WATER LAW ACCORDING TO GOVERNANCE

Organization
PILAR CAROLINA VILLAR
Authors
PILAR CAROLINA VILLAR
MARIA LUIZA MACHADO GRANZIERA
Course Water Law according to governance

Coordination
Pilar Carolina Villar

Authors
Pilar Carolina Villar
Maria Luiza Machado Granziera

Collaboration
Anderson Kazuo Nakano
Andreia Costa Vieira
Eduardo Cuoco Léo
Marco Antonio Palermo
Sara Gurfinkel Marques de Godoy
Sérgio Razera

Graphic design and editing
Ladislau Lima (limaeditoracao@gmail.com)

Audio and video
Daniel Gongorra

Video editing
Laura Videira

Photography
Pilar Carolina Villar

Translation
Alcance Consultoria de Idiomas Ltda

Brasília – DF
ANA
2019
The controlling of water is complex, because it deals with a resource that is political in nature, subject to many varied uses and indispensable for human life and the maintaining of ecosystems. The mission of the water law is to protect and guarantee this resource, as well as to distribute it among the multiple users and establish responsible bodies and the tools for their management.

The objective of the Course on Water Law in the light of Water Governance is to promote the dissemination of the legal knowledge that guides water policy and identify the challenges that need to be overcome. The legislation is one aspect of the governance of water resources and understanding it is essential to enhancing the management. Therefore, the intention is to present the legal platform that regulates the water law in Brazil and to demonstrate how it influences the development of governance, allocates the responsibilities for water management, delimits the responsible bodies and determines the management principles and tools, as well as demanding the building of an integrated and participative management format.

The diffusion of legal knowledge among the key participants is fundamental to improving the workings of the bodies responsible for the management and to their control by society, as well as helping to protect the water resources and negotiate conflicts over water usage.

The course is entirely in the distance learning format and is organized in four units:

- Unit 1: The Law in the Development of Fresh Water Governance (8 classroom hours);
- Unit 2: General Overview of the National Water Resources Policy (18 classroom hours);
- Unit 3: The Legal Treatment of Groundwaters in Brazilian Law (13 classroom hours);
- Unit 4: Water Governance and Management Integration: Building a Nexus (13 classroom hours).

The total course workload is 52 hours, comprising 44 hours of text and 8 hours of videos. The content of the didactic material was specially developed for the course, including obligatory and supplementary reading and a glossary, as well as activities to facilitate assimilation. The content of the video materials comprises institutional videos on related subjects, documentaries and video classes given by the collaborators. This material is devoted to deepening the subjects covered in the didactic material and relating successful management experiences.

The target audience is the professionals involved in the management of fresh water, notably the members of the National System for the Management of Water Resources, whether they be from the public authorities, the private sector or civil society. The course aims to train these professionals to enable them to understand and deepen the legal platform for the management of fresh water. It is not necessary to have legal training to participate in the course.

At the end of the training course, comprising those four units, the participant is expected to be able to: understand the legal aspects of water management; incorporate within their professional practice the analytical approaches to the law and recognize the principal rights and obligations imposed by the law governing fresh water.

Pilar Carolina Villar
Professor at the Federal University of São Paulo (UNIFESP)
TABLE OF CONTENTS

UNIT 1. THE LAW IN THE DEVELOPMENT OF FRESH WATER GOVERNANCE ............................................................ 5

1.1 THE WATERS ACT AND THE CENTRALIZED MANAGEMENT MODEL................................................................. 7
1.2 THE NEW ENVIRONMENTAL CONSTITUTIONAL ORDER AND THE PROTECTION OF WATERS .............. 8
1.3 LEGAL NATURE OF FRESH WATER: ENVIRONMENTAL ASSET, SOCIAL ASSET AND ECONOMIC ASSET ...... 10
1.4 CONSTITUTIONAL DOMAIN OF FRESH WATERS ...............................................................................................12
1.5 CONSTITUTIONAL JURISDICTION IN WATER ISSUES ..........................................................................................15
1.6 ADMINISTRATIVE JURISDICTION IN WATER MATTERS ....................................................................................15
   1.6.1 EXCLUSIVE MATERIAL JURISDICTION OF THE UNION ........................................................................... 17
   1.6.2 EXCLUSIVE MATERIAL JURISDICTION OF MUNICIPALITIES .................................................................. 18
   1.6.3 REMAINING MATERIAL JURISDICTION OF STATES .....................................................................................18
   1.6.4 COMMON MATERIAL JURISDICTION .........................................................................................................18
1.7 LEGISLATIVE JURISDICTION ON FRESH WATER ISSUES .................................................................................19
   1.7.1 UNION’S RESERVED POWER .....................................................................................................................20
   1.7.2 CONCURRENT JURISDICTION .........................................................................................................................21
   1.7.3 REMAINING LEGISLATIVE JURISDICTION OF STATES ....................................................................................22
   1.7.4 EXCLUSIVE AND SUPPLEMENTARY LEGISLATIVE JURISDICTION OF THE MUNICIPALITY .......... 22
   1.7.5 IF THE JURISDICTION TO LEGISLATE ON WATERS IS PRIVATE TO THE UNION, WHY DO THE STATES HAVE STATE LAWS ON THE SUBJECT? .................................................................22
1.8 FEDERAL LAW NO. 9.433/1997: A NEW PARADIGM IN THE MANAGEMENT OF FRESH WATERS ........... 23
   1.8.1 KEY ASSUMPTIONS OF THE NEW WATER RESOURCES POLICY .......................................................... 24
       1.8.1.1 PUBLIC CHARACTER OF WATER ........................................................................................................... 24
       1.8.1.2 A SCARCE ASSET WITH ECONOMIC VALUE .................................................................................. 24
       1.8.1.3 PRIORITY OF HUMAN CONSUMPTION AND WATERING OF ANIMALS ...................................... 25
       1.8.1.4 MULTIPLE USES OF WATER ............................................................................................................. 25
       1.8.1.5 THE RIVER BASIN AS A MANAGEMENT UNIT ............................................................................... 24
       1.8.1.6 THE RIVER BASIN AND THE CHALLENGE OF INTEGRATING SURFACE, UNDERGROUND, AND COASTAL WATERS ........................................................................................................... 28
       1.8.1.7 DECENTRALIZED AND PARTICIPATIVE MANAGEMENT ........................................................................ 29
## 1.8.2 Objectives

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
</tr>
</tbody>
</table>

## 1.8.3 General Guidelines for Action

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
</tr>
</tbody>
</table>

## 1.9 Human Right to Water and Sanitation in the Brazilian Legal System

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
</tr>
</tbody>
</table>

## 1.10 References

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
</tr>
</tbody>
</table>

## Unit 2. General Overview of the National Water Resources Policy

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1. The National Water Resources Management System</td>
<td>5</td>
</tr>
<tr>
<td>2.1.1. National Water Agency (ANA)</td>
<td>7</td>
</tr>
<tr>
<td>2.1.2. The National Water Resources Council (CNRH)</td>
<td>9</td>
</tr>
<tr>
<td>2.1.3. State Water Resources Councils</td>
<td>12</td>
</tr>
<tr>
<td>2.1.4. River Basin Committees: Federal and State Domain</td>
<td>12</td>
</tr>
<tr>
<td>2.1.5. Water Agencies</td>
<td>17</td>
</tr>
<tr>
<td>2.1.6. Delegated Entities</td>
<td>24</td>
</tr>
<tr>
<td>2.1.7. Water Resources State Agencies and Entities</td>
<td>27</td>
</tr>
<tr>
<td>2.1.8. Civil Water Resources Organizations</td>
<td>27</td>
</tr>
<tr>
<td>2.2. Water Resources Management Instruments</td>
<td>27</td>
</tr>
<tr>
<td>2.2.1. River Basin Plans</td>
<td>28</td>
</tr>
<tr>
<td>2.2.2. Granting of Right of Use of Water Resources</td>
<td>33</td>
</tr>
<tr>
<td>2.2.2.1. Flow Reference Rate</td>
<td>34</td>
</tr>
<tr>
<td>2.2.2.2. Insignificant Uses</td>
<td>36</td>
</tr>
<tr>
<td>2.2.3. Charging for the Use of Water Resources</td>
<td>37</td>
</tr>
<tr>
<td>2.2.4. Categorization of Watercourses (Surface and Groundwaters)</td>
<td>42</td>
</tr>
<tr>
<td>2.2.5. Water Resources Information System</td>
<td>49</td>
</tr>
<tr>
<td>2.3. Success Stories</td>
<td>51</td>
</tr>
<tr>
<td>2.3.1. The Case of the São Francisco River Basin</td>
<td>51</td>
</tr>
<tr>
<td>2.3.2. The Case of the Piracicaba, Capivari, and Jundiaí River Basins</td>
<td>55</td>
</tr>
<tr>
<td>2.4. Bibliographic References</td>
<td>59</td>
</tr>
</tbody>
</table>

## Unit 3. The Legal Treatment of Groundwaters in Brazilian Law

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1. Unveiling the Brazilian Underground Waters and Aquifers: Features and Importance</td>
<td>5</td>
</tr>
<tr>
<td>3.2. The Groundwater Domain</td>
<td>11</td>
</tr>
<tr>
<td>3.3. Mineral, Thermal, Gaseous, Potable Table Water, or Water for Bathing Purposes: Water Resources Under the Aegis of the Mineral System</td>
<td>13</td>
</tr>
</tbody>
</table>
3.4 THE NATIONAL WATER RESOURCES POLICY INSTRUMENTS AND GROUNDWATERS .......................................................... 16
  3.4.1 WATER RESOURCES PLANS ........................................................................................................................................... 17
  3.4.2 CATEGORIZATION OF GROUNDWATER BODIES ............................................................................................................. 17
  3.4.3 GRANTING OF GROUNDWATER RESOURCES .................................................................................................................. 18
  3.4.4 CHARGING FOR THE USE OF WATER RESOURCES ........................................................................................................ 19
  3.4.5 WATER RESOURCES MANAGEMENT SYSTEM ................................................................................................................... 19
3.5 THE MAIN LEGAL BASES FOR GROUNDWATER MANAGEMENT .................................................................................................................. 20
3.6 SPECIFIC INITIATIVES FOR THE PROTECTION OF GROUNDWATERS ..................................................................................... 22
  3.6.1 RESTRICTIVE USE AREAS: AREAS FOR THE RESTRICTION AND CONTROL OF GROUNDWATERS, WELL PROTECTION PERIMETERS, AND AQUIFER PROTECTION AREAS .................................................................................................................. 22
  3.6.2 REGISTER OF GROUNDWATER USERS ................................................................................................................................................. 24
  3.6.3 GROUNDWATER MONITORING NETWORKS ......................................................................................................................... 25
  3.6.4 ARTIFICIAL RECHARGE OF AQUIFERS .............................................................................................................................................. 27
  3.6.5 MANAGEMENT OF CONTAMINATED AREAS ......................................................................................................................... 27
3.7 LEGAL IMPLICATIONS OF IRREGULAR USE OF GROUNDWATERS (SANCTIONS) ............................................................................................................................................. 28
3.8 THE CASE OF THE GUARANI AQUIFER SYSTEM ......................................................................................................................... 32
  3.8.1 THE LEGAL TREATMENT OF THE GUARANI AQUIFER .............................................................................................................. 38
3.9 THE MANAGEMENT OF GROUNDWATERS AND THE NEED FOR COORDINATION ......................................................................................................................... 39
3.10 REFERENCES ......................................................................................................................................................................................... 40

UNIT 4 WATER GOVERNANCE AND MANAGEMENT INTEGRATION: BUILDING A NEXUS ............................................................. 5
4.1 ENVIRONMENT, WATER AND LAW ......................................................................................................................................................... 5
4.2 INTERNATIONAL ENVIRONMENTAL LAW AND THE WATERS ................................................................................................. 6
4.3 BRAZILIAN ENVIRONMENTAL LAW AND THE WATERS ......................................................................................................................... 9
  4.3.1 FEDERAL CONSTITUTION: THE RIGHT TO AN ECOLOGICALLY BALANCED ENVIRONMENT ............................................................................................................................................. 9
  4.3.2 THE NATIONAL ENVIRONMENTAL POLICY AND THE NATIONAL ENVIRONMENTAL SYSTEM ............................................................................................................................................. 10
  4.3.3 THE NATIONAL ENVIRONMENTAL POLICY AND THE INSTRUMENTS FOR ENVIRONMENTAL PROTECTION ............................................................................................................................................. 11
  4.3.4 ENVIRONMENTAL ZONING ......................................................................................................................................................... 12
  4.3.5 ENVIRONMENTAL IMPACT EVALUATION ............................................................................................................................................. 12
  4.3.6 ENVIRONMENTAL LICENSING ......................................................................................................................................................... 13
  4.3.7 PROTECTED TERRITORIAL SPACES ............................................................................................................................................. 14
    4.3.7.1 NATIONAL SYSTEM OF CONSERVATION UNITS ............................................................................................................. 14
    4.3.7.2 THE FOREST CODE ......................................................................................................................................................... 15
UNIT 1

FIGURE 1: SURFACE WATER RESOURCES DOMAIN ................................................................. 14
FIGURE 2: THE RIVER BASIN AND ITS ELEMENTS ............................................................ 26
FIGURE 3: BRAZILIAN HYDROGRAPHIC REGIONS ............................................................ 27

UNIT 2

FIGURE 1: SINGREH’S MATRIX AND OPERATION ............................................................. 6
FIGURE 2: INTERSTATE COMMITTEES .................................................................................. 16
FIGURE 3: BASIC SYSTEM OF MANAGEMENT IN RIVER BASINS ..................................... 18
FIGURE 4: RELATIONS BETWEEN THE WATER AGENCY, SINGREH AGENCIES, AND OTHER PARTNERS ................................................................. 22
FIGURE 5: SÃO FRANCISCO HYDROGRAPHIC REGION ..................................................... 52
FIGURE 6: MAP OF THE PCJ BASINS .............................................................................. 55

UNIT 3

FIGURE 1: DIAGRAM OF THE PORE STRUCTURE IN A SEDIMENTARY AQUIFER ......... 6
FIGURE 2: PHOTO OF A SANDSTONE ROCK SAMPLE ...................................................... 6
FIGURE 3: DIAGRAM OF FRACTURES IN FRACTURED AQUIFERS ................................................................. 6
FIGURE 4: BASALTS FROM THE SERRA GERAL AQUIFER, WITH VERTICAL FRACTURES ............................ 6
FIGURE 5: DIAGRAM OF CHANNELS FROM A KARST AQUIFER. .................................................................. 7
FIGURE 6: LAGO AZUL CAVE, IN BONITO (MS) ....................................................................................... 7
FIGURE 7: DIAGRAM OF AN UNCONFINED (FREE) AQUIFER ....................................................................... 7
FIGURE 8: DIAGRAM OF A CONFINED AQUIFER .......................................................................................... 8
FIGURE 9: DIAGRAM OF A SEMI-CONFINED AQUIFER ................................................................................ 8
FIGURE 10: RELATIONSHIP BETWEEN RIVERS AND AQUIFERS ................................................................. 10
FIGURE 11: CPRM’S (2007) MAP OF BRAZIL’S HYDROGEOLOGICAL DOMAINS AND SUB-DOMAINS, WHICH
WAS USED AS AN BACKGROUND FOR INDICATION OF THE CONCESSIONS FOR THE MINING OF MINERAL
AND POTABLE TABLE WATERS IN THE BRAZILIAN TERRITORY ................................................................. 14
FIGURE 12: MAP SHOWING THE DISTRIBUTION OF THE 374 AQUIFER-BASED MONITORING STATIONS IN RIMAS .......................... 26
FIGURE 13: SCHEMATIC MAP OF THE GUARANI AQUIFER SYSTEM ................................................................ 33
FIGURE 14: THE GUARANI AQUIFER SYSTEM AND ITS MANAGEMENT ZONES ........................................... 35
FIGURE 15: GUARANI AQUIFER SYSTEM AND AREAS WITH THE POTENTIAL FOR TRANSBOUNDARY CONFLICT ....... 37

UNIT 4
FIGURE 1: DOMESTIC SUPPLY OF ELECTRICITY BY SOURCE ..................................................................... 34
FIGURE 2: SALTO DE SETE QUEDAS REGION ............................................................................................... 35

LIST OF TABLES

UNIT 1
TABLE 1 – SUMMARY OF ADMINISTRATIVE JURISDICTIONS FOR THE FEDERAL ENTITIES AND THEIR
IMPACT ON WATER RESOURCES .................................................................................................................. 16
TABLE 2 – SUMMARY OF WATER-RELATED LEGISLATIVE POWERS FOR FEDERAL ENTITIES .................. 19

UNIT 2
TABLE 1: DIFFERENCES BETWEEN PUBLIC ARRANGEMENTS IN WATER AGENCY FUNCTIONS ................ 21
TABLE 2: RELATIONSHIP BETWEEN THE JURISDICTIONS OF THE WATER AGENCY AND THE CBH ............. 23
TABLE 3: DIFFERENCES BETWEEN PRIVATE LAW FOUNDATIONS AND CIVIL ASSOCIATIONS
IN WATER AGENCY DUTIES .......................................................................................................................... 26
TABLE 4: RELATIONSHIP BETWEEN SINGREH BODIES AND INSTRUMENTS FROM THE WATER
RESOURCES POLICY ........................................................................................................................................ 51
TABLE 5: AMOUNTS CHARGED TO USERS WITH GRANTS FOR WATER CATCHMENTS AND CONSUMPTION,
AND EFFLUENT DISCHARGE ......................................................................................................................... 54
TABLE 6: CHARGING FOR THE USE OF WATER RESOURCES UNDER THE DOMAIN OF THE STATE OF SÃO PAULO......57
TABLE 7: CHARGING FOR THE USE OF WATER RESOURCES UNDER THE DOMAIN OF THE UNION ..................... 58
TABLE 8: CHARGING FOR THE USE OF WATER RESOURCES UNDER THE DOMAIN OF THE STATE OF MINAS GERAIS ... 58

UNIT 3
TABLE 1 - CLASSIFICATION OF GROUNDWATER ACCORDING TO ART. 3 OF CONAMA RESOLUTION NO. 396/2008..... 18
TABLE 2: TABLE OF SUMMARIES WITH THE LEGAL BASES FOR GROUNDWATER MANAGEMENT AT THE FEDERAL LEVEL .................................................................................................................... 20
TABLE 3: ADMINISTRATIVE VIOLATIONS BOX ...........................................................................................................30
TABLE 4: ENVIRONMENTAL CRIMES BOX ..................................................................................................................31

UNIT 4
TABLE 1: INTERNATIONAL CONVENTIONS RATIFIED BY BRAZIL FOR THE PROTECTION OF THE ENVIRONMENT THAT IMPACT WATERS ..............................................................................................7
TABLE 2: APPS TYPES SET FORTH IN THE FOREST CODE ..........................................................................................18

LIST OF VIDEOS

UNIT 1
VIDEO 1: THE WATERS’ PATH ...........................................................................................................................................7
VIDEO 2: BRAZIL’S WATER LAW .......................................................................................................................................23
VIDEO 3: RATIONAL USE OF WATER ..........................................................................................................................24
VIDEO 4: MULTIPLE USES .............................................................................................................................................25

UNIT 2
VIDEO 1: NATIONAL WATER AGENCY ..............................................................................................................................7
VIDEO 2: JOINT REPORT ON WATER RESOURCES 2017 ..............................................................................................8
VIDEO 3: RIVER BASIN COMMITTEE ...............................................................................................................................13
VIDEO 4: WATER RESOURCES PLANS AND THE CATEGORIZATION OF WATER BODIES ..................................28
VIDEO 5: GRANTING OF RIGHT OF USE OF WATER RESOURCES ..............................................................................33
VIDEO 6: CHARGING FOR THE USE OF WATER ...........................................................................................................38
VIDEO 7: THE NATIONAL HYDROMETEOROLOGICAL NETWORK ...............................................................................49

UNIT 3
VIDEO 1: GROUNDWATER – AQUIFERS (ÁGUAS SUBTERRANEAS – AQUIFEROS) .........................................................9
VIDEO 2: THE MARVELOUS GUARANI AQUIFER VIDEO (MAGNÍFICO AQUIFERO GUARANI) ................................38
UNIT 4

VIDEO 1: LEARN ABOUT THE FRESHWATER PROGRAM. ................................................................. 11
VIDEO 2: LIVE VOLUME PROJECT: WHERE DOES WATER COME FROM? .............................. 14
VIDEO 3: FLYING RIVERS. ........................................................................................................... 14
VIDEO 4: “ENTRE RIOS” (BETWEEN RIVERS) ......................................................................... 25
VIDEO 5: THE IRRIGATION ATLAS: WATER USE IN IRRIGATED AGRICULTURE. ................... 31
VIDEO 6: VALUATION OF ECOSYSTEM SERVICES: CLASS OF VALUES. ............................... 33
VIDEO 7: WATER PRODUCER PROGRAM. .................................................................................. 33
VIDEO 8: DAM SAFETY IN BRAZIL. .......................................................................................... 36
VIDEO 9: CULTIVATING GOOD WATER PROGRAM. ................................................................. 37
VIDEO 10: GREENHOUSE EFFECT. .......................................................................................... 38
VIDEO 11: GLOBAL ENVIRONMENTAL CHANGE. ................................................................. 38
VIDEO 12: NATURAL CLIMATE CHANGE .............................................................................. 38
VIDEO 13: FUTURE CLIMATE CHANGE SCENARIOS ............................................................. 38
VIDEO 14: IMPACTS OF CLIMATE CHANGE IN BRAZIL AND WORLDWIDE. ....................... 38
VIDEO 15: WATER AND CLIMATE CHANGE. ......................................................................... 38

LIST OF VIDEO LESSONS AND TESTIMONIALS

UNIT 1

VIDEO LESSON 1: PRIVATIZATION OF WATER SERVICES AND THE HUMAN RIGHT TO WATER
BY PROF. DR. ANDREIA COSTA VIEIRA .................................................................................. 30

UNIT 2

VIDEO LESSON 1: GRANTING OF WATER RESOURCES AND THE FLOW REFERENCE RATES
BY PROF. MARCO ANTÔNIO PALERMO .................................................................................. 35
VIDEO TESTIMONIAL 1 – GOVERNANCE OF FRESH WATER IN THE PCJ BASIN – PART 1
EDUARDO CUOCO LÉO .......................................................................................................... 58
VIDEO TESTIMONIAL 2 – GOVERNANCE OF FRESH WATER IN THE PCJ BASIN – PART 2
SÉRGIO RAZERA .................................................................................................................. 58

UNIT 3

VIDEO LESSON 1: PERSPECTIVES AND CHALLENGES FOR THE GOVERNANCE OF AQUIFERS
BY PROF. PILAR CAROLINA VILLAR ...................................................................................... 22
UNIT 4

VIDEO LESSON 1: THE SÃO PAULO MASTER PLAN AND THE INSTRUMENTS TO PROMOTE WATER MANAGEMENT IN THE CITY BY PROF. DR. KAZUO NAKANO. ................................................................. 26

VIDEO LESSON 2: THE CONNECTION BETWEEN WATER RESOURCES AND BASIC SANITATION: ECONOMIC IMPACTS AND GOVERNANCE BY PROF. DR. MARIA LUIZA MACHADO GRANZIERA......................... 27

VIDEO LESSON 3: PARIS AGREEMENT, RENEWABLE ENERGY AND WATER SECURITY BY PROF. SARA GURFINKEL MARQUES DE GODOY................................................................. 38

LIST OF ABBREVIATIONS

AEB – Brazilian Space Agency
ANA – National Water Agency
ANEEL- National Electricity Sector Regulatory Agency
ANM – National Mining Agency
ANVISA – Brazilian Health Regulatory Agency
APP – Permanent Preservation Area
CAR – Rural Environmental Register
CEREGAS – Regional Centre for Groundwater
CNRH – National Water Resources Council
CONAMA – National Environment Council
CPRM – Geological Survey of Brazil
DNPM – National Department for Mineral Production
EIA/RIMA – Environmental Impact Study / Environmental Impact Report
GEF – Global Environmental Facility
IBAMA – Brazilian Institute for the Environment and Renewable Natural Resources
ICMBIO – Chico Mendes Institute for the Conservation of Biodiversity
INPE – National Institute for Space Research
MERCOSUL – Southern Common Market
MMA – Ministry of the Environment
OAS – Organization of American States
PNMC – National Policy on Climate Change
SINGREH – National System for Water Resources Management
SISNAMA – National Environmental System
SNIS – National System for Information about Sanitation
SNUC – National System of Conservation Areas
WATER GOVERNANCE AND MANAGEMENT INTEGRATION: BUILDING NEXUS

Organization
PILAR CAROLINA VILLAR

Authors
PILAR CAROLINA VILLAR
MARIA LUIZA MACHADO GRANZIERA
# TABLE OF CONTENTS

4 WATER GOVERNANCE AND MANAGEMENT INTEGRATION: BUILDING NEXUS ................................................................. 5  
4.1 ENVIRONMENT, WATER AND LAW .......................................................................................................................... 5  
4.2 INTERNATIONAL ENVIRONMENTAL LAW AND THE WATERS .................................................................................. 6  
4.3 BRAZILIAN ENVIRONMENTAL LAW AND THE WATERS ............................................................................................ 9  
  4.3.1 FEDERAL CONSTITUTION: THE RIGHT TO AN ECOLOGICALLY BALANCED ENVIRONMENT ................... 9  
  4.3.2 THE NATIONAL ENVIRONMENTAL POLICY AND THE NATIONAL ENVIRONMENTAL SYSTEM ........ 10  
  4.3.3 THE NATIONAL ENVIRONMENTAL POLICY AND THE INSTRUMENTS FOR ENVIRONMENTAL PROTECTION ................................................................................................................................................ 11  
  4.3.4 ENVIRONMENTAL ZONING ............................................................................................................................ 12  
  4.3.5 ENVIRONMENTAL IMPACT EVALUATION ..................................................................................................... 12  
  4.3.6 ENVIRONMENTAL LICENSING ...................................................................................................................... 13  
  4.3.7 PROTECTED TERRITORIAL SPACES .................................................................................................................. 14  
    4.3.7.1 NATIONAL SYSTEM OF CONSERVATION UNITS ......................................................................................... 14  
    4.3.7.2 THE FOREST CODE ........................................................................................................................................ 15  
    PERMANENT PRESERVATION AREAS ....................................................................................................................... 17  
    LEGAL RESERVE .................................................................................................................................................... 19  
    RESTRICTED USE AREAS ....................................................................................................................................... 21  
  4.3.8 NATIONAL ENVIRONMENTAL INFORMATION SYSTEM – SINIMA ......................................................................... 23  
4.4 URBAN TERRITORIAL SYSTEM AND THE WATER ........................................................................................................ 24  
4.5 BASIC SANITATION AND WATER RESOURCES ......................................................................................................... 26  
4.6 AGRICULTURE AND WATER ....................................................................................................................................... 28  
  4.6.1 FOREST CODE AND AGRICULTURAL PROPERTIES ............................................................................................ 31  
    4.6.1.1 THE RURAL ENVIRONMENTAL REGISTRY – CAR AND ENVIRONMENTAL REGULARIZATION PROGRAMS .............................................................................................................................................................................. 31  
    4.6.1.2 SUPPORT AND INCENTIVE PROGRAM FOR ENVIRONMENTAL PRESERVATION AND RECOVERY ................................................................................................................................................................. 32  
4.7 ENERGY AND WATER ..................................................................................................................................................... 33  
4.8 CLIMATE AND WATER .................................................................................................................................................. 37  
4.9 THE CHALLENGES OF BUILDING WATER GOVERNANCE IN THE LIGHT OF INTEGRATED WATER RESOURCES MANAGEMENT ......................................................................................................................................................... 42  
4.10 REFERENCES ........................................................................................................................................................... 43
LIST OF FIGURES

FIGURE 1: DOMESTIC SUPPLY OF ELECTRICITY BY SOURCE ................................................................. 34
FIGURE 2: SALTO DE SETE QUEDAS REGION ...................................................................................... 35

LIST OF TABLES

TABLE 1: INTERNATIONAL CONVENTIONS RATIFIED BY BRAZIL FOR THE PROTECTION OF THE ENVIRONMENT
THAT IMPACT WATERS ...................................................................................................................... 7
TABLE 2: APPS TYPES SET FORTH IN THE FOREST CODE .................................................................... 18

LIST OF VIDEOS

VIDEO 1: LEARN ABOUT THE FRESHWATER PROGRAM. ................................................................. 11
VIDEO 2: LIVE VOLUME PROJECT: WHERE DOES WATER COME FROM? ........................................ 14
VIDEO 3: FLYING RIVERS. .................................................................................................................. 14
VIDEO 4: “ENTRE RIOS” (BETWEEN RIVERS) ..................................................................................... 25
VIDEO 5: THE IRRIGATION ATLAS: WATER USE IN IRRIGATED AGRICULTURE. .................................. 31
VIDEO 6: VALUATION OF ECOSYSTEM SERVICES: CLASS OF VALUES. ........................................... 33
VIDEO 7: WATER PRODUCER PROGRAM. .......................................................................................... 33
VIDEO 8: DAM SAFETY IN BRAZIL. ................................................................................................... 36
VIDEO 9: CULTIVATING GOOD WATER PROGRAM. ........................................................................... 37
VIDEO 10: GREENHOUSE EFFECT. .................................................................................................... 38
VIDEO 11: GLOBAL ENVIRONMENTAL CHANGE. ............................................................................ 38
VIDEO 12: NATURAL CLIMATE CHANGE .......................................................................................... 38
VIDEO 13: FUTURE CLIMATE CHANGE SCENARIOS. ....................................................................... 38
VIDEO 14: IMPACTS OF CLIMATE CHANGE IN BRAZIL AND WORLDWIDE. .................................... 38
VIDEO 15: WATER AND CLIMATE CHANGE. ..................................................................................... 38

LIST OF VIDEO LESSONS AND TESTIMONIES

VIDEO LESSON 1: THE SÃO PAULO MASTER PLAN AND THE INSTRUMENTS TO PROMOTE WATER
MANAGEMENT IN THE CITY BY PROF. DR. KAZUO NAKANO. ............................................................. 26
VIDEO LESSON 2: THE CONNECTION BETWEEN WATER RESOURCES AND BASIC SANITATION:
ECONOMIC IMPACTS AND GOVERNANCE BY PROF. DR. MARIA LUIZA MACHADO GRANZIERA. .............. 27
VIDEO LESSON 3: PARIS AGREEMENT, RENEWABLE ENERGY AND WATER SECURITY
BY PROF. SARA GURFINKEL MARQUES DE GODOIY. .......................................................................... 38
The concept of an integrated water resources management has gained prominence over the last few decades, along with an understanding of the connections between environmental resources and their multiple uses by distinct actors and sectors. In this context, the term nexus emerges, which is used in the literature in several ways, but linked to the idea of understanding how the various economic and social sectors are linked in the use of environmental resources, in order to verify the coherence of intersectoral governance (Strasser et al, 2016). Understanding these relationships is essential for stimulating water governance. These distinct sectors have a positive or negative influence on the qualitative and/or quantitative status of the waters and, as such, require governance schemes that promote cross-sectoral convergences.

In the specific case of water resources, several Brazilian regions present problems related to scarcity, on the other hand, the demand for the resource does not decrease and, in some cases, increases. Whether caused by climatic conditions or reductions in reserves – combined with higher demands – diminished water availability jeopardizes water, energy, food and environmental security while triggering conflicts between sectors (Strasser et al, 2016). At the same time, the policies and institutions that should be coordinating management, in order to avoid this situation or mediate disputes are usually structured by niche segments with little or no convergence between them. In this sense, the more indispensable and scarce is the resource, the more evident becomes the need to build these nexus (interconnections) (Strasser et al., 2016).

The law plays an important role in this construction. The law’s interaction with public policies consists of several processes. Public policies are either externalized through laws in a formal manner (issued by lawmakers) or in a material sense (regulatory acts enacted by the Executive branch, including decrees, regulations, ordinances, resolutions, circulars, provisional, and operational instructions, and others) (Coutinho, 2013). Law permeates public policies in a variety of ways, such as in establishing its objectives and expected results, in stipulating institutional arrangements, or constructing participatory spaces (Coutinho, 2013). It also acts on defining agendas and issues, conceiving proposals and actions, as well as evaluating programs (Coutinho, 2013).

Thus, in previous units we studied how the law covered water management. This law has gained body and relevance to the point of establishing the so-called Water Law, which has a sectoral focus on the resource and even needs to build bridges between the management of the various phases of water in the hydrological cycle. This unit will attempt to confirm how the law in other areas converges with the water issue (especially related to the following themes: environment, agriculture, urban planning, sanitation and energy). This unit is not intended to exhaust each of these rights and topics, since each of them deserves a course of its own, but to indicate their points of convergence with the water theme.

Public policies generally have a tradition of sectoral planning and measures. However, environmental, agriculture, urban planning, sanitation, and energy policies somehow contemplated the waters, with a greater or lesser degree of interdependence.

### 4.1 Environment, Water and Law

Because water is an environmental resource, its availability is directly associated with the environmental conditions in which it is found. Environmental degradation causes a decrease in water resources, and this has a direct impact on the local, regional and even global water balance.

From this perspective, the environment becomes a legal asset to be protected by Law. Environment concern creates synergies that are configured on an
international and domestic scale. These movements stimulated the advent of Environmental Law, which is primarily structured at the international level and is gradually incorporated by the countries.

4.2 International Environmental Law and the Waters

The International Environmental Law (IEL) is a branch of International Law that “intends to relate subjects under International Law with the environment and seek a common purpose, which is the protection (and management) of this environment” (Rei, 2006, p.5). This law is a product of the States. But it is heavily influenced by International Organizations and NGOs, making soft law an important source of this Right (Rei, 2006).

The IEL’s work is guided by two dimensions. The first is to encourage the protection of the environment by means of the International Law instruments. The second is to inspire countries to establish domestic environmental laws and standards, as well as adopting environmental principles (Birnie, Boyle and Redgwell, 2009).

This right gained to prominence in 1970, with the United Nations Conference on the Human Environment held in Stockholm in 1972, and was consolidated with the United Nations Conference on the Environment and Development, also known as the Earth Summit or Rio-92, held in 1992 in Rio de Janeiro (Soares, 2001).

The Stockholm Declaration, or the United Nations Conference on the Human Environment, laid the foundations for the construction of IEL, and influenced national law of several countries. This was the case of Brazil, which created the Special Secretariat for the Environment (1973), which was replaced by the Ministry of the Environment to plan, coordinate, supervise and control, as a federal body, the national policy and government guidelines established for the environment (Law No. 8,028/1990) and began to issue environmental standards. Prior to this period, there had been a few provisions that addressed natural resources, like the Water Code, but the environmental focus was incidental. The primary concern was in assuring the protection of private rights in neighborhood disputes, or the control of certain activities by the Public Authority, particularly the use of hydraulic potential (Granziera, 2014, Viegas, 2005, Milaré, 2015).


Water was a central theme in discussions on the International Environmental Law, whether during the cycle of major conferences or through specific conferences. Among the general conferences, the following stand out: Stockholm Conference (1972); Rio-92; World Summit on Sustainable Development in Johannesburg, South Africa (2002); United Nations Conference on Sustainable Development, Rio+20, held in Rio de Janeiro (2012). In the context of the specific ones, the following can be mentioned: The United Nations Conference on Water at Mar del Plata, Argentina (1977); International Conference on Water and Environment, Dublin, Ireland (1992); The Bonn Conference on Freshwater, Bonn, Germany (2000); Conference on Water in Stockholm, Sweden (2007) (Ribeiro, 2005).

In addition to the Conferences, whose documents influenced practices by States, the International Environmental Law stimulated the signing of several multilateral conventions that had a direct impact on the quality and quantity of water. Chart 1 shows those to which Brazil is a party.
Table 1: International Conventions Ratified by Brazil for the Protection of the Environment that impact Waters

<table>
<thead>
<tr>
<th>MULTILATERAL CONVENTIONS FOR ENVIRONMENTAL PROTECTION RATIFIED BY BRAZIL</th>
<th>SCOPE</th>
<th>STATUS AND DATE OF RATIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIODIVERSITY AND WATER</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Convention on Wetlands of International Importance, particularly as a Habitat for Waterfowl, Ramsar</strong></td>
<td>Protection of wetlands and associated fauna</td>
<td>In effect 9/24/1993</td>
</tr>
<tr>
<td><strong>Convention on Biological Diversity</strong></td>
<td>Conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of benefits arising from the use of genetic resources</td>
<td>In effect 2/28/1994</td>
</tr>
<tr>
<td><strong>Cartagena Protocol on Biosafety</strong></td>
<td>Sets regulations on the transboundary movement, transit, handling and use of all living modified organisms that may have adverse effects on biological diversity or human health.</td>
<td>In effect 11/24/2003</td>
</tr>
<tr>
<td><strong>The International Convention for the Control and Management of Ships’ Ballast Water and Sediments</strong></td>
<td>To prevent environmental and health damages resulting from the transfer of Harmful Aquatic Organisms (HAO) and Pathogenic Agents (PA) through the control and management of the Ballast Water from ships and the sediments contained therein.&quot;</td>
<td>State party 10/15/2005</td>
</tr>
<tr>
<td><strong>VARIABILITY AND CLIMATE CHANGE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vienna Convention for the Protection of the Ozone Layer</strong></td>
<td>Control of human activities that modify or could modify the ozone layer.</td>
<td>In effect 3/19/1990</td>
</tr>
<tr>
<td><strong>The Montreal Protocol on Substances that deplete the Ozone Layer</strong></td>
<td>Reduction in the consumption of controlled substances that threaten the ozone layer, according to the parameters established for Group 1 and Group 2 countries.</td>
<td>In effect 3/19/1990</td>
</tr>
<tr>
<td><strong>United Nations Framework Convention on Climate Change</strong></td>
<td>Attaining the stabilization of concentrations of greenhouse gases in the atmosphere, at a level that would prevent anthropogenic interference (resulting from human action) in the climactic system</td>
<td>In effect 2/28/1994</td>
</tr>
<tr>
<td><strong>Kyoto Protocol</strong></td>
<td>Limitation and reduction of greenhouse gas emissions that are not controlled through the Montreal Protocol, by the countries listed in Annex I, according to the percentages expressed in Annex B, in order to stabilize concentrations of greenhouse gases in the atmosphere to a level that prevents anthropogenic interference in the climate system.</td>
<td>In effect 8/23/2002</td>
</tr>
<tr>
<td><strong>Paris Agreement</strong></td>
<td>Fortify the global response to the threat of climate change by maintaining the rise in global average temperature well below 2°C in relation to pre-industrial levels, and carry out efforts to limit this increase in temperature to 1.5°C in relation to pre-industrial levels. Increase adaptive capacity and resilience to climate change, and promote the development of a low emission of greenhouse gases.</td>
<td>In effect 9/12/2016</td>
</tr>
</tbody>
</table>
### MULTILATERAL CONVENTIONS FOR ENVIRONMENTAL PROTECTION RATIFIED BY BRAZIL

<table>
<thead>
<tr>
<th><strong>SCOPE</strong></th>
<th><strong>STATUS AND DATE OF RATIFICATION</strong></th>
</tr>
</thead>
</table>

#### SOIL, WATER, AND CLIMATE

**United Nations Convention to Combat Desertification in Countries Affected by Severe Drought and/or Desertification, Particularly in Africa**
- Combating desertification and mitigating the effects of drought in countries affected by severe drought and/or desertification, particularly in Africa
- In effect 6/25/1997

#### ENVIRONMENTAL POLLUTION

**Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal**
- Controlling the transboundary movements of hazardous wastes and their disposal.
- In effect 10/1/1992

**Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade**
- To promote shared responsibility and cooperative efforts between the Parties in international trade involving specific hazardous chemicals, in an attempt to protect human health and the environment, and contributing to the correct use of these products, facilitating the exchange of information on their characteristics, establishing a decision-making process for its import and export, and disseminating the resulting decisions to the Parties
- In effect 6/16/2004

**Stockholm Convention on Persistent Organic Pollutants (POPs)**
- To protect human health and the environment from persistent organic pollutants
- In effect 6/16/2004

**Minamata Convention**
- To protect human health and the environment from anthropogenic emissions, and releases of mercury and mercury compounds
- In effect 7/4/2017

#### WORLD CULTURAL AND NATURAL HERITAGE

**Convention on the Protection of World Cultural and Natural Heritage**
- Identify, protect, conserve, develop, and convey the cultural and natural heritage to future generations
- In effect 9/1/1977

Brazil is a signatory for the major multilateral conventions related to environmental issues, but has not signed the United Nations Convention on the Law of Non-Navigational Uses of International Watercourses, which is the instrument specifically dedicated to how international watercourses are used.

The MERCOSUR integration process has also incorporated the environmental issue through the Mercosur Environmental Framework Agreement and the Additional Protocol to the MERCOSUR Framework Agreement on the Environment in Matters of Environmental Cooperation and Assistance. The Framework Agreement was signed in Asunción (Paraguay) on June 21, 2001, by Argentina, Brazil, Paraguay, and Uruguay, and became valid on June 23, 2004. Its objective is to promote cooperation for the protection of the environment and the rational use of natural resources by MERCOSUR member countries. The Additional Protocol was signed in Puerto Iguazu on July 7, 2004, and entered into force on April 21, 2012. It was devised to foster cooperation and assistance in case of emergencies that actually or potentially cause risks to the environment and the population; to synchronize the procedures for taking action in these cases; and to promote the exchange of information.

In addition to the multilateral conventions and treaties agreed upon under the scope of the
regional integration process, Brazil has signed several international treaties with neighboring countries for environmental protection and water resources. Several of these treaties focused on the protection or shared use of river basins, border, or successive rivers, or on infrastructure projects linked to energy or navigation. The Amazon Basin, La Plata Basin and its sub-basins, the Mirim Lagoon and Guarani Aquifer have international treaties, including 14 international organizations to promote the management of transboundary water resources in the region (Villar, Ribeiro, Sant’Anna, 2018).

4.3 Brazilian Environmental Law and the Waters

International efforts aided in consolidating environmental law within Brazil. This law can be defined as an autonomous legal branch that has its own concepts, principles, and assumptions. Its primary goal is to regulate human behavior through a complex of principles and provisions devised to protect the environment, mitigate environmental damage, and improve the overall quality of life for people (Sirvinskas, 2010, Villar and Cibim, 2017). In Brazil’s case, there has been a progressive advance in its coherence and breadth since the 1980s. Its main legal frameworks are based on the following instruments: a) the National Environmental Policy (Law No. 6.938/1981), which establishes the key environmental protection instruments, and the National Environmental System (SISNAMA); b) the Public Civil Action Law (Law No. 7.347/1985), which created the main procedural instrument for the defense of the environment and other diffuse and collective interests; c) The Federal Constitution of 1988, which determined a consortium constitutional engineering for environmental protection (art. 23, IV and art. 24, VI, VII and VIII), included environmental protection in the economic order (art. 170, VI) and in the exercise of the property right (art. 186, II), as well as enshrining the fundamental right to the ecologically balanced environment (art. 225); and (d) the Environmental Crimes Law (Law No. 9605/1998), which established criminal liability and initiated the systemization of administrative liability for conduct that proves harmful to the environment, which was regulated by Decree 6514/2008 (Milaré, 2015; Villar and Cibim, 2017).

The following are the main environmental instruments available to the public administration to foster integration between the environment and water, especially those provided for in the National Water Resources Policy.

4.3.1 Federal Constitution: the Right to an Ecologically Balanced Environment

The 1988 Federal Constitution is the formal key source of Environmental Law (Antunes, 2012). It defined the ownership of environmental assets, their domain and related jurisdictions and, for the first time, instituted a specific chapter for the environment, and mentioned it in several other headings and chapters. The highest point of the environmental treatment is found in Title VIII (Of the Social Order), in its Chapter VI, in art. 225.

The right to an ecologically balanced environment belongs to all people, and can be characterized as a fundamental right (Antunes, 2012, Machado, 2013). The term “asset of common use” conditioned the exercise of economic activity, and the right to property, to its social and environmental role, as prescribed in article 170, III and VI, which deals with the economic order.

Therefore, the environment concurrently has an individual and collective dimension, as explained by Amirante apud Machado (2013, p.151):

The environment is a public asset to be used and enjoyed by individuals and the public as a whole. The right to the environment belongs to each person, but not only to one person – the right is “transindividual”. Consequently, the right to the environment falls into the category of diffuse interest. It is not consumed by just one person, but is spread to an indeterminate collectivity.
The Public Authority assumed the role as the manager of environmental assets rather than an owner (Machado, 2013). Everyone has a right to an ecologically balanced environment. On the other hand, the duty to protect it rests with the whole community, insofar as it is their responsibility and within their power to defend it. But it was directly incumbent upon the Public Authority to ensure environmental conditions and control activities or business ventures that could compromise the quality of the environment, as had been outlined in Module 1.

4.3.2 The National Environmental Policy and the National Environmental System

Law No. 6.938/1981 is one of the key foundations of Environmental Law. This provision established the National Environmental Policy and the National Environmental System. Its goal is the “preservation, improvement, and recovery of environmental quality conducive to life, seeking to ensure conditions, within Brazil, for socioeconomic development, the interests of national security, and to protect the dignity of human life” (Art. 2). The inland, surface, and groundwaters were deemed environmental resources (Article 3), they are therefore part of the environmental protection system created by this legislation.

The protection of water is incorporated into the principles of this policy, both in the quality factor (Art. 2, sections I to IX), as well as the quantitative sense. Art. 2, section II, uses the term “rationalization of water use”, which allows an interpretation that incorporates both of these aspects.

This provision established a complex institutional system that was designed to ensure environmental assets, known as the National Environmental System (SISNAMA) (Art. 6 of Law 6.938/1981 and Art. 3 of Decree No. 99.274/1990). SISNAMA is a network of government agencies and institutions, at various levels of the Brazilian Federal Government, that was implemented to protect the environment (Antunes, 2012; Milaré, 2015). Its structure consists of the following agencies (Art. 6 of Law 6.938/1981, and Art. 3 of Decree nº 99.274/1990):

- higher body: the Government Council, with the function of advising the President of the Republic in the formulation of the national policy and in the government guidelines for the environment and environmental resources;
- consultative and deliberative body: the National Environmental Council (CONAMA), with the purpose of advising, studying and proposing guidelines to the Governing Council on governmental policies for the environment and natural resources and to make decisions, within its powers, on provisions and standards that are compatible with an ecologically balanced environment and are essential to the healthy quality of life;
- central body: Ministry of the Environment, as federal body, responsible for planning, coordinating, supervising, and controlling national policy and governmental guidelines established for the environment;
- executing bodies: the Brazilian Institute for the Environment and Natural Resources – IBAMA and the Chico Mendes Institute for Biodiversity Conservation – Instituto Chico Mendes, established to execute and enforce government policy and guidelines set for the environment, according to their respective jurisdictions;
- Sectional Bodies: the state agencies or entities responsible for rolling out programs, projects, and for the control and inspection of activities capable of causing environmental degradation;
- Local Bodies: municipal agencies or entities responsible for the control and supervision of these activities in their respective jurisdictions.

These bodies and entities, to the extent of their competence, will be responsible for establishing and coordinating the implementation of public policies aimed at improving environmental quality, which certainly includes water.

CONAMA is a collegiate and decision-making body, whose jurisdiction is established in Art. 8 of Law No. 6.938/1981 and Art. 7 of Decree No. 88.351/1983. Its duties include the establishment of provisions, criteria and standards related
to controlling and maintaining the quality of the environment, aimed at the rational use of environmental resources, particularly water resources "(Art. 8, VII). CONAMA is responsible for regulating the framework of waters and the conditions and standards of effluent discharge (see CONAMA Resolutions No. 357/2005, 370/2006, 396/2008, 397/2008 and 410/2009 and 430/2011).

The Ministry of the Environment (MMA), the body that replaced the Secretariat of the Environment of the Republic (Law No. 7.735/1989), had its competence regulated by art. 1 of Annex 1 of Decree No. 8.975/2017, which was repealed by Decree No. 9672/2019. Up to the time that Decree No. 8.975/2019 was issued, the MMA was not only responsible for SISNAMA, an authority that was maintained by the decree, but also for the coordination of SINGREH. Decree No. 8.975/2019 transferred the area of water resources and its institutional structure to the Ministry of Regional Development. The MMA actively worked on implementing and coordinating public policies to protect water resources and to promote access to water. This agency is responsible for SISNAMA. For example, the Fresh Water Program has established a permanent public policy for access to quality water for human consumption, through the implementation and management of desalination systems for brackish waters, and salt pans in the Brazilian semi-arid region. Video 1 exhibits this program in detail.

Watch:
Video 1: Learn about the Freshwater Program.

IBAMA has its jurisdictions expressed in art. 1 and 2 of MMA Ordinance n° 341/2011. Its attributions include: the power of environmental police through monitoring and enforcing environmental administrative infractions, including those that affect water resources; the environmental licensing of federal jurisdiction (Complementary Law 140/2011); and environmental monitoring and control. IBAMA can work together with state environmental agencies, as is the case of the Pilot Project for Monitoring and Deforestation and Inspection of the Atlantic Forest and Cerrado, in the Rio Grande and Piracicaba, Capivari and Jundiaí Basins, carried out jointly with the state environmental agencies of Minas Gerais and São Paulo. This project foresees the joint monitoring of the conditions of the basin by means of satellite images.

ICMBIO has its powers specified in Art. 1 of Law No. 11.516/2007. Its core mission is to protect the natural heritage, and promote social, and environmental development through the administration of the Federal Conservation Units (CUs) (Art. 1 of Law 11.516/2007). ICMBIO manages 335 UCs spread over all Brazilian biomes, several of which correspond to areas of water relevance, as is the case of the Iguaçu National Park.

To see where the Federal CUs are located, click here

The states and municipalities are responsible for defining their administrative bodies for environmental control, and their collegiate structures for environmental management.

4.3.3 The National Environmental Policy and the Instruments for Environmental Protection

The National Environmental Policy has introduced a legal structure of instruments for environmental protection, that are designed to guarantee environmental quality, and place conditions on the exercise of economic activities. Art. 9 defines the following environmental management instruments:

I – the establishment of environmental quality standards;
II – environmental zoning;
III – environmental impacts evaluation
As for water, examples include the establishment of environmental quality standards, environmental zoning, environmental impact assessment, licensing, the creation of protected territorial areas and the national environmental information system. As previously stated, CONAMA is responsible for assuring that the environmental standards for the quality for water are met, in an effort to establish environmental standards.

Environmental zoning, the evaluation of environmental impacts, licensing, and protected territorial spaces are instruments that have a direct influence on shaping land use and occupation, and impose restrictions on this occupation, in order to protect the environment from non-compliant uses, according to their vulnerability or potential risks.

4.3.4 Environmental Zoning

Environmental zoning, also known as Ecological-Economic Zoning (EEZ), was regulated by Decree No. 4.297/2002 and corresponds to an “instrument involving territorial organization” that must be “followed when implementing public and private plans, works and activities” (Art. 2 of the above cited decree). Its intent is to establish “environmental protection measures and standards devised to ensure environmental, water and soil quality, and the conservation of biodiversity, guaranteeing sustainable development and improving living conditions for the population” (Art. 2). It has been adopted by several States to characterize portions of the territory, considering their environmental vulnerability or implementation for certain uses, such as, for example, zoning for coastal areas, the viability of developing agriculture or industry, etc. The federal level includes the Ecological-Economic Macro-zoning (MacroZEE) for the Legal Amazon, approved by Decree No. 7.378/2010.

4.3.5 Environmental Impact Evaluation

Environmental impact evaluations are conducted through the drafting of environmental studies, which were defined by CONAMA Resolution No. 237/1997, Art. 1, III as:

any and all studies on the environmental aspects relating to the location, installation, operation and expansion of an activity or enterprise, presented as an input to the analysis of the required Permit, such as an environmental report, plan and environmental control project, preliminary environmental report, environmental assessment, management plan, degraded area recovery plan and preliminary risk analysis.

In this manner, environmental impact assessments reflect the genre of all environmental studies, including the Environmental Impact Study/Environmental Impact Report (EIA/RIMA), provided for in Article 225, § 1, IV of the Federal Constitution and in CONAMA Resolution No. 1/1986. The EIA/RIMA already has these attributes
for implementing business ventures, and it is applied whenever there is construction or an activity that has the potential to cause significant environmental damage. It relates to more complex evaluations, which require a multidisciplinary team to become involved. A public hearing must be held, according to CONAMA Resolutions 1/1986 and 9/1987, during the licensing processes that require the EIA/RIMA. The meeting is intended to publicize the conclusions coming from the technical studies and whether there are potential risks to society. In cases where there is not any potential for a significant impact, other studies (simplified studies, Project Characterization Memorandum, etc.) may be applied according to prevailing laws.

Environmental studies are part of the environmental licensing process, and the environmental agency or entity may choose the kind of study that will be applied. A significant portion of hydraulic works will be subject to these environmental studies. Moreover, CONAMA Resolution No. 1/1986 determines the EIA/RIMA requirement for “hydraulic works intended to exploit water resources”, in cases involving an “dams for hydroelectric purposes, over 10MW, sanitation or irrigation, opening of channels for navigation, drainage and irrigation, adjusting watercourses, opening of bars and inlets, transposition of basins, dikes”. Depending on the level of complexity for the project or its vulnerability, the environmental agency or entity may request an alternate study, other than the EIA/RIMA, if it believes that the work does not pose a significant threat for degradation.

4.3.6 Environmental Licensing

Environmental licensing is based on Articles 9, section IV and 10 of Law 6.938/1981, CONAMA Resolution No. 237/1997, Complementary Law No. 140/2011 and Federal Decree No. 8.437/2015, in addition to applicable state and local laws. Its most recent legal definition is found in Art. 2, I, of Complementary Law No. 140/2011, which defines it as:

the administrative procedure intended for licensing activities or ventures using environmental resources that are effectively or potentially polluting or capable, in any way, of causing environmental degradation;

This instrument is applicable in the construction, installation, expansion and operation of establishments and activities that use environmental resources, effectively or potentially polluting, or that are capable, in any way, of causing environmental degradation. Complementary Law No. 140/2011 defined the authority for licensing. It can be done at the federal, state, or municipal level according to the degree of impact, the domain of the environmental resource that will be affected, or the activity that will be performed.

The Union’s authority is expressed in Art. 7, XIV, of Complementary Law 140/2011 and in Art. 3 of Decree No. 8.437/2015. Municipalities may license the activities established in Art. 9 and XIV of the referred Law. In order to apply municipal licensing, the municipality must have a qualified environmental agency and environmental council (Art. 15, II), and the State Environmental Council must have environmental impacts defined at a local level for the activities or projects, accounting for criteria such as scale, polluting potential and type of activity (Art. 9, XIV, a). The state will have residual jurisdiction (Art. 8). The general aspects of the licensing procedure and its types of license are regulated within Articles 8 and 10, of CONAMA Resolution No. 237/1997, and in applicable state and municipal legislation.

Environmental licensing protects water in two ways. First, it controls any impacts that construction projects or ventures using environmental resources may have that are, or could be, polluting or capable of causing environmental damage. The second demands that works directly related to the water be obliged to follow this procedure. In this case, CONAMA Resolution No. 273/1997 determined whether projects such as waterways, dams, dikes, drainage canals, diverting waterways, transposing
river basins, etc. are subject to licensing. Item 22.9, of Annex I, from the IBAMA Normative Instruction No. 06/2013 included the boring and drilling of artesian wells, in its list of activities that are potentially polluting and use environmental resources.

### 4.3.7 Protected Territorial Spaces

Protected territorial spaces may be characterized as “public or private areas that are subject to special protection systems or, in other words, on which limitations are imposed in an effort to provide full or partial protection of their natural attributes” (Leuzinger, 2002, p. 93).

These spaces function as a way to conserve biodiversity and have a direct relationship with maintaining the native forest. They provide a series of environmental services that include the conservation of water resources and climate regulation. In this sense, video 2 demonstrates the importance of forests for water and climate.

**Watch:**

**Video 2:** *Live Volume Project: Where does water come from?*
*Directed by: Caio Silva Ferraz.*

The forest's evapotranspiration contributes to the rainfall pattern in Brazil. Studies show that the Amazon forest contributes to the water regime of the Midwest, Southeast and Southern regions, producing moisture masses that are moved via air currents. This movement of moisture mass is referred to as “Rios Voadores” (Flying Rivers). That relationship is studied by many researchers. Some examples include the Flying River Project, which is carried out with support from Petrobras. For more information please visit this website: [http://riosvoadores.com.br/o-projeto/](http://riosvoadores.com.br/o-projeto/). Video 3 exhibits this project and calls attention to the importance of protected spaces and vegetation.

**Watch:**

**Video 3:** *Flying Rivers.*
*Production: PETROBRAS.*

The protection of forests is benefited by these protected spaces, and specific regulations, such as the case of the special regime applied to the Atlantic Forest biome that was instituted by Law No. 11.428/2003 and Decree No. 6.660/2008.

There are several different types of Protected Territorial Areas, such as: a) the national system of protected areas, based on Article 225, § 1, items I, II, III and VII, Law 9.985/2000 and Decree No. 4340/2002; b) permanent preservation areas, c) legal reserves, and d) restricted use areas, regulated by the Forest Code (Law No. 12.651/2012).

### 4.3.7.1 National System of Conservation Units

Law No. 9.985/2000 established the National System of Nature Conservation Units - (SNUC), consisting of all federal, state, and municipal conservation units. SNUC's objectives include the express protection and recovery of water and soil resources (Art. 4, VIII). The SNUC's management is coordinated by the Ministry of the Environment, which is the central agency, by CONAMA, which is an advisory and decision-making agency that is responsible for monitoring the implementation of the system, and by IBAMA and ICMBio, which are the executing agencies that perform the “role of implementing the SNUC, to subsidize proposals for the creation and management of federal, state, and municipal conservation units, in their respective spheres of activity” (Art. 6, III).

Art. 2, item I, of Law No. 9.985/2000, defines protected areas as follows:

I – conservation unit: territorial space and its environmental resources, including jurisdictional waters, with relevant natural attributes, legally established by the Public Authority, with objectives for conservation
and defined limits, under a special administration system in which the proper guarantees for protection apply;

Protected areas are divided into two groups: fully protected areas, and sustainable use areas.

Full-protection units are used to keep the ecosystems free of changes caused by human interference, only permitting the indirect use of natural attributes (Amado, 2015). This group is composed of the following categories, which, according to the type, may be in the public or private domain:

- Ecological station: “intended to preserve nature and to conduct scientific research” (Art. 9 of Law No. 9.985/2000). Public Domain
- Biological Reserve: “devised to carry out the full preservation of biota and other natural assets that are within its borders, without direct human interference or environmental modifications, except for recovery measures for its ecosystems that have been altered, and management actions needed to recover and preserve the natural balance, biological diversity, and natural ecological processes” (Art. 10 of Law 9.985/2000). Public Domain
- National Parks: “their primary objective is to preserve natural ecosystems that have major ecological relevance and scenic beauty, allowing scientific research to be conducted along with educational activities and environmental interpretation, with recreation that maintains contact with nature and ecological tourism” (Art. 11 of Law 9.985/2000). Public Domain
- Natural Monument: “its basic objective is to preserve rare natural sites that are singular, or sites with great scenic beauty” (Art. 12 of Law 9.985/2000). Public or Private Domain.
- Wildlife Refuge: “seeks to protect natural environments that ensure conditions for the existence or reproduction of species or communities from the local flora, and the resident or migratory fauna” (Art. 13 of Law 9.985/2000). Public or Private Domain.

Exploitation is permitted within sustainable use units, as long as it is done in a way “to ensure the sustainability of renewable environmental resources and ecological processes, maintaining biodiversity and other ecological attributes, in a socially equitable and economically viable manner”, according to Art. 2, XI of Law 9.985/2000. These units are classified into:

- Environmental Protection Area: “a generally extensive area with a certain degree of human occupation, containing abiotic, biotic, aesthetic or cultural traits that are particularly important for the quality of life and well-being of human populations, and its primary purpose is to protect biological diversity, regulate the occupation process and ensure sustainability in the use of natural resources” (Art. 15 of Law 9.985/2000). Public or Private Domain.
- Area of relevant ecological interest: “a generally small area with little or no human occupation, having extraordinary natural features or that serves as a home to rare examples of the regional biota, and is intended to maintain natural ecosystems with regional or local importance, and regulate the permissible use of these areas in an effort to make it compatible with nature conservation goals” (Art. 13 of Law 9.985/2000). Public or Private Domain.
- National Forest: “an area with a forest cover that features predominantly native species, and its essential purpose is the multiple sustainable use of forest resources and scientific research, with an emphasis on methods for the sustainable exploitation of native forests” (Art. 17 of Law 9.985/2000). Public Domain.
- Extractive Reserve: “an area used by traditional extractive populations, whose livelihood is based on extractivism and, in a complementary manner, on subsistence farming and small-
scale animal husbandry. Its basic objective is to protect the ways of life and culture of these populations, and ensure that the area's natural resources are used in a sustainable manner” (Art. 18 of Law 9.985/2000). Public Domain.

- Fauna Reserve: “is a natural area populated by native, terrestrial or aquatic, resident or migratory animal species, conducive for technical and scientific studies on the sustainable economic management of fauna resources” (Art. 19 of Law 9.985/2000). Public Domain.

- Sustainable Development Reserve: “a natural area that shelters traditional populations, and whose existence is based on sustainable systems for exploiting natural resources, developed over generations, adapted to local ecological conditions, and which play a fundamental role in protecting nature and maintaining biological diversity” (Art. 20 of Law 9.985/2000). Public Domain.


The protection areas are created through an act by the Federal Government (Art. 22) and must include a management plan approved by the relevant environmental agency, within five years after its creation (Art. 27). The management plan is “the technical document by which [...] establishes its zoning and the provisions that should govern the use of the area and the management of natural resources, including the implementation of the physical structures that may be required for environmental management” (Art. 2, XVII of Law 9.985/2000). This document must include restrictions on the use and occupation of a Conservation Unit.

With the exception of environmental protection areas (APA), and the private natural heritage reserve (RPPN), conservation units will include a buffer zone for their protection, that corresponds to the surrounding areas of a conservation unit, and entails restrictions on human activities in an effort to minimize impacts on the unit. These areas must also establish ecological corridors corresponding to portions of natural or semi-natural ecosystems, that permit linkages between conservation units, allowing for the flow of genes, biota movement, the dispersal of species, recolonization of damaged areas, and maintaining populations (Art. 2, XIX of Law 9.985/2000).

As a way to promote the integrated management of conservation units, mosaics were established (Art. 26 of Law 9.985/2000 and Art. 8 to 10 in Decree 4340/2002), corresponding to: “areas where a set of conservation units, whether or not they are distinct categories, that are close, juxtaposed or overlapping and other public or private protected areas are located” (Art. 26). These areas are certified through an act by the Ministry of the Environment, at the request of the management agencies for the conservation units, and should be connected by ecological corridors.

Disallocating or reducing the limits for a Conservation Unit can only be done through a specific law. Activities or projects that are conducted in the Conservation Units are also regulated by ICMBio Normative Instructions Nos. 4/2009 and 5/2009, in addition to CONAMA Resolution No. 428/2010. This resolution stipulates the specific procedures that need to be complied with, in the sphere of licensing, involving significant environmental impacts that may affect a conservation unit or its buffer zone. State and municipal conservation units need to observe the applicable state and municipal statutes.

4.3.7.2 The Forest Code

The Forest Code was enacted through Law No. 12.651/2012 and regulated by Decree Nos. 7.830/2012 and 8.235/2014, as well as MMA Normative Instruction No. 2/2014. This statute establishes three specific forms of protected territorial spaces: the permanent preservation areas, legal reserves, and restricted use areas.
Permanent Preservation Areas

The areas of permanent preservation (APP) take place in rural and urban areas, and were established by Art. 3, II, of Law No. 12.651/2012 as follows:

“protected area, whether covered by native vegetation or not, with the environmental function of preserving water resources, landscape, geological stability, and biodiversity, facilitate gene flow of fauna and flora, protect soil and ensure the well-being of human populations;

These areas have been listed in Art. 4 of that law. The requirement for their protection is linked to the presence of certain geographical conditions, requiring vegetation to be maintained in order to protect the environmental role of these areas. The presence of water resources or wetlands is a factor that creates an obligation to maintain APP areas. These areas can be classified into three categories: those related to inland wetlands, coastal wetlands and relevant situations (Milaré, 2015).

The New Forest Code also established administrative APPs, dealing with areas that are covered with forests or other forms of vegetation that were declared APP, through an act by the Chief Government Authority, because they serve one of the specific purposes listed in Art. 6 of Law 12.651/2012. In this case, the Chief Government Authority will not exercise legislative activity. That executive can only identify, mark and declare that a certain area will be deemed to have a social interest for the purpose of permanent preservation (Milaré, 2015). Table 2 demonstrates these two types of APPs, those linked to specific natural and administrative aspects, and when they occur.
Área de Preservação Permanente (APP)
art. 4º da Lei 12.651/2012

Art. 4º Considera-se Área de Preservação Permanente, em zonas rurais ou urbanas, para os efeitos desta Lei:
I - as faixas marginais de qualquer curso d’água natural perene e intermitente, excluídos os efêmeros, desde a borda da calha do leito regular [...];
II - as áreas no entorno dos lagos e lagoas naturais [...];
III - as áreas no entorno dos reservatórios d’água artificiais, decorrentes de barramento ou represamento de cursos d’água naturais [...];
IV - as áreas no entorno das nascentes e dos olhos d’água [...]
V - as encostas ou partes destas com declividade superior a 45º, equivalente a 100% na linha de maior declive;
VI - as restingas, como fixadoras de dunas ou estabilizadoras de mangues;
VII - os manguezais, em toda a sua extensão;
VIII - as bordas dos tabuleiros ou chapadas, até a linha de ruptura do relevo, em faixa nunca inferior a 100 metros em projeções horizontais;
IX - no topo de morros, montes, montanhas e serras, com altura mínima de 100 (cem) metros e inclinação média maior que 25º, as áreas delimitadas a partir da curva de nível correspondente a 2/3 (dois terços) da altura mínima da elevação sempre em relação à base, sendo esta definida pelo plano horizontal determinado por planicie ou espelho d’água adjacente ou, nos relevos ondulados, pela cota do ponto de sela mais próximo da elevação;
X - as áreas em altitude superior a 1.800 (mil e oitocentos) metros, qualquer que seja a vegetação;
XI - em veredas [...].

APPs Administrativas (art. 6º da Lei 12.651/2012)

Margens dos cursos de água
Entorno de lagos e lagoas naturais
Reservatórios de água artificiais
Entorno de nascentes e olhos d’água
Margem das veredas

Áreas úmidas interiores
Manguezais

Áreas úmidas litorânea
Encostas superiores a 45º
Restingas

Situações de Relevo
Bordas de Tabuleiros ou Chapadas
Topos de Morros
Altitudes Superiores a 1800 metros

Áreas sujeitas a erosão, enchentes e deslizamentos
Proteção de restingas e veredas
Proteção de várzeas
Fauna e flora ameaçadas de extinção
Sítios de excepcional beleza ou de valor científico, cultural ou histórico
Margens de rodovias e ferrovias
Bem estar público
Defesa do território nacional

Table 2: APPs types set forth in the Forest Code
### Permanent Preservation Areas (APP) Art. 4 of Law 12.651/2012

Art. 4 considers Permanent Preservation Areas, in rural or urban areas, for the purposes of this Law as:

1. the marginal strips of any natural perennial and intermittent watercourse, ephemeral excluded, from the edge of the regular bed [...];
2. the areas surrounding the lakes and natural lagoons [...];
3. the areas around artificial water reservoirs due to the damming or impounding natural waterways [...];
4. the areas around springs and water holes [...];
5. hillsides or portions of them having a slope of over 45°, equivalent to 100% in the line of a higher slope;
6. sandbanks for dune fixation or as a stabilizer of marshes;
7. the entire strip of mangroves;
8. the edges of flat tableland, starting at the break in relief, in a strip no less than 100 meter in horizontal projections;
9. on hilltops, hillsides, mountains and ridges, with a minimum height of 100 (one hundred) meters and an average slope greater than 25°, the areas delimited from the contour corresponding to 2/3 (two thirds) of the minimum height of elevation in relation to the base, which is defined by the horizontal plane determined by the adjacent plain or water surface or, in the corrugated reliefs, by the height of the saddle point closest to the elevation;
10. areas at a height of 1,800 (one thousand eight hundred) meters, no matter what type of vegetation there is;
11. in palm swamps [...].

### Areas úmidas interiores

<table>
<thead>
<tr>
<th>Inland wetland areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margens dos cursos de água</td>
</tr>
<tr>
<td>Entorno de Lagos e lagos naturais</td>
</tr>
<tr>
<td>Reservatórios de água artificiais</td>
</tr>
<tr>
<td>Entorno de nascentes e olhos d’água</td>
</tr>
<tr>
<td>Margem das veredas</td>
</tr>
</tbody>
</table>

### Áreas úmidas litorânea

<table>
<thead>
<tr>
<th>Coastal wetland areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manguezais</td>
</tr>
</tbody>
</table>

### Situações de Relevo

<table>
<thead>
<tr>
<th>Situations of Terrain Relief</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encostas superiores a 45°</td>
</tr>
<tr>
<td>Restingas</td>
</tr>
<tr>
<td>Bordas de Tabuleiros ou Chapadas</td>
</tr>
<tr>
<td>Topos de Morros</td>
</tr>
<tr>
<td>Altitudes Superiores a 1800 metros</td>
</tr>
</tbody>
</table>

### APPs Administrativas (art. 6º da lei 12.651/2012)

<table>
<thead>
<tr>
<th>Administrative APPs (Art. 6 of Law 12.651/2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Áreas sujeitas a erosão, enchentes e deslizamentos</td>
</tr>
<tr>
<td>Proteção de restingas e veredas</td>
</tr>
<tr>
<td>Proteção de várzeas</td>
</tr>
<tr>
<td>Fauna e flora ameaçadas de extinção</td>
</tr>
</tbody>
</table>
In the case of the APPs established in Article 4, their existence depends solely and exclusively on whether there is a geographical condition in place. If these geographic features occur (river, lake, reservoir, spring and water holes, palm swamps, mangroves, slopes of more than 45°, salt marshes, edges of flat tableland, hilltops and altitudes above 1,800m) the owner is responsible for maintaining a strip of vegetation or to rebuild it according to the parameters set forth in Art. 4 of Law 12.651/2012. Even if the area has already been cleared, they are still required to be restored. The obligation to maintain the APP is an effective right, and it is passed on to the successor when there is a transfer of ownership or possession of a rural property (Art. 1, § 2 and Art. 7, § 2).

In turn, the existence of administrative APPs is formed through a determination and creation by the Executive Branch, and it must be based on the situations provided for in Article 6.

According to Article 8 of Law 12.651/2012, intervention and suppression within PPAs areas can only take place in cases involving a public utility, social interest and low environmental impact. Article 2, VIII, IX and X of Law No. 12.651/2012 respectively defines each of these situations. CONAMA Resolution No. 396/2000, which regulated the matter under the former Forest Code, has been considered repealed. Law No. 12.651/2012 had not transferred this authority in the cases of public utility and social interest, and in the case of low impact, all the situations stipulated have already been incorporated in article 2, section X, of the new Forest Code (Milaré, 2015).

In an effort to promote the legalization of rural properties, the new Forest Code created an exception to the recovery parameters in the APPs, set forth in Art. 4th, for cases involving consolidated rural areas. These areas were defined as follows by Art. 3, IV: “rural property area occupied by humans before July 22, 2008, with buildings, improvements or agroforestry activities, authorizing the adoption of a set-aside system in the latter case.” If the area fulfills the requirements - pre-existing occupation on 07/22/2008 and maintenance of agroforestry activities - the maintenance and recomposition parameter of the APP ranges will be reduced and guided by the arts. 61-A and 61-B.

The Forest Code also acknowledged the possibility of an urban consolidated APP, defined as that “referred to in section II of the caput of Art. 47 of Law 11.977 dated July 7, 2009” (Art. 3, XXVI). Despite the repeal of Art. 47, through Law No. 13.465/2017, the consolidated urban area is considered to be an item that meets the following criteria (see Art. 16-C, § 2 of Law 9.636/1998).

- The following is included in the urban perimeter or urban area by the master plan or by specific municipal law;
- Equipped with an implanted road system and paved roads;
- Organized into blocks and predominantly erected lots;
- Its use is mostly urban, characterized by buildings that are residential, commercial, industrial, institutional, mixed or focused on providing services; and
- At least three of the following pieces of urban infrastructure equipment are present: a) rainwater drainage network; b) sewage system;
c) supply of drinking water;
d) electrical energy distribution; and
e) urban cleaning, collection and management of solid waste.

The consolidated urban APPs did not garner as much prominence as rural ones in Law No. 12.651/2012, and their treatment is restricted to what is contained in Arts. 3, XXVI, 64 and 65.

Legal Reserve

Another instrument for the protection of forests, which has an impact on water resources in the face of the relationship between water and vegetation, provided for in the Code, is the institute of the Legal Reserve, defined by art. 3, III, as:

an area located within a rural property or rural possession, delimited under the terms of art. 12, serving to ensure the sustainable economic use of the natural resources from the rural property, while helping to conserve and rehabilitate ecological processes and promote biodiversity conservation, in addition to sheltering and protecting wildlife and native flora.

The Legal Reserve only applies in rural areas and serves an economic function. This is done so that the area can be exploited through a Sustainable Forest Management Plan that is approved by the relevant environmental agencies. While serving an economic role, it also has an environmental duty. According to article 14 of Law No. 12.651/2012, its location must take the following factors into account: i) the guidelines of the river basin plans, making sure that the instruments interact with the water policy; ii) Ecological and Economic Zoning; iii) the formation of ecological corridors with other protected areas, like a Legal Reserve, Permanent Preservation Area, with a Conservation Unit, so there is direct interaction with the SNUC; iv) areas that have significance importance for the conservation of biodiversity; and v) areas that are most fragile environmentally. Like the APPs, maintaining a legal reserve represents an effective right (Art. 1, § 2 and Art. 66, § 1).

Article 12 in the Forest Code specifies that all rural property must have the Legal Reserve defined without impairing the application of rules on Permanent Preservation Areas, noting the following minimum percentages related to the property area, except for the cases provided in Art. 68, of the previously mentioned code:

Art. 12. All rural property must maintain an area covered by native vegetation, under the title of a Legal Reserve, without impairing the application of provisions on Permanent Preservation Areas, noting the following minimum percentages related to the property area, except for the cases provided in Art. 68 of this Law:

I - if located in the Legal Amazon:
   a) 80%, in the property located in a forest area;
   b) 35%, in the property located in a savanna;
   c) 20%, in the property located in area of general fields;

II - if properties are located in other regions of Brazil: 20%

As can be seen, the Legal Reserve percentage required varies according to the Brazilian region. In the Legal Amazon area, this percentage can range from 20% to 80% of the property. For properties located in the Legal Amazon, line a, section I, the legal reserve area may be reduced to up to 50% in the cases established in Art. 12, § 4 and § 5 and in Art. 13, I. If marked by ecological economic zoning, the Legal Reserve can be expanded by up to 50% to comply with biodiversity protection or greenhouse gas emission reduction targets (Art. 13, II).

According to Art. 12, Legal Reserve areas will not be required to be constituted in public water supply and sewage treatment projects ($6); in areas acquired or expropriated by a concession or permit holder, or someone authorized to exploit hydraulic power potential, where activities related to electric power generation, substations or electricity transmission and distribution lines are being operated ($7); and in areas acquired or expropriated for the purpose of implementing and expanding the capacity of highways and railways ($8).
Art. 15 of the referred law allows the permanent preservation areas to be computed in the calculation of the Legal Reserve as long as they meet the following criteria:

I - the benefit established in this article does not imply the conversion of new areas for alternative land use;

II - the area to be computed is preserved or in the process of being recovered, according to proof of ownership to the state agency that is part of Sisnama; and

III - the owner or possessor has requested to include the property in the Environmental Rural Registry – CAR, under the terms of this Law.

Another innovation coming from the Code was the establishment of Consolidated Areas in Legal Reserve Areas (Arts. which corresponds to those properties that, on July 22, 2018, possessed percentages of a Legal Reserve that were lower than those instituted by Art. 12.

In this case, the Code established conditions and recovery parameters that were different from those set out in Article 12. Article 66 determines how this recovery will happen, which may include planting up to 50% of exotic species in the area, as well as using one of the compensation possibilities of the reserve, provided for in § 5,

Art. 66. The owner or holder of rural property that, on July 22, 2008, held a stretch of a Legal Reserve area under what was established in Art. 12, will be able to regulate their status regardless of adhesion to the PRA, solely or jointly adopting the following alternatives:

I – restoring a Legal Reserve;

II – allowing the natural vegetation to regenerate in the Legal Reserve area;

III – compensating the Legal Reserve

§ 1 The obligation set forth in the caput has a true nature and is transmitted to the successor in the event that ownership or possession of the rural property is transferred.

§ 2 The restoration referred to in item I of the caput should comply with the criteria stipulated by the relevant Sisnama agency, and be completed in up to 20 (twenty) years, covering every 2 (two) years at least 1/10 (one tenth) of the total area required for its complementation.

§ 3 The restoration cited in item I of the caput may be performed through the interspersed planting of native tropical or fruit trees in an agroforestry system, complying with the following parameters:

I - exotic or tropical species that are planted should be combined with native species that naturally occur in the region;

II - the area that is restored with exotic or tropical species may not exceed 50% (fifty percent) of the total area to be reclaimed.

§ 4 The owners or possessors of the property who choose to restore the Legal Reserve according to § 2 and § 3 will be entitled to its economic exploitation, according to this Law.

§ 5 The compensation referred to in item III of the caput must be preceded by the property’s registration in the CAR and may be made through:

I - acquiring an Environmental Reserve Quota – CRA;

II - leasing an area under the environmental services or Legal Reserve system;

III - donating to the State an area within a public Conservation Unit pending the regularization of land tenure;

IV - registering an equivalent area exceeding the size of the Legal Reserve in a property belonging to the same owner or in an acquired property belonging to a third party, with established native vegetation, vegetation in a state of regeneration or re-composition, as long as it is located within the same biome.

§ 6 The areas to be used for compensation in the form of § 5o must:

I - be equivalent in extension to the area of the Legal Reserve to be offset;

II - be located in the same biome Area as the Legal Reserve to be offset;

III - if outside the State, be located in areas identified as priorities by the Federal Government or by the states.

§ 7 The definition of priority areas cited in § 6 will seek to promote, among other things, the restoration of excessively deforested river basins to create ecological corridors, to conserve large protected areas, and to preserve or recover threatened ecosystems or species.
WATER GOVERNANCE AND MANAGEMENT INTEGRATION: BUILDING NEXUS

§ 8 – In the case of public real estate, the compensation referred to in item III of the caput may be made by granting a real right of use or donation, by the legal entity under public law owning a rural property that does not have a sufficient Legal Reserve, to the public body responsible for the Conservation Unit of the area located within the Public Domain Conservation Unit, to be created or pending land title regularization.

§ 9 The compensation measures set forth in this article can not be used as a way of having new areas converted for alternative land use.

Lastly, Articles 67 and 68 established exceptional situations that allow the owner to maintain legal reserve percentages that are lower than those established in Art. 12. The exception provided for in article 67 applies to properties with up to four hectares that had remaining native vegetation, on July 22, 2008, but had legal reserve deficits. The exception to Article 68 aims to protect the rural landowner who followed the law of the time of deforestation of the legal reserve.

Restricted Use Areas

The Forest Code was an innovative step that created a new category of protected space, known as restricted use areas, which include the following areas:

- Pantanal and Other Wetlands: “ecologically sustainable use is allowed, as long as technical recommendations of official research entities are taken into account, and the removal of native vegetation is authorized by the state environment agency” (Art. 10);
- Areas with a slope between 25º and 45º: “sustainable forest management, agricultural, ranching and forestry activities are allowed, including the necessary physical infrastructure, as long as best agronomic practices are applied. Conversion of new areas is not allowed, except in cases of public utility and social interest “(Art. 11);
- salt flats and salt pans: can be used in shrimp and salt plan activities, provided that the following requirements are met: a) “total area occupied in each State does not exceed 10% of this type of phytophysiognomy in the Amazonian biome and 35% in the rest of the Country [...] “, (b) “safeguarding the absolute integrity of shrubby mangroves and the essential ecological processes associated with them, as well as their biological productivity and nursery condition of fish stocks”; c) licensing of the activity and facilities by the state environmental agency, known as IBAMA and, in the case of use of marine land or other assets belonging to the Union, prior regularization of the entitlement by the Union; d) adequate collection, treatment and disposal of effluents and waste; f) guarantee that water and soil quality is maintained, respecting the Permanent Preservation Areas; and (g) respect for the traditional survival activities of local communities (Art. 11-A, § 1).

4.3.8 National Environmental Information System – SINIMA

The National Information System for the Environment - SINIMA is set forth in Art. 9, VII, of Law No. 6.938/198 and was regulated by Art. 11, II, of Decree No. 99.274/1990. The Ministry of the Environment is responsible for its maintenance, and its primary mission is to integrate and facilitate information being shared among the SISNAMA member agencies. MMA Ordinance No. 160/2009 determines that the Ministry of the Environment’s Information Policy is based on the construction and maintenance of SINIMA as a conceptual platform, based on integrating, sharing or adding to information between the various existing systems within the National Environmental System. Therefore, this system should seek to integrate environmental data as well as related systems, such as the National Water Resources Information System (SNIRH) and the Groundwater Information System (SIAGAS).
4.4 Urban Territorial System and the Water

Urban spatial planning is under the authority of the municipalities, as established in Art. 30, VIII, of the Federal Constitution. This urban development policy must plan the city’s development and ensure the population’s well-being (Art. 182 of the Federal Constitution). According to the Federal Constitution, the key instrument for development and urban expansion is the master plan, mandatory for cities with a population of over 20,000 inhabitants; those in metropolitan regions and urban concentrations, where the Municipal Government intends to use the instruments provided for in the 4th paragraph of Art. 182 in the Federal Constitution; those in tourist locations placed in areas that have business or other activities that may have a significant national or local environmental impact, included in the national register of Municipalities with areas susceptible to the occurrence of impactful mudslides, sudden floods or correlating geological or hydrologic processes. (Art. 182, §§ 1 and 4 of the Federal Constitution and Law No. 10.257/2001, Art. 41). This instrument is responsible for defining the social role of urban property.

In addition to the Federal Constitution, the following laws offer guidelines for implementing this municipal ordinance: Law No. 6.766/1979, which outlines the Urban Land Parceling and provides other Provisions; Law 10.257/2001, which establishes the general urban policy guidelines, known as the City Statute; and Law 11.977/2009, which discusses the “Minha Casa, Minha Vida” (My house, My Life) Program and the landholding regularization of settlements located in urban areas. Also included is the Metropolis Statute (Law 13.089/2015), which establishes guidelines for the planning, management and execution of public duties that are in the common interest of metropolitan regions and in urban concentrations instituted by States, general provisions on the plan for integrated urban development and other instruments related to interdepartmental governance, and criteria for the Union’s support for measures that involve this governance in the field of urban development.

Law No. 6.766/1979 established some environmental restrictions on urban land parceling. Article 3 prohibits urbanization on swamplands that are subject to flooding, in contaminated areas, on land with a slope of 30% or more, in areas where geological conditions are not suitable for building, ecological preservation areas or where there are no proper sanitary conditions available due to pollution. This standard also established a non-building strip of 15m along running and sleeping waters and public domain strips of highways and railways (art. 4, III). However, its focus was putting regulations in place for housing development and subdivision projects, without being concerned with comprehensive city planning.

In return, the City Statute brought the concern to encourage municipalities to develop a policy and urban reform. Some of the general guidelines instituted in Article 2 include the right to sustainable cities; democratic management; urban development planning, spatial distribution of the population and economic activities in order to avoid and correct distortions in urban growth and their negative effects on the environment; the management and control of land use in order to prevent pollution and environmental degradation; land regularization and urbanization of areas occupied by low-income populations; the production and consumption patterns of goods and services and urban expansion compatible with the limits of environmental sustainability; and the protection, preservation and recovery of the natural and built environment, cultural, historical, artistic, landscape and archaeological heritage.

Ensuring rights to sustainable cities is a major milestone that embodies the principle of a right to an ecologically balanced environment. This principle unfolds in seven other rights: the right to a) urban land, b) housing, c) environmental sanitation, d) urban infrastructure, e) transportation and public
services, f) labor and g) leisure, for present and future generations. Several instruments are proposed to achieve this right:

- Municipal planning instruments: a) master plan; b) regulations for the parceling, use and occupation of the land; c) environmental zoning; d) multi-annual plan; e) budget guidelines and annual budget; f) participatory budget management; g) sectoral plans, programs and projects; h) plans for economic and social development;
- Tax and financial instruments: a) taxes on built property and urban land - IPTU; b) contribution of improvement; and c) incentives and tax and financial benefits;
- Legal and political instruments: a) expropriation; b) administrative servitude; c) administrative limitations; d) seizing ownership of real estate or urban fixtures; e) establishment of conservation units; f) establishment of special social interest zones; g) concession of effective right of use; h) granting a special use for housing purposes; i) compulsory subdivision, construction or use; j) special adverse possession of urban property; l) surface right; m) right of preemption; n) onerous grant for the right to build and change usage; o) transfer of the right to build; p) urban consortium operations; q) landholding regularization; r) free technical and legal assistance to disadvantaged communities and social groups; s) popular referendum and plebiscite; t) urban demarcation for land regularization purposes; u) legitimation of tenure, and VI - previous environmental impact study (EIA) and prior study of neighborhood impact (EIV).

These instruments contribute to water protection through prescribing urbanization planning and allowing restrictions to be enacted on the use and occupation of sensitive areas like water sources, the regularization of areas that do not have adequate infrastructure, especially pertaining to sanitation; directing the city to more consolidated sanitation; removing the pressure from rural or environmentally sensitive areas, or further conditioning new developments to comply with specific obligations for environmental protection. As can be seen, several environmental instruments were inserted as urban policy instruments, such as environmental zoning, conservation units and prior environmental impact studies. One environmental instrument that is not included in this list but has become mandatory for urban property after the publication of Law 12.651/2012 is the maintenance of permanent preservation areas (Art. 4).

These instruments are available to municipalities to incorporate the water issue into their municipal land use plans. Municipal urban policy can positively or negatively transform the relationship between water resources and land use planning. Video 4 demonstrates how the urbanization process for the city of São Paulo significantly contributed to the degradation of water resources.

Watch:
Video 4: “Entre Rios” (Between Rivers)
Directed by: Caio Silva Ferraz.

As a constitutional entity in charge of territorial planning, the municipality plays a prominent role in protecting water resources. So much so that SINGREH and the State Water Resources Management Systems and the Federal District must support them in adopting the guidelines contained in the basin plans (see Art. 6 of CNRH Resolution 15/2001).

Adopting City Statute instruments can contribute to this mission. As a counterpoint to the Entre Rios Documentary, the new master plan of São Paulo sought to include some instruments that seek to have a more harmonious relationship with the waters.
For more information on the master plan’s potential for water resource protection, watch:

**Video lesson 1:**
*The São Paulo Master Plan and the instruments to promote water management in the city by Prof. Kazuo Nakano.*

Lastly, although the Metropolis Statute does not specifically mention water resources, it does bear the concept of interdepartmental governance, which is defined as the “sharing responsibilities and measures between Federal entities in terms of organizing, planning and executing public functions that have a common interest” (Art. 2, IV). The coordinated and joint efforts between states and metropolitan areas is vital for implementing the basin plan recommendations, as well for confronting the challenges related to water management in these areas. Supplying water to high concentrations of the population and managing the sewage that is generated are particularly sensitive in metropolitan areas.

### 4.5 Basic Sanitation and Water Resources

Basic sanitation in Brazil is handled by the National Sanitation Policy (Law No. 11.445/2007) and its regulation, Decree 7.217/2010. Article 2, I of Law No. 11.445/2007 defines sanitation as a set of services, infrastructures and operational facilities that:

- a) supply drinking water and comprising the activities involved in the availability, maintenance, infrastructure and facilities required for the public supply of drinking water, from the catchment to connections to buildings and their instruments for measuring;

- b) provide sewage systems and comprising the activities involved in the availability and maintenance of the proper infrastructure and operational facilities for the collection, transportation, treatment and providing the proper disposal of sanitary sewage, from the land connections to its final disposal for producing reusable water or its final discharge into the environment;

- c) urban cleaning and solid waste management, and comprising the activities involved in the infrastructure and operational facilities for the collection, transportation, transhipment, treatment and final destination of household solid and urban cleaning waste;

- d) drainage and management of urban rainwater, and comprising the activities involved in the infrastructure and operational facilities for draining rainwater, the transportation, holding or retention in order to absorb flood flows, the treatment and final disposal of drained rainwater, including the cleaning and preventive monitoring of systems.

Water resources are not part of the public basic sanitation services (Art. 4 of Law 11.445/2007 and Art. 18 of Decree No. 7.217/2010), so its use depends on the concession of water resources (Art. 4, single paragraph in Law No. 11.445/2007 and Art. 20 of Decree No. 7.217/2010). The urban supply sector is considered to be a sector that uses water resources and should be set in the Basin Committees and Councils of Water Resources (Art. 14, line “a” of CNRH Resolution No. 5/2000). Work carried out for this service should take the sustainable use of water into account (Art. 18, single paragraph of Decree No. 7.217/2010).

The supply of drinking water and sanitary sewage are directly related to the water: the supply accounts for one of the major usages of water, while the discharge of waste is one of the primary causes of its pollution. The physical losses of supply systems for drinking water are a challenge that need to be confronted by service providers in order to ensure water security for the population. The numbers in Brazil related to losses reach 70% and reach up to 80%, while levels that are considered appropriate vary between 10% and 15%. With the scarcity of water that threatens many regions, there is no point in failing to maintain networks and waste treated water. On the other hand, sewage system losses are unknown and can compromise the water quality of aquifers, resulting in serious environmental damage.
The drainage and management of urban rainwater is critical to preventing floods, and can become a source of diffuse pollution, especially if there are irregular sewage connections in the system. Urban clean-up and adequate solid waste management contribute to avoiding water pollution from solid waste and tailings.

The fundamental principles of basic public sanitation services that are listed in Art. 3 of Law No. 11.445/2007 expressly convey the idea of the linkage between water and sanitation, as can be deduced from items III, VI, XII and XIII:

III – water supply, sewage networks, street cleaning and solid waste management performed in a manner that attends to public health and environmental protection;

VI – coordination with urban and regional development, housing and poverty eradication policies, environmental protection, health promotion and other relevant social interest policies aimed at improving the quality of life, for which basic sanitation is a determining factor;

XII – integration of infrastructures and services with the efficient management of water resources; and

XIII – combating water loss while encouraging its rational consumption by users and promoting energy efficiency, the reuse of sanitary effluents and the use of rainwater.

Therefore, the National Sanitation Policy acknowledges the relationship between sanitation and the environment, sanitation and water, and the need to further coordination between these policies, as well as integrating their infrastructures and services with water management. Also, in Title I - Preliminary Provisions, Chapter IV of Decree No. 7.217/2010 provides terms for the relationship between public services involving basic sanitation and water resources and expressly acknowledges the convergence between these systems (see Arts. 18 to 21).

For more information about the relationship between water resources and sanitation, watch:

**Video lesson 2:**
The connection between Water Resources and Basic Sanitation: Economic Impacts and Governance by Prof. Maria Luiza Machado Granziera.

Article 45 requires urban buildings to be connected to a public water supply and sewage systems, and that they be subject to pay for the service. The second paragraph of that article establishes that “the building water system connected to the public water supply network can not be supplied by other sources”. The lack of a concession and the prohibition brought by this article have served as a basis for capping several illegal wells in the States located in the urban area equipped with a water network infrastructure. By contrast, this Article could encourage the already high illicitness of well users in urban areas.

Article 46 of Law No. 11.445/2007 and Art. 21 of Decree No. 7.217/2010 deal with rationing situations caused by water shortages or contamination declared by the water resources management authority. Art. 46, single paragraph, allows ANA, regardless of domain, to recommend a restriction or interruption in the use of water resources, and the priority of use for human consumption and for animals. These articles allow the regulator to adopt contingency tariff mechanisms, in a way that ensures the financial stability of the service, or to manage demand.

Basic sanitation is the responsibility of the Municipalities and the Federal District (Art. 8, A), and this service can be provided directly by the Government or delegated to the a private party through an administrative contract that is preceded by a bidding process, except in cases outlined in Art. 10, § 1 of Law 11.445/2007. The duties of the sanitation service provider include:
I – drafting plans for sanitation, under the terms of this Law;
II – directly providing or delegating the provision of services;
III – establishing the entity responsible for the regulation and surveillance of public sanitation services and the procedures for its functioning, subject to the provisions of § 5 of Art. 8, A;
IV – defining the parameters that will be adopted for ensuring essential services to public health, including the minimum per capita volume of water for public supply, according to national standards for the quality of drinking water;
V – establishing the rights and duties of users;
VI – setting mechanisms and procedures in place for social control, as outlined in section IV of the caput in Art. 2;
VII - implementing an information system about public sanitation services, in conjunction with the National Information System for Basic Sanitation - SINISA, the National Information System for Solid Waste Management - SINIR and the National Water Resources Management System, observing the methodology and frequency established by the Ministry of Cities; and
VIII – intervening and resuming operations of the delegated services when indicated by the regulatory entity, in the cases and under the conditions set forth in the legislation and in the contracts.

Sanitation plans should be compatible with water resources plans (Art. 19, § 3 of Law No. 11.445/2007 and Art. 19 of Decree No. 7.217/2010). Its minimum content is prescribed in Art. 19 of Law No. 11455/2007 and in Art. 25 of Decree No. 7.217/2010. In addition to this, information on sanitation services must be coordinated with the National Information System for Basic Sanitation - SINISA, the National Information System for Solid Waste Management - SINIR and the National Water Resources Management System.

The National Information System on Basic Sanitation is a database that contains information and suggestions on the provision of Water and Sewage services, Urban Solid Waste Management and Drainage and Urban Rainwater Management. This information is submitted annually by the service providers of water, sewage, municipal solid waste, and urban rainwater. It is divided into three components: Water and Sewage (SNIS-AE), Solid Waste (SNIS-RS), and Rain Water (SNIS-AP). For further information, click on the site: http://www.snis.gov.br/.

The National Information System for Solid Waste Management, SINIR is one of the instruments for the National Solid Waste Policy (PNRS) established by Law No. 12.305 of August 2, 2010, and regulated through Decree No. 7.404 of December 23, 2010. For further information, visit the site at: http://sinir.gov.br/.

Articles 48 and 49 of Law No. 11.445/2007 established the guidelines and objectives in the Federal Sanitation Policy. These guidelines point out that planning for sanitation measures should adopt the river basin as a reporting unit and strive to improve environmental and health conditions. The objectives also include the mitigation of environmental impacts related to the sector. One of the primary instruments in the Federal Policy is the National Sanitation Plan, the National Plan for Basic Sanitation (Plansab), which was published in December of 2013, with the approval of seven state ministries (Cities, Farm, Civil House, Health, Planning, Environment and National Integration). Interministerial Ordinance No. 571 institutes basic sanitation guidelines, goals and measures for the country over the upcoming 20 years (2014-2033).

Plasab is available to be reviewed

4.6 Agriculture and Water

Water is a key element in agricultural productivity, and a lack of this vital resource compromises or limits agriculture. Therefore, the Federal Constitution, the
Land Statute (Law no. 4.504/1964), the Agrarian Policy (Law no. 8.171/1991), the National Irrigation Policy (Law 12.787/2013) and the Forestry Code (Law No. 12651/2012) were all put in place to establish points of convergence between the output of agricultural activity and the conservation of natural resources that assure production.

The concern for the environment within rural properties received constitutional forms. Article 186 placed conditions on fulfilling the social role of rural property to comply with the following requirements:

I – rational and appropriate use;
II – appropriate use of the available natural resources, and preservation of the environment;
III – compliance with the provisions governing labor relations;
IV – utilization which favors the well-being of the proprietors and laborers.

Hence, the proper use of natural resources (which include water) and environmental preservation are prerequisites for the social purpose of the property. Failure to comply with these criteria allows the property to be seized for agrarian reform purposes (Art. 184 of the Federal Constitution).

Requirements for the proper use of natural resources, as an integral component of the social purpose of property, were already covered in Art. 2 of Law No. 4.504/1964:

Art. 2 Everyone is entitled to the opportunity to have access to land ownership, conditioned by their social purpose in the manner provided in this Law.
§ 1. Land ownership fully carries out its social function when, simultaneously:
  a) it favors the welfare of the owners and laborers who work there, as well as of their families;
  b) it maintains satisfactory levels of productivity;
  c) it ensures the conservation of natural resources.

Art. 20, III, of the Land Statute allowed the expropriation of properties that refused to put into practice the norms of conservation of natural resources. The importance of access to water or related infrastructure construction was brought up as one of the concerns in the colonization projects (Art. 61, § 4, b) and in the national and regional agrarian reform plans (Art. 89).

Law No. 8.171/1991, which provides for agricultural policy, included an interest in managing natural resources in its preconditions and objectives. This provision is based on the assumption that natural resources are used and managed by agriculture and “tied to the provisions and principles of public interest, so that the social and economic role of property is fulfilled” (Art. 2, a). Art. 3, section IV, determines that the agricultural policy is intended “to protect the environment, ensure rational use, and stimulate the recovery of natural resources.”

This policy set a specific chapter for the protection of the environment and the conservation of water resources (chapter VI). In this sense, Article 19 states that:

Art. 19. The Public Authority must:
  I – incorporate in the preservation of the environment and conservation of natural resources at the level of the Federal Government, the States, the Federal District, the Territories, the Municipalities and the communities;
  II – discipline and supervise the rational use of land, water, fauna and flora;
  III – implement agro and ecological zoning to establish criteria for regulating and planning the spatial occupation by various productive activities, as well as for installing new hydroelectric plants;
  IV – promote and/or encourage the revival of areas in the process of desertification;
  V – develop both formal and informal environmental education programs directed to population;
  VI – promote the production native species of seeds and seedlings;
  VII – coordinate programs that motivate and encourage the preservation of water sources and the environment, along with the use of animal waste for conversion into fertilizers.
Single Paragraph. The control and rational use of the natural resources from the environment is also the responsibility of the rightful owners, the beneficiaries of the agrarian reform and the temporary occupants of the rural properties.

Art. 19, single paragraph, included rural landowners in the duty to control and supervise over natural resources. The holder or owner of rural property is obliged to comply with the environmental provisions related to the rational use of natural resources, which includes water. Combating desertification is also a joint obligation of the owners and the State (Art. 21), along with erosion control (Art. 102, single paragraph), because the land was considered to be part of the country’s natural heritage. Art. 23 is responsible for the companies or concessionaires of electric energy that exploit dammed water through environmental changes that cause and impose the obligation to remedy any damages.

As is the case with water and sanitation policy, agricultural policy also adopted the river basin as the basic planning unit for the use, conservation and recovery of natural resources (Art. 20). To have environmental protection reinforced, the Public Authorities must include it as criteria for granting services or resources, as well as implementing multi-annual programs and annual operational plans for this purpose (Art. 22 and 26).

Agricultural policy measures and instruments specifically refer to the need for agricultural planning (Art. 4, I); protection of the environment, conservation and recovery of natural resources (Art. 4, IV) and irrigation and drainage (Art. 4, XV). When discussing water, irrigation and drainage are also important aspects. They are regulated by Art. 84 and 85 of Law 8.171/1991 and by Law No. 12.787/2013, which establishes the National Irrigation Policy.

Law No. 12.787/2013 revoked the following Laws Nos. 6.662/1979 and 8.657/1993 and Decree Laws 2.032/1983 and 2.369/1987. Interaction with waters is covered several times. In this respect, the National Irrigation Policy adopted the following principles: the sustainable use and management of soils and water resources for irrigation (Art. 3, I); integration with sectoral policies on water resources, the environment, energy, environmental sanitation [...], prioritizing projects that permit multiple uses of water resources (Art. 3, II); and the prevention of rural water-borne endemic diseases (Art. 3, V). Its objectives include an incentive to expand the irrigated area and increase productivity on an environmentally sustainable basis.

In addition, the following National Irrigation Policy instruments should be mentioned: Irrigation Plans and Projects (Art 5, I), the National Information System on Irrigation (Art. 5, II) and the certification of irrigation projects (Art 5, VIII).

Irrigation Plans and Projects were devised to “serve as guidance for the planning and implementation of the National Irrigation Policy, in line with the Water Resources Plans” (Art. 6). As such, these plans must follow the guidelines of the water resources plans when the contents of these plans are prepared. They should include information on, for example, water availability, prioritization of river basins for implementing these projects; designation of crops and recommended irrigation systems according to the particularities of the basin, etc.

The National Information System on Irrigation, outlined in articles 8, 9 and 10, is a computerized database “for the collection, processing, storage and retrieval of information on irrigated agriculture” (Art. 8). This system must register, for example, “irrigated areas, harvested crops, the irrigation methods used and the technological level of activity” (Art. 8, I); “the inventory of water resources and hydrological information of river basins” (Art. 8, II); and data on agro-climatology (Art. 8, IV).

The law does not expressly state that it must be coordinated with the SNIRH. However, considering that its basic principles include institutional
cooperation and unified coordination, there is an urgent need to tighten communication between these systems. ANA has even published an Irrigation Atlas as a way to provide technical grounds with information on irrigated agriculture and its interface with water resources. Video 5 offer more information on the topic.

Watch:

Video 5: The Irrigation Atlas: Water Use in Irrigated Agriculture.
Production: ANA

Certification for Irrigation Projects (Art. 19) involves the certification of public and private irrigation projects and parceled out units of Public Irrigation Projects regarding the quantitative and qualitative aspects associated with water and irrigation technology. The Federal Executive Branch establishes the authorized public agency and certification criteria. This instrument has not yet been regulated.

Certification for water related projects comes from the Sustainability Assessment of the Project Certificate, issued by the National Water Agency (ANA), established in Decree No. 4.024/2001, for water infrastructure projects that have a value equal to or greater than R$ 10,000,000.00 (ten million reais).

Irrigation projects are subjected to environmental licensing when required by specific federal, state, district or municipal legislation (Art. 22) and the use of water resources depends on receiving prior grants for the rights to use water, conceded by the authorized federal agency or state, according to the domain of the water to be exploited.

4.6.1 Forest Code and Agricultural Properties

In addition to maintaining and restoring permanent preservation areas and legal reserves, the Forest Code placed an obligation on rural landowners to register in the Rural Environmental Registry and, if the property has environmental liabilities, to adhere to the Environmental Regulation Programs (PRAs). Moreover, the Support and Incentive Programs for the Preservation and Recovery of the Environment had been established in order to encourage environmentally responsible behavior.

4.6.1.1 The Rural Environmental Registry – CAR and Environmental Regularization Programs

The Rural Environmental Registry is associated with the National Environmental Information System – SINIMA, and managed by the Rural Environmental Registration System - SICAR (Art. 3 of Decree 7.830/2012). SICAR and CAR, according to Art. 2 of Decree 7.830/2012, can be defined as follows:

I – The Rural Environmental Registration System – SICAR – a nationwide electronic system for managing environmental information on rural properties;

II – Rural Environmental Registry - CAR - a nationwide electronic registration linked to the relevant environmental agency under the National Environmental Information System – SINIMA. It is required for all rural properties in order to integrate environmental information on rural properties and possessions, forming a database for control, monitoring, environmental and economic planning and combating deforestation.

Registration is regulated through Arts. 29 and 30 of Law No. 12.651/2012 and Arts. 5 to 8 of Decree No. 7.830/2012. This is an obligatory instrument for all rural properties, and is one of the conditions for the legalizing ownership and granting a series of benefits provided by law, such as: implementing aquaculture activities in the APP area (Art. 4, paragraph 6, IV); dispensing the registration of the legal reserve in the real estate registry (Art. 18, § 4); computing the APP area in the legal reserve (Art. 15); transacting the legal reserve surplus (Art. 15, § 2) or adhere to the PRAs (Art. 59, § 2), which are fundamental for the environmental legalization of the property.
In addition to being illegal, non-compliance with the CAR can result in several issues for the owner. These include: revoking access to rural credit (Art. 78-A), blocking access to vegetation suppression authorizations and other licenses (Art. 12, § 3), as well as restrictions on joining support programs and payments for governmental environmental services (Art. 41, § 3). A lack of registration could also be considered an administrative infraction by state regulations.

The Environmental Regularization Programs were addressed in Arts. 59 and 60 of Law No. 12.651/2012 and Arts. 9 to 19 in Decree No. 7.830/2012 and regulated by Decree No. 8.235/2014. These programs include “the set of actions or initiatives that are to be carried out by rural land holders and owners in order to adapt and promote environmental regularization” in permanent preservation areas, a Legal Reserve or a restricted use area, which can be done through recovery, recomposition, regeneration or compensation measures (Arts. 2 and 9 of Decree 8.235/2014). The owners who adhere to the PRAs by signing the Term of Commitment can take advantage of a series of benefits related to environmental responsibility, like having administrative sanctions and punishments for crimes related to the unlawful suppression of vegetation in Permanent Preservation, Legal Reserve and restricted use areas suspended. Once the terms of the commitment are fulfilled, punishment is repealed and administrative fines are converted into environmental services. If they are implemented well, the CAR and PRAs have the potential to be used as way to promote the compatibility of agricultural activity with the environment, which will provide obvious benefits to water resources, especially since many of the APPs are connected to water resources.

4.6.1.2 Support and Incentive Program for Environmental Preservation and Recovery

This program is provided for in art. 41 of Law No. 12.651 and is aimed at encouraging best practices in the field and reducing environmental impacts. Three strategies are defined to make this happen: payment for environmental services, compensation and incentives for commercialization and innovation, and the acceleration of vegetation recovery measures.

Payment for environmental services is defined as a compensation instrument where environmental service providers are paid by the beneficiaries of these services (Guedes and Seehusen, 2011). The law (Art. 41, I) defined it as an instrument to provide monetary retribution for actions dedicated to the conservation and improvement of ecosystems and that manage the following environmental services:

a) the sequester, conservation, maintenance and increase of the stock and decrease of carbon flow;

b) the conservation of natural scenic beauty;

c) the conservation of biodiversity

d) the conservation of water and water services;

e) regulating the climate;

f) cultural appreciation and traditional ecosystem awareness;

g) the maintenance and improvement of the soil;

h) maintaining Permanent Preservation Areas, Legal Reserves and restricted use areas;

As seen above, water conservation was expressly included among the environmental services to be protected. The recovery of Permanent Preservation, Legal Reserves and restricted use Areas can benefit from these programs, as well as the owners located in the buffer zones of Fully Protected Conservation Units (Art. 41, § 4 and 6). These programs must show preference to family farmers.

Video 6 explains the idea of environmental services, also known as ecosystem services, and how they are valued in order to permit payments for environmental services. Video 7 illustrates an initiative from an environmental services program.
related to the recovery of water resources, organized by ANA.

**Watch:**
*Video 6: Valuation of Ecosystem Services: Class of Values.*
*Production: Conservation Strategy Fund*

**Watch**
*Video 7: Water Producer Program.*
*Production: ANA.*

The compensation instrument (Article 41, II) is based on attaining special conditions, like: securing credit and agricultural insurance in improved market conditions; a deduction in Permanent Preservation, Legal Reserve and restricted use Areas based on the calculation of the Tax on Rural Territorial Property – ITR; lines of financing for preservation; and tax exemptions for raw materials and equipment. In addition to this, Art. 41, II, line “d”, establishes that part of the funds collected from charging a fee for the use of water must be earmarked to the maintenance, recovery or recomposition of the Permanent Preservation, Legal Reserve and restricted use Areas within the basin where the revenue is generated.

Finally, Art. 41, III, establishes the incentives for commercialization, innovation and acceleration of the recovery, conservation and sustainable use of forests and other forms of native vegetation, which include preferential participation in programs to support agricultural production sales and allocating resources for scientific and technological research and rural extension.

### 4.7 Energy and Water

The National Energy Policy is regulated by Law No. 9.478/1997, but the provision is focused on the oil sector at the expense of the power complex that makes up the Brazilian energy grid. Figure 1 shows the domestic supply of electricity in Brazil. As can be seen, the electric grid in Brazil comes predominantly from renewable sources, emphasized by hydropower, which accounts for 65.2% of the supply (EPE, 2018). Therefore, problems related to water shortages can compromise the country’s energy security, either due to lack of water for the turbines or by jeopardizing the production of biomass.
<table>
<thead>
<tr>
<th>Oferta Interna de Energia Elétrica por Fonte</th>
<th>Domestic Supply of Electricity by Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carvão e derivados 1 4,1%</td>
<td>Coal and derivatives(^1) 14.1%</td>
</tr>
<tr>
<td>Solar 0,13%</td>
<td>Solar 0.13%</td>
</tr>
<tr>
<td>Eólica 6,8%</td>
<td>Wind 6.8%</td>
</tr>
<tr>
<td>Biomassa 3 8,2%</td>
<td>Biomass(^3) 38.2%</td>
</tr>
<tr>
<td>Hidráulica 65,2%</td>
<td>Hydraulics(^2) 65.2%</td>
</tr>
<tr>
<td>Nuclear 2,5%</td>
<td>Nuclear 2.5%</td>
</tr>
<tr>
<td>Derivados de petróleo 2,5%</td>
<td>Petroleum Derivate 2.5%</td>
</tr>
<tr>
<td>Gás Natural 10,5%</td>
<td>Natural Gas 10.5%</td>
</tr>
</tbody>
</table>

**Notas / Notes:**
1. Inclui gás de coqueria
2. Inclui importação de eletricidade
3. Inclui lenha, bagaço de cana, lixivia e outras recuperações

**Notes:**
1. Includes coke oven gas
2. Includes the importation of electricity
3. Includes firewood, sugarcane bagasse, leach and other salvages
The energy policy includes environmental protection (Art. 1, IV), along with incentives for alternative energy generating sources, particularly biofuels and biomass (Art. 1, VIII, XII, XIII and XIV).

Also, part of the energy sector is required to pay compensation or interests to the Union, State, Federal District and Municipalities, arising from the use of water resources for generating electric energy and mineral resources (Art. 20, §1, of the Federal Constitution, Art. 1 of Law No. 7.990/1989, Arts. 48, 49 and 50-F of Law No. 9.478/1997).

In addition to distributing interests to States or Municipalities who produce, are confronted by or are affected by the loading and unloading of fuel, the petroleum sector is required to allocate part of the royalties from production to the Ministry of Science and Technology to finance programs that support scientific research and technological development, which includes the prevention and recovery of damages caused to the environment as a result of this industrial sector (Art. 49, items I and II, lines “d” and “f” respectively, and Art. 50-F). In the case of the pre-salt areas contracted under the concession system, a portion of the royalties that is the direct responsibility of the Union will be earmarked for a fund that includes environmental protection and mitigation and adaptation efforts pertaining to climate change (Art 49, § 3 and Art. 50-F).

Hydroelectric generation is required to pay a Financial Compensation for the Use of Water Resources (CFURH) as restitution for the use of river water and for the expropriation of areas needed to form reservoirs (Law No. 7.990/1989). The National Electric Energy Agency (ANEEL) manages the collection and distribution of revenue among the beneficiaries: States, Municipalities and agencies under the Direct Administration of the Union.

The hydroelectric plants collect 7% of the value of energy produced as Financial Compensation (FC). The total amount to be paid is calculated using a standard formula: FC = 7% x power generated in the month x Current Reference Rate – TAR. The TAR is set annually through an ANEEL Resolution. The 0.75% percentage is transferred to the MMA to implement the National Water Resources Policy and the National Water Resources Management System. The remaining 6.25%, as established by Law No. 8.001/1990, as amended by Laws No. 9.433/97, No. 9.984/00, No. 9.993/00, No. 13.360/16 and No. 13.661/18, are allocated in the following manner: 65% of the funds earmarked for municipalities affected by the reservoirs from the hydroelectric plants, and 25% to the States. The Union receives the remaining 10%, divided between the Ministry of the Environment (3%); the Ministry of Mines and Energy (3%) and the National Fund for Scientific and Technological Development (4%), administered by the Ministry of Science, Technology and Innovation. Hydroelectric ventures categorized as Small Hydropower Plants are exempted from the collection of Financial Compensation under Law No. 9.427, dated December 26, 1996 (ANEEL, 2018).

A portion of the funds from the CFURH are directly applied to the management of water and environmental resources, contributing to the implementation of the National Water Resources Policy.

In addition to these impacts, the energy sector is broadly regulated by environmental legislation, energy facilities, especially those related to the oil and gas, thermoelectric and hydroelectric power chain, are subject to the environmental licensing process (Annex I of CONAMA Resolution No. 237/1997) and are on the list of activities that require an Environmental Impact Study and Environmental Impact Report be completed (EIA/RIMA) (Art. 2 of CONAMA Resolution 1/1986).

Another provision that should be pointed out is Law No. 12.334/2010, which established the National Policy for Dam Safety targeted at the accumulation of water for any use, the final or temporary disposal of tailings and the accumulation of industrial waste, and created the National Information System
on Dam Safety. This policy applies directly to the hydroelectric and mining activities that have tailings ponds. Video 08 shows the uses of dams, and their impacts and risks, as well as institutional responsibilities.

Watch:

Video 8: Dam Safety in Brazil.
Production: ANA.

Article 5 determines the jurisdiction for monitoring the safety of dams to the following entities:

I – to the entity that granted the right to use water resources, subject to the area of the body of water, when the purpose is water accumulation, except for hydroelectric generation;

II - to the entity which granted or authorized the use of the hydraulic potential, in the case of a predominant use for the purpose of hydroelectric generation;

III – to the entity granting mining rights for the purpose of final or temporary disposal of tailings;

IV – to the entity that provided the environmental license for the installation and operation intended for disposing industrial wastes.

ANA and the state water resources management agencies have the authority to monitor the dams related to section I. ANEEL is responsible for the inspection of dams for hydroelectric generation purposes. The ANM/DNPM will be responsible for oversight in the case of tailings ponds from mining. In case of item IV, IBAMA or the environmental agency responsible for the licensing will hold jurisdiction. These powers do not preclude monitoring activities by the environmental agencies that are part of SISNAMA.

Faced with the potential risk for a rupture or leakage in these structures, the supervisory agency (Art. 5) is required to immediately report “to the National Water Agency (ANA) and the National Civil Defense System (SINDEC) any non-compliance involving an immediate safety risk or any accident that occurs in dams” (Art. 16, § 1). CNRH Resolution No. 143/2012 is responsible for establishing the overall criteria for classifying dams via risk status, associated potential damage and reservoir volume.

The National Information System on Dam Safety (SNISB), instituted through Article 13 of Law No. 12.334/2010, was established in order to collect, store, treat, manage and provide information related to dam safety throughout Brazil. The supervisory agencies and the entrepreneurs will submit data on the dams under their jurisdiction to ANA, who must aggregate this information in order to prepare an Annual Report on Dams, as well as to facilitate the unified management of Brazilian dams. The SNISB was regulated by Resolution No. 144/2012 CNRH.

For further information on the topic, see:

In addition to these requirements, the Agricultural Policy (Law No. 8.171/1991) decides on the responsibility of electric power utilities for environmental changes. In this sense, Article 23 states that:

Art. 23. Companies that economically benefit from exploiting accumulated waters and electric power utilities will be responsible for the environmental changes they cause and are required to restore the environment in the area covered by their respective river basins.

Hydropower generation triggers environmental impacts in the river basin. This includes impacts on its geomorphology, the water quality and normal ecosystem conditions, affecting local fauna and flora (Guerra and Carvalho, 1995). These damages appear at the time of construction, but also arise when the energy system is running. As such, several hydroelectric plants have sought to compensate for
these damages through monitoring and campaign programs.

For example, there is the Itaipu Binacional’s Cultivating Good Water Program, which was awarded by the UN to incorporate and apply Sustainable Development Goals (SDGs) in the Paraná hydrographic basin, in a comprehensive and integrated manner, with the participation of a broad network of partners. Video 9 offers more details on this program. The Itaipu Hydroelectric Plant is located on the Paraná River, and its construction became feasible after the signing of the Treaty of Itaipu in 1973 between Brazil and Paraguay. This treaty permitted the Hydroelectric usage of Water Resources on the Paraná River, jointly belonging to both Countries, from and including the Salto Grande de Sete Quedas or Salto de Guaira to the Foz do Rio Iguaçu. Figure 2 shows the Sete Quedas region, which was flooded during the construction of the plant.

Watch

Video 9: Cultivating Good Water Program.
Production: ITAIPU

Figure 2: Salto de Sete Quedas Region
Source: Images courtesy of Maria de Lourdes Souza Badona.
Date: 1/26/1975

All energy production has some impacts, but hydropower and other alternative renewable sources have been recognized as more sustainable than fossil fuels, especially because of greenhouse gas emissions, which are responsible for the phenomenon of climate change. The National Policy on Climate Change, regulated by Decree 7.390/2010, emphasizes that investments in the expansion of renewable energy are one of the strategies employed to increase energy efficiency and to meet targets for reducing these gases.

4.8 Climate and Water

Climate change is defined as a significant statistical variation in an average climatic benchmark (including its natural variability) that persists over an extended period (typically a few decades or longer). In abstract terms, climate change can be
caused by natural processes, and there were in fact major variations in the Earth’s climate in the past, such as the glacial periods. However, there is increasing acceptance that the recent change in temperature patterns is caused by human activities that release greenhouse gases and have interfered in the equilibrium of the climate. (IPCC, 2014). Video 10 explains the phenomenon of the greenhouse effect, while video 11 and 12 present the natural and anthropogenic causes that contribute to the greenhouse effect.

Watch:
Video 10: Greenhouse Effect.
Production: Brazilian Space Agency (AEB) and National Institute for Space Research (INPE).

Watch:
Video 11: Global Environmental Change.
Production: AEB and INPE

Watch:
Video 12: Natural Climate Change
Production: AEB and INPE

Shifting climatic conditions are directly linked to waters. Climate change generally tends to change the global rainfall system, as well as generating a boost in extreme phenomena such as floods and droughts that cause serious impacts to water-dependent sectors and territories. Videos 13 and 14 put these issues into context and depict scenarios related to climate changes, while video 15 presents their effects on water sources.

Watch:
Video 13: Future Climate Change Scenarios.
Production: AEB and INPE.

Watch:
Video 14: Impacts of climate change in Brazil and Worldwide.
Production: AEB and INPE.

Watch:
Video 15: Water and climate change.
Production: ANA.

As a way to address this scenario, the National Policy on Climate Change (PNMC), instituted by Law No. 12.187/2009 and regulated by Decree No. 7.390/2010, provides support to the National Environmental Policy. This policy was enacted after the end of the COP 15 – the 15th Session of the Conference of the Parties, held by the UNFCCC – United Nations Framework Convention on Climate Change in Copenhagen, Denmark. The PNMC is directly related to the commitments made by Brazil in the international instruments on the subject: the United Nations Framework Convention on Climate Change, the Kyoto Protocol and, more recently, the Paris Agreement.

For more information on the Paris Agreement and its developments in the field of energy and water, watch:

Video lesson 3:
The PNMC’s goals are established in Art. 4 of Law 12.187/2009 as follows:

I – to reconcile economic and social development with the protection of the climate system;
II – to reduce the anthropogenic emissions of greenhouse gases in relation to their distinct sources;
III – (VETOED);
IV – to strengthen the anthropogenic removals by sinks of greenhouse gases in the national territory;
V – to set measures for promoting climate change adaptations through the three spheres of the Federal Government, with the participation and collaboration of economic and social actors or beneficiaries, particularly those vulnerable to their adverse effects;
VI – to preserve, conserve and recover environmental resources, with particular attention paid to the major natural biomes considered to be National Heritage;
VII – to consolidate and expand legally protected areas and encourage reforestation and to restore vegetation cover in damaged areas;
VIII – to induce the development of the Brazilian Emission Reduction Market – MBRE.

With regard to its guidelines, Art. 5 lists them as:

I – the commitments made by Brazil to the United Nations Framework Convention on Climate Change, the Kyoto Protocol and other documents on climate change to which it has undersigned;
II – the actions taken to mitigate climate change that are aligned with sustainable development, which are, wherever possible, measurable for their proper quantification and verification afterwards;
III – the adaptation measures for reducing the adverse effects of climate change and the vulnerability of environmental, social and economic systems;
IV – the integrated strategies for mitigating and adapting to climate change at the local, regional and national levels;
V – the stimulus and support to the federal, state, district and municipal governments participation, including the productive sector, academia and organized civil society, for developing and implementing policies, plans, programs and actions related to climate change;
VI – the promotion and development of scientific and technological research, and the diffusion of technologies, processes, and practices aimed at:
   a) mitigating climate change through a reduction of anthropogenic emissions via sources and strengthening of anthropogenic removals by sinks of greenhouse gases;
   b) reducing uncertainties in future national and regional climate change projections;
   c) identifying vulnerabilities and taking appropriate adaptation measures;
VII – to use financial and economic instruments for encouraging climate change mitigation and adaptation actions, complying with the provisions of Art. 6;
VIII – the identification, and its connection with the Policy provided for in this Law, of established governmental instruments that are capable of contributing to protecting the climate system;
IX – supporting and promoting the activities that effectively reduce emissions or promote removals by sinks of greenhouse gases;
X – the promotion of international bilateral, regional and multilateral cooperation for the financing, training, development, transfer and diffusion of technologies and processes for setting up mitigation and adaptation actions, including scientific research, systematic observation and exchanging information;
XI – improving the accurate and system-wide observation of the climate and its manifestations in the national territory and nearby ocean areas;
XII – publicizing information, education, training and public awareness on climate change;
XIII – encouragement and support for the maintenance and promotion of:
   a) practices, activities and technologies to lower emissions of greenhouse gases;
   b) sustainable patterns of production and consumption,

The PNMC, as seen above, establishes the planning standards for mitigating and adapting to the phenomenon of climate change. To fulfill the proposed goals and guidelines, Art. 6 established the following instruments:
I – the National Plan on Climate Change;
II – the National Fund on Climate Change;
III – the Action Plans for Deforestation Prevention and Control in the biomes
IV – Brazil’s National Communication to the United Nations Framework Convention on Climate Change, according to the criteria established by this Convention and its Conferences of the Parties;
V – resolutions by the Interministerial Commission on Global Climate Change;
VI – tax policies to encourage a reduction in emissions, and the removal of greenhouse gases, including differentiated tax rates, exemptions, compensations and incentives, to be established in a specific law;
VII – specific lines of credit and financing of public and private financial agents;
VIII – the development of a research pipeline by funding agencies;
IX – specific appropriations for measures on climate change in the Federal Government’s budget;
X – financial and economic mechanisms for mitigating climate change and adapting to the effects of climate change that exist under the context of the United Nations Framework Convention on Climate Change and the Kyoto Protocol;
XI – national financial and economic mechanisms relating to mitigation and adaptation to climate change;
XII – existing or future measures that boost the development of processes and technologies contributing to the reduction of emissions, adaptation and removal of greenhouse gases, among which is establishing preference criteria in public bids and competitions, including public-private partnerships and the authorization, permission, grant and concession for the exploitation of public services and natural resources for proposals that provide more energy, water and other natural resources savings and reduce the emission of greenhouse gases and waste;
XIII – registries, inventories, estimates, assessments and any other studies on greenhouse gas emissions and their sources, based on information and data provided by public and private entities;
XIV – promotional, educational and awareness-raising measures;
XV – national climate monitoring;
XVI – sustainability indicators;
XVII – the establishment of quantifiable and verifiable environmental standards and targets for the reduction of anthropogenic emissions by sources, and removals by sinks of greenhouse gases;
XVIII – an evaluation of environmental impacts on the microclimate and macroclimate.

The National Climate Change Plan was introduced in 2008 in order to serve as an incentive for mitigation measures aimed at reducing greenhouse gas emissions, as well as for creating conditions to cope with the impacts of global climate change (adaptation). The Plan is structured around four themes: mitigation opportunities; impacts, vulnerabilities and adaptation; research and development; and education, training and communication. Its contents can be found in:

The National Plan on Climate Change

The mission of the National Fund on Climate Change is to finance projects, studies and projects dedicated to reducing greenhouse gas emissions and adapting to the effects of climate change. The plan is managed by a Steering Committee chaired by the MMA Executive Secretary. Further information and public bidding notices can be found on the MMA website.

In the case of the Action Plans for the Prevention and Control of Deforestation in the biomes, the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) was launched in 2004 and was drafted by the Interministerial Permanent Working Group (GPTI), and the Action Plan for the Prevention and Control of Deforestation and Forest Fires in the Cerrado (PPCerrado), which was first released in 2009.

The PPCDAm, introduced in 2004, was drafted by the Interministerial Permanent Work Group
(GPTI), constituted in 2003 through Decree s/n of July 3 in order to contain an increase in Amazon deforestation. The document and the phases of these plans can be found at:

The document and the phases of these plans can be found at:

Following the experience gained through the development of the PPCDAm, the first version of the PPCerrado was released in 2009.

The base document can be found in:

*Action Plan for the Prevention and Control of Deforestation and Forest Fires in the Cerrado - PPCerrado*

In 2010, the Action Plan for the Prevention and Control of Deforestation in Caatinga (PPCaatinga) was published.

The base document can be found in:

*The Action Plan for the Prevention and Control of Deforestation in Caatinga (PPCaatinga)*

Article 7 of Law 12.187/1997 also established the following institutional instruments:

- **Interministerial Committee on Climate Change**: created through Decree No. 6.263/2007, and its duties are outlined in Art. 1 of the above mentioned law. Its primary role is to guide the preparation, implementation, monitoring, evaluation and dissemination of the National Plan on Climate Change.
- **Interministerial Commission on Global Climate Change**: instituted through a Presidential Decree dated July 7, 1999, with the purpose of coordinating the actions of government under the United Nations Framework Convention on Climate Change and its subsidiary instruments ratified by Brazil. Its bylaws were published by Ordinance No. 533/2000.
- **Brazilian Forum on Climate Change**: a space for raising awareness and mobilizing actors to discuss the issues arising from climate change. It was established through Presidential Decree No. 3.515/2000, which was amended by Decree No. 9.082/2017. The Forum has representatives from civil society, businesses and the Public Authority.
- **Brazilian Research Network on Climate Change (Climate Network)**: instituted by the Ministry of Science and Technology in 2007 with the intention of generating and publicizing awareness on climate change.
- **Coordinating Commission for Meteorological, Climatology and Hydrology Activities - CMCH**: enacted by Decree No. 6.065/2007, it corresponds to a collegiate body that is part of the basic structure of the Ministry of Science and Technology. Its bylaws were published by Ordinance No. 533/2000. Its duties include putting together a proposal of the National Policy of Meteorology and Climatology and the National System of Meteorology and Climatology, and linking meteorology, climatology and hydrology activities with the National Water Resources Management System and the environment, seeking to share the uses of infrastructure, resources and databases.

In its Article 12, the PNMC set a goal for reducing gases that cause global warming. Thus, the country has adopted a voluntary commitment to reduce between 36.1% and 38.9% its projected emissions by 2020. The projected emissions for 2020 were regulated by Decree No. 7.390/2010. The article 5 specifies that this projection is of 3,236 million tonCO2eq which are distributed among the sectors as follows:
4.9 The Challenges of Building Water Governance in the Light of Integrated Water Resources Management

Water plays a central role in human activities and ecosystems. Policies for the environment, urban land use, sanitation, agriculture, energy and climate are all linked to water policy. In some cases this interrelationship manifests itself directly, as in the case of the environmental policy. In others, it takes place in a diffuse way and depends on specific regulations, like urban planning policies.

Because it is a key element in these sectors, the building of nexus need is necessary for achieving governability and governance. The Government has been facing some difficulties in coordinating these multiple institutional systems and their instruments. The institutional arrangements and public policies still have a very sectored character, and this can be seen even in the water policy that has not yet fully integrated surface, underground and coastal waters. The edition of the National Water Resources Policy marks an effort to seek initiatives for the building of integrated management, but there is still much to do, either in the sense of consolidating it or integrating it with other policies.

The creation of participatory spaces between the various sectors needs to be expanded. Water, environmental and urban policies have established participatory forums, but these do not exist in other sectors, such as the energy sector.

The regulation and implementation of public policies related to water present difficulties. One example is the Rural Environmental Registry and the Environmental Regularization Programs, which face delays and problems in their implementation. These two instruments can transform the environmental reality of the countryside and benefit water resources. The institutions and instruments of the National Water Resources Policy are not yet fully operational, several basins have not yet defined their committees and agencies, or have fully applied the tools provided by law.
The national environmental, agricultural, water, energy and sanitation information systems are not working in a fully cooperative manner, although it is recognized that progress has been made in systematizing and integrating the data and information produced by each of the sectors.

Institutional coordination between the scales of governance also needs to be improved. The protection of water resources often requires the coordination of the Union, States and municipalities in order to build a management that truly encompasses the basin area. A classic example of this lack of coordination is in the integration of urban and water policy, many municipalities have not included the guidelines of water resources plans in their territorial planning norms.

The last decades have marked representative advances in the management of water resources, but the growing demand for the resource, climate variability and degradation of sources will require closer relations between water policies and the policies of the sectors that use them or are responsible for their degradation.

4.10 References

AGÊNCIA NACIONAL DE ÁGUAS – ANA.


