Kangaré – Water

An Introduction to Environmental –Economic Accounts for Water (SEEA-Water)

6 November 2013

Based on the introduction to national accounts exercise prepared by NGO Thi Cuc and Jean-Louis WEBER.

BACKGROUND INFORMATION

THE COUNTRY CALLED KANGARÉ

Kangaré could be anywhere...

It is a small republic, with a population made up largely of farmers - who produce enough agricultural produce to feed all the inhabitants - and employees working in industry. The country's industry consists of petroleum extraction and refining, the manufacture of basic chemicals and the canning of food products. There are also civil servants and quite a few unemployed.

Kangaré has only **two natural resources: agriculture and petroleum**. All agricultural output comes from individual small holdings on which farmers do not employ any paid workers. Some of this output is processed on the spot by the **"General Canning"** corporation. The **International Oil Corporation (IOC)** is a foreign company with a local establishment, **IOC 1**, which produces oil. It exports most of the crude oil but a second local unit, **IOC 2**, also refines some, most of which is used locally. IOC2 also makes basic chemical products for export. All the other industrial products used in Kangaré - consumer and capital goods - are imported.

The State plays an important role in the country's economy. As well as being responsible for all the usual administrative tasks (police, army, justice, education, etc.), it runs a Treasury which acts as a "central" bank - and which is, in fact, the only bank in the Republic. Note that households in Kangaré do not pay any income tax. The only tax collected by the State is on corporate profits.

As we have seen, the economy of Kangaré is based on agriculture and petroleum. It is dependent on other countries, on both the IOC, which controls the main industrial activity in the country, and suppliers of manufactures. Kangaré also has substantial unemployment.

THE KANGARIAN GOVERNMENT'S PLAN

The current situation has led to the government's decision to launch a two-year development plan. In the first year, the accent will be on industrialisation, with the purchase of a consumer goods factory. In the second year, the objectives will be to raise the population's standard of living, develop local amenities, mechanise agriculture and increase oil production capacity.

To assess the impact of these plans on the country's economy, the government has decided to compile national accounts for Kangaré for the year just past, t_o. These accounts will then form the basis for calculations forecasting the outlook for the economy in the two years of the plan, t_1 and t_2.

Once this work is complete, it will be possible to measure the likely impact of the development plan, so that the government can judge whether certain charges are acceptable and, if necessary, revise its initial plans.

THE WORK TO BE DONE

Compile the monetary supply and use tables to assist the government in evaluating its plan. The following set of documents provides all the information required.

Note: for the Kangaré-Water exercise not all the information provided is necessary to complete the exercises. It is important to first identify the information that is relevant for the purposes of the exercise about water accounts.

DOCUMENT FOR STAGE A – YEAR t_o

Accounting and statistical data available for year t_o

1. Public accounts (unit: K million)

Non-financial account

Expenditure		Receipts	
Purchases of supplies	1.0	Profit taxes	17.4
Wages and salaries	4.0		
Unemployment benefits paid	3.8		
Balance on non-financial accounts	8.6		
Total	**17.4**	**Total**	**17.4**

Treasury account

Accounts receivable		Accounts payable	
Foreign currency	+10.9	Current accounts (residents)	+3.9
Loans	+2.5	Bonds	+0.9

2. Customs statistics (unit: K million)

Products	Imports	Exports
Agricultural products		1.2
Crude oil		34.2
Refined petroleum		2.4

Chemicals		1.1
Other industrial products	27.2	
Total	**27.2**	**38.9**

3. Results of the "agriculture" survey (unit: K million)

Output of agricultural products	5.1
Purchases of seeds and fodder	0.1
Purchases of refined petroleum	0.5
Investment	0.4

There are no paid employees in agriculture.

4. Results of the household consumption survey (unit: K million)

Agricultural products	3.2
Refined petroleum products	4.5
Other industrial products	12.8

5. Data on corporations (unit: K million)

Extracts from the International Oil Corporation (IOC) annual report

Sales			42.7
Of which:	crude oil	34.2	
	refined petroleum	7.4	
	chemical products	1.1	
Internal deliveries (crude oil supplied by IOC 1 to IOC 2)			
	For refined petroleum		1.6
	For the manufacture of chemical products		0.4
Purchases of consumables			4.0
Of which:	For petroleum extraction	2.2	
	For the refinery	1.4	
	For the chemical works	0.4	
Wages and salaries (of which 2.0 for refinery workers and 0.1 for those in the chemical works)			11.8
Interest (on loans from foreign suppliers)			0.2
Dividends (paid to the parent corporation abroad)			0.6
Investments			10.2
Depreciation expense			5.0
Pre-tax profit			21.7

(Profit tax	17.4)
Loan received	2.5
Issue of shares (acquired by households)	0.4
Acquisition of Bonds	0.9

Remaining cash assets are kept in a current account at the Treasury

Extracts from the General Canning's annual report

Turnover		1.9
Manufacturing costs		
	-purchases of agricultural products	0.6
	-purchases of other industrial products	0.7
	-wages and salaries	0.3
	-depreciation expense	0.1
	-profit	0.2

INCLUDING WATER SUPPLY AND SANITATION IN KANGARÉ

In the previous accounts of the Republic of Kangaré there was no information about the establishments that provide the services of drinking water and sewerage. These services are important for the Republic of Kangaré and therefore information was collected to be included in the accounts. The data collected is the following:

The establishments in charge of providing the drinking water services have sales of drinking water of 1.1 million Ks and they have to purchase imported industrial products for 0.3 million Ks. They pay 0.8 million Ks in salaries to the workers. The establishments collect 0.81 million Ks from the sales of 20 million cubic meters of water to the households of Kangaré during the year. They also collect 0.28 million Ks from the sales of 7 million cubic meters of water to the "General Canning" corporation during the year.

Different establishments are in charge of providing the sewerage services. They receive 0.9 million Ks for the concept of providing the sanitation service and they have to purchase imported industrial products for 0.4 million Ks. They pay 0.4 million Ks in salaries to the workers. The establishments collect 0.72 million Ks for collecting 16 million cubic meters of wastewater from the households of Kangaré during the year. They also collect 0.18 million Ks for collecting 4 million cubic meters of wastewater from the "General Canning" corporation during the year.

The establishments in charge of providing the sewerage service treat all the wastewater before discharging it to the rivers.

THE WORK TO BE DONE

With this information correct the diagrams and the supply and use tables.

WATER IN KANGARE

The Republic of Kangaré has a population of 301 500 inhabitants. The country is in an area of 2 592 km^2. There are four river basins with the areas shown in the table below (see the map attached). Kangaré receives an almost constant inflow of 1 m^3/s from a river that originates in a neighboring territory, as measured reported by Kangaré's Government, which monitors the flow with several stream gages installed throughout the country.

Precipitation is measured daily in several climatologic stations. The normal precipitation (1971-2000) has been calculated using the Thiessen polygons for each watershed. According to the characteristics of the soil in the different watersheds there are estimates of the surface runoff and infiltration to the aquifers. The data is as follows:

Zone	Area	Normal Precipitation (1971-2000) (mm/year)	Surface runoff as percentage of precipitation (%)	Infiltration to aquifers as percentage of precipitation (%)
A	340	650	32	9
B	912	580	26	5
C	325	750	24	3
D	1 015	685	24	6

Thirty five percent of the water abstracted for the water supply networks is lost due to leaks.

There are 17 000 hectares of crops, to which a height of 300 mm of water are applied to complement the water received from the rain. Forty percent of the water abstracted for irrigation is lost when transported to the fields.

For its processes the refinery abstracts 31 million cubic meters of water each year from a nearby aquifer. For the abstraction of oil, sea water is used.

The outflow of water to the sea, according to stream gages located at the mouth of the rivers, is 20.6 m^3/s (650 million cubic meters per year) in average.

THE WORK TO BE DONE

With this information compile the water accounts according to SEEA-Water to assist the government in evaluating its plan.

WATER POLLUTING EMISSIONS IN KANGARE

Agriculture:

With the help of a model the diffuse emissions of agriculture (in tons per year) were calculated to be

- BOD: 800 t/y
- COD: 1 600 t/y
- P: 150 t/y
- N: 2 500 t/y

This pollution results mainly from the use of fertilizers, wastewater from livestock, erosion and various uses of water for cleaning of products, equipment, etc. in the farms.

Households:

The majority of households is connected to the sewer utility. Household wastewater mainly consists of organic pollution (measured in BOD and COD), nitrogen and phosphorus. With the help of emission factors and measurements at the inlet of the wastewater treatment plant it was possible to calculate the annual gross emissions of households as follows:

- BOD: 7 400 t/y
- COD: 16 500 t/y
- P: 430 t/y
- N: 1 300 t/y

General Canning Corporation:

The wastewater of the canning company is collected and treated by the sewer utility. As the canning company is required to take daily samples concerning wastewater volumes and concentration of pollutants it was possible to determine the annual load of gross emission as follows:

- BOD: 800 t/y
- COD: 1 500 t/y
- P: 120 t/y
- N: 500 t/y

Sewer utility:

The sewer utility operates a wastewater treatment plant which achieves the following treatment efficiency:

- BOD: 90%
- COD: 85%
- Phosphorus: 75%
- Nitrogen: 80%

There is a daily measurement of the discharged wastewater volume and the concentration of main pollutants (including some heavy metals). The annual load of pollutants discharged is

- BOD: 820 t/y
- COD: 2 700

- P: 138 t/y
- N: 360 t/y
- Cu: 0.05 t/y

The copper results from the collection of urban runoff which is also collected and treated by the sewer utility.

International Oil Corporation IOC

Only one of the establishments of the IOC abstracts and discharges water from freshwater resources. IOC 1 only uses seawater.

IOC 2 makes measurements of the quality of the abstracted water and calculated an annual uptake of about 6 kg copper per year.

The annual emissions of pollutants (based on daily measurements) are the following:

- BOD: 300 t/y
- COD: 800 t/y
- P: 4 t/y
- N: 35 t/y
- Cu: 0.01 t/y (remark: only 4 kg/y were added by the production process, 6 kg/year result from background concentration)

THE WORK TO BE DONE

With this information complete the water accounts according to SEEA-Water to include emissions.

Kangaré – Water

An Introduction to Environmental –Economic Accounts for Water (SEEA-Water)

WORKBOOK

7 September 2012

Based on the introduction to national accounts exercise prepared by NGO Thi Cuc and Jean-Louis WEBER.

Kangaré example
(million kagarés)

SUPPLY AND USE TABLES

SUPPLY

	Agriculture	General Canning Company	IOC 1	IOC 2	Administration	**National production**	Final consumption households	Final consumption Government	Rest of the World (RoW)	**TOTAL**
Seed and fodder										
Agricultural products										
Canned food										
Crude oil										
Refined petroleum										
Chemical products										
Administrative services										
Other industrial products										
Raw materials and furniture										
Final consumption goods										

USE

	Agriculture	General Canning Company	IOC 1	IOC 2	Administration	**Intermediate consumption**	Final consumption households	Final consumption Government	Gross Fixed Capital Formation (GFCF)	Rest of the World (RoW)	**TOTAL**
Seed and fodder											
Agricultural products											
Canned food											
Crude oil											
Refined petroleum											
Chemical products											
Administrative services											
Other industrial products											
Raw materials and furniture											
Final consumption goods											
Value added											

Kangaré example (SUPER SYNTHESIS)

SUPPLY AND USE TABLES

(million kagarés)

SUPPLY

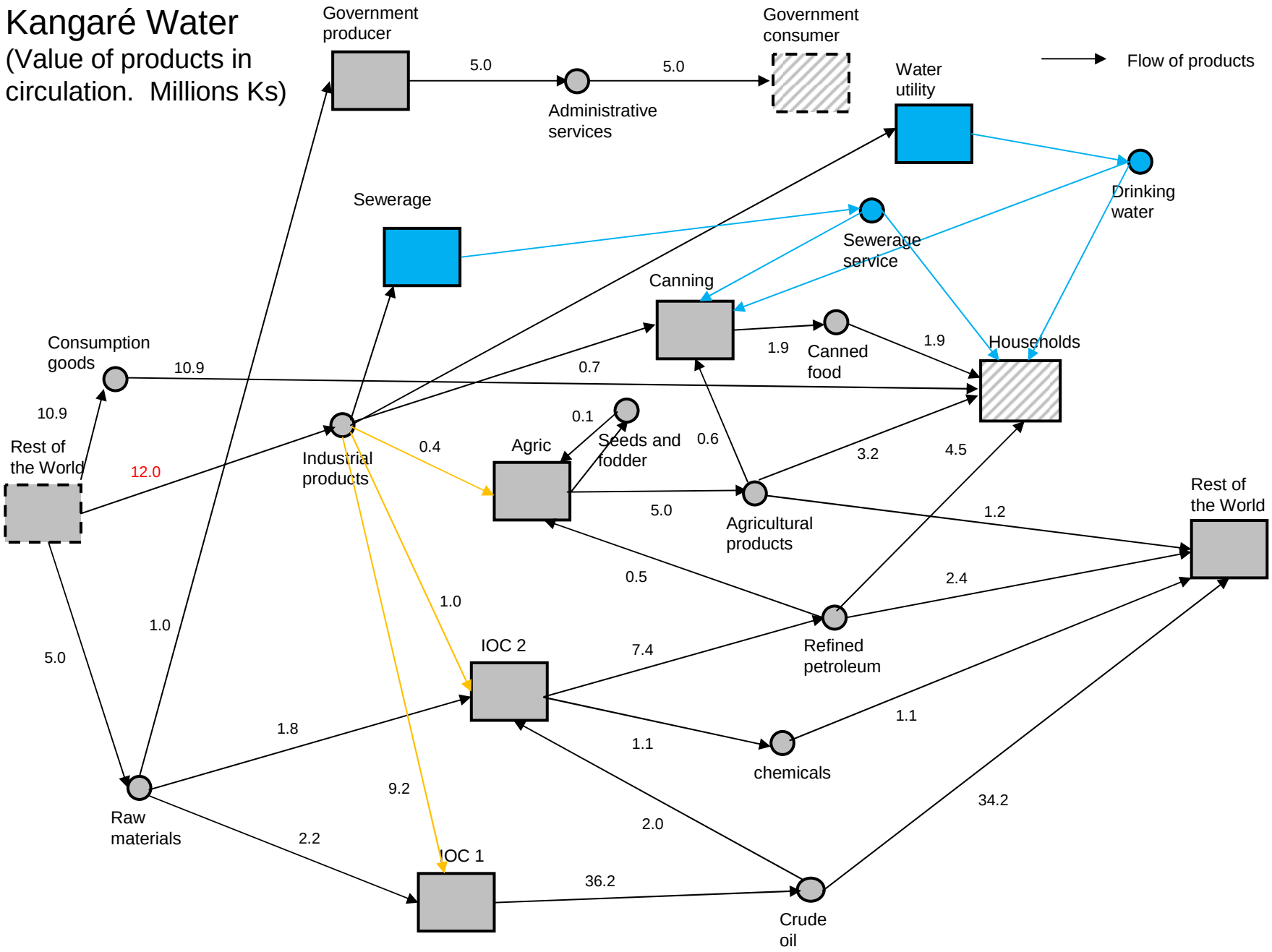
	National industries	**National production**	Final consumption households	Final consumption Government	Rest of the World (RoW)	**TOTAL**
National products						
Imported products						

USE

	National industries	**Intermediate consumption**	Final consumption households	Final consumption Government	Gross Fixed Capital Formation (GFCF)	Rest of the World (RoW)	**TOTAL**
National products							
Imported products							
Value added							

Kangaré Water

(Value of products in circulation. Millions Ks)



Kangaré-Water example SUPPLY AND USE TABLES
(million kagarés)

SUPPLY

	Agriculture	General Canning Company	IOC 1	IOC 2	Administration	Water utility	Sewerage utility	**National production**	Final consumption households	Final consumption Government	Rest of the World (RoW)	**TOTAL**
Seed and fodder												
Agricultural products												
Canned food												
Crude oil												
Refined petroleum												
Chemical products												
Administrative services												
Drinking water service												
Sewerage service												
Other industrial products												
Raw materials and furniture												
Final consumption goods												

USE

	Agriculture	General Canning Company	IOC 1	IOC 2	Administration	Water utility	Sewerage utility	**Intermediate consumption**	Final consumption households	Final consumption Government	Gross Fixed Capital Formation (GFCF)	Rest of the World (RoW)	**TOTAL**
Seed and fodder													
Agricultural products													
Canned food													
Crude oil													
Refined petroleum													
Chemical products													
Administrative services													
Drinking water service													
Sewerage service													
Other industrial products													
Raw materials and furniture													
Final consumption goods													

Value added								

Kangaré example (SUPER SYNTHESIS) SUPPLY AND USE TABLES
(million kagarés)

SUPPLY

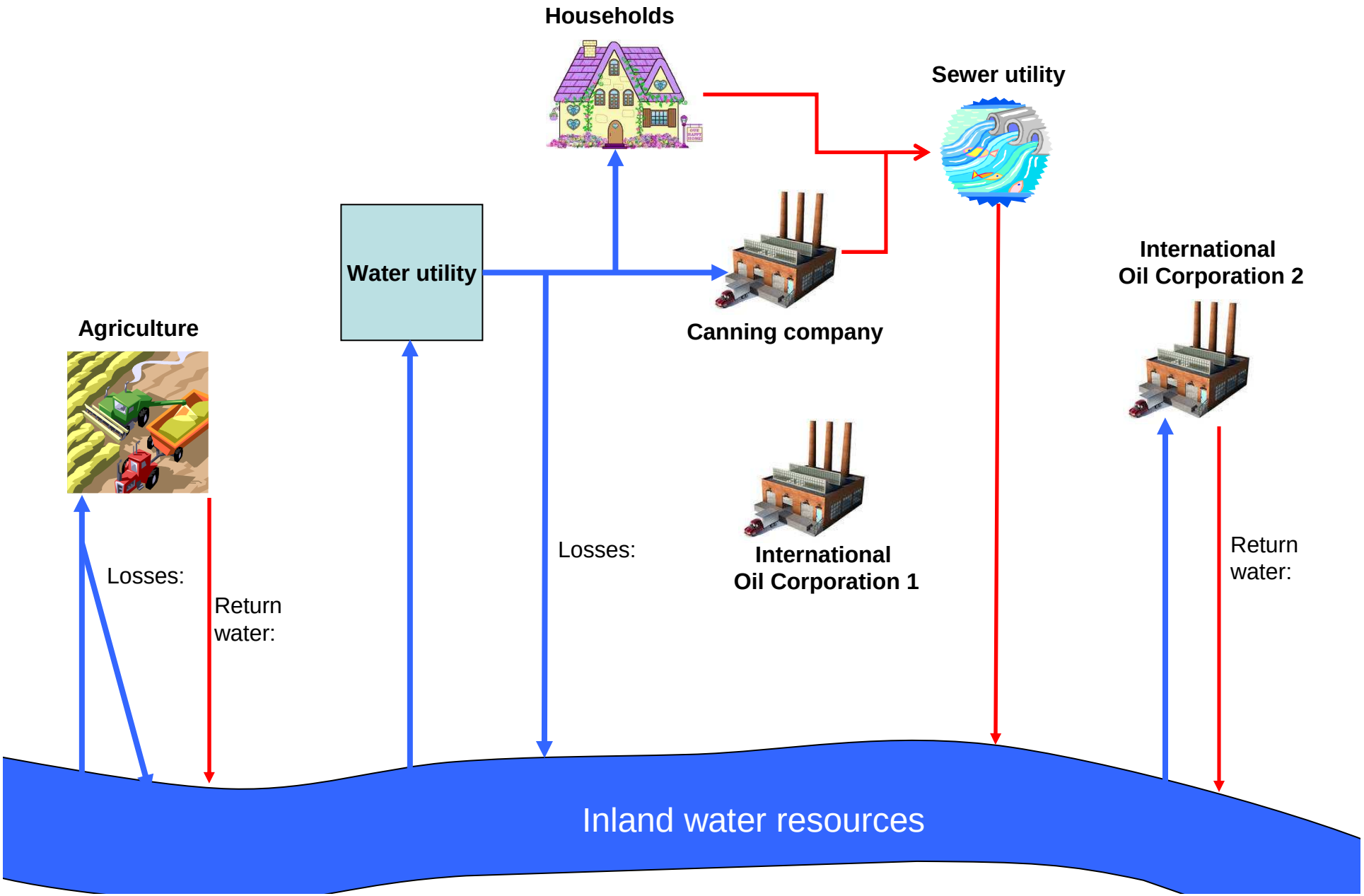
	National industries	Water utility	Sewerage utility	**National production**	Final consumption households	Final consumption Government	Rest of the World (RoW)	**TOTAL**
National products								
Drinking water service								
Sewerage service								
Imported products								

USE

	National industries	Water utility	Sewerage utility	**National production**	Final consumption households	Final consumption Government	Gross Fixed Capital Formation (GFCF)	Rest of the World (RoW)	**TOTAL**
National products									
Drinking water service									
Sewerage service									
Imported products									
Value added									

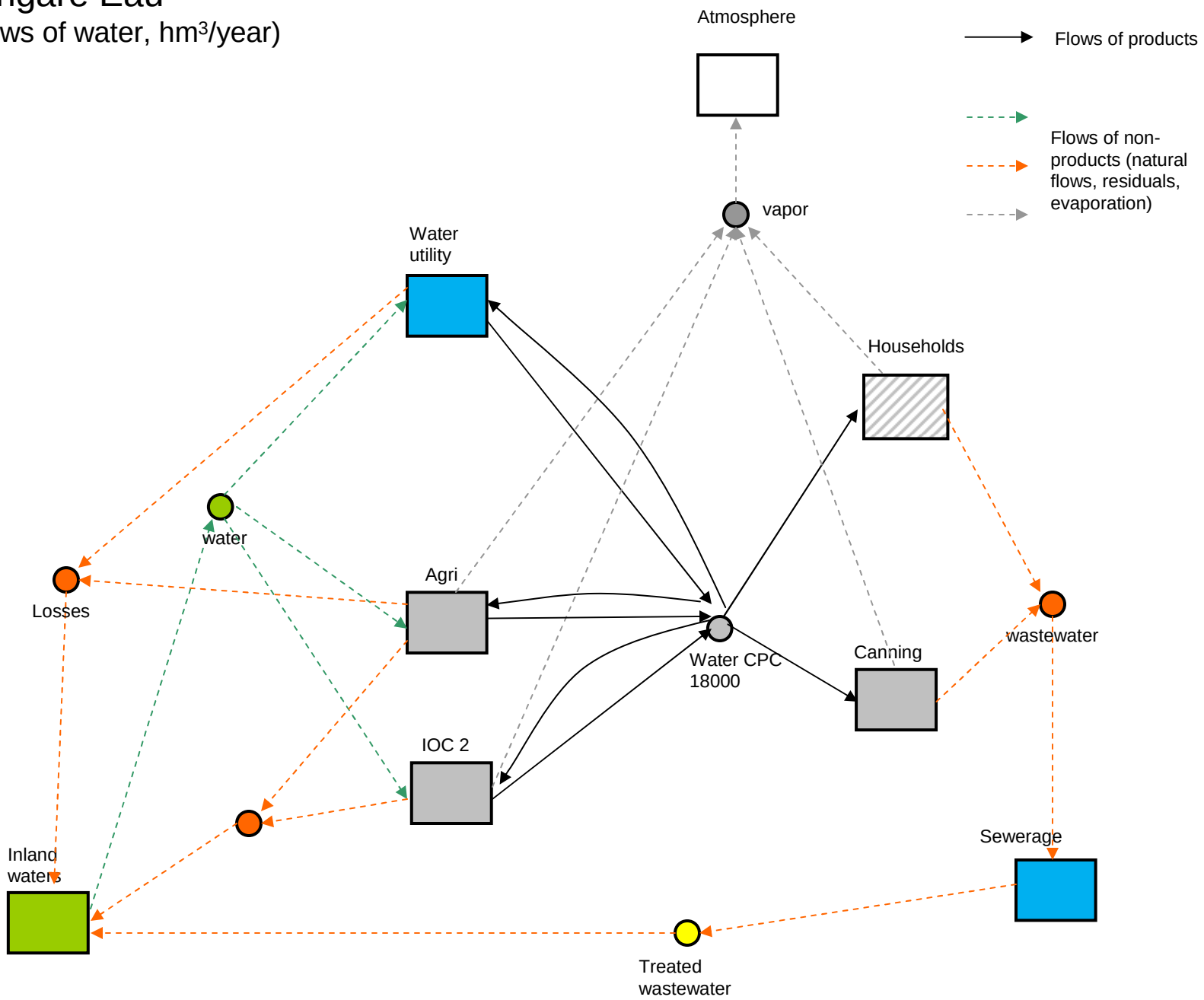
Kangaré Water

(Flows of water in hm^3/year)



Kangaré Eau

(Flows of water, hm³/year)



KANGARE WATERSHED EXAMPLE (SUPPLY AND USE TABLES)

SUPPLY (LEAVING)	Agriculture	Water utility	Sewer utility	Canning Company	IOC 1	IOC 2	Administration	House-holds	Flows from the environment	SUM
(I) Sources of abstracted water										
Inland water										
Other water sources										
(II) Abstracted water										
Produced water for distribution										
Produced water for own use										
(III) Wastewater and reused water										
Sewage										
Treated wastewater										
(IV) Return flows of water										
Losses										
Return water										
(V) Evaporation of abstracted water, transpiration and water incorporates into products										
Evaporation of abstracted water										

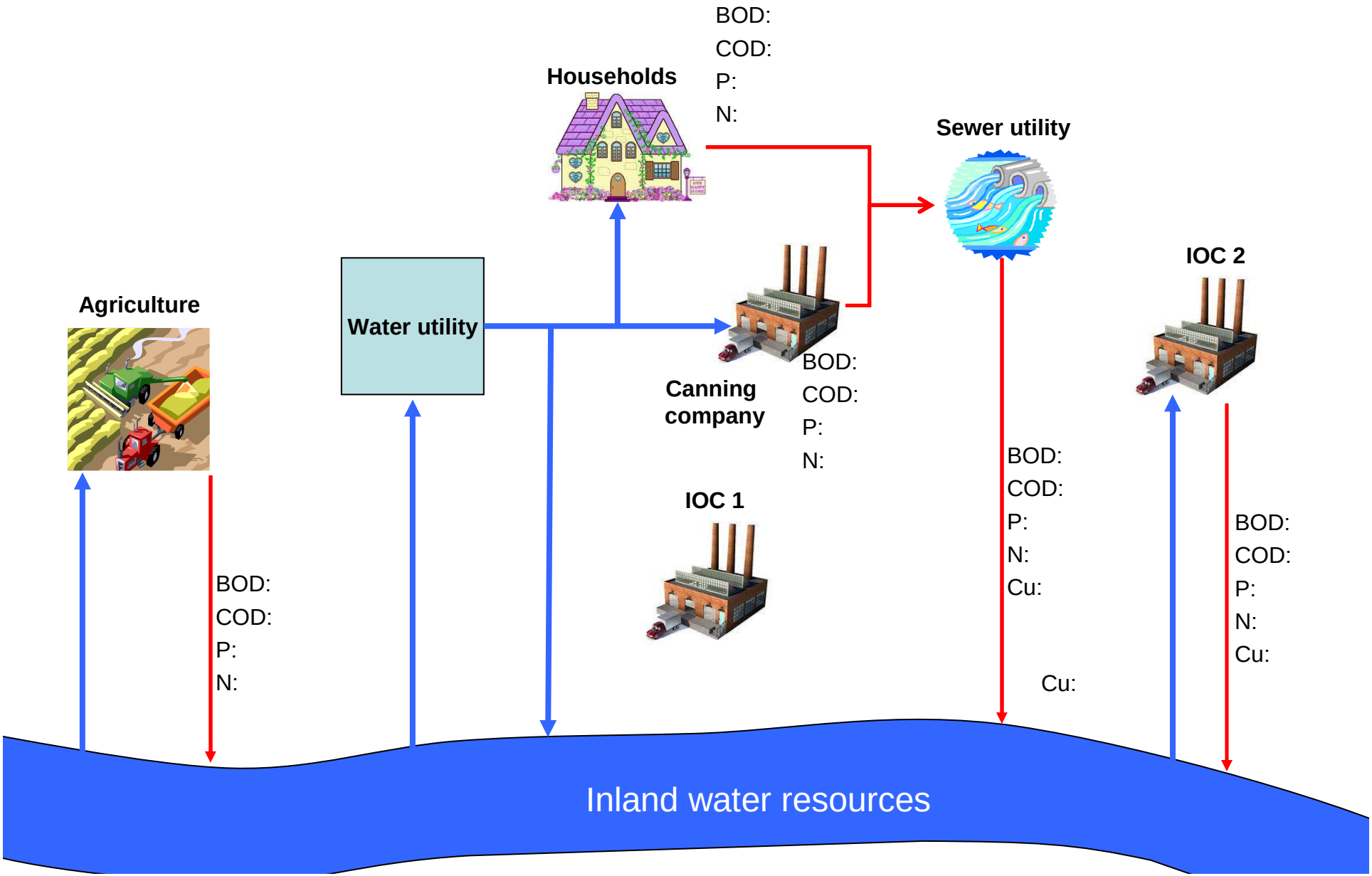
USE (ENTERING)	Agriculture	Water utility	Sewer utility	Canning Company	IOC 1	IOC 2	Administration	House-holds	Flows to the environment	SUM
(I) Sources of abstracted water										
Inland water										
Other water sources										
(II) Abstracted water										
Produced water for distribution										
Produced water for own use										
(III) Wastewater and reused water										
Sewage										
Treated wastewater										
(IV) Return flows of water										
Losses										
Return water										
(V) Evaporation of abstracted water, transpiration and water incorporates into products										
Evaporation of abstracted water										

KANGARÉ WATERSHED EXAMPLE (ASSET ACCOUNTS)

	Inland Water Resources
Opening stock of water resources	
Additions to stock	
Returns	
Precipitation	
Inflows from other inland water resources	
Reductions in stock	
Abstractions	
Evaporation/ Evapotranspiration	
Ouflows to other inland water resources	
Outflows to the sea	
Closing stock of water resources	

Kangaré Water – EMISSION ACCOUNTS, TRAINING EXAMPLE

(Flows of emissions in ton/year)



KANGARE-WATER. EMISSION ACCOUNTS

Physical supply table for gross releases of substances to water

SUPPLY (LEAVING)	Agriculture	Water utility	Sewer utility	Canning Company	IOC 1	IOC 2	Administration	Households	Flows from the environment	Total supply
Emissions to the environment										
BOD										
COD										
Phosphorous										
Nitrogen										
Copper										
Releases to other economic units										
BOD										
COD										
Phosphorous										
Nitrogen										
Copper										

Physical use table for gross releases of substances to water

USE (ENTERING	Agriculture	Water utility	Sewer utility	Canning Company	IOC 1	IOC 2	Administration	Households	Flows to the environment	Total use
Emissions received by the environment										
BOD										
COD										
Phosphorous										
Nitrogen										
Copper										
Collection by other economic units										
BOD										
COD										
Phosphorous										
Nitrogen										
Copper										

Kangaré – Eau

An Introduction to Environmental –Economic Accounts for Water (SEEA-Water)

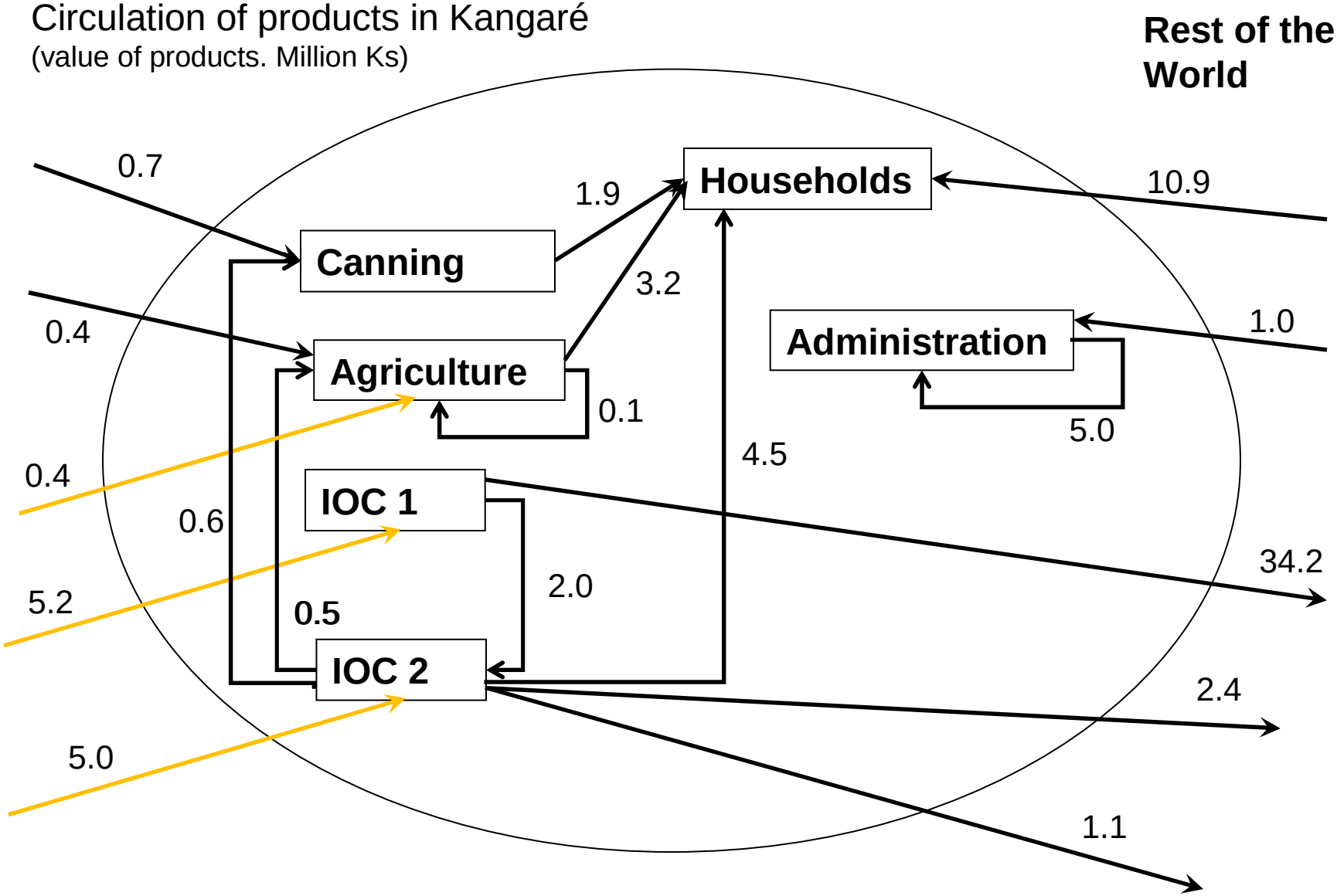
SOLUTION BOOKLET

7 September 2012

Based on the introduction to national accounts exercise prepared by NGO Thi Cuc and Jean-Louis WEBER.

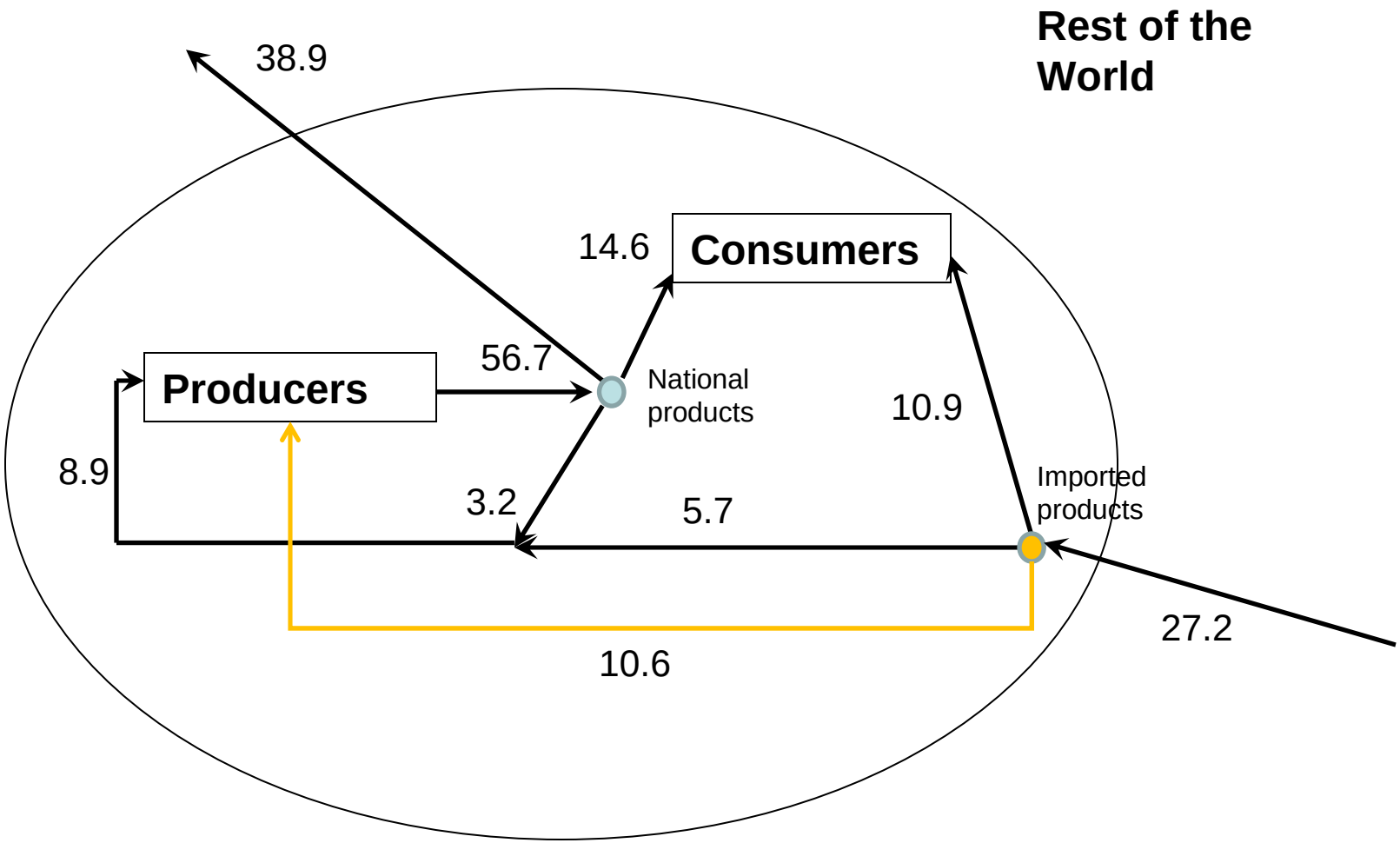
Circulation of products in Kangaré

(value of products. Million Ks)



Kangaré

(Value of products in circulation. Million Ks)



GDP = 56.7 – 8.9 = 47.8

GDP = 14.6+10.9+10.6+38.9-27.2= 47.8

Kangaré example
(million kagarés)

SUPPLY AND USE TABLES

SUPPLY

	Agriculture	General Canning Company	IOC 1	IOC 2	Administration	**National production**	Final consumption households	Final consumption Government	Rest of the World (RoW)	**TOTAL**
Seed and fodder	0.1					**0.1**				**0.1**
Agricultural products	5					**5**				**5**
Canned food		1.9				**1.9**				**1.9**
Crude oil			36.2			**36.2**				**36.2**
Refined petroleum				7.4		**7.4**				**7.4**
Chemical products				1.1		**1.1**				**1.1**
Administrative services					5	**5**				**5**
Other industrial products						**0**			11.3	**11.3**
Raw materials and furniture						**0**			5	**5**
Final consumption goods						**0**			10.9	**10.9**
	5.1	**1.9**	**36.2**	**8.5**	**5**	**56.7**	**0**	**0**	**27.2**	**83.9**

USE

	Agriculture	General Canning Company	IOC 1	IOC 2	Administration	**Intermediate consumption**	Final consumption households	Final consumption Government	Gross Fixed Capital Formation (GFCF)	Rest of the World (RoW)	**TOTAL**
Seed and fodder	0.1					**0.1**					**0.1**
Agricultural products		0.6				**0.6**	3.2			1.2	**5**
Canned food						**0**	1.9				**1.9**
Crude oil				2		**2**				34.2	**36.2**
Refined petroleum	0.5					**0.5**	4.5			2.4	**7.4**
Chemical products						**0**				1.1	**1.1**
Administrative services						**0**		5			**5**
Other industrial products		0.7				**0.7**			10.6		**11.3**
Raw materials and furniture			2.2	1.8	1	**5**					**5**
Final consumption goods						**0**	10.9				**10.9**
	0.6	**1.3**	**2.2**	**3.8**	**1**	**8.9**	**20.5**	**5**	**10.6**	**38.9**	**83.9**
Value added	4.5	0.6	34	4.7	4	**47.8**	20.5	5	10.6	11.7	**47.8**
						GDP					**GDP**

Kangaré example (SUPER SYNTHESIS)

SUPPLY AND USE TABLES

(million kagarés)

SUPPLY

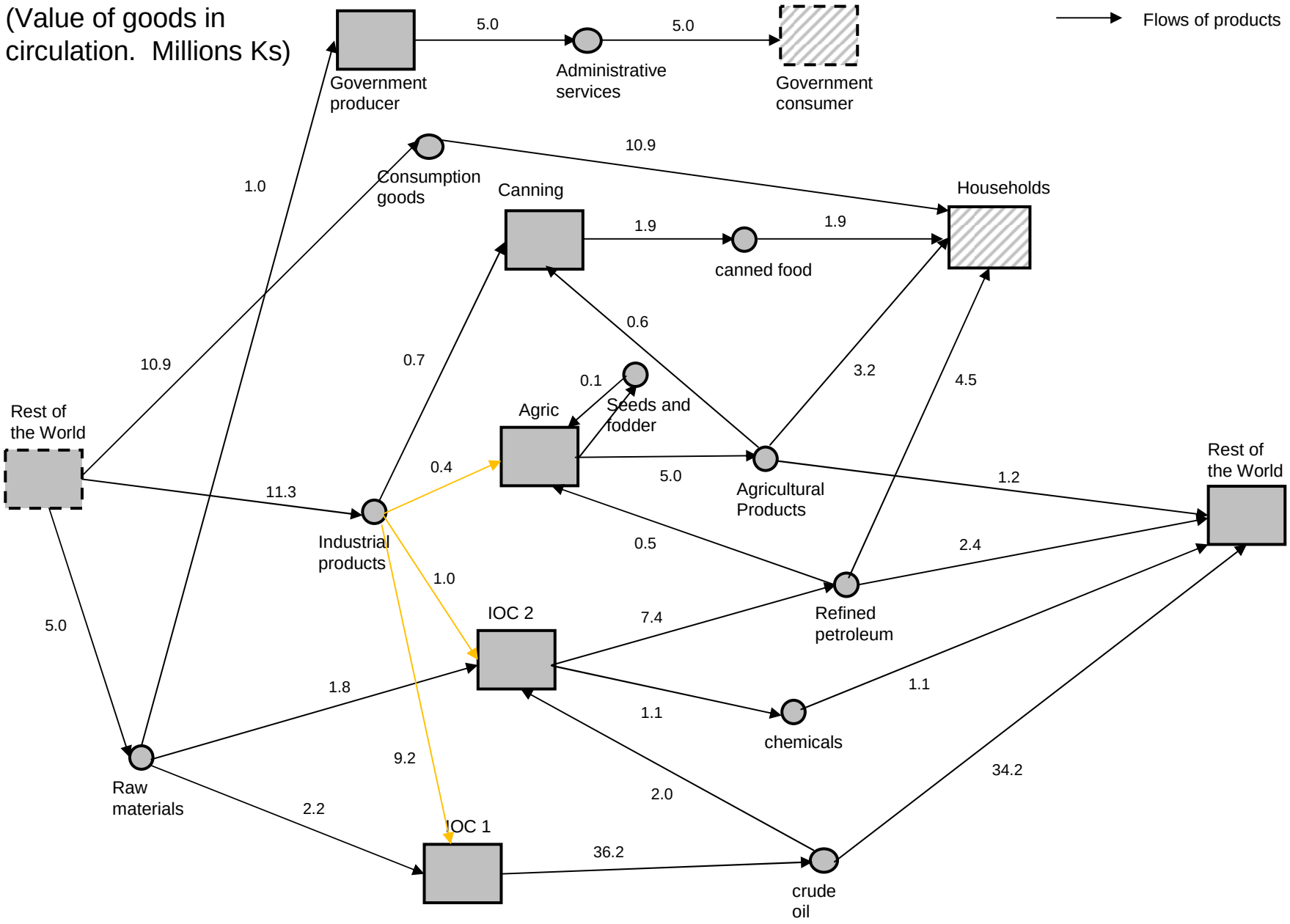
	National industries	**National production**	Final consumption households	Final consumption Government	Rest of the World (RoW)	**TOTAL**
National products	56.7	**56.7**				**56.7**
Imported products		**0**			27.2	**27.2**
	56.7	**56.7**	**0**	**0**	**27.2**	**83.9**

USE

	National industries	**Intermediate consumption**	Final consumption households	Final consumption Government	Gross Fixed Capital Formation (GFCF)	Rest of the World (RoW)	**TOTAL**
National products	3.2	**3.2**	9.6	5		38.9	**56.7**
Imported products	5.7	**5.7**	10.9		10.6		**27.2**
	8.9	**8.9**	**20.5**	**5**	**10.6**	**38.9**	**83.9**
Valeu added	**47.8**	**47.8**	**-20.5**	**-5**	**-10.6**	**-11.7**	**-47.8**
		GDP					

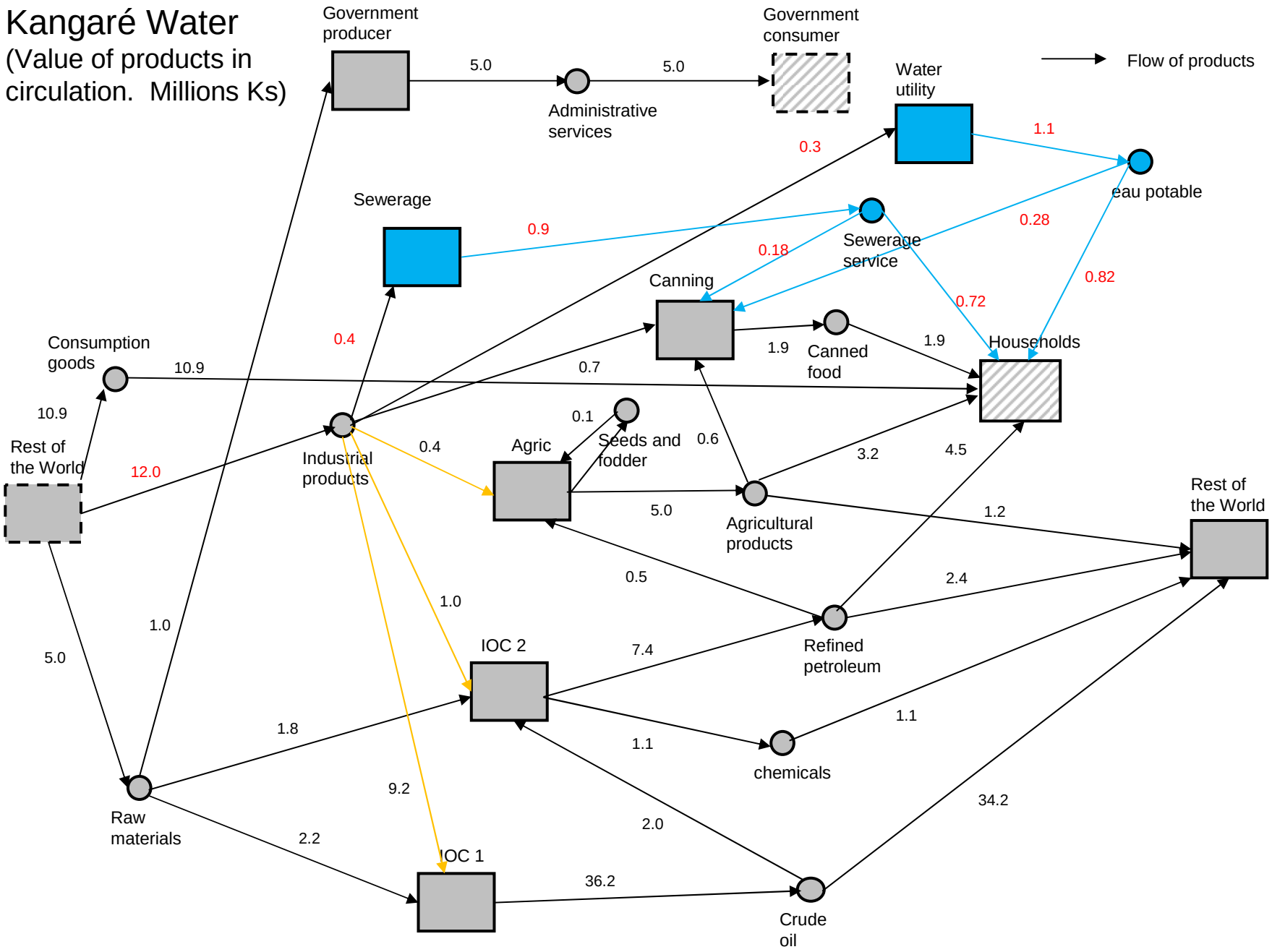
Kangaré

(Value of goods in circulation. Millions Ks)



Kangaré Water

(Value of products in circulation. Millions Ks)



Kangaré example WATER SUPPLY AND USE TABLES WITH WATER AND SEWERAGE
(million kagarés)

SUPPLY

	Agriculture	General Canning Company	IOC 1	IOC 2	Administration	Water utility	Sewerage utility	**National production**	Final consumption households	Final consumption Government	Rest of the World (RoW)	**TOTAL**
Seed and fodder	0.1							**0.1**				**0.1**
Agricultural products	5							**5**				**5**
Canned food		1.9						**1.9**				**1.9**
Crude oil			36.2					**36.2**				**36.2**
Refined petroleum				7.4				**7.4**				**7.4**
Chemical products				1.1				**1.1**				**1.1**
Administrative services					5			**5**				**5**
Drinking water service						1.1		**1.1**				**1.1**
Sewerage service							0.9	**0.9**				**0.9**
Other industrial products								**0**			12	**12**
Raw materials and furniture								**0**			5	**5**
Final consumption goods								**0**			10.9	**10.9**
	5.1	**1.9**	**36.2**	**8.5**	**5**	**1.1**	**0.9**	**58.7**	**0**	**0**	**27.9**	**86.6**

USE

	Agriculture	General Canning Company	IOC 1	IOC 2	Administration	Water utility	Sewerage utility	**Intermediate consumption**	Final consumption households	Final consumption Government	Gross Fixed Capital Formation (GFCF)	Rest of the World (RoW)	**TOTAL**
Seed and fodder	0.1							**0.1**					**0.1**
Agricultural products		0.6						**0.6**	3.2			1.2	**5**
Canned food								**0**	1.9				**1.9**
Crude oil				2				**2**				34.2	**36.2**
Refined petroleum	0.5							**0.5**	4.5			2.4	**7.4**
Chemical products								**0**				1.1	**1.1**
Administrative services								**0**		5			**5**
Drinking water service		0.28						**0.28**	0.81				**1.1**
Sewerage service		0.18						**0.18**	0.72				**0.9**
Other industrial products		0.7				0.3	0.4	**1.4**			10.6		**12**
Raw materials and furniture			2.2	1.8	1			**5**					**5**
Final consumption goods								**0**	10.9				**10.9**
	0.6	**1.76**	**2.2**	**3.8**	**1**	**0.3**	**0.4**	**10.06**	**22.03**	**5**	**10.6**	**38.9**	**86.6**
Value added	4.5	0.14	34	4.7	4	0.8	0.5	**48.64**	**-22.03**	**-5**	**-10.6**	**-11**	
								GDP					**-48.63**

Kangaré example (SUPER SYNTHESE) SUPPLY AND USE TABLES WITH WATER AND SEWERAGE

(million kagarés)

SUPPLY

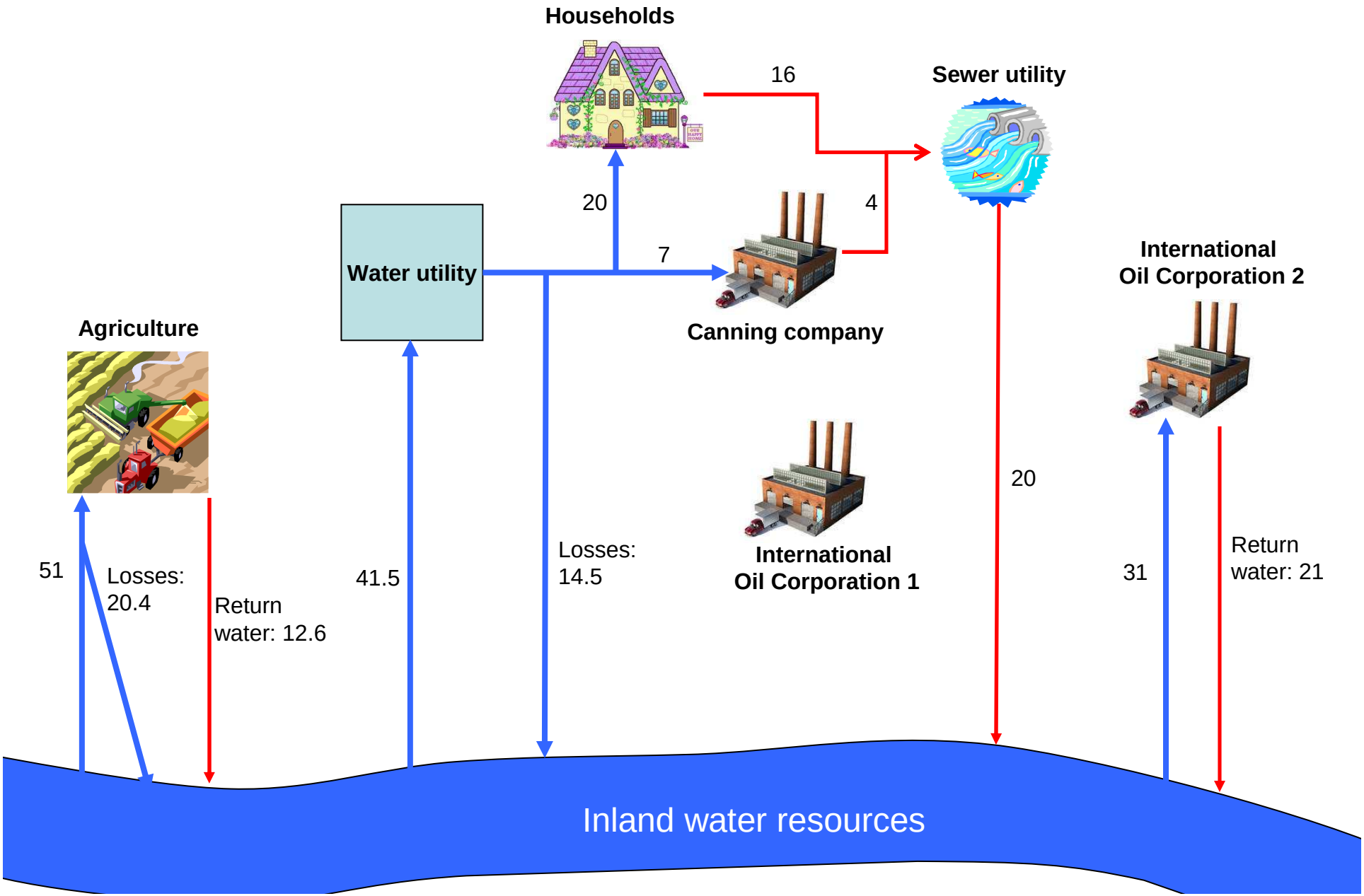
	National industries	Water utility	Sewerage utility	**National production**	Final consumption households	Final consumption Government	Rest of the World (RoW)	**TOTAL**
National products	56.7			**56.7**				**56.7**
Drinking water service		1.1		**1.1**				**1.1**
Sewerage service			0.9	**0.9**				**0.9**
Imported products				**0**			27.9	**27.9**
	56.7	**1.1**	**0.9**	**58.7**	**0**	**0**	**27.9**	**86.6**

USE

	National industries	Water utility	Sewerage utility	**Intermediate consumption**	Final consumption households	Final consumption Government	Gross Fixed Capital Formation (GFCF)	Rest of the World (RoW)	**TOTAL**
National products	3.2			**3.2**	9.6	5		38.9	**56.7**
Drinking water service	0.28			**0.28**	0.81				**1.09**
Sewerage service	0.18			**0.18**	0.72				**0.9**
Imported products	5.7	0.3	0.4	**6.4**	10.9		10.6		**27.9**
	9.36	**0.3**	**0.4**	**10.06**	**22.03**	**5**	**10.6**	**38.9**	**86.59**
Value added	**47.34**	**0.8**	**0.5**	**48.64**	**-22.03**	**-5**	**-10.6**	**-11**	
				GDP					**-48.63**

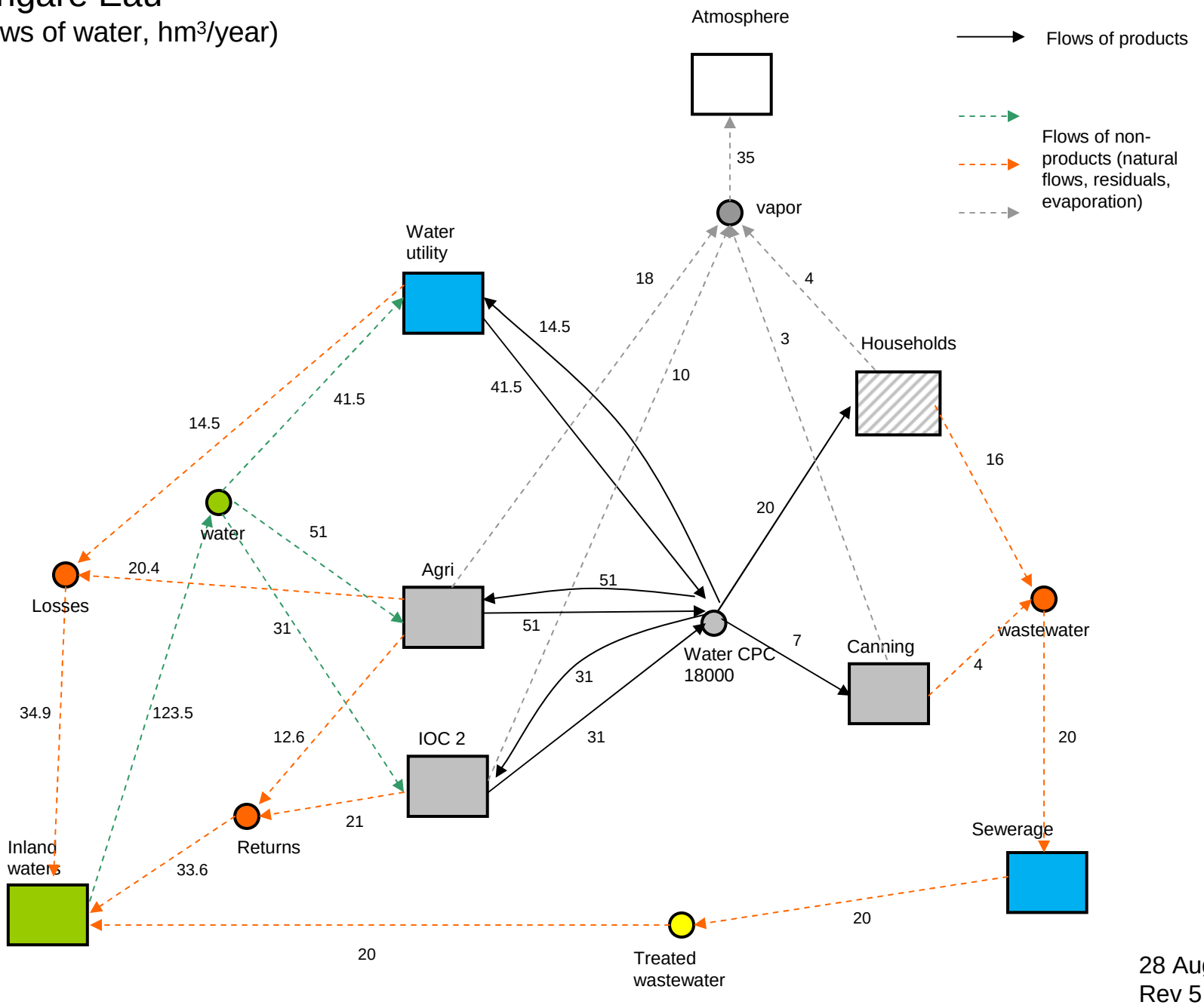
Kangaré Water

(Flows of water in hm^3/year)



Kangaré Eau

(Flows of water, hm³/year)



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KANGARE WATERSHED EXAMPLE (SUPPLY AND USE TABLES)

SUPPLY (LEAVING)	Agriculture	Water utility	Sewer utility	Canning Company	IOC 1	IOC 2	Administration	House-holds	Flows from the environment	SUM	
(I) Sources of abstracted water											
Inland water									123.5	**123.5**	
Other water sources									0	**0**	
(II) Abstracted water											
Produced water for distribution		27							0	**27**	
Produced water for own use	51	14.5				31			0	**96.5**	
(III) Wastewater and reused water											
Sewage				4				16	0	**20**	
Treated wastewater			20						0	**20**	
(IV) Return flows of water											
Losses	20.4	14.5							0	**34.9**	
Return water	12.6					21			0	**33.6**	
(V) Evaporation of abstracted water, transpiration and water incorporates into products											
Evaporation of abstracted water	18			3		10	0	4	0	**35**	
	102	**56**	**20**	**7**	**0**	**62**	**0**	**20**	**123.5**		**390.5**
										390.5	

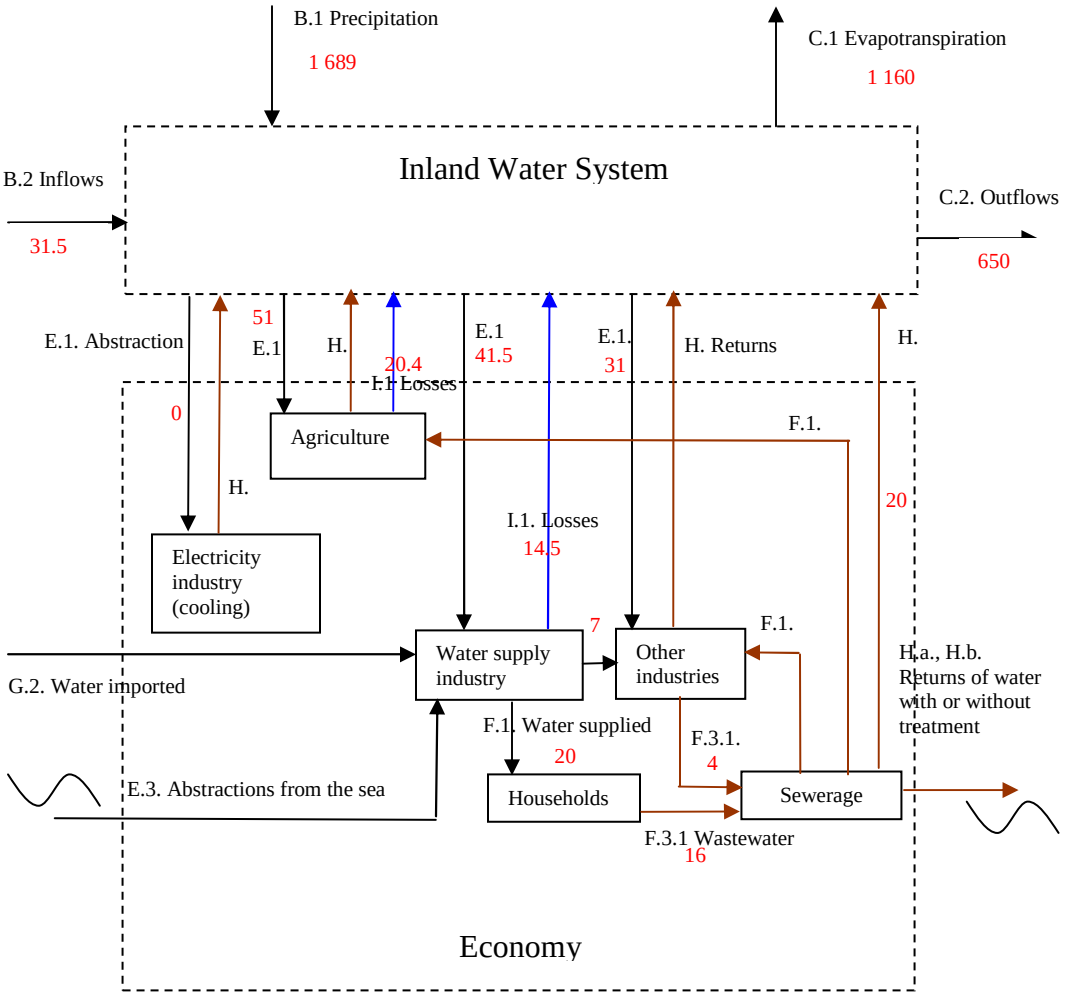
USE (ENTERING)	Agriculture	Water utility	Sewer utility	Canning Company	IOC 1	IOC 2	Administration	House-holds	Flows to the environment	SUM	
(I) Sources of abstracted water											
Inland water	51	41.5				31			0	**123.5**	
Other water sources									0	**0**	
(II) Abstracted water											
Produced water for distribution				7				20	0	**27**	
Produced water for own use	51	14.5				31			0	**96.5**	
(III) Wastewater and reused water											
Sewage			20						0	**20**	
Treated wastewater									20	**20**	
(IV) Return flows of water											
Losses									34.9	**34.9**	
Return water									33.6	**33.6**	
(V) Evaporation of abstracted water, transpiration and water incorporates into products											
Evaporation of abstracted water									35	**35**	
	102	**56**	**20**	**7**	**0**	**62**	**0**	**20**	**123.5**		**390.5**
										390.5	

KANGARÉ WATERSHED EXAMPLE (ASSET ACCOUNTS)

	Inland Water Resources
Opening stock of water resources	***0***
Additions to stock	***1 809.0***
Returns	88.5
Precipitation	1 689.0
Inflows from other inland water resources	31.5
Reductions in stock	***1 933.5***
Abstractions	123.5
Evaporation/ Evapotranspiration	1 160.0
Ouflows to other inland water resources	0.0
Outflows to the sea	650.0
Closing stock of water resources	***-124.5***

SIMPLIFIED SEEA-WATER FLOWS. Chapter III. Physical Supply and Use.
KANGARE EXERCISE (hm^3/year)

The following diagram shows a simplification of Figure II.4 in SEEA-Water. The diagram only shows the flows that are more frequently used to describe the water cycle with emphasis in the Economy.



Calculated data (not explicitly included in the IRWS):
--Internal flow = B.1 – C.1 = 529 hm^3/year
--Renewable freshwater resources = Internal flow + B.2 = 560.5 hm^3/year

Some indicators (based on WWAP indicators):
--Total actual renewable water resources (TRWR): = B.1-C.1+B.2 = 560.5 hm^3/year
--Total actual renewable resources per capita = TRWR/Population = 1 673 m^3/inhab/year

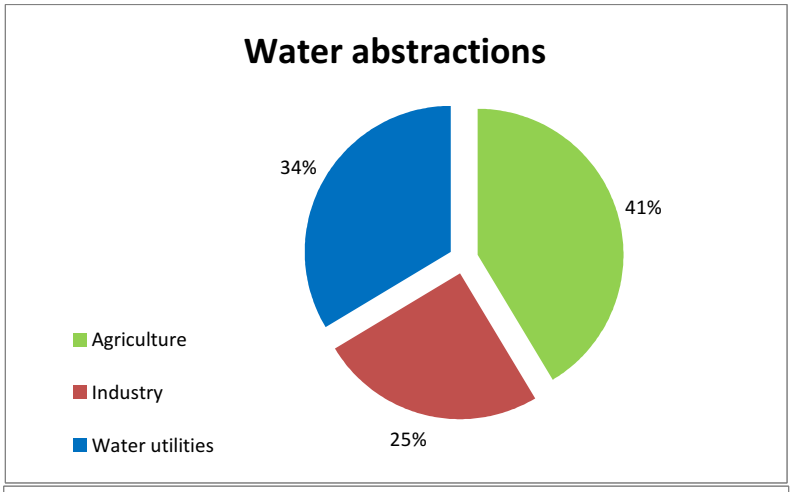
--Inflow from other countries as share of total actual renewable water resources (Dependency Ratio) = B.2/TRWR = 5.6%
--Proportion of total actual renewable freshwater resources abstracted (MDG Water Indicator): (Sum of E.1, only offstream)/TRWR = 22%

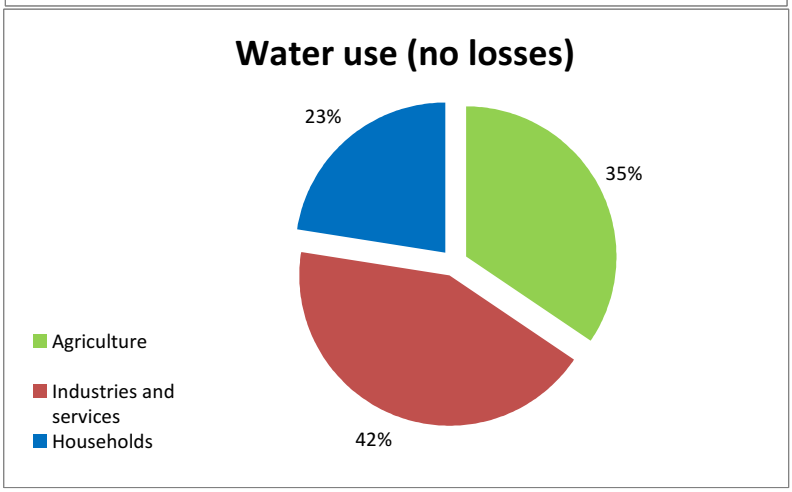
--Water use by major sector. Interpreted as water abstractions by major sector:
E.1 Agriculture/(Sum of E.1, only offstream) = 41%
E.1 Water Supply Industry (only water utilities)/(Sum of E.1, only offstream) = 34%
E.1 Electricity industry (cooling)/(Sum of E.1, only offstream) = 0%
E.1 Other industries/(Sum of E.1, only offstream) = 25%

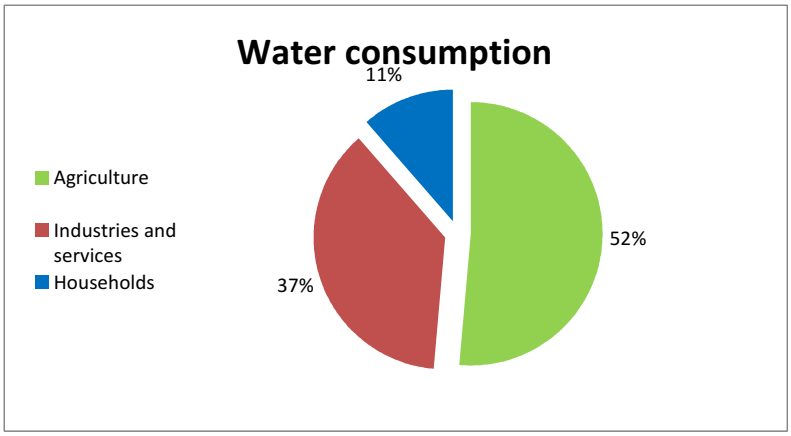
Other commonly used indicators:
Water received in households per capita per day = F.1 supplied to households/Population = 182 L/inhabitant/day
Losses by water utilities = (I.1 by water supply industry (no agriculture))/(E.1+E.3+G.2) = 35%
Losses in agriculture = (I.1 by agriculture)/(E.1+E.3+G.2) = 40%

WATER IN KANGARÉ (SUMMARY)

			Agriculture	Industries and services	Households
	Abstractions	**Losses**			
Agriculture	51	20.4	30.6		
Industry	31			31	
Water utilities	41.5	14.5		7	20
TOTAL USE			**30.6**	**38**	**20**
Of which:					
Water consumption			18	13	4
To sewers				4	16
To inland water resources			12.6	20	
To the sea			0	0	

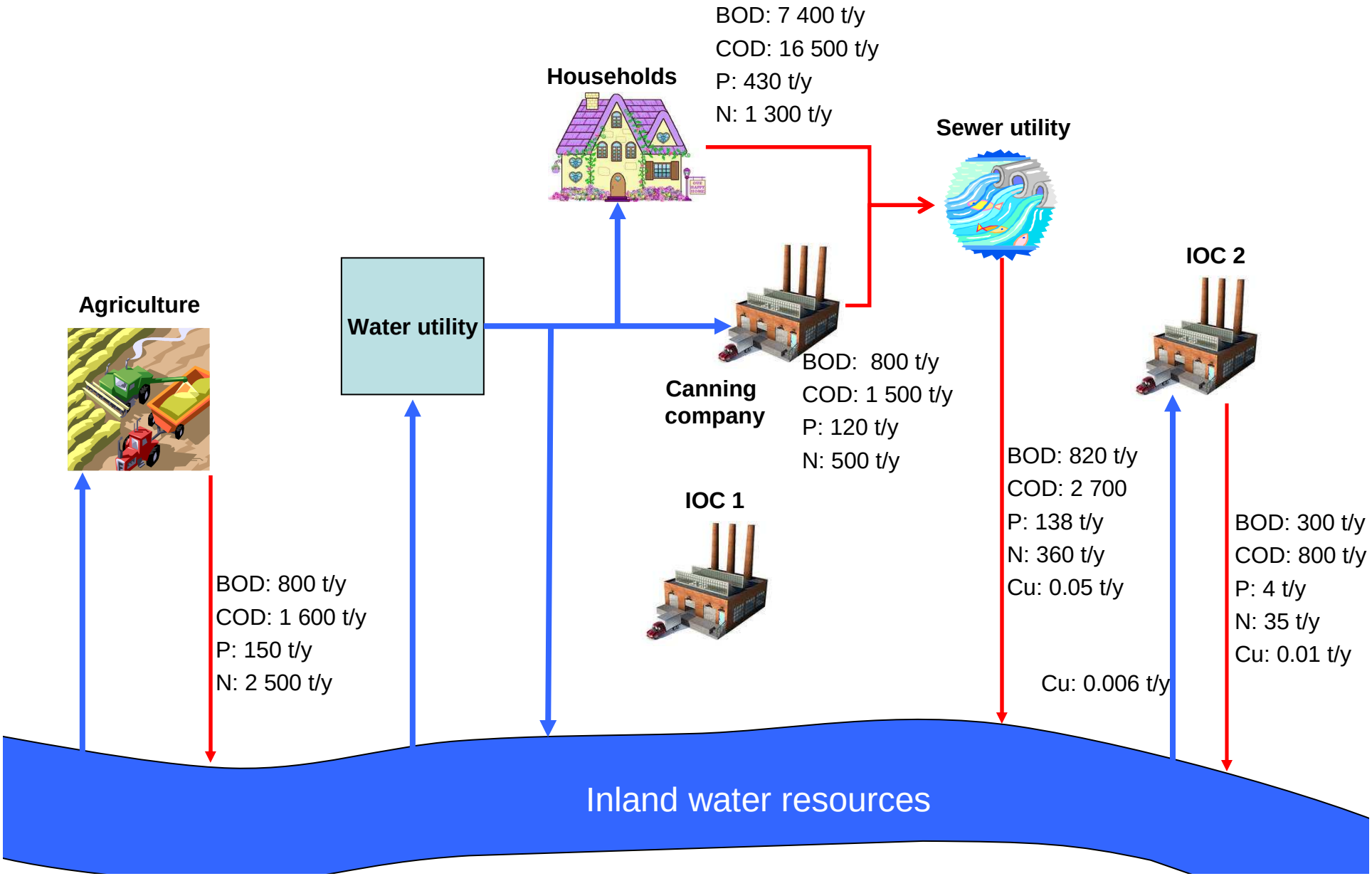






Kangaré Water – EMISSION ACCOUNTS, TRAINING EXAMPLE

(Flows of emissions in ton/year)



KANGARE-WATER. EMISSION ACCOUNTS

Physical supply table for gross releases of substances to water

SUPPLY (LEAVING)	Agriculture	Water utility	Sewer utility	Canning Company	IOC 1	IOC 2	Administration	Households	Flows from the environment	Total supply
Emissions to the environment										
BOD	800		820			300				**1 920**
COD	1 600		2 700			800				**5 100**
Phosphorous	150		138			4				**292**
Nitrogen	2 500		360			35				**2 895**
Copper			0.05			0.004				**0.054**
Releases to other economic units										
BOD				800				7 400		**8 200**
COD				1 500				16 500		**18 000**
Phosphorous				120				430		**550**
Nitrogen				500				1 300		**1 800**
Copper										**0**

Physical use table for gross releases of substances to water

USE (ENTERING	Agriculture	Water utility	Sewer utility	Canning Company	IOC 1	IOC 2	Administration	Households	Flows to the environment	Total use
Emissions received by the environment										
BOD									1 920	**1 920**
COD									5 100	**5 100**
Phosphorous									292	**292**
Nitrogen									2 895	**2 895**
Copper									0.054	**0.054**
Collection by other economic units										
BOD			8 200							**8 200**
COD			18 000							**18 000**
Phosphorous			550							**550**
Nitrogen			1 800							**1 800**
Copper			0							**0**