

## Product Category Rules (PCR)

(Approved PCR ID: PA-BS-01)

Publicity printings and Printing products for business use

Release date: October 7, 2010

The Carbon Footprint of Products Calculation and Labeling Pilot Program

NOTICE: Use latest version for your calculation. Check the website if it is the newest one.  
<http://www.cfp-japan.jp/english/pcr/pcrs.html>

(Provisional Translation)

**Product Category Rule of  
“Publicity printings and Printing products for business use”  
(Approved PCR ID: PA-BS-01)**

Foreword

-The contents provided in this PCR may be changed and revised as needed for further refinement, through PCR revision procedures, as a result of continued discussions with relevant stakeholders during the period of the Japanese CFP Pilot Project. This PCR will expire at the end of the Project (scheduled until March 31, 2012).

-This English translation of the original Japanese PCR is provided for information purpose.

No.	Items	Contents
1	Scope	This PCR shall prescribe rules, requirements, and instructions on CFP calculation and communication applicable to “publicity printings and printing products for business use” under the CFP Pilot Project.
2	Definitions of products	
2-1	Descriptions of product category	<p>(1) This PCR shall cover “Publicity printings (9231)” and “Printings products for business use (9232)” prescribed in “Japan standard commodity classification (revised in June 1990, Statistics bureau of the Ministry of Internal Affairs and Communications)”.</p> <p>(2) <u>The following items shall be excluded</u> from the assessment.</p> <ul style="list-style-type: none"><li>- of publicity printings, items of “Point of purchase (92314),” “Wrapping paper and shopping bags (92317),” and “Other publicity printings (92319)”</li><li>- of publicity printings, items of “Calendars (not including for advertisement) (92155)” classified in “Printed pictures and musical scores (9215),” and “Pocket memorandum books (935116)” classified in “Business paper supplies (9351)”</li><li>- of printings products for business use, items of “Specifications (92324)” and “Other printings products for business use (92329)”</li><li>- of publicity printings and printings products for business use, items produced by on-demand printing processes that do not use printing plates</li><li>- of publicity printings and printings products for business use, items of electronically published goods (CD, DVD, etc.)</li><li>- Supplements of publicity printings (electronic media, samples, etc.)</li></ul> <p>(3) As for details of products covered by this PCR, see <b>Annex B (normative)</b>.</p>
2-2	Components of products	<p>(1) Paper, ink, glue, wire, metal fittings and applicable containers/packaging etc. for offset printing, gravure printing, flexography printing, or letterpress, etc.</p> <p>(2) Processes for creating contents (e.g., interviews, taking images, writings, etc.) is excluded from the components</p>
3	Referenced Standards and PCRs	<p>Following PCRs are referred. When referring these PCRs, use the latest edition downloaded from the CFP website.</p> <ul style="list-style-type: none"><li>- “PA-AD <i>Publishing and Commercial printing (intermediate goods)</i>”</li><li>- “PA-BB <i>Paper containers, packaging and wrapping (intermediate goods)</i>”</li><li>- “PA-BC <i>Plastic containers and packaging</i>”</li></ul>
4	Terms and Definitions	<p>(1) Publicity printings Printings used for company advertisements or promotions, etc. [Source: <i>Vision for the Print Industry of the Year 2000</i>, The Ministry of International Trade and Industry (1988)]</p>

		<p>(2) Printing products for business use          Printing products mainly for business use (e.g. report printings, corporate minutes, or mailing lists, etc. which are used internally in government offices, companies, or schools, etc.)          [Source: <i>Vision for the Print Industry of the Year 2000</i>, The Ministry of International Trade and Industry (1988)]</p>
5	Range of assessment	
5-1	Calculation unit	Distribution unit (e.g., copy, sheet, etc.)
5-2	Life cycle stages	<p>(1) The raw material acquisition stage          (2) The production stage          (3) The distribution stage          (4) The use and maintenance stage          (5) The disposal and recycling stage</p>
6	General requirements applied to all stages	
6-1	Life cycle flow chart	<p>(1) Life cycle flow chart is provided in <b>Annex A (normative)</b>. For better understanding, this chart includes "PA-AD <i>Publishing and Commercial printing (intermediate goods)</i>".          (2) This chart provides the product system of this assessment. When calculating GHG emissions, make detailed life cycle chart of each "targeted publicity printings and printings products for business use" by reference to this chart.</p>
6-2	Range of data collection	<p>(1) Primary data shall be collected for the process significantly contributes to the total GHG emissions of entire life cycle of final goods. Secondary data can be used for process that has small contribution to the total GHG emissions, or process that has difficulty in collecting primary data.          (2) Also primary data shall be collected within the suppliers of final goods for consumer has operational control. Scope of operational control in this PCR means the scope that applicable company or its subsidiary has the full authority to introduce and implement its operating policies at the operation (e.g., facility of the operating company).          (3) Indirect department such as clerical department shall be excluded. If it is difficult to separate only direct department from those indirect departments, indirect department may be included.          (4) Capital goods, such as facilities or transit vehicles for manufacturing or transporting products shall be excluded.</p>
6-3	Data collection period	<p>(1) The data collection period shall be the most recent and consecutive one year.          (2) When (1) is not collected, its validity shall be verified.</p>
6-4	Allocation	<p>(1) Weight ratio shall be used.          (2) When other allocation method is used due to product characteristic, the method used and its validity shall be verified.</p>
6-5	Cut-off criteria	When conducting cut-off, the range of cut-off shall be within 5% of the total life cycle GHG emissions and it shall be clearly reported. Cut-off shall, however, be conducted, provided that it is difficult to use any scenarios, similar data, and estimated data.
6-6	Others	<p>[Rules related to transport]          (1) Transport within the country          - The primary data shall be collected as much as possible, either by the "fuel consumption method," the "fuel cost method," or the "ton-kilometer method".  <u>(See Annex C for your understanding.)</u>          - Transport distance data collection shall be basically based on actual</p>

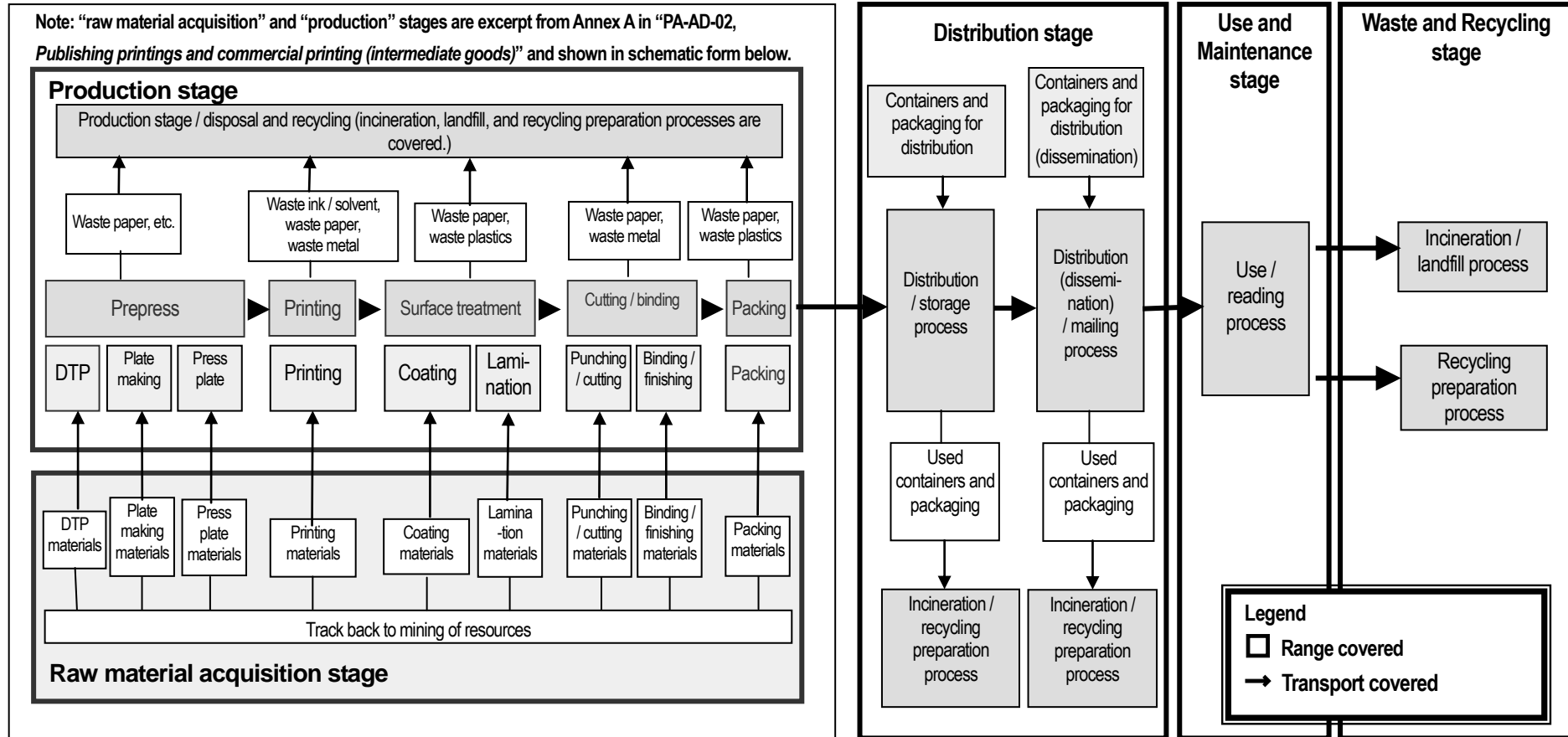
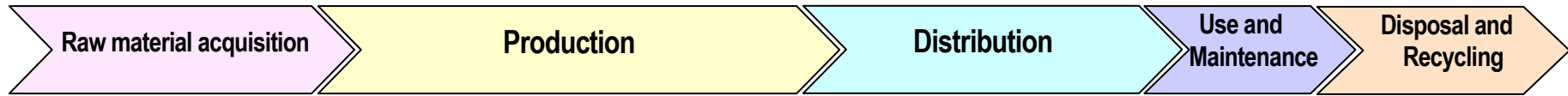
		<p>measurement, but it may be measured by navigation software. The name, etc. of the navigation software used shall be reported.</p> <ul style="list-style-type: none"> <li>- When there are multiple suppliers or clients (delivery sites), weighted average value may be used.</li> <li>- Calculation method for fuel consumption during transport, see <b>Annex C (normative)</b>.</li> <li>- To set up transport scenario, see <b>Annex F (normative)</b>.</li> </ul> <p>(2) International transport</p> <p>Primary data shall be collected pursuant to (1). For road transport in the country where acquired raw materials, if there are national or private rules of transport in the country where acquired raw materials, data may be collected pursuant to the rules.</p> <p>[Rules related to wastes treatment]</p> <p>(1) Life cycle GHG emissions from incineration of biomass (e.g. paper) are not taken into account.</p> <p>(2) For component materials other than biomass (resins such as polyethylene laminated on product itself and packaging materials), life cycle GHG emissions related to incineration shall be calculated from carbon content of each material. When conducting its calculation, assume that carbons contained in these materials are all emitted as CO<sub>2</sub>, and use CO<sub>2</sub> emissions calculated by using stoichiometry concerned.</p> <p>[Rules related to recycling]</p> <p>(1) Regarding the ones to be recycled, life cycle GHG emissions of transport process for recycling and up to and including recycling preparation process (preprocessing) shall be calculated.</p> <p>(2) Indirect effect of recycling shall not be calculated.</p> <p>[Rules related to locality and seasonality]</p> <p>(1) Local differences are not taken into account.</p> <p>(2) Annual data shall be collected as primary data to eliminate effect of seasonal variations.</p>
7	Requirements for raw material acquisition stage	
7-1	Range of the processes	<p>(1) For components (paper, ink, glue, wire, metal fitting), refer processes prescribed in “raw material acquisition stage” in "PA-AD <i>Publishing and Commercial printing (intermediate goods)</i>".</p> <p>(2) For containers and packaging, refer processes prescribed in “raw material acquisition stage,” “production stage,” and “Distribution stage” of containers and packaging in “PA-BB <i>Paper containers, Packaging and Wrapping (intermediate goods)</i>” and “PA-BC <i>Plastic Container and Packaging</i>”.</p>
7-2	Data collection items	<p>(1) For components, follow the rules prescribed in "PA-AD <i>Publishing and Commercial printing (intermediate goods)</i>".</p> <p>(2) For containers and packaging, follow the rules prescribed in “PA-BB <i>Paper Containers, Packaging and Wrapping (intermediate goods)</i>” and “PA-BC <i>Plastic Container and Packaging</i>”.</p>
7-3	Primary data collection items	Conform to “No. 7-2”.
7-4	Primary data Collection method and	Conform to “No. 7-2”.

	Requirements	
7-5	Scenario	Conform to “No. 7-2”.
7-6	Other	Conform to “No. 7-2”. [Special exceptions of primary data] When life cycle GHG emissions of raw material acquisition stage are calculated by under referenced PCRs and approved by the CFP verification panel in advance, the result may be used with its verification ID.
8	Requirements for the production stage	
8-1	Range of the processes	Refer processes prescribed in “production stage” in "PA-AD <i>Publishing and Commercial printing (intermediate goods)</i> ".
8-2	Data collection items	Follow the rules prescribed in "PA-AD <i>Publishing and Commercial printing (intermediate goods)</i> ".
8-3	Primary data collection items	Conform to “No. 8-2”.
8-4	Primary data Collection method and Requirements	Conform to “No. 8-2”.
8-5	Scenario	Conform to “No. 8-2”.
8-6	Other	Conform to “No. 8-2”. [Special exceptions of primary data] When life cycle GHG emissions of raw materials acquisition stage are calculated by under referenced PCRs and approved by the CFP verification panel in advance, the result may be used with its verification ID.
9	Requirements for the distribution stage	
9-1	Range of the processes	Following processes shall be considered (1) Transport within / outside of the country, from production site to orderer or to distribution warehouse, etc. specified by the orderer. (2) Storage at distribution warehouse, etc. (3) Transport from the orderer to end consumer (4) Distribution from the orderer to end consumer (5) Transport of resource mining, production, to distribution stage, of “containers and packaging” which are input to this stage (6) Transport and waste treatment of “used containers and packaging” which were used in this stage (7) Any processes other than the ones described in (1) through (4) above. NOTE; Typical flow chart of distribution stage is provided in <b>Annex D (informative)</b> .
9-2	Data collection items	Amount of and life cycle GHG emissions of listed (1)-(4) and data (5)-(9) shall be collected. (1)Transported product from the production site to orderer or to the place specified by orderer (2) Stored product at distribution warehouse, etc. (3) Transported product from orderer to end consumer (4) Distributed product from orderer to end consumer (5) Amount of “containers and packaging” used in the distribution stage, and life cycle GHG emissions related to its transports from resource mining and production up to and including this stage (6) Life cycle GHG emissions related to transport of “used containers and packaging, etc.” to waste treatment facility, used in this stage.

		<p>(7) Amount of incineration of the “used containers and packaging etc.” at treatment facility, life cycle GHG emissions related to incineration at treatment facility, and CO<sub>2</sub> emissions from incineration of product</p> <p>(8) Amount of “used containers and packaging, etc.” which landfilled at treatment facility, and life cycle GHG emissions related to the facility</p> <p>(9) Amount of “used containers and packaging, etc.” which is treated in recycling preparation process, and life cycle GHG emissions related to treatment for recycling preparation at the facility</p>
9-3	Primary data collection items	<p>(1) Amount of product transported and distributed</p> <p>(2) Amount of used containers and packaging, etc. properly treated (disposed) in this stage</p>
9-4	Primary data Collection method and Requirements	When “containers and packaging” are “Paper Containers, Packaging and Wrapping” or “Plastic Container or Packaging,” it shall follow to the rules prescribed in “raw material acquisition stage,” “production stage,” and “distribution stage” of containers and packaging, in referred PCRs; “PA-BB” and “PA-BC” (see No.3).
9-5	Scenario	<p>[Transport scenario] Collect primary data as much as possible, but if it is difficult, the scenario provided in “<b>Annex E (normative)</b>” may be used.</p> <p>[Waste treatment scenario] If it is difficult to collect primary data, the following scenario may be used (values are the ratio of generated amounts by treatment method). (1) For “waste paper,” incineration shall be set as 2%, recycling as 98% (*). (2) For “waste metal,” recycling shall be set as 100% (*). (3) For “waste plastic,” incineration shall be set as 100%. (* Source: “Investigation into the State of By-Products Generation (2006 Results),” Clean Japan Center (issued on March 2008)</p>
9-6	Other	<p>[Rules related to storage at distribution warehouse, etc.] For storage process at distribution warehouse, etc., it may be excluded from assessment. if the GHG emissions are extremely small,</p>
10	Requirements for the use and maintenance stage	
10-1	Range of the processes	Processes that consumer uses the product which were distributed or purchased.
10-2	Data collection items	There is no data collection item, since the product does not consume energy when using.
10-3	Primary data collection items	Not stipulated.
10-4	Primary data Collection method and Requirements	Not stipulated.
10-5	Scenario	Not stipulated.
10-6	Other	Not stipulated.
11	Requirements for the disposal and recycling stage	
11-1	Range of the processes	Processes related to transport and proper treatment of the used product and “used containers and packaging, etc.” from consumers or users
11-2	Data collection items	<p>(1) Life cycle GHG emissions related to its transport</p> <p>(2) Amount of incineration at treatment facility, life cycle GHG emissions related to incineration at treatment facility, and CO<sub>2</sub> emissions from incineration of “used containers and packaging”</p>

		(3) Amount of landfill at treatment facility, and life cycle GHG emissions related to incineration at treatment facility (4) Amount of treatment in recycling preparation process, and life cycle GHG emissions related to recycling preparation process at treatment facility
11-3	Primary data collection items	Amount of transport and proper treatment of used product and “used containers and packaging, etc.”
11-4	Primary data Collection method and Requirements	When “used containers and packaging” is “paper containers, packaging or wrapping” or “plastic container or packaging,” it shall follow to the rules prescribed in the “disposal and recycling stage” in referred PCR “PA-BB” and “PA-BC”.
11-5	Scenario	[Waste transport scenario] Collect primary data as much as possible. If it is difficult to collect primary data, the scenario provided in <b>Annex E (normative)</b> may be used.  [Waste treatment scenario] Regarding the treatment of wastes transported to treatment facility, collect primary data. If it is difficult to collect primary data, the scenario provided in <b>Annex G (normative)</b> may be used.
11-6	Other	Not stipulated.
12	Items applied secondary data	(1) The data provided in the “Tentative Database of GHG Emission Factors”. Use the latest version of the “Tentative Database of GHG Emission Factors” released on the CFP website. (2) Of secondary data which is not included in the “Tentative Database of GHG Emissions Factors,” the data prepared as “reference data” by the CFP Pilot Project Secretariat
13	Communication requirements	
13-1	Unit to be displayed on the label	It shall basically use calculation unit. It is also permitted to use communication method described in the “ <i>Guidelines of CFP system</i> ” and the “ <i>Standards of PCR development</i> ”. However, in this case, its appropriateness shall be studied on the CFP verification panel.
13-2	Label position and Size	It shall conform to the “ <i>Specifications of CFP Label and Displaying Other Information</i> ”. However, during the CFP Pilot Project, when the CFP verification panel judges other communication method (on label position or size, etc.) is appropriate, to the extent of not deviating from the objective of the CFP system and of not giving consumers false recognitions, the method is also permitted.
13-3	Contents of additional information	During the CFP Pilot Project, when the CFP verification panel judges that display of additional information is appropriate, to the extent of not deviating from the objective of the CFP system and of not giving consumers false recognitions, the display of additional information is also permitted.

**Annex A (normative): Life cycle flow chart**



- When using "containers and packaging (packing materials, sacks, etc.)" in the distribution stage, calculate pursuant to the following PCRs: "PA-BB Paper Containers, Packaging and Wrapping (intermediate goods)" and "PA-BC Plastic Containers and Packaging".

## Annex B (normative): List of products covered by assessment

The following chart is created by excerpting from Japan standard commodity classification (revised in June 1990, Ministry of Internal Affairs and Communications). The products covered by this PCR are shown with “boldface texts, region fills” in the chart below.

<b>9231: Publicity printings</b>	<b>92311: Posters</b>		
	<b>92312: Brochures</b>	<b>923121: Flyer</b>	
		<b>923122: Public relation magazines</b>	
	<b>92313: Catalogues</b>		
	92314: Point of purchase		<b>Excluded from assessment</b>
	<b>92315: Calendars</b>		“9215: Calendars (not including for advertisement)” classified in “9215: Printed pictures and musical scores” is excluded from assessment.
	<b>92316: Memorandum books</b>		“935116: Pocket memorandum books” classified in “9351: Business paper supplies” is excluded from assessment.
	92317: Wrapping paper and shopping bags		<b>Excluded from assessment</b>
	<b>92318: Seals and labels</b>		
92319: Other publicity printing		<b>Excluded from assessment</b>	
<b>9232: Printing products for business use</b>	<b>92321: Commemorative printings</b>	<b>923211: Company histories</b>	
		<b>923212: Histories</b>	
	<b>92322: Report printings</b>	<b>923221: Corporate minutes</b>	
		<b>923222: Annual reports</b>	
		<b>923229: Other report printings</b>	
	<b>92323: Mailing lists</b>		
	92324: Specifications		<b>Excluded from assessment</b>
	<b>92325: Internal (company) newsletter</b>		
92329: Other printing products for business use		<b>Excluded from assessment</b>	

## **Annex C (normative): Calculation Method for GHG Emissions associated with Fuel Consumption during Transport**

### **C.1 Fuel consumption method**

- 1) Collect data on fuel consumption [L] for each mean of transport, and convert the fuel unit, “L,” to “kg” by using following equation.

$$\text{Fuel consumption [kg]} = \text{Fuel consumption [L]} \times \text{fuel density } \gamma \text{ [kg/L]}$$

$$\text{Fuel density of gasoline: } \gamma = 0.75\text{kg/L}$$

$$\text{Fuel density of light oil: } \gamma = 0.83\text{kg/L}$$

- 2) Calculate life cycle GHG emissions [kg-CO<sub>2</sub>e] by multiplying fuel consumption [kg] and the “life cycle GHG emissions related to supply and use of fuel” [kg-CO<sub>2</sub>e/kg] (secondary data) for each type of fuel.

### **C.2 Fuel cost method**

- 1) Collect data on fuel cost [km/L] and transport distance[km] for each mean of transport, and calculate fuel consumption [kg] by using the following equation.

$$\text{Fuel consumption [kg]} = \text{transport distance [km]} / \text{fuel cost [km/L]} \times \text{fuel density } \gamma \text{ [kg/L]}$$

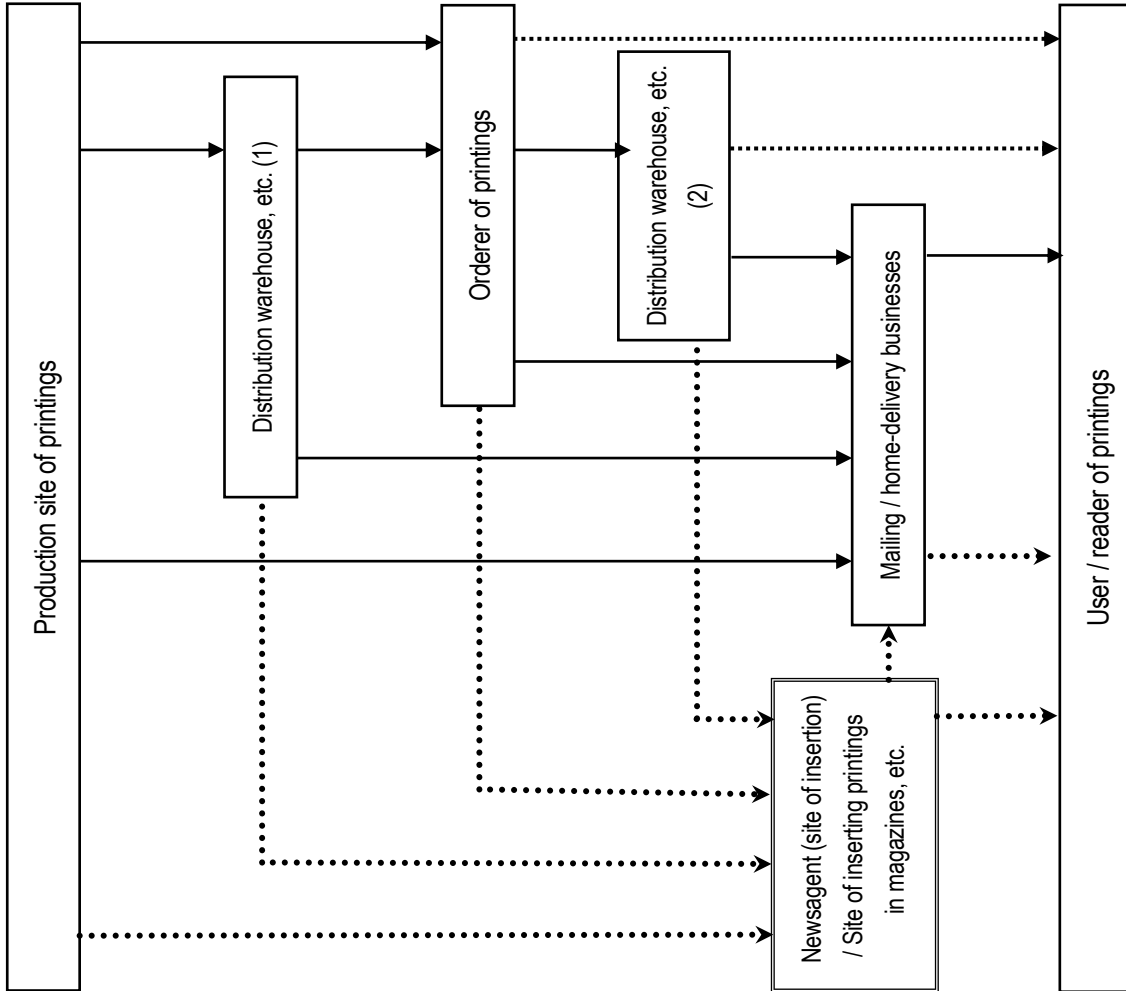
- 2) Calculate life cycle GHG emissions [kg-CO<sub>2</sub>e] by multiplying fuel consumption [kg] and the “life cycle GHG emissions related to supply and use of fuel” [kg-CO<sub>2</sub>e/kg] (secondary data) for each type of fuel.

### **C.3 Ton-kilometer method**

- 1) Collect data on loading ratio [%] and transport load (transport ton-kilometer) [t-km] for each mean of transport.
- 2) Calculate life cycle GHG emissions [kg-CO<sub>2</sub>e] by multiplying the transport load (transport ton-kilometer) [t-km] by the “life cycle GHG emissions related to fuel consumption per transport ton-kilometer” [kg-CO<sub>2</sub>e/t-km] (secondary data) for different transport loads for each mean of transport.

**Annex D (informative): Typical flow chart of distribution stage**

The chart below shows a typical flow chart of “publicity printings and printing products for business uses (in the chart below, shortly called “printings”)” of distribution stage for reference.



- > This flow shows transport by truck, etc.
- .....> This flow includes “delivery by hand” in the case of distribution.
- .....> This flow shows “newspaper inserts” and “printings inserted in product,” etc.

## Annex E (normative): Transport scenario

The following chart describes that transport scenario of each stage if no primary data can be obtained. In addition, assumptions for transport scenarios are provided in **Annex F**.

Life cycle stage	Transport scenario
Raw material acquisition stage	<p>(1) Transport related to raw material acquisition</p> <ul style="list-style-type: none"> <li>- Product itself shall follow the rules prescribed in "PA-AD <i>Publishing and Commercial printing (intermediate goods)</i>".</li> <li>- Containers and packaging shall follow the rules prescribed in "PA-BB <i>Paper Containers, Packaging and Wrapping (intermediate goods)</i>" and "PA-BC <i>Plastic Container and Packaging</i>".</li> </ul>
Production stage	<p>(1) Transport between sites in production stage</p> <ul style="list-style-type: none"> <li>- Product itself shall follow the rules prescribed in "PA-AD <i>Publishing and Commercial printing (intermediate goods)</i>".</li> <li>- Containers and packaging shall follow the rules prescribed in "PA-BB <i>Paper Containers, Packaging and Wrapping (intermediate goods)</i>" and "PA-BC <i>Plastic Container and Packaging</i>".</li> </ul>
	<p>(2) Transport for waste treatment</p> <ul style="list-style-type: none"> <li>- Product itself shall follow the rules prescribed in "PA-AD <i>Publishing and Commercial printing (intermediate goods)</i>".</li> <li>- Containers and packaging shall follow the rules prescribed in "PA-BB <i>Paper Containers, Packaging and Wrapping (intermediate goods)</i>" and "PA-BC <i>Plastic Container and Packaging</i>".</li> </ul>
Distribution stage	<p>(1) Transport of product within / outside of the country, from production site to orderer or to the places specified by orderer</p> <ul style="list-style-type: none"> <li>- Transport within the country shall be set as follows: 4-ton truck, one-way as 500km, and loading ratio as 50%.</li> <li>- Transport outside of the country shall be calculated as follows: scenario of transport within the country (including road transports both before and after maritime transport) by adding maritime transport by container ship (4,000TEU or less). For maritime transport distance, see the "database of distance between countries / regions" (*).</li> </ul>
	<p>(2) Transport from production site to distribution warehouse, etc. (or to home, in the case of mailing or home-delivery)</p> <ul style="list-style-type: none"> <li>- Same as (1). However, transport by mailing or home-delivery shall be set as follows: 4-ton truck, one-way as 1,000km, and loading ratio as 25%.</li> </ul>
	<p>(3) Transport for distribution from ordering party to end consumer.</p> <ul style="list-style-type: none"> <li>- Transport by mailing or home-delivery shall be set as follows: 4-ton truck, one-way as 500km, and loading ratio as 50%.</li> </ul>
Use/maintenance stage	Not stipulated.
Disposal/recycling stage	<p>(1) Transport for waste treatment</p> <ul style="list-style-type: none"> <li>- Transport shall be set as follows: 2-ton truck, one-way as 50km, and loading ratio as 25%.</li> </ul>

	(2) Transport related to collection and recycling (up to and including recycling preparation process) - Transport shall be set as follows: 2-ton truck, one-way as 50km, and loading ratio as 50%.
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\*The CFP Pilot Project Secretariat will prepare the “database of distance between countries / regions” for using as “reference data”.

## **Annex F (informative): grounds for setting the transport scenario**

Assumptions for transport scenario (Annex E; transport distance, means of transport, and loading ratio) applied to this PCR are as follows.

### **F.1 Transport Distance**

For an incentive to provide primary data collection, transport distance is set to a little longer than the average at possible.

(a) Transport within a city or not across adjacent cities: 50km

[Assumption] The distance from a prefectural center to a prefectural border is assumed.

(b) Transport within a prefecture: 100km

[Assumption] The distance from a prefectural border to another side of the border is assumed.

(c) Transport possibly across prefectural border to another side of the border is assumed: 500km

[Assumption] The distance from Tokyo to Osaka is assumed.

(d) Transport from producer to delivery site (client) (delivery site is not limited within a specific area): 1,000km

[Assumption] The distance a little longer than half Honshu (the main island of Japan: 1,600km) is assumed.

### **F.2 Means of transport**

Truck transport is basically assumed for an incentive to take CO<sub>2</sub> reduction measures in distribution such as modal shift. Large vehicles were set for distributors and rather small ones for others.

(a) Transport by distributor: 10-ton truck

(b) Transport by other businesses: 2 to 4-ton truck

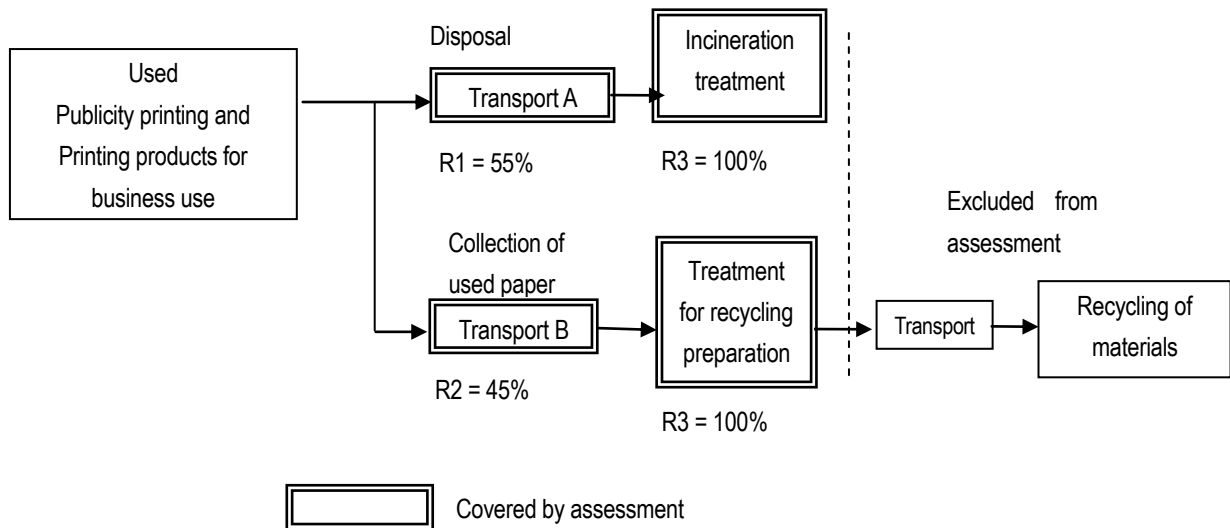
### **F.3 Loading ratio**

For an incentive to provide primary data collection, loading ratio is set to a little lower than the average at possible.

## Annex G (normative): Disposal and recycling scenario

The followings are assumptions for disposal and recycling scenario applied to this PCR.

### G.1 Treatment scenario for disposal and recycling



### G.2 Calculation method of disposal / recycling treatment ratio

(1) Rate that used paper is collected and recycled

- Percentage of R2 shall be set as 45%, since total collection ratio of "hard white shavings," "white card," "white ledger," "colored ledger," "color-printed wood-containing shavings," "high-grade wood-containing waste," and "old magazines" is 44.7% from survey result of "Collection rate of used paper by type, 2008 (source: *Used paper handbook 2008*, website version, Paper Recycling Promotion Center)".

(2) Rate of disposal and incineration

- It shall be set as follows:  $R1 = 1 - R2 = 55\%$

(3) In both cases of (1) and (2), it shall be set that used paper is not increased or decreased after transported and all of them are treated by incineration or treated for recycling preparation.  $R3 = 100\%$