0.0 | 0.0 | 0.0 | 392.3 | | | 662.4 | 1,054.7 |
| Biofuels | | 279.8 | 0.0 | 34.3 | 0.0 | 0.0 | 0.0 | 314.1 | | | 3.3 | 317.4 |
| Waste | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | | | 0.0 | 0.2 |
| Electricity | | 0.0 | 0.0 | 0.0 | 272.2 | 0.0 | 0.0 | 272.2 | | | 0.0 | 272.2 |
| Heat | | 0.0 | 0.0 | 0.0 | 357.4 | 0.0 | 0.0 | 357.4 | | | 0.0 | 357.4 |
| Nuclear fuels and other fuels | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | 0.0 | 0.0 |
| 3 Energy residuals: | | | | | | | | | | | | |
| Energy residuals from end-use | | 14.6 | 16.9 | 272.6 | 16.8 | 385.8 | 117.2 | 823.9 | 256.4 | | | 1,080.3 |
| Energy residuals from losses | | 0.0 | 0.0 | 66.2 | 578.5 | 0.0 | 0.0 | 644.6 | 0.0 | | | 644.6 |
| 4 Other residual flows: | | | | | | | | | | | | |
| Residuals from end-use for non-en | | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 | 5.0 | 0.0 | | | 5.0 |
| Energy from solid waste | | | | | | | | | | 0.2 | | 0.2 |
| 5 TOTAL SUPPLY | | | | | | | | | | | | |
| | | 294.4 | 332.6 | 731.4 | 1,224.9 | 385.8 | 117.4 | 3,086.5 | 256.4 | 0.2 | 933.2 | 5,262.0 |

Regional E



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



Sample Physical Supply and Use Tables: Energy Flow Accts

| PHYSICAL USE TABLE (unit: PJ) | | | | | | | | Final Consumption | Accumulation | Flows to the rest of the World (Exports) | Flows to the environment | TOTAL | |
|---|-----------------------------------|----------------------|---------------|---|----------------------------|------------------|----------------|-------------------|--------------|--|--------------------------|---------|---------|
| Intermediate consumption, use of energy resources, receipt of energy losses | | | | | | | | Households | | | | | |
| Industries (by ISIC) | | | | | | | | | | | | | |
| | Agriculture, Forestry and Fishery | Mining and Quarrying | Manufacturing | Electricity, gas, steam and air conditioning supply | Transportation and storage | Other industries | Total Industry | | | | | | |
| | ISIC | A | B | C | D | H | Other | HH | Acc | RoW | Env | | |
| 1 Energy from natural inputs: | | | | | | | | | | | | | |
| Natural resource inputs | | 279.8 | 315.7 | 4.5 | 0.0 | 0.0 | 0.0 | 600.0 | | | | 600.0 | |
| Inputs of energy from renewable | | 0.0 | 0.0 | 0.0 | 385.7 | 0.0 | 0.0 | 385.7 | | | | 385.7 | |
| Other natural inputs | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | 0.0 | |
| 2 Energy products: | | | | | | | | | | | | | |
| Transformation of energy products by SIEC class: | | | | | | | | | | | | | |
| Coal | | 0.0 | 0.0 | 5.5 | 230.8 | 0.0 | 0.0 | 236.2 | | | | 236.2 | |
| Peat and peat products | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | 0.0 | |
| Oil shale / oil sands | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | 0.0 | |
| Natural gas | | 0.0 | 0.0 | 0.0 | 115.2 | 0.0 | 0.0 | 115.2 | | | | 115.2 | |
| Oil | | 0.0 | 0.0 | 358.0 | 62.0 | 0.0 | 0.0 | 420.0 | | | | 420.0 | |
| Biofuels | | 0.0 | 0.0 | 85.9 | 0.5 | 0.0 | 0.0 | 86.3 | | | | 86.3 | |
| Waste | | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.2 | | | | 0.2 | |
| Electricity | | 0.0 | 0.0 | 0.0 | 28.3 | 0.0 | 0.0 | 28.3 | | | | 28.3 | |
| Heat | | 0.0 | 0.0 | 0.0 | 357.4 | 0.0 | 0.0 | 357.4 | | | | 357.4 | |
| Nuclear fuels and other fuels | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | 0.0 | |
| End-use of energy products by SIEC class: | | | | | | | | | | | | | |
| Coal | | 0.0 | 0.0 | 78.8 | 0.0 | 0.0 | 0.0 | 78.8 | 0.0 | 11.0 | 90.6 | 180.4 | |
| Peat and peat products | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Oil shale / oil sands | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Natural gas | | 0.0 | 9.5 | 2.9 | 0.0 | 0.0 | 0.0 | 12.5 | 0.0 | 0.0 | 0.0 | 12.5 | |
| Oil | | 9.1 | 6.6 | 65.7 | 0.0 | 377.7 | 42.9 | 501.9 | 38.9 | 12.9 | 75.9 | 629.7 | |
| Biofuels | | 0.2 | 0.1 | 61.0 | 0.0 | 7.7 | 13.6 | 82.6 | 149.7 | -1.3 | 0.0 | 231.0 | |
| Waste | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Electricity | | 5.3 | 0.6 | 64.2 | 44.9 | 0.4 | 60.6 | 176.1 | 67.8 | 0.0 | 0.0 | 243.9 | |
| Heat | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Nuclear fuels and other fuels | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| End-use of energy products for non-energy purposes | | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 | 5.0 | |
| 3 Energy residuals: | | | | | | | | | | | | | |
| Energy residuals from end-use | | | | | | | | | | | 1,080.3 | 1,080.3 | |
| Energy residuals from losses | | | | | | | | | | | 644.6 | 644.6 | |
| 4 Other residual flows: | | | | | | | | | | | | | |
| Residuals from end-use for non-energy purposes | | | | | | | | | 5.0 | | | 5.0 | |
| Energy from solid waste | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | | | | 0.2 | |
| 5 TOTAL USE | | 294.4 | 332.6 | 731.4 | 1,224.9 | 385.8 | 117.4 | 3,086.5 | 256.4 | 27.7 | 166.5 | 1,724.9 | 5,262.0 |

Regional

5



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



Sample Physical Supply and Use Tables: Solid Waste Accts

Physical supply table for solid waste

| | Generation of solid waste | | | | | | | | | | Rest of the world | Flows from the environment | Total supply |
|-------------------------------------|---|--------------|--|---------------------|-----------------|-------------|-------------------|----------|------------------|------------|------------------------|----------------------------|--------------|
| | Waste collection, treatment and disposal industry | | | | | Agriculture | Food and beverage | Services | Other industries | Households | Imports of solid waste | Recovered Residuals | |
| | Landfill | Incineration | | Recycling and reuse | Other treatment | | | | | | | | |
| | | Total | Of which incineration to generate energy | | | | | | | | | | |
| Generation of solid waste residuals | | | | | | | | | | | | | |
| Animal and vegetal wastes | | | | | | | | | | | | | |
| Generation of solid waste products | | | | | | | | | | | | | |
| Animal and vegetal wastes | | | | | | | | | | | | | |



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



Sample Physical Supply and Use Tables: Solid Waste Accts

Physical use table for solid waste

| | Intermediate consumption, Collection of residuals | | | | | | | | | Final Consumption | Rest of the world | Flows to the environment | Total use |
|--|---|--------------|--|---------------------|-----------------|-------------|-------------------|----------|------------------|-------------------|------------------------|--------------------------|-----------|
| | Waste collection, treatment and disposal industry | | | | | Agriculture | Food and beverage | Services | Other industries | Households | Exports of solid waste | | |
| | Landfill | Incineration | | Recycling and reuse | Other treatment | | | | | | | | |
| | | Total | Of which incineration to generate energy | | | | | | | | | | |
| Collection and disposal of solid waste residuals | | | | | | | | | | | | | |
| Animal and vegetal wastes | | | | | | | | | | | | | |
| Use of solid waste products | | | | | | | | | | | | | |
| Animal and vegetal wastes | | | | | | | | | | | | | |



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



DATA ASSESSMENT FOR ENERGY FLOW

| INDICATOR | | AVAILABILITY OF DATA | SOURCE | PROXY INDICATORS/ REMARKS |
|--|--|----------------------|--------|---|
| Energy from natural inputs (Supply and Use Table) | Natural resource inputs | Available | BENECO | Hydro Power Plant |
| | Inputs of energy from renewable sources | Available | BENECO | Proposal – Solar |
| | Other natural inputs | Not Available | | |
| Energy products (Supply and Use Table) | Coal | Available | BENECO | Data from TeaM Energy Corporation |
| | Peat and peat products | Not Available | | |
| | Oil shale/oil sands | Not Available | | |
| | Natural gas | Available | BENECO | Data from TeaM Energy Corporation |
| | Oil | Not Available | | |
| | Biofuels | Not Available | | |
| | Waste | Not Available | | |
| | Electricity | Available | BENECO | Consumption of households, establishments, and energy transmitted from NGCP |
| | Heat | Not Available | | |
| | Nuclear fuels and other fuels | Not Available | | |
| Energy residuals (Supply and Use Table) | Energy residuals from end-use | Not Available | | |
| | Energy residuals from losses | Available | BENECO | Technical (Energy lost from transmission lines, energy not perfectly transferred) and non-technical (stolen energy) losses. |
| Other residual flows (Supply and Use Table) | Residuals from end-use for non-energy purposes | Not Available | | |
| | Energy from solid waste | Not Available | | |



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



DATA ASSESSMENT FOR SOLID WASTE

| INDICATOR | | AVAILABILITY OF DATA | SOURCE | PROXY INDICATORS/ REMARKS |
|---|------------------------|----------------------|---------|---|
| Generation of waste (Supply and Use Table) | Landfill | Available | EMB | |
| | Incineration | Not Available | | Proxy: Open Burning (for Local Government Units (LGU) where trash is not collected) |
| | Recycling and use | Not Available | | Waste Analysis and Characterization Study (WACS) by EMB |
| | | | | Not all Material Recovery Facilities (MRF) / Junkshops have statistics/data available because of a lack of personnel/budget |
| | Other treatment | Not Available | | No data for ambulant buyers |
| | | | | Composting – biodegradables used for fertilizers |
| | Agriculture | Not Available | | Waste to Energy technology is too expensive |
| | | | | Crushed bottles that are not sold are made into tiles or hollow blocks |
| | Food and beverages | Available | EMB/LGU | For Cordillera Administrative Region (CAR) – based only on WACS |
| | Services | Available | EMB | EMB does not explicitly collect data from farmers and/or agricultural stakeholders |
| Rest of the world | Imports of solid waste | Not Available | | Kitchen waste and data from food and beverage establishments are available |
| | Exports of solid waste | Available | EMB/LGU | Commercial, Establishment, and Market Waste available |
| Flows from the environment | Recovered residuals | Not Available | | Yard waste, animal waste, special waste, and hazardous waste (hospitals) are available |
| | Exports of solid waste | Not Available | | No collection of data from households |
| Rest of the world | Imports of solid waste | Not Available | | CAR does not import solid waste |
| | Exports of solid waste | Available | LGU | Proxy: Waste diversion |
| Flows to the environment | | Not Available | | How much the LGU is diverting its trash – does not go to sanitary landfill |
| | | | | Only an approximated percent of total trash diverted is available |
| | | | | Baguio City and La Trinidad export trash to Metro Clark Waste Management Corporation (MCWMC) in Capas, Tarlac |
| | | | | Proxy: Indiscriminate dumping |
| | | | | LGUs whom not all barangay collect trash |



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



Daily Waste Generation Cordillera Administrative Region | March 2022

| LGU | 2020 POPULA TION | PER CAPITA GENERATION (BASED ON WACS/HH LEVEL) | DAILY WASTE GENERATION (kg/day) | BIODEGRADABLE (kg/day) | RECYCLABLE (kg/day) | RESIDUAL (kg/day) | SPECIAL WASTES (kg/day) | PERCENT WASTE DIVERSION |
|-------------------------------|------------------------|---|---------------------------------------|---------------------------|------------------------|----------------------|-------------------------------|-------------------------------|
| ABRA | 250,985 | 0.16 | 71233.70 | 40,486 | 21,008 | 7,837 | 1,903 | 86.33% |
| APAYAO | 124,366 | 0.24 | 32683.20 | 14,137 | 11,755 | 5,342 | 1,449 | 79.22% |
| BENGUET | 460,683 | 0.23 | 125614.77 | 66,119 | 23,966 | 33,160 | 2,369 | 71.72% |
| IFUGAO | 207,498 | 0.24 | 45132.37 | 19,236 | 4,859 | 9,319 | 811 | 53.39% |
| KALINGA | 108,537 | 0.12 | 14533.47 | 9,730 | 2,717 | 2,037 | 204 | 85.65% |
| MT. PROVINCE | 158,200 | 0.18 | 32726.26 | 19,240 | 7,388 | 5,253 | 846 | 81.37% |
| BAGUIO CITY | 366,358 | 0.419 | 467219.53 | 194690.39 | 157826.76 | 112833.52 | 1915.60 | 75.45% |
| Tabuk City | 121,033 | 0.403 | 30091.00 | 20275.32 | 4983.07 | 4483.56 | 349.06 | 83.94% |
| Benguet including Baguio City | | | 592,834.30 | 260,809.48 | 181,793.25 | 145,993.17 | 4,284.55 | 74.66% |
| Kalinga including Tabuk City | | | 44,624.47 | 30,005.52 | 7,700.16 | 6,520.50 | 552.83 | 84.50% |
| CAR | | | 819,234.30 | 383,914.40 | 234,503.18 | 180,264.03 | 9,846.16 | 76.58% |

WACS - Waste Analysis and Characterization Study
Source: Ecosystems Management Bureau- CAR



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



Conclusion

Most important aspects of any compilation:

- Framework
 - Availability of data
 - Sufficiency
-
- CAR can proceed to estimate the energy flow and solid waste accounts
 - *There are **indicators not available** at the moment. However, the **accounting frameworks** are **flexible** in that they **accommodate** the **actual** situations on the ground.*



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



Conclusion

Energy Flow Accounts

- Number of regional data might be **less** than what is **desired** but is more or less **sufficient to present** a picture of the region's **energy supply and use**
- **MAS-ENRAD** of PSA has already **prepared** the **energy accounts** of the country. **Regional staff** can **model** the **work** done by the ENRAD staff.

Solid Waste Accounts

- **First** to account for **solid wastes**
- **Regional compilers** will be learning side by side with **central office experts**
- **Head start** in the regional compilation with **generated table** of **EMB-CAR** on the **daily waste generation** of the region



15TH NATIONAL CONVENTION ON STATISTICS

03-05 OCTOBER 2022

Organized by the Philippine Statistical System
Spearheaded by the Philippine Statistics Authority



Thank you!



<http://www.psa.gov.ph/ncs>



<http://openstat.psa.gov.ph>



<https://twitter.com/PSAgovph>



<https://www.facebook.com/PhilippineStatisticsAuthority>