

# **Joint OECD/UNECE Seminar on Implementation of SEEA**

**20-21 February 2019, Salle VII, Palais des Nations, Geneva**

**IBGE**

**NATIONAL ACCOUNTS DEPARTMENT**

# ENVIRONMENTAL- ECONOMIC ACCOUNTING FOR WATER IN BRAZIL



**IBGE**  
Instituto Brasileiro de Geografia e Estatística

**ANA**  
AGÊNCIA NACIONAL DE ÁGUAS

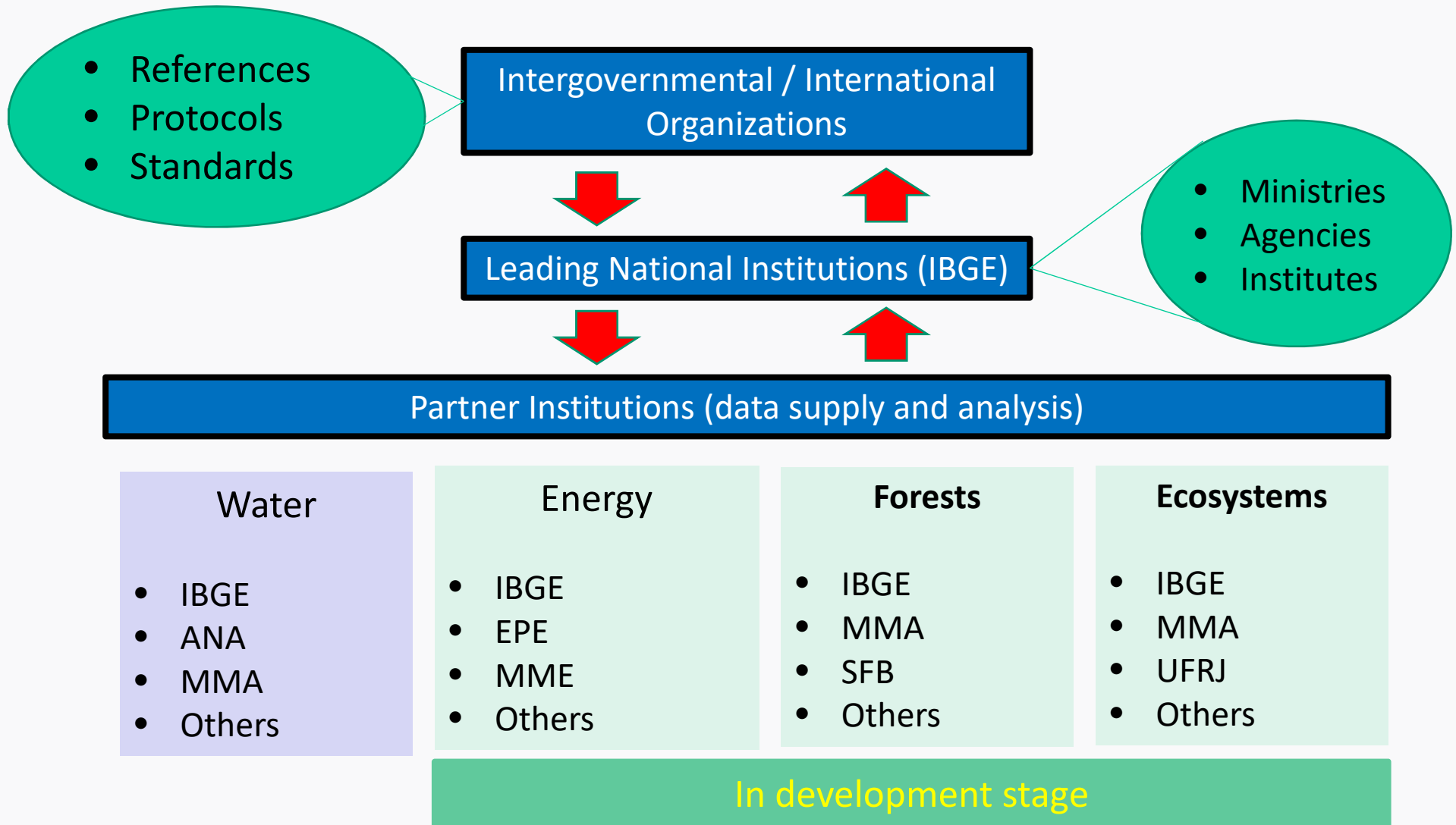
MINISTÉRIO DO  
MEIO AMBIENTE

**BRASIL**  
GOVERNO FEDERAL

## Agenda:

1. System of Environmental Economic Accounts (SEEA): a challenging trajectory for an important change in perspectives;
2. Lessons learned from SEEA-Water;
3. Results and Analysis of SEEA-Water in Brazil;
4. Way forward: improvements in the SEEA-Water Brazil and other SEEA development.

# Institutional Arrangements for SEEA in Brazil



# 1. System of Environmental – Economic Accounts: a challenging trajectory for an important change in perspectives

- Integration of economic and physical aspects related to a specific issue requires an extensive database acquired from different institutions that most of the time do not have the same perspective in terms of statistics;
- Data exchanging is not an easy task within the governmental administration;
- Data analysis must be carefully conducted to avoid erroneous conclusions;
- The choice of indicators must be discussed in regarding not only technical issues but also political use;

## 2. Lessons learned from SEEA-Water

- The legal framework for SEEA-Water in the country was established in 2012 and the first publication were released in March 2018;
- SEEA development requires a continuous synergism involving several institutions;
- SEEA-Water required a joint effort of the Brazilian Institute of Geography and Statistics (IBGE), the National Water Agency (ANA), and the Ministry of the Environment (MMA);
- International aid can help with budget and technical support. In the case of Brazil we had the collaboration of the German Cooperation for Sustainable Development through GIZ.

### 3. Results and Analysis of SEEA-Water Brazil

➤ **Period: 2013 – 2015**

➤ **Includes:**

➤ Asset Tables

➤ Physical Tables

➤ Hybrid Tables

➤ Indicators

# 3. Results and Analysis

**Tabela 2 - Tabela de Recursos e Usos Física**

Fluxos	Recursos e Usos	Recursos					
		Atividades econômicas					
		Agricultura, pecuária, produção florestal, pesca e aquicultura	Indústrias extrativas	Indústrias de transformação e construção	Eletricidade e Gás		Captação e distrib
				Hydroenergia	Térmicas e distribuição de gás		
	1. Retirada total (=1.a+1.b+1i+1ii+1iii)	32 505	1037	6 112	3 104 094	10 199	
	1.a Retirada para atendimento próprio	32 505	1037	6 112	3 104 094	10 199	
	1.b Retirada para distribuição						
Do meio ambiente	1.i De recursos hídricos interiores	32 505	1037	6 112	3 104 094	7 023	
	1.i.1 Águas superficiais	30 358	1020	4 431	3 104 094	7 023	
	1.i.2 Águas subterrâneas	2 147	17	1 681			
	1.i.3 Água do solo						
	1.ii Coleta de água de chuva						
	1.iii Retirada do mar					3 176	
Dentro da economia	2. Uso de água proveniente de outras atividades econômicas	1 138	7	277	3	4	
	2.a Águas residuais para redes de esgotos						
	2.b Uso de água tratada fornecido por outra atividade econômica	1 138	7	277	3	4	
	<b>3. Uso total da água (=1+2)</b>	<b>33 643</b>	<b>1 044</b>	<b>6 389</b>	<b>3 104 097</b>	<b>10 203</b>	
Dentro da economia	4. Suprimento para outras atividades econômicas	0	4	171	2	2	10 862
	4.a Águas residuais para redes de esgotos	0	4	171	2	2	10 862
	4.b Suprimento de água tratada para outra atividade econômica						
Para o meio ambiente	5. Retorno total (=5.a + 5.b)	9 938	758	2 768	3 104 094	10 101	3 999 36 869
	5.a Para os recursos hídricos interiores (5.a.1+5.a.2+5.a.3)	9 938	758	2 768	3 104 094	6 925	3 999 26 809
	5.a.1 Águas superficiais	9 938					3 168 527 2 604
	5.a.2 Águas subterrâneas						3 155 292 1 658
	5.a.3 Água do solo						
	5.b Para o mar						
	<b>6. Total fornecido (=4+5)</b>	<b>9 939</b>					
	<b>7. Consumo total (=3-6)</b>	<b>23 704</b>					

Fontes: 1. IBGE. 2. Ministério do Meio Ambiente. 3. Agência Nacional de Águas - ANA.

**Tabela 1 - Tabela de Estoques - 2015**

Estoques e fluxos (hm³/ano)	Tipos de recursos hídricos					Total
	Reservatórios artificiais	Águas superficiais		Água Subterrânea	Água do solo	
		Fios e riachos	Lagos			
<b>1. Estoque inicial (ano anterior)</b>	<b>225 324</b>					<b>1 053 285</b>
2. Retornos	3 119 491		36 119			3 156 949
3. Precipitação	60 702	157 656	20 022		13 127 952	13 366 332
4. Entradas		9 276 760				9 276 760
4.a Entradas de outros países a montante		3 074 419				3 074 419
4.b Entradas de outros recursos no território		6 202 341				6 202 341
<b>Total de adições ao estoque (-) (2+3+4)</b>	<b>3 180 193</b>	<b>9 490 557</b>			<b>13 129 291</b>	<b>25 800 042</b>
5. Captação	3 120 678	40 760		7 023		3 168 461
6. Evaporação / evapotranspiração real	54 132	91 325	14 315		10 077 510	10 237 282
7. Saídas		9 276 760			3 051 781	12 328 541
7.a Saídas para territórios a jusante		901 825				901 825
7.b Saídas para o mar		8 374 935				8 374 935
7.c Saídas para outros recursos do território					3 051 781	3 051 781
<b>Total de reduções no estoque (-) (5+6+7)</b>	<b>3 174 810</b>	<b>9 423 160</b>		<b>7 023</b>	<b>13 129 291</b>	<b>25 734 283</b>
<b>8. Estoque final</b>	<b>230 708</b>				<b>1 046 262</b>	

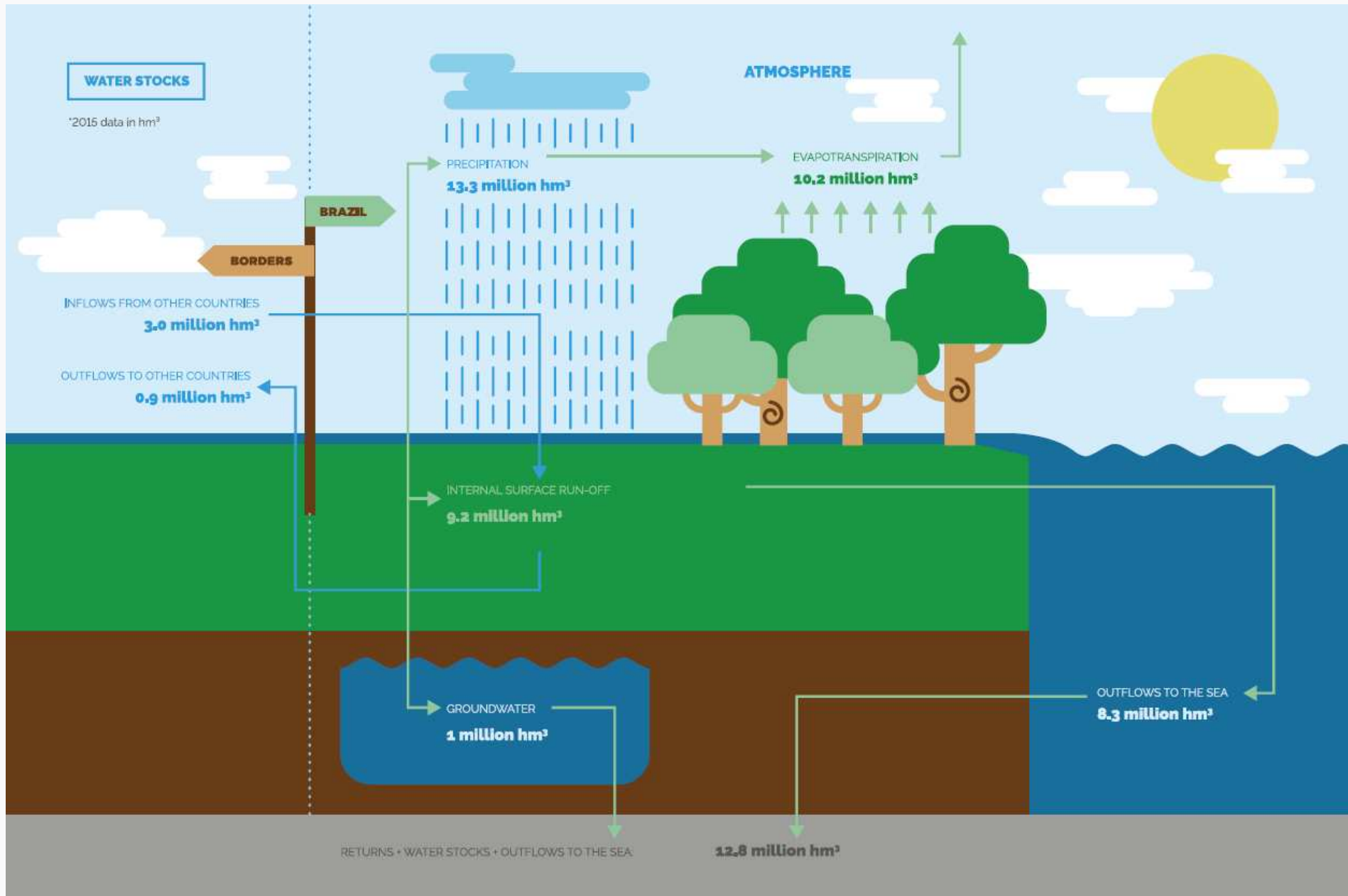
Fontes: 1. IBGE. 2. Ministério do Meio Ambiente. 3. Agência Nacional de Águas - ANA.

**Tabela 3 - Tabela de Recursos e Usos Híbrida - Recursos 2015**

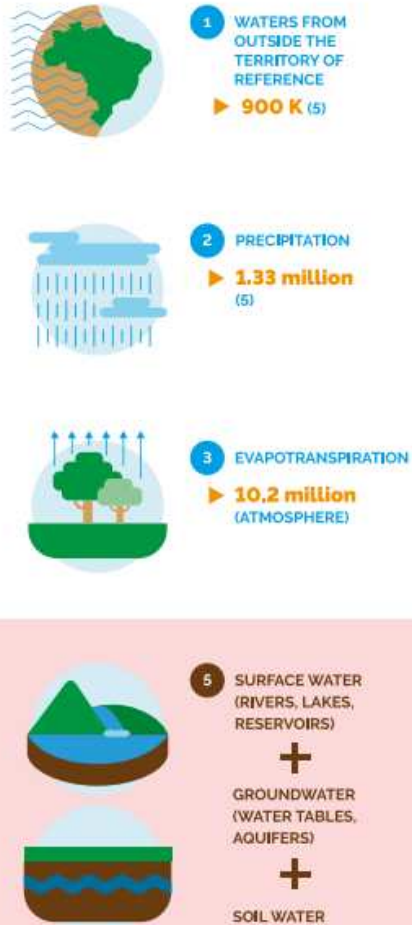
Recursos	Produção das atividades econômicas							Importações	Impostos menos subsídios sobre produtos, margens de comércio e transporte	Total
	Agricultura, pecuária, produção florestal, pesca e aquicultura	Indústrias extrativas	Indústrias de transformação e construção	Eletricidade e gás	Água e esgoto	Demais atividades	Total das atividades econômicas			
<b>1. Produção e fornecimento total (Em R\$ 1 000 000)</b>	<b>478 730</b>	<b>260 573</b>	<b>3 408 768</b>	<b>260 753</b>	<b>43 037</b>	<b>5 775 133</b>	<b>10 226 994</b>	<b>842 614</b>	<b>840 186</b>	<b>11 909 794</b>
1.a. Água de distribuição							28 574		1 290	29 864
1.b. Serviços de esgoto							13 920		531	14 450
<b>2. Fornecimento total (Em hm³/ano)</b>	<b>9 939</b>	<b>762</b>	<b>2 939</b>	<b>3 114 199</b>	<b>51 730</b>	<b>1 298</b>	<b>3 180 867</b>			<b>3 180 867</b>
2.a. Suprimento para outras atividades econômicas	0	4	171	4	10 862	1 298	12 340			12 340
2.a.1. Águas residuais para redes de esgotos	0	4	171	4			1 478			1 478
2.b. Retorno total	9 938	758	2 768	3 114 195	40 868		3 168 527			3 168 527

Fontes: 1. IBGE. 2. Ministério do Meio Ambiente. 3. Agência Nacional de Águas - ANA.





**FLOWS AND USES OF WATER IN BRAZIL**

 \*2015 data in hm<sup>3</sup>
**WATER RESOURCES**

 ▶ **3.1 million** (A,B,C,D,E,F,G,H)  
▶ **7.5 million** (4)

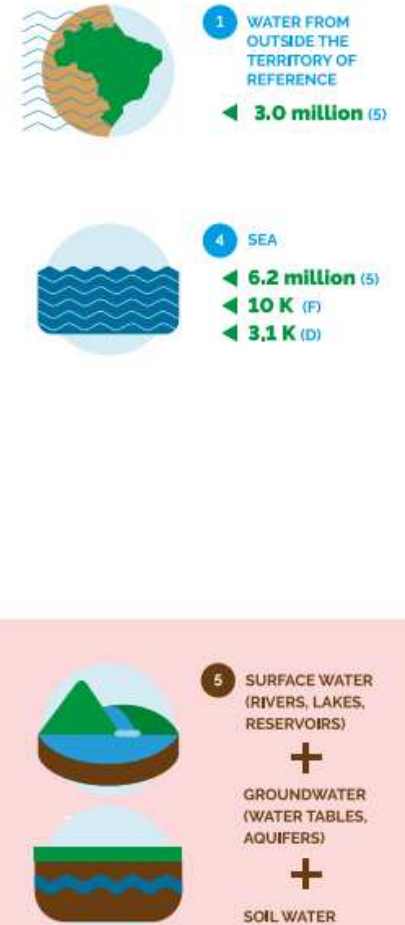
 ◀ WATER INFLOWS  
▶ WATER OUTFLOWS

**USES IN THE ECONOMY**

**EXAMPLE OF HOW TO READ IT**

Water inflows (◀) represent the volume of water that entered for each component in the water resource system or in the economy in 2015. For instance, 3 million hm<sup>3</sup> of water entered the internal water resources system (5) in Brazil coming from other countries (1). The Manufacturing and Construction Industries activity (C) withdrew 6 k hm<sup>3</sup> from the internal water resources system (5).

Water outflows (▶) represent the volume of water that left from each component of the water resources system or the economy in 2015. For instance, 10.8 k hm<sup>3</sup> were used by Households (G) coming from the Water Collection, Treatment and Supply economic activity (E). The Sea (4) received 13.3 k hm<sup>3</sup> from the economic activity Sewerage and Related Activities (F).

**WATER RESOURCES**

 ◀ **15.425 million** (2)  
◀ **2.4 million** (3)  
◀ **3.1 million** (A,B,C,D,E,F,G,H)

# Additions to asset stocks






## TOTAL ADDITIONS TO ASSET STOCKS IN BRAZIL (in million hm<sup>3</sup>/YEAR)

Type of Water Resource	2013	2014	2015
Surface Water 	12,1 ▲	13,2 ▼	12,7
Soil Water 	14,7 ▼	14,5 ▼	13,1
<b>TOTAL</b>	<b>26,8 ▲</b>	<b>27,7 ▼</b>	<b>25,8</b>

\*1 hm<sup>3</sup> corresponds to a million m<sup>3</sup>. One m<sup>3</sup> corresponds to 1,000 liters.

Source: EEA-W-Brazil.

## TOTAL INITIAL STOCK AND ADDITIONS TO STOCK IN SURFACE ASSETS IN BRAZIL (in million hm<sup>3</sup>/YEAR)

	2013	2014	2015
Initial stock (in artificial reservoirs) 	0,21 ■	0,21 ■	0,22
Returns 	2,9 ▲	3,0 ▲	3,1
Portion of rainfall that feeds rivers and streams, lakes and artificial reservoirs 	0,27 ▼	0,26 ▼	0,24
Inflows from other upstream countries 	2,6 ▲	3,0 ▲	3,1
Inflows from other resources in the territory 	6,3 ▲	7,0 ▼	6,2
<b>TOTAL</b>	<b>12,2 ▲</b>	<b>13,3 ▼</b>	<b>12,7</b>

Source: EEA-W-Brazil.

# Subtractions of asset stocks

**TOTAL SUBTRACTIONS OF SURFACE ASSET STOCKS IN BRAZIL PER YEAR**  
(in million hm<sup>3</sup>/YEAR)

		2013		2014		2015
Abstraction		2,9	▲	3,0	▲	3,1
Actual evaporation/ evapotranspiration of rivers and streams, lakes and artificial reservoirs		0,16	■	0,16	■	0,16
Outflows to other countries		0,74	▼	0,72	▲	0,90
Outflows to the sea		8,1	▲	9,3	▼	8,4
<b>TOTAL</b>		<b>12,0</b>	▲	<b>13,1</b>	▼	<b>12,6</b>

**TOTAL SUBTRACTIONS OF ASSET STOCKS IN BRAZIL** (in million hm<sup>3</sup>/YEAR)

Type of Water Resource		2013		2014		2015
Surface Water		12,0	▲	13,1	▼	12,6
Groundwater		0,007	■	0,007	■	0,007
Soil Water		14,7	▼	14,5	▼	13,1
<b>TOTAL</b>		<b>26,7</b>	▲	<b>27,6</b>	▼	<b>25,7</b>

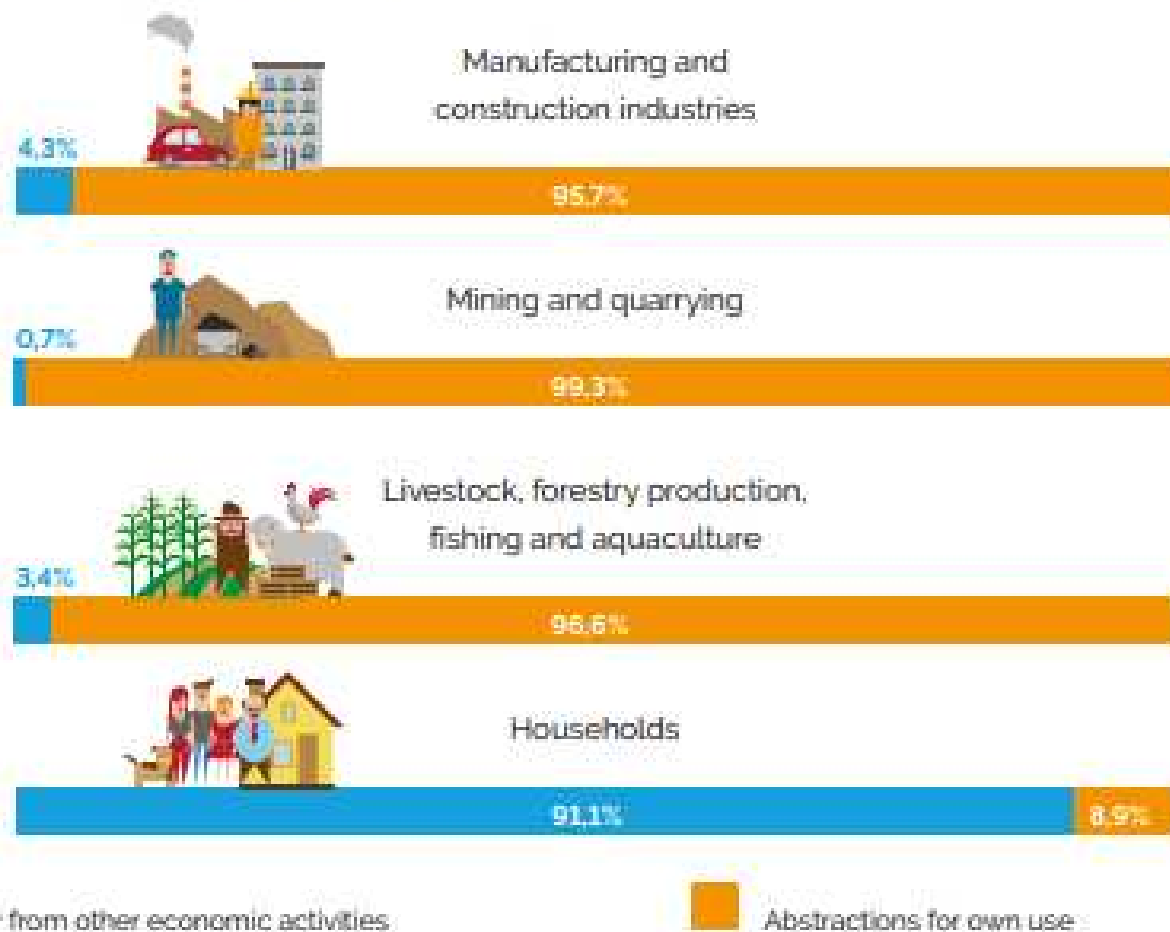
# Water direct abstractions

**TOTAL ABSTRACTIONS IN BRAZIL, ACCORDING TO THE EEA-W CLASSIFICATION (in K hm<sup>3</sup>/YEAR)**

		2013		2014		2015
Agriculture, forestry production, fishing and aquaculture		30,52	▲	31,98	▲	32,5
Mining and quarrying		0,95	▲	0,99	▲	1,04
Manufacturing and construction industries		6,57	▼	6,45	▼	6,11
Electricity and gas		2.931,61	▲	2.943,77	▲	3.114,29
Water and sewage		48,68	▼	48,58	▼	47,09
Other activities		0	■	0	■	0
<b>Total of Economic Activities</b>		<b>3.018,33</b>	▲	<b>3.031,77</b>	▲	<b>3.201,03</b>
Households		0,81	▼	0,72	▼	0,7
<b>TOTAL</b>		<b>3.019,14</b>	▲	<b>3.032,49</b>	▲	<b>3.201,73</b>

# Water use (public water supply x direct abstraction)

DISTRIBUTION OF WATER USE IN VOLUME BY SOURCE TYPOLOGY  
(2013-2015 AVERAGE)<sup>13</sup>



# Water use from economic activities (public water supply)

**USE OF WATER FROM OTHER ECONOMIC ACTIVITIES IN BRAZIL, ACCORDING TO THE EEA-W CLASSIFICATION**  
(in K hm<sup>3</sup>/YEAR)

		2013	2014	2015
Agriculture, forestry production, fishing and aquaculture		1,06	▲ 1,12	▲ 1,14
Mining and quarrying		0,01	■ 0,01	■ 0,01
Manufacturing and construction industries		0,3	■ 0,3	▼ 0,28
Electricity and gas		0,01	■ 0,01	■ 0,01
Water and sewage		7,26	▲ 7,41	▼ 7,16
Other activities		2,12	▼ 2,09	▼ 2,05
<b>Total of Economic Activities</b>		<b>10,74</b>	<b>▲ 10,93</b>	<b>▼ 10,63</b>
Households		7,72	▲ 7,74	▼ 7,39
<b>TOTAL</b>		<b>18,46</b>	<b>▲ 18,67</b>	<b>▼ 18,02</b>

Source: EEA-W-Brazil.

# Water Consumption

TOTAL CONSUMPTION IN BRAZIL, ACCORDING TO EEA-W CLASSIFICATION (in K hm<sup>3</sup>/YEAR)















		2013		2014		2015
Agriculture, forestry production, fishing and aquaculture		21,72	▲	23,9	▼	23,7
Mining and quarrying		0,26	▲	0,27	▲	0,28
Manufacturing and construction industries		3,8	▼	3,64	▼	3,45
Electricity and gas		0,09	▲	0,1	■	0,1
Water and sewage		2,4	▼	2,34	▼	2,27
Other activities		0,81	▼	0,78	▼	0,75
<b>Total of Economic Activities</b>		<b>29,07</b>	▲	<b>31,03</b>	▼	<b>30,56</b>
Households		0,38	▼	0,11	▼	0,05
<b>TOTAL</b>		<b>29,45</b>	▲	<b>31,14</b>	▼	<b>30,6</b>

Source: EEA-W-Brazil



# Indicators

## TIME SERIES OF THE INDICATORS TO ASSESS AVAILABILITY AND PRESSURE ON WATER RESOURCES DERIVED FROM EEA-W

Indicator	Units	2013	2014	2015
Internal Renewable Water Resources (IRWR)	hm <sup>3</sup> /year	4.829.036 	4.615.364 	3.129.050
External Renewable Water Resources (ERWR)	hm <sup>3</sup> /year	2.588.276 	2.953.856 	3.074.419
Total Renewable Water Resources (TRWR)	hm <sup>3</sup> /year	7.417.312 	7.569.220 	6.203.469
Dependency Ratio (DR)	%	35% 	39% 	50%
Per Capita Total Renewable Water Resources	m <sup>3</sup> /inhab./year	36.896 	37.329 	30.342
Volume withdrawn as a percentage of TRWR – Exploitation Index (EI)	%	0.9% 	0.9% 	1.1%
Consumption Index (CI)	%	0.4% 	0.4% 	0.5%

Source: 1. IBGE. 2. MMA. 3. ANA.

# Indicators

Hybrid Indicators	Units	2013	2014	2015
<b>Households</b>				
Per capita volume of water received by Households (Vh)	V/inhab/day	116	114	108
<b>Water intensity consumption</b>				
Agriculture, forestry production, fishing and aquaculture	litres/R\$	90,40	95,64	91,58
Mining and quarrying	litres/R\$	1,36	1,46	2,54
Manufacturing and construction industries	litres/R\$	4,48	4,03	3,72
Electricity and gas	litres/R\$	1,48	1,82	1,18
Water and sewage	litres/R\$	91,06	84,88	85,89
Other activities	litres/R\$	0,25	0,22	0,20
<b>Efficiency of water use</b>				
Agriculture, forestry production, fishing and aquaculture	BRL/m <sup>3</sup>	7,61	7,55	7,69
Mining and quarrying	BRL/m <sup>3</sup>	197,87	184,67	106,11
Manufacturing and construction industries	BRL/m <sup>3</sup>	123,61	134,18	145,06
Electricity and gas	BRL/m <sup>3</sup>	0,02	0,02	0,03
Water and sewage	BRL/m <sup>3</sup>	0,47	0,49	0,49
Other activities	BRL/m <sup>3</sup>	1.506,71	1.699,37	1.832,07

Source: 1. IBGE. 2. MMA. 3. ANA.

## 4. Way forward: improvements in the SEEA-W and other SEEA development.

- Brazilian second water accounts – programmed for 2020:
  - Improvement of estimates;
  - Updating of SEEA-W time-series (2013-2017);
  - Regionalization;
  - Production of new estimates. For example: use of water by non-irrigated agriculture.

# Regionalization

- Division in 5 regions: North, Northeast, South, Southeast, Central-West
- Each region consider geographic, social and economic factors and takes into account environmental similarities, even though is not based in a river-basin division.



# Thank you!

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