GREEN CHOICE PHILIPPINES
NELP-GCP 20170006
PRINTING AND WRITING PAPER

I. BACKGROUND

Printing and writing paper are paper grades used for newspapers, magazines, catalogs, record books, journals, books, commercial printing, business forms, stationeries, copying and digital printing. Production of printing and writing paper uses cellulosic fibers. The fiber may be 100% virgin, 100% recycled or mixed. The main source of recovered fiber is office paper collection for recycling. The virgin fiber is mostly kraft fiber which is produced from softwood or hardwood.

A. MARKET DESCRIPTION

From the tables presented in Greening the Roadmap for the Philippine Pulp and Paper Industry, in 2014, printing and writing paper accounted for 132,000 tons of local production and 137,000 tons of imports. This is 23% of total paper and board production for that year, second only to packaging paper and board at 53%. The paper printing and writing sector is expected to grow by 1% each year.

Current socio-economic conditions in the Philippines are profitable for businesses in the pulp and paper industry. While paper products consumption is currently low at 19 kg per capita, total annual demand is growing at 2.5% per year.

The following table shows the facts and figures for the pulp and paper industry in the Philippines. In general, from 2006 to 2011, the pulp and paper industry is growing especially in 2011, with the exception of export volume. The decline in the indicators for 2009 can be attributed to the Asian financial crisis at that time.

In 2014 the paper and paper products industry, ranked 7th in terms of the most number of establishments in the country accounting for 3.3% with 205 establishments.

Facts and Figures

Volume of Paper and Paperboard ('000 MT)

	2006	2007	2008	2009	2010	2011
Exports	176	168	135	132	165	130
Imports	620	419	339	326	400	823

Value of Paper and Paperboard (in M US$)

	2006	2007	2008	2009	2010	2011
Exports	105.9	102.2	110.1	98.8	132.1	144.2
Imports	386	291	252	223	284	737

Paper and Paperboard Production and Consumption (in '000 MT)

	2006	2007	2008	2009	2010	2011
Production	524	1097	843	1019	1038	950
Consumption	968	1348	1468	1253	1834	1643

Figure 1 Facts and Figures on the Paper Industry from DTI

From the sample of bid requirements for record books, government requirements seem to focus on 300 or 500 page record books with dimensions of 214mm x 278mm (min.) at 10 books per bundle for 300 page record books and 5 books per bundle for 500 page record books.

B. ENVIRONMENTAL IMPACTS AND INITIATIVES

In the last 5 years there has been a shift to increase the recovered fiber content in all grades of paper. At the moment the recycled content is at 95 to 100% compared to the minimum required recycled content of 25 to 35% being implemented in developed countries.

Pulp and paper is considered as one of the most pollutive industries. The extraction of virgin pulp can contribute to deforestation which is considered as the biggest impact in the manufacture of pulp and paper. The manufacturing process also contributes to water pollution, and air pollution. The paper product itself can also contribute to solid wastes. While recycling mitigates this impact, the energy consumed by the process (manufacturing, transporting, reprocessing) is not.

Additionally, the printing & writing papers produce the greatest environmental damage in the process of their production and manufacturing, including higher energy and water use, as well as greater greenhouse gas releases. This category should be where adding recycled content can do the most good for the environment because it can avoid so much of this negative impact, plus it returns resources to the manufacturing process rather than wasting them.

Bleaching which makes the paper whiter also has serious environmental impacts. They use different chemicals, some of which are reduced and replaced because they release toxic pollutants to the environment.

Greenhouse gas emissions from the pulp and paper industry come from the combustion of fossil fuels required for raw material production and transportation, operation of wastewater treatment facilities, power from manufacturing operations, product transportation, and disposal and recycling. Paper disposed in landfills breakdown and produce methane which also adds to the carbon footprint of paper products.

Environmental initiatives within the pulp and paper industry have mainly been focused in the use of recovered fiber. While the use of recycled paper is expensive, it does have environmental benefits aside from the obvious one of reducing logging for fiber. These include 1) energy conservation, 2) water conservation, 3) reduction of air and water pollution, and reduction of greenhouse gases (GHG). Recycling paper instead of disposing in landfills can reduce the global warming potential by 15 to 25%. The US EPA also has found that using recycled paper causes 35% less water pollution and 74% less air pollution that using virgin pulp.

With regards to the bleaching process, the move to non-elemental chlorine has reduced the emission of carcinogenic organochlorines. Chemicals that produced totally chlorine free (TCF) paper are now also being used.

In 2015, the Philippine Paper Manufacturers Association, Inc. (PPMAI) presented a roadmap for the “greening” of the Philippine pulp and paper industry. Their initiatives mainly focus on establishing a kraft pulp mill that will be based on sustainably-managed tree plantations. The mill will have modern and environmentally-friendly technologies in wood fiber pulping, bleaching and water use. Its energy will be from biomass and waste and it will be compliant with ISO standards. It will also seek international certification from the Programme for the Endorsement of Forest Certification (PEFC) and the Forest Stewardship Council (FSC).

II. DEFINITION OF TERMS

1. Adsorbable Organic Halogens (AOX) – which is the amount of organic chlorine compound contained in effluent produced during bleaching of pulp by the reaction of chlorine chemicals with residual lignin in the wood fiber
2. Air Dry Metric Ton (ADMT) or Air Dried Pulp (ADP)- One ton of air-dry pulp containing 90% bone dry fiber and 10% moisture.
3. Agricultural residues – agricultural wastes, such as wheat straw, rice straw, corn waste and sugar cane bagasse, alternatively used for paper production
4. Annual crop fiber – fiber coming from annual crops, such as kenaf and hemp, alternatively used for paper production
5. Biological oxygen demand (BOD) – a measure of the rate of dissolved oxygen used by water borne microorganisms in removing organic compounds dissolved in the water.
6. Bond paper – sized writing or printing paper, sometimes containing virgin fibers, and normally wood free, with additional requirements of strength and durability in order to withstand handling and filing.
7. Chemical pulp – pulp obtained by removal from the fiber raw material considerable part of non-carbohydrate components by chemical treatment.
8. Copy paper – paper, usually uncoated, used for xerographic, ink-jet and other types of home and office copiers and printers
9. Elemental chlorine – gaseous chlorine or chlorine derived from sodium or calcium hypochlorite, which is used as a bleaching agent
10. Local waste paper – waste paper generated and procured within the country of paper production
11. Mechanical pulp – pulp made from wood by purely mechanical means, i.e., grinding or refining of chips using mechanical refiners or grinding stones. Lignin and other impurities are not removed and further bleaching is needed if a white sheet is required. A lower grade pulp than chemical pulp.
12. Optical brighteners – chemical substance used to enhance brightness and whiteness of pulp.
13. Pulp substitute – total or partial replacement for virgin pulp by paper waste of higher category. They are usually unprinted paper trimmings.
14. Recovered fiber (recycled fiber or secondary fiber) refers to Post-consumer fiber such as paper, paperboard, and fibrous materials from retail stores, office buildings, homes, and so forth, after they have passed through their end-use as a consumer item; all paper, paperboard, and fibrous materials that enter and are collected from municipal solid waste; and manufacturing waste such as dry paper and paperboard waste generated after completion of the papermaking process; and repulped finished paper and paperboard from obsolete inventories of paper and paperboard. It also includes recovered waste paper and any fibrous material that has already undergone a manufacturing process and is being recycled as the raw material for another manufactured product, excluding wood residues and sawmilling residues, which has been repulped or reintroduced into the paper manufacturing process and make it into a product or form usable in the manufacture of a product.
15. Safety Data Sheets (SDS), Material Safety Data Sheet (MSDS), Product Safety Data Sheet (PSDS)- document that contains information on the potential hazards and how to work safely with the chemical product.
16. Surfactants- compounds that are intended to lower the surface tension thereby helping water to remove dirt or staining from surfaces
17. Sustainably-managed forest – a forest managed to meet all existing regulations such that environmental, social and economic factors are balanced to meet the needs of the present without compromising the ability of future generations to meet their needs.
18. Total Chlorine Free (TCF)- Bleaching process that does not use chlorine or chlorine containing chemicals
19. Virgin pulp – fibrous material separated from wood or other plant material by chemical or mechanical means for the manufacture of paper and paperboard.
20. Wet strength – ability of paper to retain its strength when wet
21. Woodfree – paper or board having, in principle, only chemical pulp in its fiber composition. In practice, however, it may contain up to 10% of mechanical pulp.

III. SCOPE

These criteria shall apply to unprinted printing and writing paper, which is used for bond papers, mimeographing paper, manifold or onion skin paper, plain copy paper, colored ruled paper, correspondence envelopes, continuous forms used for information processing, grade school pads, notebooks, record books (log books), machine-finished uncoated book paper and writing paper.

IV. GREEN CHOICE PHILIPPINES REQUIREMENTS

To carry the Green Choice Philippines seal, the product must meet the following requirements:

Criteria	Evaluation/Validation Method
A. Packaging, Marking and Labeling	
1. Packaging should be marked with "please collect used paper for recycling" and the country of origin	Visual inspection of actual packaging and documentation and certification provided by applicant company
2. Packaging must NOT be made from chlorine-based plastics and they must be suitable for recycling.	Documentation and certification provided by the applicant company
B. Common Criteria	
1. The product shall conform to the most recent Philippine National Standards (PNS) specifications. PNS on notebook, bond paper, copy paper, mimeographing paper, grade school pads, newsprint, machine-finish uncoated book paper, textbook paper and colored rule paper must follow the standards. PNS 70- Bond paper - White and colored PNS 122 - Mimeographing paper PNS 125 - Manifold or onion skin paper PNS 222 - Plain paper copiers PNS 265 - Colored ruled paper PNS 473 - Grade school pads PNS 474 - Notebooks - Specification PNS ISO 269- Correspondence envelopes - Designation and sizes PNS ISO 2784 - Continuous forms used for information processing - Sizes and sprocket feed holes PNS ISO 216 - Writing paper and certain classes of printed matter - Trimmed sizes - A and B series PNS 221 - Machine-finish uncoated book paper – PNS 126- Newsprint PNS 1824- Textbook paper	The applicant shall submit a certified true copy of the PS Mark Certificate if a PS licensee holder. Otherwise, the applicant shall submit the certified true copy of test results from an independent Bureau of Product Standards (BPS) accredited laboratory that the product is in compliance with the existing PNS. BPS shall evaluate the test results and shall issue the corresponding certification.
2. The production process shall meet the requirements of all applicable environmental laws and regulations including those for water, air, solid wastes, and hazardous wastes.	The applicant shall submit all applicable licenses, certificates and/or permits indicating the applicant's compliance with all applicable environmental rules and regulations.
3. The bleaching process for recovered	The applicant shall submit a self-certification

fiber shall not use elemental chlorine (chlorine gas) and the amount of AOX in the discharge from the production of pulp must not exceed 0.3 kg/air dry metric ton (ADMT), tested in accordance with ISO 9562.	from the company CEO, indicating the non-usage of elemental chlorine in their bleaching process. The applicant shall also submit certification that the AOX discharge from their production of pulp was evaluated in accordance with ISO 9562.
4. Dyes, colorants and optical brighteners used in the paper manufacturing process shall not contain heavy metals such as lead, mercury, cadmium and chromium (+6). Ingredients may contain traces of those metals up to 0.01 % (w/w) deriving from impurities in the raw materials.	The applicant shall submit a compliance certification from FDA or recognized testing laboratories by DTI-Philippine Accreditation Bureau (PAB)any internationally recognized independent laboratories or organizations to support the claim that no heavy metals, such as lead, mercury, cadmium and chromium were intentionally used in the paper manufacturing process.
5. The bleaching process should at a minimum be Elemental Chlorine Free (ECF) or Totally Chlorine Free (TCF))	Declaration and certification provided by the applicant and documentation (including SDS/MSDS/PSDS) of chemicals used
6. Carbon dioxide emissions should be less than 1,500 ppm (1,500 kg of carbon dioxide per ton of product) for non-renewable sources and carbon dioxide fossil per air dry ton of product The fuels used for converting the paper into a product and transport in distributing this product, pulps or other raw materials shall not be included in the calculations.	Provide computations which must include emissions from all pulp and paper production processes, and laboratory analysis of samples and results. Information on CO_2 of different fossil fuels are provided in Section VII
7. Alkylphenol ethoxylates or other alkylphenol derivatives shall not be added to cleaning chemicals, de-inking chemicals, foam inhibitors, dispersants or coatings.	Declaration and certification provided by the applicant and documentation (including SDS/MSDS/PSDS) of chemicals used
8. The chemical oxygen demand (COD) in the water discharge from both pulp and paper production shall not exceed 20kg/ton of paper produced.	Review COD laboratory test reports and by on-site factory visits. COD shall be determined using the method in ISO 60610, APHA 5220 or equivalent
9. The applicant must meet all government regulations on safety, health and the environment	No documentation is necessary but the Mark may be revoked if the ecolabelling board finds out that it did not meet the regulations through available public information
10. Solvents used in the cleaning of production equipment shall be free of halogenated hydrocarbons	Documentation (to include SDS/MSDS/PSDS) and certification provided by applicant company
11. All producers should have a system for the handling or waste and residual products.	Applicants will be required to provide a description of the waste management system for the sites concerned and a declaration of compliance
12. Paper manufacturer must have a water management system in place which outlines at least: a. all categories/ areas of water use that are being measured (with details on how these are measured, e.g., flow rate, meter readings, etc.) and those which are not currently being measured; and b. all categories/ areas of known emissions to water that are measured	Applicants will be required to provide a description of the water management system for the categories/areas that are being measured including flow rate, meter readings, etc. They should be able to show/calculate the volume of water used in the production of the product, and the volume of effluent discharged to the environment. DENR's Self-Monitoring Report may be used for this requirement provided that it has been received by the DENR

(with details on how these are measured, e.g., flow rate, meter readings, etc.) and those which are not currently being measured.	office. Refer to criteria B.2 and C.2.
13. The product should be recyclable. The non-paper components of the converted paper product should be easily removable to ensure that those components will not hinder the recycling process. a. Wet strength agents may be used only if the recyclability of the finished product can be proved b. Non-soluble adhesives may be used only if their removability can be proved c. Coating varnishes and lamination, including polyethene and/or polyethene/polypropylene, may be used only for binders, folders, exercise books, notebooks and diaries.	The applicant shall provide the test result of the recyclability for wet strength agents and removability for adhesives. The reference test methods are PTS method PTS-RH 021/97 (for wet strength agents), INGEDE Method 12 (for non-soluble adhesive removability), or equivalent test methods. Where a part of a paper product is easily removable (for instance a metal bar in a suspension file or a plastic cover or reusable exercise book cover), the recyclability test may be made without this component. *The easiness of removal of the non-paper components shall be proven via a declaration of the paper collecting company, the recycling company or an equivalent organisation.*
14. The applicant shall establish a register of all energy consuming devices (including machinery, lighting, air conditioning, cooling) and a programme consisting of measures for improvement of energy efficiency.	The applicant shall provide the register of energy consuming devices together with the improvement programme.
C. Products made from 100% Recovered Fiber	
1. The product shall be made from 100% recovered fiber, at least of which is 10% of which is local (country of origin) waste paper.	The applicant shall submit a self-certification from the company CEO, indicating that the fiber used is 100% recycled and the percentage of locally-generated waste paper is at least 5%. Furthermore, the applicant shall also submit a certified true copy of its delivery receipt of its locally-generated waste paper. If further validation is required, actual verification may be conducted.
2. Fresh water usage in the production process shall not exceed 30m^3/ton.	The applicant shall submit a DENR certified true copy of its Self-Monitoring Report (SMR) for the last four (4) quarters, indicating the volume of paper production, fresh water usage and wastewater discharge in their paper production process.
D. Products made from the Combination of Recovered Fiber and Virgin Pulp	
1. The product shall be a combination of recovered fiber and virgin pulp, not exceeding 20%, produced from annual crop fiber, agricultural residues or pulp from sustainably-managed forests. At least of which 10% of the recovered fiber shall be local waste paper.	The applicant shall submit a self-certification from the company CEO and certification from its supplier that the virgin pulp used was obtained from a sustainably-managed forest such as the Forest Stewardship Council (FSC) certification and the percentage of locally-generated waste paper is at least 5%.
2. Fresh water usage in the production process must not exceed 20 m^3/ton	The applicant shall submit a DENR certified true copy of its Self-Monitoring Report (SMR) for the last four (4) quarters, indicating the volume of paper production, fresh water usage and wastewater discharge in their paper production process.

V. PERIOD OF VALIDITY

The product criteria is valid for three years from the date of its approval unless otherwise revised or withdrawn by the NELP-GCP Board, if proven necessary at any period of time.

VI. REFERENCES

Department of Environment and Natural Resources (DENR), 1990. RA 6969 – Toxic Substances, Hazardous and Nuclear Wastes Control Act, Philippines.

Department of Environment and Natural Resource (DENR), 2004. RA 9275 – The Philippine Clean Water Act of 2004, Philippines.

Department of Trade and Industry (DTI), Board of Investments (Philippines). No date. Paper [Online]. Available: http://industry.gov.ph/industry/paper/

Department of Trade and Industry (DTI), Bureau of Philippine Standards (BPS), 2012. MM No. 2012-035 PNS on Paper, Board, and Pulps [Online]. Available: http://www.bps.dti.gov.ph/index.php?option=com_docman&task=cat_view&gid=131&Itemid=99

Department of Trade and Industry (DTI), Bureau of Philippine Standards (BPS), 2013. MM No. 2013-031 PNS on Paper, Board, and Pulps [Online]. Available: http://www.bps.dti.gov.ph/index.php?option=com_docman&task=cat_view&gid=143&Itemid=77

Der Blau Engel, July 2014. Basic Criteria for Award of the Environmental Label Recycled Paper (RAL-UZ 14) [Online]. Available: https://produktinfo.blauer-engel.de/uploads/raluz_uz/e-UZ-014-2014.zip

Dictionary of Paper - TAPPI Press, Edited by Michael Kouris

European Commission, 21 August 2012. COMMISSION DECISION of 16 August 2012 establishing the ecological criteria for the award of the EU Ecolabel for printed paper [Online]. Available: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32012D0481

European Commission, 8 June 2011. COMMISSION DECISION of 7 June 2011 on establishing the ecological criteria for the award of the EU Ecolabel for copying and graphic paper [Online]. Available: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32011D0333

European Commission, 8 May 2014. COMMISSION DECISION of 2 May 2014 establishing the ecological criteria for the award of the EU Ecolabel for converted paper products [Online]. Available: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014D0256

EU Ecolabel, December 2012. User's Manual for the Application for Newsprint Paper [Online]. Available: http://ec.europa.eu/environment/ecolabel/documents/newsprint_manual.pdf

EU Ecolabel, November 2012. User's Manual for the Application for Copying and Graphic Paper [Online]. Available: http://ec.europa.eu/environment/ecolabel/documents/usermanual_paper.pdf

EU Ecolabel, 27 October 2014. User's Manual for the Application for the EU Ecolabel for the Converted Paper Products [Online]. Available: http://ec.europa.eu/environment/ecolabel/documents/User_manual_converted_paper.pdf

Geganto, Ray N., no date. Greening the Roadmap for the Philippine Pulp and Paper Industry [Online]. Available: http://industry.gov.ph/wp-content/uploads/2015/03/Greening-the-Roadmap-of-the-Philippine-Pulp-and-Paper-Industry.pdf

Hong Kong Green Label Scheme, 28 August 2014. Product Environmental Criteria for Note Pad (GL-001-003) [Online]. Available: http://www.greencouncil.org/eng/doc/GL-001-003ver4.pdf

ISO definitions.

ISO 9562:2004 – Water Quality – Determination of adsorbable organically bound halogens (AOX)

Japan Eco Mark, 28 April 2006. Stationery/Office Supplies Version 1.4 [Online]. Available: https://www.ecomark.jp/english/pdf/11214eI.pdf

Kinsella, Susan, April 2012. Paperwork: Comparing Recycled to Virgin Paper (Why Recycled Content is Crucial for Printing and Writing Paper), Project presented by Environmental Paper Network [Online]. Available: http://conservatree.org/learn/WhitePaper%20Why%20Recycled.pdf

National Council for Air and Stream Improvement, Inc. (NCASI), 8 July 2005. Calculation Tools for Estimating Greenhouse Gas Emissions from Pulp and Paper Mills [Online]. Available: http://www.ncasi.org/Programs/Climate-Change/Resources/GHG-Calculation-Tools/GHG-Tools-Pulp-and-Paper/Index.aspx

Nordic Ecolabelling, 11 June 2011. Nordic Ecolabelling of Paper Products-Basic Module [Online]. Available: http://www.nordic-ecolabel.org/CmsGlobal/Criteria/Basic_module.pdf

Nordic Ecolabelling, 11 June 2011. Nordic Ecolabelling of Paper Products-Chemical Module [Online]. Available: http://www.nordic-ecolabel.org/CmsGlobal/Criteria/Ecolabelling_criteria_chemical_module.pdf

North Carolina Division of Pollution Prevention and Environmental Assistance, no date. Availability, Performance, and Cost of Recycled Paper [Online]. Available: http://infohouse.p2ric.org/ref/03/02243.pdf

Nurmesniemi, Hannu, 22 February 2013. Waste Water Load of Pulp and Paper Industry [Online]. Available: http://oamk.fi/~mohameda/materiaali16/water%20management2014/WEM2012-13/Nurmesniemi/Waste%20water%20load%20of%20pulp%20and%20paper%20industry.pdf

Paper Life Cycle, no date. Recovered and Recycled: Paper Fiber Types Defined [Online]. Available: http://thepaperlifecycle.org/recovery/in-depth/recovered-and-recycled-paper-fiber-types-defined/

Philippine Statistics Authority, 26 January 2017. 2014 Annual Survey of Philippine Business and Industry (ASPBI) - Manufacturing Sector For Establishments with Total Employment of 20 and Over : Preliminary Results [Online]. Available: https://psa.gov.ph/content/2014-annual-survey-philippine-business-and-industry-aspbi-manufacturing-sector

Philippine Statistics Authority, 23 September 2016. 2013 Annual Survey of Philippine Business and Industry (ASPBI) - Manufacturing Sector : Final Results [Online]. Available: https://psa.gov.ph/content/2013-annual-survey-philippine-business-and-industry-aspbi-manufacturing-sector-final-results

Philippine Statistics Authority, 29 December 2014. 2012 Census of Philippine Business and Industry - Manufacturing Sector for All Establishments : Final Results [Online]. Available: https://psa.gov.ph/content/2012-census-philippine-business-and-industry-manufacturing-sector-all-establishments-final

PNS ISO 4046-2:2002 - Paper, board, pulps and related terms - Vocabulary Part 2: Pulping terminology

PNS ISO 4046-42002 - Paper, board, pulps and related terms - Vocabulary Part 4: Paper and board grades and converted products

PNS 70:2004: - Bond paper - White and colored - Specification

PNS 122:1988 - Mimeographing paper - Specification

PNS 125:1988 - Manifold or onion skin paper - Specification

PNS 222:1988 - Plain paper copiers - Specification

PNS 265:1989 - Colored ruled paper – Specification

PNS 473:1997 - Grade school pads – Specification

PNS 474:1997 - Notebooks - Specification

PNS ISO 269:2002 - Correspondence envelopes - Designation and sizes

PNS ISO 2784:2002 - Continuous forms used for information processing - Sizes and sprocket feed holes

PNS ISO 216:2001 - Writing paper and certain classes of printed matter - Trimmed sizes - A and B series

PNS 221:1988 - Machine-finish uncoated book paper - Specification

PULPAPEL data

The New Zealand Ecolabelling Trust, June 2015. License Criteria for Office Paper and Stationery (EC-26-15) [Online]. Available: https://www.environmentalchoice.org.nz/assets/Specifications/ec-26-15-office-paper-and-stationery-specification.pdf

TGL-08-97, Thailand's Green Label Specifications for Paper

Wikipedia, No Date. Environmental Impact of Paper [Online]. Available: https://en.wikipedia.org/wiki/Environmental_impact_of_paper

World Bank Group, July 1998. Pollution Prevention and Abatement Handbook, Pulp and Paper Mills [Online]. Available: https://www.ifc.org/wps/wcm/connect/7b62180048855aef878cd76a6515bb18/pulp_PPAH.pdf?MOD=AJPERES

Yahoo, Inc., 1996-2001. Hawkins Wright Ltd. Glossary & Terms, A-Z

VII. CARBON DIOXIDE OF DIFFERENT FOSSIL FUELS AND GRID ELECTRICITY

This section is taken from Annex 1 of the User's Manual for the Application for Tissue Paper for the European Ecolabel Scheme.

Fuel	Carbon Dioxide Fossil Emission	Unit
Coal	95	g $CO_{2,\ fossil}$ /MJ
Crude Oil	73	g $CO_{2,\ fossil}$ /MJ
Fuel Oil 1	74	g $CO_{2,\ fossil}$ /MJ
Fuel Oil 2-5	77	g $CO_{2,\ fossil}$ /MJ
LPG	62 (standard) 40 (high efficiency)	g $CO_{2,\ fossil}$ /MJ
Natural Gas	56	g $CO_{2,\ fossil}$ /MJ
Grid Electricity (European Average)	400	g $CO_{2,\ fossil}$ /MJ

VIII. TECHNICAL WORKING GROUP MEMBERS

Ms. Ann Fernando
Engr. Janine Adordionisio, Alternate
Bureau of Philippine Standards-Department of Trade and Industry (BPS-DTI)

Engr. Adela Torres
Forest Products Research and Development Institute –Department of Science and Technology (FPRDI-DOST)

Engr. Julieta Lozano
Procurement Service-PhilGEPS (PS-PHILGEPS)

Engr. Rey Geganto
Philippine Paper Manufacturers Association Inc. (PPMAI)

Ms. Maritess De Guzman
QUANTA PAPER CORPORATION

Dr. Emilyn Espiritu
Ms. Abigail Marie Favis, Alternate
Ateneo De Manila University