GOVERNO DO ESTADO
RIO GRANDE DO SUL

PROREDES PROGRAM – BIRD

ZEE-RS /SEMA PROJECT - TERM OF REFERNECE

Term of Reference for the preparation of
Ecological-Economic Zoning of
Rio Grande do Sul (ZEE-RS)

Contents

1. Objective of the Contract

1.1. General Objective

Prepare Ecological-Economic Zoning of Rio Grande do Sul (ZEE-RS), integrating the State planning system with the information necessary for management of the territory.

1.2. Specific Objectives

I. Establish priority areas for environmental conservation, preservation and recovery, as well as for economic development;

II. Subsidize the preparation of plans, programs and projects and propose alternatives for decision making, in accord with the focus on capability of economic activities with the natural environment;

III. Join the elements of physical-biotic and social-economic diagnosis, to establish exploratory macro-scenarios with the aim of presenting alternatives to sustainable social and environmental development;

IV. Identify social and economic problems linked to populations that occupy fragile natural environments, as well as the conflicts of interest between the use of natural resources and environmental policies, and the competition of use among segments of society.

V. Identify and analyze environmental problems, such as degraded areas, inadequate use of soil, surface water and underground water, irregular exploration of environmental resources and uncontrolled urban development;

VI. Identify opportunities for the use of natural resources, defining areas of environmental value, with the aim of guaranteeing the maintenance of ecosystemic services, establishing the parameters necessary for their use;

VII. Indicate potential areas for the implementations of conservation units, so as to guarantee the representativeness of the ecosystems protected in the state conservation unit system;

VIII. Map the existing information about the traditional communities that are part of the region's social-cultural heritage, artisanal fishing communities, *quilombolas*, indigenous peoples;

IX. Map the information generated in the diagnosis of the natural factors and the social-economic dynamic;

X. Identify archaeological, paleontological and material and immaterial cultural heritage of the region;

XI. Identify and analyze the characteristics related to endogenous, natural and social-cultural heritage of the region for the preparation of public policies for regional development;

XII. Provide subsidies for the elaboration of legal instruments by the State Environmental Body in the analysis of permits, management and guardianship of the environment;

XIII. construct and implement a database, in a universal language, with ample access and easy to use, containing thematic information used by the project, including metadata, describing the information in a Database Management System, using the Geographic Information System (GIS);

XIV. Create outputs (responses) from the information systems that cater to the main users of territorial management;

XV. Create mechanisms for systemizing existing information and guaranteeing ample access, promoting the state ZEE actions in analogical, multimedia and Internet formats for the service of its users.

2. Context and Previous Cases

2.1. Contextualization of the Problem

A lack in territorial planning by public power has caused a number of regional asymmetries in terms of social and economic development. The lack of order in the process of occupation, generally guided merely by economic interests, has determined which regions must receive investments, in detriment to others. consequentially, the environmental issue has been in the "background" for a long time, always noted later, after the location decisions have been established due to the facility available in term of logistics, infrastructure, labor for public and private enterprises.

Thus, the occupation of territory usually occurs due to the potential economic activity of the region, which in turn does not always consider all the developments triggered by the territorial occupation process. As such, aspects associated to environmental conservation have suffered the most negative impact of this process. As a result, the reasoning behind the preparation of an Ecological-Economic Zoning (ZEE) study becomes clear: to generate subsidies in the definition of areas for development by the State, guiding investments from the Government and society, so that environmental values are considered.

As such, the process for the preparation of ZEE-RS must establish a public debate with the goal of producing recommendations in a state, city and regional scope, with the

purpose of contributing to the preparation of regulations for the use and occupation of ground and the handling of natural resources from the entire territory, comparing the affinities and incongruities, considering and reconciliating their interests. The technical consistency of this discussion will be ensured through the generation of intermediary diagnoses of the natural factors, the social-economical dynamic and the legal-institutional organization, which will be submitted to consideration by society in the form of participatory workshops.

It is important to note that ZEE is a management instrument for ordering the use of land with the premise of allowing the definition of different development strategies and unique environmental permit levels, in accord with the peculiarities of each region. Zoning can be defined as a political and technical planning instrument, the ultimate finality of which is to optimize the use of space and public policies in an environmentally suitable manner.

Note, further, that the management and handling activities are greatly benefited by zoning, as it carries the precise cartographic representation of a territory divided into zones in which areas with finite natural recourses are identified and where occupation calls for a high level of attention. As such, homogeneous areas will be established in the territory of the State regarding the possibility of occupation by a human development being viable from an economical, social and environmental point of view.

Lastly, beside providing information that may form the base of the development process in which the predominating environmental characteristics of each location, city or region are respected, ZEE may also represent a significant stimulus to entrepreneurs so that they turn to the state of Rio Grande do Sul for the expansion of their enterprises. This, in turn, stimulates the elevation of revenue, employment and social well-being, mitigating the dilemma existing between the process of economic development and the maintenance of environmental services.

2.2 Project Proposal

The construction of Ecological-Economic Zoning (ZEE) proposes to develop a clear tool so that society and entrepreneurs discover the particularities, vulnerabilities and potential in advance, along with the environmental demands in order to set up operations in each area/region.

In this manner, zoning should contribute to equipping management instruments, using essentially technical criteria in establishing new and impersonal procedures for the analysis of projects. The establishment of new and clear procedures regarding the processes will be evaluated, guaranteeing sufficient information to ensure entrepreneurs are not caught off guard by unexpected requirements, thereby creating an environment favorable to the installation of new enterprises committed to the development and sustainability of the region. Instruments like ZEE contribute to a reduction in conflicts,

subsidizing planning of public policies. The construction of environmental management instruments, at a state level, represents managerial empowerment in terms of operational bottlenecks that impede the economic development of the state and make little contribution to the conservation and protection of the environment.

Ecological-Economic Zoning shall, therefore, fulfill the role of a planning instrument, providing technical-scientific subsidies for the preparation of an environmental policy and the development of the State, allowing, especially: 1st) regulate and promote uses compatible with the ecological, social and economic sustainability of the different planning units defined through diagnosis and prognosis; 2nd) establish criteria and principles that guide development, allowing economic and environmental imbalances to be corrected and overcome, conserving natural resources and elevating the life quality of the population.

In short, it is hoped that this study will generate two main charters, the environmental Vulnerability charter and the Social-economic Potential charter, which, in conjunction, with conceive areas with unique characteristics, determining the Ecological-Economic Zoning of the State.

2.3 Project History

The ZEE-RS proposal was made viable through Proredes-IBRD (Support Program for the Reinstitution of Development of Rio Grande do Sul), funded through resources from the World Bank's International Bank for Reconstruction and Development (IBRD).

In 2011, the State Government, through the Department of the Environment, submitted a version of the ZEE project to the IBRD, obtaining a positive response in relation to viability and funding.

In 2012, the ZEE-RS State Committee was established, by means of State Decree n° 49,255, with the purpose of assessing and approving the proposal of: 1st) Ecological-Economic Zoning; 2nd) promote the institutional articulation of public and private entities, as well as non-governmental organization that comprise them, in a way to guarantee the promotion and debate surrounding efforts undertaken in the scope of zoning; 3rd) to seek, alongside the National Territory ZEE Committee, technical and financial support in the execution of Ecological-Economic Zoning works and; 4th) support articulation with international organizations.

Following the establishment of the State Committee, the ZEE-RS Executive Technical Team was created, through the joint SEMA/FEPAM/FZB Directive n° 60, formed by technicians from the State Department of the Environment and associates, responsible for monitoring and final approval of the ZEE proposal, the subject of this Term of Reference (TR).

In the same year, activities were initiated for planning the project, aimed at the preparation of the Terms of Reference for contracting services that allow the elaboration and implementation of Ecological-Economic Zoning in Rio Grande do Sul.

At the current phase of the project, with the initial stages of planning done, the idea to contract a consultancy able to conduct studies necessary for the preparation of ZEE-RS.

Scope and Limits of the Project

Considering that the proposal for the creation of Ecological-Economic Zoning is of a multidisciplinary nature, the consultancy system shall encompass the data existing within governmental entities (federal, state and municipal) as well as traditional sources regarding the activities developed in the region. Primary data shall also be studied, when necessary, involving field research.

For preparation of ZEE, the following activities shall be considered:

1) Project Planning;

2) Participation of society in the process of building ZEE-RS;

3) Environmental, Social-Economical and Legal Inventory;

4) Diagnosis of the Natural factors (Physical-Biotic), of the Social-economic Dynamic and the Legal-Institutional organization;

5) Prognosis (descriptive guidelines for the occupation of territory in an environmentally suitable manner);

6) Modeling and Implementation of an IT (Information Technology) tool;

7) Strategies for the legal implementation of ZEE-RS;

Activities 2 and 6 shall be planned and executed from the start of work, ensuring public participation during the preparation of ZEE and the storage and employment of data in a geographic information system that shall be implanted at SEMA-RS.

They shall be considered in the preparation of ZEE-RS, Ecological-Economic Zoning (GERCO - 2000) and the application of the rules in terms of current conservation conditions of the ecosystems in the 18 municipalities that make up the North Coast of RS. Further considerations shall include the evolution of planning the use and occupation of regional lands, as based on their application, actions were developed that results in the proposal of Municipal Guidance Plans and Sectoral Management Plans.

Lastly, in the preparation of ZEE-RS, the Ecological-Economic Zoning proposal in development in the Mid-coastal Area, by means of the RS-Biodiversidade (RS-Biodiversity) Project, encompassing Capivari do Sul, Tavares, Mostardas, Palmares do Sul, São José do Norte, Tapes, Barra do Ribeiro and Viamão shall also be considered.

3.1 Expected key product

The activities described in this Term of Reference shall result in the preparation of ZEE-RS, leading to the definition of planning units and guidelines for the occupation and use of land, environmental resources and social-economical potential for each of the units.

The information and cartography bases generated shall be made available through a geographic information system implanted at the State Department of the Environment, so as to provide a territorial planning and management tool for the region, permitting access to information to different system users.

3.2 Proposing entity and institutions involved

The State Department of the Environment (Sema), established through State Law n° 11,362/99, (central body of the State Environmental Protection System (SISEPRA), created through State Law n° 10,330/94), responsible for proposing and coordinating the preparation and implementation of the ZEE-RS Project, with funding from the World Bank (IBRD).

The Project also has the technical support of two institutions linked to the Department, which operate jointly on guaranteeing the protection of the environment in the State, namely: 1st) Fundação Estadual de Proteção Ambiental Henrique Luiz Roessler – FEPAM (Henrique Luiz Roessler State Environmental Protection Foundation), the technical body of SISEPRA, created through State Law nº 9,077/90; and 2nd) Fundação Zoobotânica do Rio Grande do Sul – FZB (RS Zoo-Botanical Foundation), created through State Law nº 6,497/72.

Coordination and monitoring activities for the preparation of ZEE-RS shall be the responsibility of the technical team designated by SEMA.

3.3 Expectations to be met

Ecological-Economic zoning is an environmental management instrument, cited in Article 9, Clause II of Federal Law n° 6,938/81 for the National Environmental Policy used at different levels of public administration, constituting a fundamental tool in subsidizing decision making in terms of plans, programs, projects and activities that directly or indirectly use natural resources and biodiversity.

The gain in importance of management tools like ZEE was the motive for determining the regulation of Article 9 of Law n°6,938/81, through Federal Decree n° 4,297/2002, which established the principles and minimum criteria for the preparation of ZEEs. As such, the preparation of ZEE-RS shall be guided by the pertinent legislation in effect. This is to standardize concepts and allow for greater efficiency in the application of ZEE-RS as a management instrument. The following objectives stand out:

- Strive for ecological, economic and social sustainability, resulting from the recognition of the intrinsic value of biodiversity and its components;
- Rely on ample participation by society, sharing actions and responsibilities;
- Place value on multidisciplinary scientific expertise.

The state of Rio Grande do Sul, in line with the guidelines of national planning and faced with a territorial reality that is increasingly complex and dynamic, is attempting to bolster its traditional instruments of action, through the adoption of more agile and technically specialized management mechanisms, which shall ensure enhancements and improvements in the state's environmental management and the services rendered to society.

Of note is the acute expectations surrounding the preparation of this tool among productive sector, non-governmental organizations and "traditional populations" , which uses natural resources in their habitual activities. We believe that is has the potential to make a huge contribution in articulating polices and for occupation in an ordered manner, most importantly through guidance of the productive activity in the territory. The scope of the State, ZEE is seen as a significant instrument for territorial planning and support in licensing and management of environmental policy.

Thus, the preparation of the ZEE-RS is focused on the promotion of actions and generation of products that offer a glimpse of social and economic cohesion in the region covered by the study. Regional guidelines are expected, along with the definition of strategies for the economic development of the State, while observing environmental values.

3.4 Area of Coverage

For the purpose of the preparation of Ecological-Economic Zoning for the entire State of Rio Grande do Sul, we propose the division of this work into two areas. The first (area 1) shall include the municipalities listed in TABLE 1, which are included on MAP 1. The area covers the North, Mid and South Coast of RS and the adjacent municipalities, limited preliminarily due to geomorphological aspects, natural drainage, rapid process of social-economic transformations, existing studies and municipal limits,

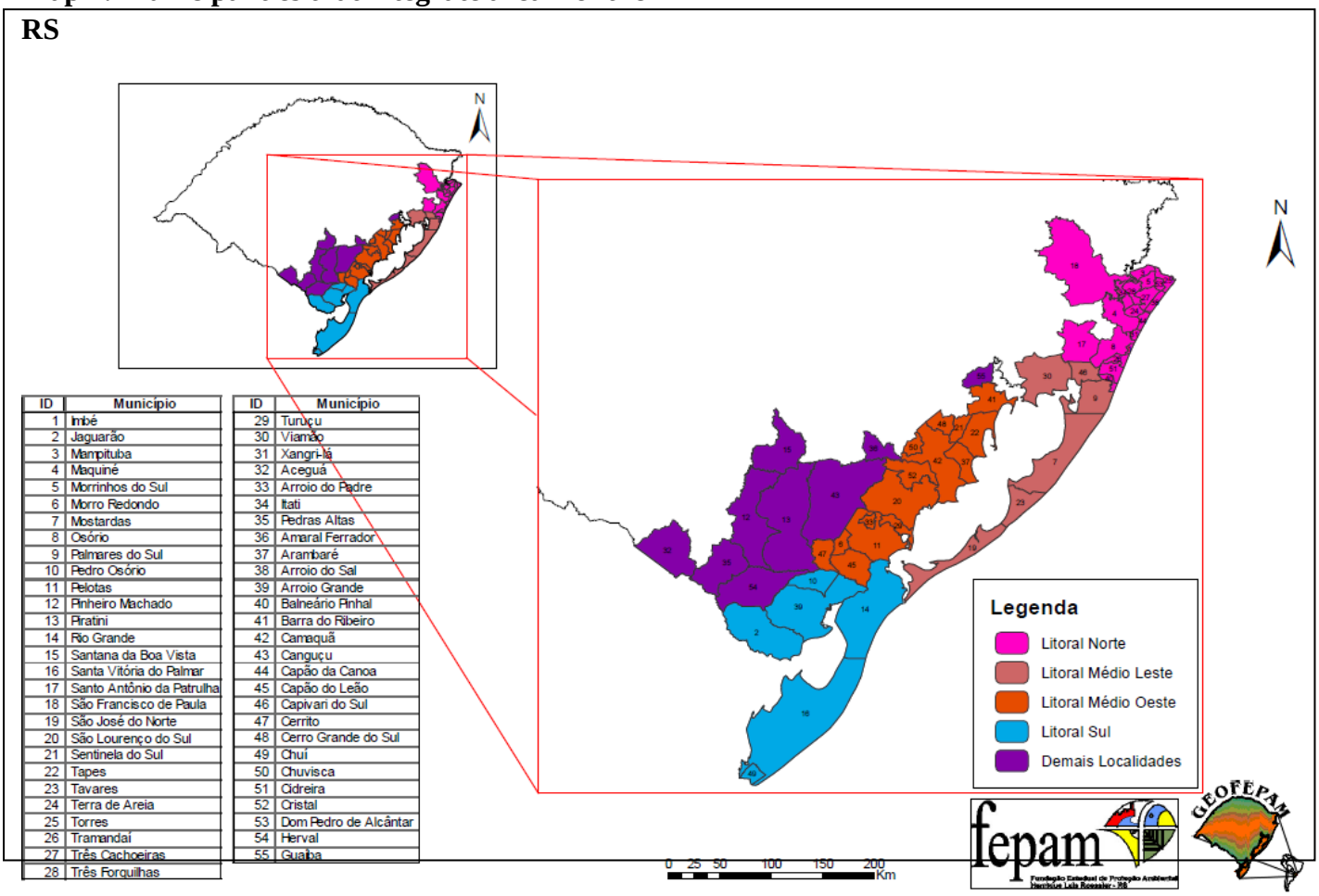
with these final limits possible reevaluated as the studies are undertaken. The second (area 2) shall encompass the municipalities listed in TABLE 2, which are included on MAP 2.

Table 1: Municipalities that integrate area 1 of the ZEE-RS study

Arroio do Sal[1]	Cerro Grande do Sul[2]	Morro Redondo[2]	São José do Norte[3]
*Aceguá**	Chuí[4]	Mostardas[3]	São Lourenço do Sul[2]
*Amaral Ferrador**	Chuvisca[2]	Osório[1]	Sentinela do Sul[2]
Arambaré[2]	Cidreira[1]	Palmares do Sul[3]	Tapes[2]
Arroio do Padre[2]	Cristal[2]	*Pedras Altas**	Tavares[3]
Arroio Grande[4]	Dom Pedro de Alcântara[1]	Pedro Osório[4]	Terra de Areia[1]
Balneário Pinhal[1]	*Guaíba**	Pelotas[2]	Torres[1]
Barra do Ribeiro[2]	*Herval**	*Pinheiro Machado**	Tramandaí[1]
Camaquã[2]	Imbé[1]	*Piratini**	Três Cachoeiras[1]
*Canguçú**	Itati[1]	Rio Grande[4]	Três Forquilhas[1]
Capão da Canoa[1]	Jaguarão[4]	Santa Vitória do Palmar[4]	Turuçu[2]
Capão do Leão[2]	Mampituba[1]	*Santana da Boa Vista**	Viamão[3]
Capivari do Sul [3]	Maquine [1]	Santo Antônio da Patrulha[1]	Xangri-Lá[1]
Cerrito[2]	Morrinhos do Sul[1]	São Francisco de Paula[1]	

[1] North Coast; [2] Midwest Coast; [3]Mideast Coast; [4] South Coast; * Other Municipalities (Locations)

Map 1: Municipalities that integrate area 1 of the ZEE-RS



ID	Município
1	Imbé
2	Jaguarão
3	Mampituba
4	Maquiné
5	Morrinhos do Sul
6	Morro Redondo
7	Mostardas
8	Osório
9	Palmares do Sul
10	Pedro Osório
11	Pelotas
12	Pinheiro Machado
13	Piratini
14	Rio Grande
15	Santana da Boa Vista
16	Santa Vitória do Palmar
17	Santo Antônio da Patrulha
18	São Francisco de Paula
19	São José do Norte
20	São Lourenço do Sul
21	Sentinela do Sul
22	Tapes
23	Tavares
24	Terra de Areia
25	Torres
26	Tramandaí
27	Três Cachoeiras
28	Três Forquilhas

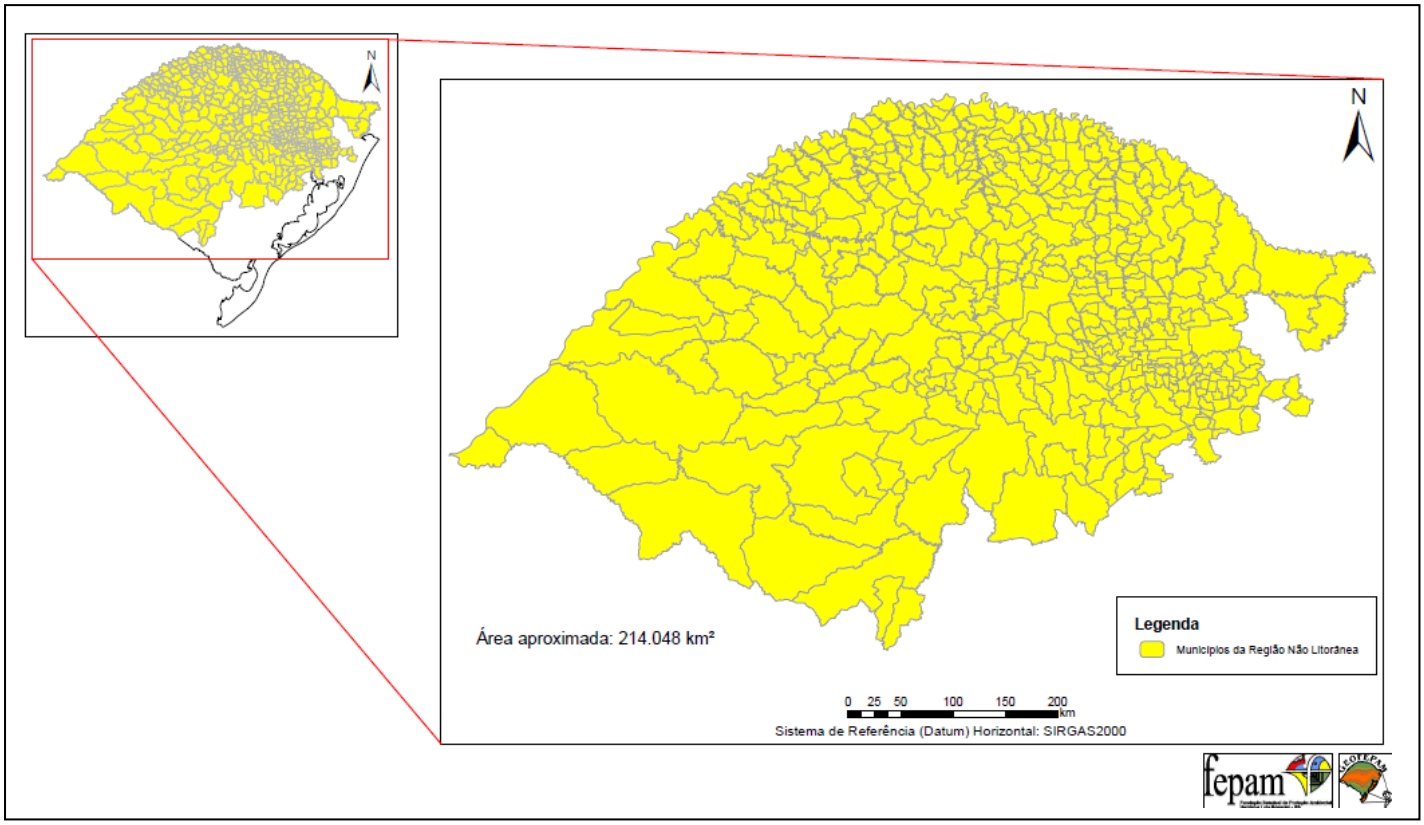
ID	Município
29	Turuçu
30	Viamão
31	Xangri-lá
32	Aceguá
33	Arroio do Padre
34	Itati
35	Pedras Altas
36	Amaral Ferrador
37	Arambaré
38	Arroio do Sal
39	Arroio Grande
40	Balneário Pinhal
41	Barra do Ribeiro
42	Camaquã
43	Canguçu
44	Capão da Canoa
45	Capão do Leão
46	Capivari do Sul
47	Cerrito
48	Cerro Grande do Sul
49	Chuí
50	Chuvisca
51	Cidreira
52	Cristal
53	Dom Pedro de Alcântar
54	Herval
55	Guaíba

Table 2: Municipalities that integrate area 2 of the ZEE-RS

Id	Cod_IBGE	Município	Id	Cod_IBGE	Município	Id	Cod_IBGE	Município	Id	Cod_IBGE	Município	Id	Cod_IBGE	Município	Id	Cod_IBGE	Município
1	4300059	Água Santa	87	4305207	Cerro Largo	173	4309704	Humaitá	259	4313441	Novo Tiradentes	345	4318408	São Jerônimo	431	4322905	Viadutos
2	4300109	Agudo	88	4305306	Chapada	174	4309753	Ibarama	260	4313466	Novo Xingu	346	4318424	São João da Urtiga	432	4323101	Vicente Dutra
3	4300208	Ajuricaba	89	4305355	Charqueadas	175	4309803	Ibiaçá	261	4313490	Novo Barreiro	347	4318432	São João do Polêsine	433	4323200	Victor Graeff
4	4300307	Alecrim	90	4305371	Charrua	176	4309902	Ibiraiaras	262	4313607	Paim Filho	348	4318440	São Jorge	434	4323309	Vila Flores
5	4300406	Alegrete	91	4305405	Chiapetta	177	4309951	Ibirapuitã	263	4313706	Palmeira das Missões	349	4318457	São José das Missões	435	4323358	Vila Lângaro
6	4300455	Alegria	92	4305504	Ciríaco	178	4310009	Ibirubá	264	4313805	Palmitinho	350	4318465	São José do Herval	436	4323408	Vila Maria
7	4300471	Almirante Tamandaré do Sul	93	4305587	Colinas	179	4310108	Igrejinha	265	4313904	Panambi	351	4318481	São José do Hortêncio	437	4323457	Vila Nova do Sul
8	4300505	Alpestre	94	4305603	Colorado	180	4310207	Ijuí	266	4313953	Pantano Grande	352	4318499	São José do Inhacorá	438	4323507	Vista Alegre
9	4300554	Alto Alegre	95	4305702	Condor	181	4310306	Ilópolis	267	4314001	Paraí	353	4318606	São José do Ouro	439	4323606	Vista Alegre do Prata
10	4300570	Alto Feliz	96	4305801	Constantina	182	4310363	Imigrante	268	4314027	Paraíso do Sul	354	4318614	São José do Sul	440	4323705	Vista Gaúcha
11	4300604	Alvorada	97	4305835	Coqueiro Baixo	183	4310405	Independência	269	4314035	Pareci Novo	355	4318622	São José dos Ausentes	441	4323754	Vitória das Missões
12	4300646	Ametista do Sul	98	4305850	Coqueiros do Sul	184	4310413	Inhacorá	270	4314050	Parobé	356	4318705	São Leopoldo	442	4323770	Westfalia
13	4300661	André da Rocha	99	4305871	Coronel Barros	185	4310439	Ipê	271	4314068	Passa Sete	357	4318903	São Luiz Gonzaga			
14	4300703	Anta Gorda	100	4305900	Coronel Bicaco	186	4310462	Ipiranga do Sul	272	4314076	Passo do Sobrado	358	4319000	São Marcos			
15	4300802	Antônio Prado	101	4305934	Coronel Pilar	187	4310504	Iraí	273	4314100	Passo Fundo	359	4319109	São Martinho			
16	4300877	Araricá	102	4305959	Cotiporã	188	4310538	Itaara	274	4314134	Paulo Bento	360	4319125	São Martinho da Serra			
17	4300901	Aratiba	103	4305975	Coxilha	189	4310553	Itacurubi	275	4314159	Paverama	361	4319158	São Miguel das Missões			
18	4301008	Arroio do Meio	104	4306007	Crissiumal	190	4310579	Itapuca	276	4314308	Pejuçara	362	4319208	São Nicolau			
19	4301107	Arroio dos Ratos	105	4306072	Cristal do Sul	191	4310603	Itaqui	277	4314423	Picada Café	363	4319307	São Paulo das Missões			
20	4301206	Arroio do Tigre	106	4306106	Cruz Alta	192	4310702	Itatiba do Sul	278	4314456	Pinhal	364	4319356	São Pedro da Serra			
21	4301404	Arvorezinha	107	4306130	Cruzaltense	193	4310751	Ivorá	279	4314464	Pinhal da Serra	365	4319364	São Pedro das Missões			
22	4301503	Augusto Pestana	108	4306205	Cruzeiro do Sul	194	4310801	Ivoti	280	4314472	Pinhal Grande	366	4319372	São Pedro do Butiá			
23	4301552	Áurea	109	4306304	David Canabarro	195	4310850	Jaboticaba	281	4314498	Pinheirinho do Vale	367	4319406	São Pedro do Sul			
24	4301602	Bagé	110	4306320	Derrubadas	196	4310876	Jacuizinho	282	4314530	Pinto Bandeira	368	4319505	São Sebastião do Caí			
25	4301651	Barão	111	4306353	Dezesseis de Novembro	197	4310900	Jacutinga	283	4314555	Pirapó	369	4319604	São Sepé			
26	4301701	Barão de Cotegipe	112	4306379	Dilermando de Aguiar	198	4311106	Jaguari	284	4314704	Planalto	370	4319703	São Valentim			
27	4301750	Barão do Triunfo	113	4306403	Dois Irmãos	199	4311122	Jaquirana	285	4314753	Poço das Antas	371	4319711	São Valentim do Sul			
28	4301800	Barracão	114	4306429	Dois Irmãos das Missões	200	4311130	Jari	286	4314779	Pontão	372	4319737	São Valério do Sul			
29	4301859	Barra do Guarita	115	4306452	Dois Lajeados	201	4311155	Jóia	287	4314787	Ponte Preta	373	4319752	São Vendelino			
30	4301875	Barra do Quaraí	116	4306502	Dom Feliciano	202	4311205	Júlio de Castilhos	288	4314803	Portão	374	4319802	São Vicente do Sul			
31	4301925	Barra do Rio Azul	117	4306601	Dom Pedrito	203	4311239	Lagoa Bonita do Sul	289	4314902	Porto Alegre	375	4319901	Sapiranga			
32	4301958	Barra Funda	118	4306700	Dona Francisca	204	4311254	Lagoão	290	4315008	Porto Lucena	376	4320008	Sapucaia do Sul			
33	4302006	Barros Cassal	119	4306734	Doutor Maurício Cardoso	205	4311270	Lagoa dos Três Cantos	291	4315057	Porto Mauá	377	4320107	Sarandi			
34	4302055	Benjamin Constant do Sul	120	4306759	Doutor Ricardo	206	4311304	Lagoa Vermelha	292	4315073	Porto Vera Cruz	378	4320206	Seberi			
35	4302105	Bento Gonçalves	121	4306767	Eldorado do Sul	207	4311403	Lajeado	293	4315107	Porto Xavier	379	4320230	Sede Nova			
36	4302154	Boa Vista das Missões	122	4306809	Encantado	208	4311429	Lajeado do Bugre	294	4315131	Pouso Novo	380	4320263	Segredo			
37	4302204	Boa Vista do Buricá	123	4306908	Encruzilhada do Sul	209	4311502	Lavras do Sul	295	4315149	Presidente Lucena	381	4320305	Selbach			
38	4302220	Boa Vista do Cadeado	124	4306924	Engenho Velho	210	4311601	Liberato Salzano	296	4315156	Progresso	382	4320321	Senador Salgado Filho			
39	4302238	Boa Vista do Incra	125	4306932	Entre-Ijuís	211	4311627	Lindolfo Collor	297	4315172	Protásio Alves	383	4320404	Serafina Corrêa			
40	4302253	Boa Vista do Sul	126	4306957	Entre Rios do Sul	212	4311643	Linha Nova	298	4315206	Putinga	384	4320453	Sério			
41	4302303	Bom Jesus	127	4306973	Erebango	213	4311700	Machadinho	299	4315305	Quaraí	385	4320503	Sertão			
42	4302352	Bom Princípio	128	4307005	Erechim	214	4311718	Maçambara	300	4315313	Quatro Irmãos	386	4320552	Sertão Santana			
43	4302378	Bom Progresso	129	4307054	Ernestina	215	4311759	Manoel Viana	301	4315321	Quevedos	387	4320578	Sete de Setembro			
44	4302402	Bom Retiro do Sul	130	4307203	Erval Grande	216	4311791	Maratá	302	4315354	Quinze de Novembro	388	4320602	Severiano de Almeida			
45	4302451	Boqueirão do Leão	131	4307302	Erval Seco	217	4311809	Marau	303	4315404	Redentora	389	4320651	Silveira Martins			
46	4302501	Bossoroca	132	4307401	Esmeralda	218	4311908	Marcelino Ramos	304	4315453	Relvado	390	4320677	Sinimbu			
47	4302584	Bozano	133	4307450	Esperança do Sul	219	4311981	Mariana Pimentel	305	4315503	Restinga Seca	391	4320701	Sobradinho			
48	4302600	Braga	134	4307500	Espumoso	220	4312005	Mariano Moro	306	4315552	Rio dos Índios	392	4320800	Soledade			
49	4302659	Brochier	135	4307559	Estação	221	4312054	Marques de Souza	307	4315701	Rio Pardo	393	4320859	Tabaí			
50	4302709	Butiá	136	4307609	Estância Velha	222	4312104	Mata	308	4315750	Riozinho	394	4320909	Tapejara			
51	4302808	Caçapava do Sul	137	4307708	Esteio	223	4312138	Mato Castelhano	309	4315800	Roca Sales	395	4321006	Tapera			
52	4302907	Cacequi	138	4307807	Estrela	224	4312153	Mato Leitão	310	4315909	Rodeio Bonito	396	4321204	Taquara			
53	4303004	Cachoeira do Sul	139	4307815	Estrela Velha	225	4312179	Mato Queimado	311	4315958	Rolador	397	4321303	Taquari			
54	4303103	Cachoeirinha	140	4307831	Eugênio de Castro	226	4312203	Maximiliano de Almeida	312	4316006	Rolante	398	4321329	Taquaruçu do Sul			
55	4303202	Cacique Doble	141	4307864	Fagundes Varela	227	4312252	Minas do Leão	313	4316105	Ronda Alta	399	4321402	Tenente Portela			
56	4303301	Caibaté	142	4307906	Farroupilha	228	4312302	Miraguaí	314	4316204	Rondinha	400	4321451	Teutônia			
57	4303400	Caiçara	143	4308003	Faxinal do Soturno	229	4312351	Montauri	315	4316303	Roque Gonzales	401	4321469	Tio Hugo			
58	4303558	Camargo	144	4308052	Faxinalzinho	230	4312377	Monte Alegre dos Campos	316	4316402	Rosário do Sul	402	4321477	Tiradentes do Sul			
59	4303608	Cambará do Sul	145	4308078	Fazenda Vilanova	231	4312385	Monte Belo do Sul	317	4316428	Sagrada Família	403	4321493	Toropi			
60	4303673	Campestre da Serra	146	4308102	Feliz	232	4312401	Montenegro	318	4316436	Saldanha Marinho	404	4321626	Travesseiro			
61	4303707	Campina das Missões	147	4308201	Flores da Cunha	233	4312427	Mormaço	319	4316451	Salto do Jacuí	405	4321634	Três Arroios			
62	4303806	Campinas do Sul	148	4308250	Floriano Peixoto	234	4312476	Morro Reuter	320	4316477	Salvador das Missões	406	4321709	Três Coroas			
63	4303905	Campo Bom	149	4308300	Fontoura Xavier	235	4312609	Muçum	321	4316501	Salvador do Sul	407	4321808	Três de Maio			
64	4304002	Campo Novo	150	4308409	Formigueiro	236	4312617	Muitos Capões	322	4316600	Sananduva	408	4321857	Três Palmeiras			
65	4304101	Campos Borges	151	4308433	Forquetinha	237	4312625	Mulitermo	323	4316709	Santa Bárbara do Sul	409	4321907	Três Passos			
66	4304200	Candelária	152	4308458	Fortaleza dos Valos	238	4312658	Não-Me-Toque	324	4316733	Santa Cecília do Sul	410	4321956	Trindade do Sul			
67	4304309	Cândido Godói	153	4308508	Frederico Westphalen	239	4312674	Nicolau Vergueiro	325	4316758	Santa Clara do Sul	411	4322004	Triunfo			
68	4304358	Candiota	154	4308607	Garibaldi	240	4312708	Nonoai	326	4316808	Santa Cruz do Sul	412	4322103	Tucunduva			
69	4304408	Canela	155	4308656	Garruchos	241	4312757	Nova Alvorada	327	4316907	Santa Maria	413	4322152	Tunas			
70	4304606	Canoas	156	4308706	Gaurama	242	4312807	Nova Araçá	328	4316956	Santa Maria do Herval	414	4322186	Tupanci do Sul			
71	4304614	Canudos do Vale	157	4308805	General Câmara	243	4312906	Nova Bassano	329	4316972	Santa Margarida do Sul	415	4322202	Tupanciretã			
72	4304622	Capão Bonito do Sul	158	4308854	Gentil	244	4312955	Nova Boa Vista	330	4317103	Santana do Livramento	416	4322251	Tupandi			
73	4304655	Capão do Cipó	159	4308904	Getúlio Vargas	245	4313003	Nova Bréscia	331	4317202	Santa Rosa	417	4322301	Tuparendi			
74	4304689	Capela de Santana	160	4309001	Giruá	246	4313011	Nova Candelária	332	4317251	Santa Tereza	418	4322343	Ubiretama			
75	4304697	Capitão	161	4309050	Glorinha	247	4313037	Nova Esperança do Sul	333	4317400	Santiago	419	4322350	União da Serra			
76	4304705	Carazinho	162	4309100	Gramado	248	4313060	Nova Hartz	334	4317509	Santo Ângelo	420	4322376	Unistalda			
77	4304713	Caraá	163	4309126	Gramado dos Loureiros	249	4313086	Nova Pádua	335	4317558	Santo Antônio do Palma	421	4322400	Uruguaiana			
78	4304804	Carlos Barbosa	164	4309159	Gramado Xavier	250	4313102	Nova Palma	336	4317707	Santo Antônio das Missões	422	4322509	Vacaria			
79	4304853	Carlos Gomes	165	4309209	Gravataí	251	4313201	Nova Petrópolis	337	4317756	Santo Antônio do Planalto	423	4322525	Vale Verde			
80	4304903	Casca	166	4309258	Guabiju	252	4313300	Nova Prata	338	4317806	Santo Augusto	424	4322533	Vale do Sol			
81	4304952	Caseiros	167	4309407	Guaporé	253	4313334	Nova Ramada	339	4317905	Santo Cristo	425	4322541	Vale Real			
82	4305009	Catuípe	168	4309506	Guarani das Missões	254	4313359	Nova Roma do Sul	340	4317954	Santo Expedito do Sul	426	4322558	Vanini			
83	4305108	Caxias do Sul	169	4309555	Harmonia	255	4313375	Nova Santa Rita	341	4318002	São Borja	427	4322608	Venâncio Aires			
84	4305116	Centenário	170	4309571	Herveiras	256	4313391	Novo Cabrais	342	4318051	São Domingos do Sul	428	4322707	Vera Cruz			
85	4305132	Cerro Branco	171	4309605	Horizontina	257	4313409	Novo Hamburgo	343	4318101	São Francisco de Assis	429	4322806	Veranópolis			
86	4305157	Cerro Grande	172	4309654	Hulha Negra	258	4313425	Novo Machado	344	4318309	São Gabriel	430	4322855	Vespasiano Correa			

Source: Fepam, Geoprocessing Division

Map 2: Municipalities that integrate area 2 of the ZEE-RS



4 Activities

4.1 Activity 1 - Project Planning

This stage is before the actual technical studies. It is part of the bridge between the mobilization thus far regarding ZEE-RS and the execution of technical activities to generate specific products. Its importance consists of planning the execution of work s in accord with the proposed objectives and the problems that require resolution.

The following actions for realizing these activities are of note:

4.1.1 Develop a preliminary version of the Work Plan for the execution of activities described in this Term of Reference, including, at least, the identification of demands, instruments and methodological procedures, detailed schedule of activities, physical-financial and product timetable;

4.1.2 Submit the preliminary version of the Work Plan for approval from the Technical Team designated by SEMA, with at least on meeting with the key team coordinator, to present the Plan;

4.1.3 If necessary, make adjustments to the version of the Work Plan , with the aim of ensuring approval by the Technical Team designated by SEMA;

4.1.4. Deliver the final version of the Work Plan approved by the Technical Team designated by SEMA.

4.2 Activity 2 - Participation of society in the process of building ZEE-RS

4.2.1 Preparation of the plan for the execution of participatory workshops - this activity shall plan ample participation from all social-economic actors with influence in the area of the project and, as such, shall include a minimum of 38 (thirty-eight) participatory workshops, so that it is possible for at least 100 people to take part in each workshop. The idea behind this activity is to allow the work developed in the phases of pre-diagnosis, diagnosis and prognosis (Activity 4 and 5) to be presented for the consideration of those present, and so that contributions are made by the participants. Thereby allowing for adjustments to the study for future validation of ZEE. The number of workshops must be programmed considering the distance for travel. Articulation of municipalities involved shall comply with certain criteria established previously in the State plan, such as, for example, *Conselhos Regionais de Desenvolvimento do Rio Grande do Sul* – COREDES (Regional Boars of Development of

Rio Grande do Sul) The physical structure for hosting the workshops is the responsibility of SEMA, with the organization (for example: hiring third-party services for event organization, promotion of workshops in magazines and/or newspapers, lease of IT and audio equipment) the responsibility of the contracted party.

4.2.2 Presentations at the participatory workshops shall include the intermediary diagnoses for the participants' consideration, permitting contributions and adjustments to the work. The prognoses, scenarios and proposals of guidelines shall also be presented for consideration and adjustment. Public evaluation of the consultancy activities should validate the final version of ZEE-RS.

4.2.3 The validation process for these ZEE shall include the social safeguards recommended by IBRD in terms of issues of indigenous peoples and also when involving the proposal of involuntary resettlement for any type of population. At least 02 (two) workshops shall be held and directed toward the public covered by the social safeguards of the World Bank.

4.3 Activity 3 - Environmental, Social-economic and Legal Inventory

The following actions for realizing these activities are of note:

4.3.1 Survey existing data. this activity shall include ample bibliographical research with the goal of obtaining all the environmental, social-economic and legal milestone information and mapping available. Institutional agreements shall also be formalized for obtaining said existing data. Identification of knowledge gaps, and plan for the collection of primary data, necessary for the work, which should be included in the diagnosis stage;

4.3.2 Collect data to be systemized and separated in accord with the groups established in the methodology model of the Ministry of the Environment, which are: human, natural, productive and institutional components. Thus, each component shall be structured through the conditioning factors, that is, the main social themes constituted by a set of social indicators, identified to represent the real changes of each municipality;

4.3.3 Due to the objectives and the scale of the project, the identification, collection and systemization of secondary data must be defined. The entry and exit of data shall be compatible with the analyses required

for the preparation of the project and shall be planned in the modeling of the GIS information system to be implemented;

4.3.4 This activity shall include considerations regarding zoning of the North Coast, produced by FEPAM in 2000, and the data produced for the zoning of the Mid Coast region through the RS-Biodiversidade Project, in 2013, so as to integrate them into the zoning proposal, the subject of this TR.

4.3.5 Systemize and format obtained data. The passive descriptive data shall be formatted in a Geographic Information System (GIS) for a cartographic base of a scale of 1:100,000, page to page, in accord with official cartographic standards. The cartographic base to be used for the inclusion of data shall be defined in conjunction with the SEMA. The non-passive descriptive data shall be stored, to permit processing, integrated analysis and availability. The information about legislation should also be indexed in the database.

4.3.6 Develop and implement a georeferenced and modeled database for implementation of ZEE.

4.4 Activity 4 - Diagnosis of the Natural factors (Physical-Biotic), of the Social-economic Dynamic and the Legal-Institutional organization

After preparing the planning bases and the database to be completed, the diagnosis should be guided for filling the existing gaps and the comprehension of the current study based on the environment and social-economic dynamic, aimed at complying with the objectives of ZEE-RS The diagnoses processes shall include a systemized integration of sectoral analyses, with references on the natural environments, the social-economic dynamic and the legal-institutional organization. The methodological procedures cited in the documentation produced by the Ministry of the Environment (MMA) - "Methodological Guidelines for Ecological-Economic Zoning of Brazil" shall be observed in all activities related to ZEE-RS.

The following actions for realizing these activities are of note:

4.4.1 **Diagnosis of the Physical factors -** Generate a map that includes physical factor variables, considering the development and dynamics of spatial heterogeneity. The diagnosis shall permit, along with the diagnosis of the biotic factor, an assessment of the natural integrity, the potential, fragilities/vulnerabilities and limits of use, as such, the minimum basic themes shall be approached: hydrology, climatology, geology, geomorphology, pedology.

4.4.2 Map the physical variable generating qualitative and quantitative indicators and a summarized map with the help of satellite images, based on the integrated evaluation of the thematic maps;

4.4.3 Define the natural fragility indicators, aimed at identifying the units with greater environmental susceptibility;

4.4.4 Prepare intermediary vulnerability/fragility zoning of the physical factor;

4.4.5 Prepare a hydrosedimentological diagnosis of Guaíba Lake based on data generated through the Superintendency of Ports and Waterways (SPH) in conjunction with SEMA, in accord with the technical specifications of ANNEX III;

4.4.6 **Diagnosis of the Biotic Factors** - Diagnose the ecological structure that maintains the functioning and integrity of ecosystems. Based on this diagnosis, assess the integrity of the biotic factor, as well as subsidize the future use guidelines. This diagnosis, with the aid of a remote sensing tool, shall begin with attributes of rapid identification by expressing the physiognomy of the landscapes, with a focus on the biotic attributes represented through associated fauna and flora. Natural fragility shall be gauged through indicators such as: the percent of remaining native plant cover, the rate of conversion of natural areas, the existence of natural biodiversity corridors, the level of connectivity and fragmentation, loss of diversity, percentages of APP and legal reserves. For the analysis of Biotic Factor Integrity, a least the following basic themes shall be considered: Phytogeography; Fauna and flora; Land fauna; Aquatic fauna; Threatened fauna; Loss of biodiversity; Wealth of fauna and flora species; Areas of environmental risk;

4.4.7 Map the fauna and flora, and generate a map of the ecological integrity with the aid of satellite images, cased in the integrated assessments of thematic maps;

4.4.8 Define the natural fragility indicators, aimed at identifying the units with greater environmental susceptibility;

4.4.9 Prepare intermediary zoning of the ecological vulnerability/fragility of the biotic factor;

4.4.10 Identify ecosystems and potential areas for the implementation of conservation units and ecological corridors;

4.4.11 Prepare the zoning of the natural environment, through the integrated analysis of physical/biotic factor results, indicating at least: 1) Natural Potential, defined by the environmental services of the ecosystems and the available natural resources, including, among other things, agricultural aptitude, timber potential and potential for non-wood forest products, which includes the potential for exploration of products derived from biodiversity; 2) Potential Natural Fragility, defined by indicators on loss of biodiversity, natural vulnerability through soil loss, quantity and quality of surface and underground water resources; 3) Indication of ecological corridors;

4.4.12 **Diagnosis of the Social-Economic Dynamic** – The recommendations expressed by the MMA in the document "Methodological Zoning Guidelines" (SEDR/ZEE/MMA, 2006) shall be complied with for mapping the social-economic potential that shall guide the diagnosis. The objective of the social-economic study is to explain the dynamics of the use of the territory, the forms of production and the methods and conditions of life associated to them starting with specific social and economic conditions. This analysis reconstructs the historical trends of the ways social production and reproduction relations appear in different areas, which occurs through the reconstruction of territories and the appropriation of the available natural resources. The themes shall consider the most recent demographic, economic, urban-regional and living condition studies, as long as there is no objection from the SEMA Technical Team regarding the use of said studies. The information to be used shall be municipal-based (census sector), collected from different official sources, such as the *Instituto Brasileiro de Geografia e Estatística* – IBGE (Brazilian Geographic and Statistics Institute), *Fundação de Economia e Estatística* – FEE (Economic and Statistic Foundation), *Ministério da Saúde* – MS (Ministry of Health), *Ministério da Educação* – MEC (Ministry of Education);

4.4.13 Identify the leading characteristics associated to the Use of Land. This concept involves a complex of human activities applied to a limited area of territory that is manifested in different forms;

4.4.14 Undertake a historical survey of the physical-territorial occupation of the State. The history of territorial occupation will permit the reconstruction of the occupation process and the appropriation of natural resources. This diagnosis shall permit the comprehension of the process, detecting the spatial distribution of the population and its

contribution to the formation of the society of Rio Grande do Sul over the decades.

4.4.15 Identify the use and occupation of rural land, with at least: the boundary structure, occupation and use of land through extractive activity, agriculture and livestock farming, irrigated areas, and rural development conditions;

4.4.16 Identify the use and occupation of urban land, with at least the infrastructure aspects: roadways with description of centralities; energy; public water supply; sewage; landlines and mobile telephony; transport;

4.4.17 Identify the economic activities (traditional, new and overlaps) and established infrastructure, boundary infrastructure, urbanized areas and urban expansion areas, landscape and historic-cultural heritage, institutional areas and inherent programs;

4.4.18 Identify the Urban-Regional Network This dimension of ZEE must take into account the role of articulation and management performed by the urban centers that, despite being specific phenomena in terms of physical occupation of the land, articulate the political and economic relations;

4.4.19 Identify the conditions of the Economic dynamic and Space Management. This term shall include studies on the most relevant forms of productive organization in the region. Comprehension of the regional economic dynamic passes through an analysis of the location standard of the range of economic activities and the alterations and trends noted in this standard over time. From that point, discussions on the sustainability of diverse activities in different territorial contexts must be undertaken, thereby subsidizing the identification of those to be encouraged or destimulated. Studies aimed at the economy shall focus on surveying and characterizing the issues of logistics and infrastructure available;

4.420 Analyze the macro-economic aggregates of the State, identifying the trends that determine the economic dynamics, regional occupation and articulation, per capita income, family income, gross internal product formation for the region, employment, trade, service sector, industrial sector and agricultural activities;

4.4.21 Map the location and regional distribution of economic development, using sectoral studies to identify the main productive chains and local production systems;

4.4.22 Analyze the Population Studies. The social-economic assessments must have the central focus of understanding, in an articulated manner, the demographic processes underway in the different regions, associating them to other elements that interact and influence the appropriation and use of territory. It shall further be necessary to distinguish other characteristics of this distribution. Furthermore, the population shall be distributed according to social division of work (small, medium and large property-owners and non-owners, in accord with the specific economic activity, gaining specific remuneration, monopolizing specific production and consumption goods);

4.4.23 Using the population dynamic to identify the current structure of the population (age, gender, demographic density in rural and urban areas), the existence of migratory movements and geometric growth;

4.4.24 Analyze the Living Conditions of the Population. At a regional level, the analysis of living conditions requires an approach covering the social inequalities associated to natural, demographic, social and political diversity. The concept of public health shall include the general conditions of health and encompass the field of education;

4.4.25 Identify the social dynamic, observing at least the indexes of living conditions – Human Development Index (HDI), Social and Economic Development Index (SEDI) – as well as the rates of poverty, archaeological and anthropological sites, traditions and customs, levels of health, education and public safety;

4.4.26 Identify Traditional Populations. The studies involving traditional populations in zoning must include the territorial implications resulting from the concrete existence of these communities in the space and their relations to surrounding society. Part of these communities, in the event of indigenous populations and the remaining *quilombolas*, receive institutional treatment, with specific public administrative and political structures. Their approach in ZEE shall consider the political contingencies of their existence on territory disputed by a number of social actors;

4.4.27 Identify archaeological and paleontological, archeology and cultural, material (declared at federal, state and municipal level) and immaterial heritage sites, represented through community cultural manifestations;

4.4.28 Define indicators that shall demonstrate the social-economic dynamic by means of the productive capacity in space-time, of the conditions in which this is established, as well as the established

social relations, at, least, by means of work, education, income, social self-organization;

4.4.29 Establish hierarchies municipal census sectors within each variable worked on, that is, an order of the municipalities from highest to lowest value percentage, with the purpose of facilitating the analysis of human, natural, productive and institutional components, as well as transposing these data to the thematic maps in GIS;

4.4..30 Attribute weight and generate categories of municipalities/regions, indicating their leading characteristics in potential, allowing for the generation of information in reference to the living conditions of the population, the natural potential, the productive capacity and the social organization capacity, shown by means of individual thematic maps for each conditioning factor;

4.4.31 Systemize the information from the municipal regions with the highest and lowest potential in each of the components, indicating the concerning and/or favorable conditions in accord with scale of specific colors on the thematic maps.

44.32 A description of the different potentials (human, natural, productive and institutional) should be used as another layer of information in GIS and, as such, crossed with each of the Planning Units (PU) to be defined. This procedure shall guide the goals for the suitable use of each PU, as well as the potential use to be developed and the restrictions to be complied with;

44.33 Detail the diagnosis and the proposal for zoning for the area of the Guaíba Lake Hydrographic Basin 1:25,000 due to the intensive pressure of use (examples: extraction of sand, navigation). For this area, management guidelines shall be created with the goal of mitigating conflicts of use identified in the region of the Lake. The final limits of the proposed area may be reevaluated as the studies are executed;

4.4.34 Detail the diagnosis and the zoning proposal for the area of the Mirim-São Gonçalo Hydrographic Basin, adding to this region the municipality of São José do Norte. this is the region of direct and indirect influence of the São Gonçalo – Rio Grande waterway on which the study shall be conducted at a scale of 1:25,000, due to the intensive pressure of use established due to the implementation of the Shipping Hub and other major enterprises. For the areas of

influence (direct and indirect) of the Rio Grande shipping hub, management guidelines must be created along with territorial order, with the aim of making the use pressures compatible, established through the implementation of the Shipping Hub, with the conservation of environmental resources from the region;

4.4.35 The diagnosis of the social-economic dynamic shall identify: 1) Trends and potential for regional occupation and articulation, defined due to the use of the land, economic flows and population flow, location of infrastructure and the circulation of information; 2) living conditions of the population defined by indicators for health, education, job market, and basic sanitation. Georeferenced vector maps shall be prepared on digital media, with the indicators capable of description, aimed at characterization of the current conditions, the social-economical potentials and trends and the leading vectors of regional development;

4.4.36 Legal-Institutional Diagnosis The legal-institutional organization diagnosis shall be aimed at learning the institutional order, legal provisions and identifying the partner organizations from civil society. Considerations shall include the expectations of the public institutions and civil society in relation to ZEE, identifying formal aspects of legislation, pertinent federal, state and municipal programs, aimed at establishing a base for the normalization proposal;

4.4.37 Identify and Map the Legally Protected Areas, such as conservation units and areas of permanent protection;

4.4.38 Generate a Map of Environmental Impacts and Legal Nonconformities. This map may be generated based on the correlation between land use charters, the conservation units and environmental legislation. Legal nonconformities occur when the legislation applicable to protected areas is ignored, provoking competed forms of usage. The impacted areas correspond to those on which occupation caused significant environmental changes (deforestation, intensive erosion, aggradation and pollution of water courses, unsuitable deposit of solid waste, threat or loss of biodiversity and environmental services);

4.4.39 Identify Institutional Areas. This theme touches on the normative classification and the physical division of territory contextualizing the federative compact. The different spheres of power, through the juxtaposition of major areas of special legislation, compete in some

way with the established rules. The diverse areas of administrative authority must be considered as an important information plan for ZEE. It is necessary to map the institutional areas (conservation units, indigenous areas, border regions) as well as identify the propositions of policies that lead to the convergence of federal, state and municipal actions aimed at regulation and the use of the territory. Here occurs a hybrid understanding of territory, derived from political and tax decentralization, as well as from constitutionalization, also in decentralized molds, of the environment. Thus, a basic product, generated by this theme, consists in the spatial representation of the leading jurisdictions of a organization relative to ZEE, of the conservation units, indigenous areas;

4.4.40 Identify the Legal Aspects. This is aimed at providing the existing elements of a legal nature and in processing necessary for ZEE. Here, the survey of the legal provisions assumes relevance, relative to the use and the preservation of natural resources, territorial order (federal, state and municipal), of development of economic activities in rural and urban areas. Besides the discussion relative to the laws that politically divide the national territory and that, in the present, make a juxtaposition of the political-administrative network with the environmental network, environmental legislation must also be considered, as well as that aimed specifically at access and use of natural resources;

4.4.41 Identify the Leading Civil Organizations. This topic deals with identifying, learning about and creating conditions for incorporating the leading institutions and leaders of civil society with involvement relevant to the objectives of ZEE. Among the leading procedures is the need to identify the main institutions and leaders in each area of study. The state shall have powerful allies in the process of executing and implementing ZEE if its manages to make use of the positive points if alliances. Of note, in this case, is the capacity of these organization to warn the government about the problems and undesirable direction of the project that are not always noted by those undertaking it. Besides identifying the leading allies and partners in civil society, the diagnosis permits the identification of difficulties in the implementation of the project, checking all types of obstacles and the best manner to overcome them.

4.4.42 At the end of this activity, prepare reports and maps that present the methodological application, interpretation of data and results obtained.

4.5. Activity 5 – Prognosis

After the diagnosis of the natural factors, social-economic dynamic and legal-institutional organization, a factual proposal shall be defined on territorial ordering aimed at the compatibility of the multiple interests of economic development and environmental conservation for the territory, based on the fragilities and potentials identified in the area of the project.

4.5.1 Define and map the Planning units (PU) through the integrated analysis of the diagnosis of the physical and biotic factors, associated to the social-economic dynamic and the legal-institutional organization;

4.5.2 Identify the activities suited to each PU, in accord with their ecological fragility, environmental support capacity and potentials;

4.5.3 Identify the environmental protection and conservation needs for water, soil, underground, fauna and flora and other renewable and non-renewable resources;

4.5.4 define the areas for conservation units, integral protection and sustainable use;

4.5.5 establish criteria to guide the wood and non-wood cutting, agricultural, livestock farming, fishing and fish farming activities, urbanization, industrialization, mining and other options for using environmental resources;

4,5,6 Generate scenarios and simulations after the analysis of maps of the natural factors and the social-economical potential in each planning unit (PU). This analysis shall indicated the limitation trends, fragilities and potentials of use identified in each PU, while also guiding the proposition of guidelines for the use of natural resources and potential activities to be encouraged within each PU;

4.5.7. Quantify, in percentage terms and within each planning unit, at least the necessities for environmental conservation and recovery and the use potentials.

4.5.8. Generate a ZEE (Environment and Local Territory Management Plan) of the area under the influence of the São Gonçalo – Rio Grande Waterway and the Shipping Hub at a scale of 1:25,000.

4.5.9 Integrate the Guaíba Lake Hydrosedimentary Study to Ecological-Economic Zoning of RS at a scale of 1:25,000;

4.5.10 Generate a georeferenced vector map in digital format identifying the planning units (zones) in accord with the economic potentials and the potential conflicts with the fragilities of the natural environment. This mapping shall contain all the possible descriptive information produced by the prognosis.

4.5.11 At the end of this activity, prepare reports and maps that present the methodological application, interpretation of data and results obtained.

4.6 Activity 6 - Modeling and Implementation of an IT (Information Technology) tool

4.6.1 An IT toll shall be constructed and installed at SEMA that permits access to the database, allowing, at least, thematic integration, spatial consultations and data modeling. The correlation of these elements shall produces summaries for the analysis of the current situation and future trends, guided by the objective of the project.

4.6.2 Define, in conjunction with SEMA, the institutional arrangements necessary to implement the Database that stores, updates and ensures the shared use if products generated through ZEE. SEMA shall guarantee the storage of generated data in a digital format, constituting a Georeferenced Database, as well as access to its different users.

4.6.3 Define environmental and social-economic indicators that permit the monitoring/oversight of guidelines established in ZEE-RS. The indicators shall permit the identification of medium-and long-term trends, so as to subsidize the update of the diagnoses and prognoses undertaken. Project performance indicators shall also be included.

4.6.4 Training must be conducted with technicians from the state environmental organization. Capacity building for technicians shall ensure qualification sufficient for the effective use and application of ZEE-RS.

4.7 Activity 7 - Strategies for the legal implementation of ZEE-RS

4.7.1, In conjunction with the SEMA Technical Team, prepare a draft of the legal instrument proposal aimed at the implementation of ZEE-RS –considering the discussion of legal and institutional forms of implementing zoning, validated through public participation throughout the entire area of the project.

5 Expected Products

At least the following minimum products are expected from the activities for the preparation of ZEE-RS, considering that each of them must be approved by the SEMA Technical Team.

Activities	Product	Deadline	Expenditure	Time accumulated in days starting from date of contract
Activity 1	1. Work Plan.	30 days	2%	30 days
Activity 2	2. Execution plan for ZEE participatory workshops	30 days	1%	60 days
Activity 3	3. Thematic maps (geology, geomorphology, soils, agricultural use capacity, altimetric amplitude, slope, digital elevation, hydrographic, hydrogeological, waterway system, urban area, vegetation, APP protected areas, legal reserves). 4. Report containing a study of environmental, social-economic and legal-institutional organization data. 5. Systemization of environmental social-economic and legal-institutional organization data. 6. Summarized Report with existing information, as well as identification of gaps to be filled. 7. Report with identification of data necessary to filling gaps. 8. Implementation of a database with all the primary and secondary information systemized in a GIS.	120 days	10%	180 days
Activity 4	9. Thematic mapping and descriptive reports of the physical factor variables. 10. Intermediary zoning of physical factor variables. 11. Physical factor zoning, indicating the vulnerabilities/fragilities of each zone. 12. Thematic mapping and descriptive reports of the biotic factor variables. 13. Intermediary zoning of biotic factor variables. 14. Biotic factor zoning, indicating the vulnerabilities/fragilities of each zone. 15. Zoning of the physical-biotic (natural factor) factors. 16. Mapping of Land Use, with a descriptive report on use dynamics. 17. Mapping of regional Urban Network Interconnections, with a descriptive report. 18. Thematic Mapping of Economic Dynamic and Space Management with the leading economic activities, Available infrastructure and main development vectors, with a descriptive report. 19. Thematic Mapping of Population Studies, with a descriptive report. 20. Thematic Mapping o f Population's Living condition, with a descriptive report. 21. Thematic Mapping identifying the presence of traditional populations, with a descriptive report. 22. Report on Aggregate Social Indicators. 23. Mapping and report containing a study of the archaeological, paleontological and cultural (material and immaterial) heritage of the region. 24. Diagnosis of the area of influence of the São Gonçalo - Rio Grande Waterway and Shipping Hub. 25. Hydrosedimentological Diagnosis of Guaíba Lake 26. Zoning of the Social-economic Dynamic. 27. Mapping of Legally Protected Areas, with a descriptive report. 28. Mapping of Environmental Incompatibilities and Impacts. with a descriptive report. 29. Mapping of Institutional Areas, with a descriptive report. 30. Report containing Legal Aspects for ZEE 31. Report Identifying the leading civil organizations with potential to articulate wit ZEE. 32. Final consolidation report on the methodological application, integration and interpretation of data and obtainment of results with zoning realized in the diagnostic activity. 33. Realization of 26 (twenty-six) Participatory Workshops.	240 days	40%	420 days
Activity 5	34. Thematic Mapping and descriptive reports on the Planning Units. 35. Mapping of Environmental Potential, with a descriptive report. 36. Mapping of Social-economic Potential, with a descriptive report. 37. Georeferenced maps and reports identifying economic potential and potential conflicts with the fragility of the natural environment. 38. ZEE (Environment and Local Territory Management Plan) of the area under the influence of the São Gonçalo – Rio Grande Waterway and the Shipping Hub. 39. Hydrosedimentological Study of Guaíba Lake Integrated into ZEE. 40. Generate reports with analyses and simulation of established scenarios. 41. Final mapping of Planning Units, with a descriptive report and proposal guidelines. 42. Ecological-Economic Zoning 43. Realization of 12 (twelve) Participatory Workshops. 44. Ecological-Economic Zoning - Final Report	120 days	30%	540 days
Activity 6	45. Preparation and Implementation of an IT Tool. 46. Training	135 days	10%	675 days
Activity 7	47. Draft of the proposal of the Law for the legal implementation of ZEE-RS, Stage 1	45 days	7%	720 days
Note: All 47 products listen in this table shall only be considered valid after approval by the technical team designated by SEMA for the monitoring of activities for the preparation of ZEE.				

6 Manner of Presenting Results

The results of the work shall be presented in the following manner:

- A map of the ZEE proposal printed on special paper (glossy-type paper) at a compatible scale to cover the entire area of study on a panel measuring 100 cm x 150 cm;

- A set of printed maps with spatial coverage of the limits of the pages at a scale of 1:100,000;
- A map of ZEE with spatial coverage of the municipal limits;
- Digital database in GIS with an operating IT tool in a system implemented at SEMA;
- A printed report with the descriptive memorandum of ZEE. This document shall contain a compilation of all the Final Technical Reports in reference to Goals described previously. The report shall be delivered in thirty printed copies in hardcover format, A4, with a grammage of 75g/m2, printed in Times New Roman font, size 12 and in accord with the regulations of the ABNT NBR 14724/2011. A copy in CD/DVD format shall also be delivered.
- A dynamic Information Technology tool that permits simulations for the installation of developments and that is capable of accessing all the information generated through ZEE-RS.

The georeferenced maps shall be delivered in a digital vector file ARC-GIS, at a scale of 1:100,000 and 1:25,000 when requested. The Reference System to be used for georeferencing shall be SIRGAS 2000 (Geocentric Reference System for the Americas – 2000 Edition).

The reports shall be delivered in digital Word 2003 format, in Portuguese, according to the regulations of the ABNT, printed in A4 format, with Arial font, main titles in Arial 12, uppercase, bold, subtitles in Arial 12, lowercase, bold, text in Arial 12, justified, spaced at 1.1/2, with page and item numbering in Arabic numerals, upper and lower margin – 2 cm, left – 3 cm, right – 2 cm, header and footnote 1.5 cm.

The following instructions shall also be followed during the composition of the documents:

- Tables, charts, diagrams and any other instructions shall be numbered and present captions and complete titles;
- Abbreviations should only be explained in the first citation, with a list of acronyms and abbreviations appearing at the start of the document;
- Words in other languages shall be presented in italics;
- Authors and words cited shall only be referenced through uppercase initials, followed by a comma and date.
- Cartographic material, which may eventually be produced, shall be delivered in an open format digital media.

All material produced resulting from the execution of activities defined in the aforementioned items, shall remain in the possession and become the property of the State of Rio Grande do Sul. All documents shall also be delivered in CD/DVD digital format.

7 Key Team Specifications

The Key Team of the contracted consultancy for the execution of the subject of this term of reference shall be comprised of professionals possessing the minimum education and qualifications specified in the list below:

1. 01 (one) General Coordinator, a professional with a graduate degree related to the environment, having acted in the coordination of ecological-economic zoning projects or environmental zoning with at least 10 (ten) years of experience in activities connected to environmental planning and/or management.
2. 01 (one) Assistant Coordinator, a professional with a graduate degree related to the environment, having acted in ecological-economic zoning projects or environmental zoning with at least 5 (five) years of experience in activities connected to environmental planning and/or management.
3. 01 (one) Consultant with a background in the area of social sciences or similar with at least 05 (five) years experience in participatory management or social mobilization or conflict resolution activities, aimed at validation of studies or projects;
4. 01 (one) Consultant with a background in social-economic field, a professional with a undergraduate degree in Economics and a degree in the field of social-economics, with at least 05 (five) years experience in analysis, interpretation and simulation of social-economic variable trends;
5. 01 (one) Consultant with a background in the area of biotic factors, a professional with a graduate degree in biology or similar, with at least 05 (five) years experience in the analysis and interpretation of biotic factor variables;
6. 01 (one) Consultant with a background in the field of earth sciences, with an undergraduate degree geography, geology or similar, professional with a graduate degree in the environment, with at least 05 (five) years experience in the interpretation of physical factor variables;
7. 01 (one) Consultant with higher education, specialized in Remote Sensing and/or Geoprocessing, with at least 5 (five) years of experience in activities connected to environmental planning and/or management;

7.1 Suggested Support Team

The suggested support team of the contracted consultancy for the execution of the subject of this term of reference shall be comprised of professionals possessing the minimum education and qualifications specified in the list below:

1. 01 (one) Legal Consultant, a professional with a Bachelor's degree in Legal Sciences, with at least 05 (five) years of experience;
2. 01 (one) Project Manager Consultant, a professional with a background in Administration or similar and a graduate degree in Project Management, with at least 05 (five) years of experience;
3. 01 (one) IT Consultant with expertise in Geographic Information System (GIS) environments and the construction of software, a professional with an undergraduate or graduate degree in Computer Sciences or Systems Engineering or Systems Analysis, with at least 05 (five) years of experience;
4. 01 (one) Chemical Analysis Consultant, a professional with a graduate degree or similar, with at least 05 (five) years of experience in activities connected to analysis of water, sediments from aquatic environments and soil;
5. 01 (one) Geoprocessing technician with expertise in spatial database management systems, a professional with a graduate degree in geoinformation technology;
6. 01 (one) Sociology Technician, a professional with an undergraduate or graduate degree in sociology;
7. 01 (one) Social-economic Technician, a professional with an undergraduate or graduate degree in social-economics;
8. 01 (one) Flora Technician, a professional with a graduate degree in Botanics, Forestry Engineering or similar;
9. 01 (one) Forestry Technician, a professional with an education or graduate degree in Forestry Engineering, Agronomy or similar;
10. 01 (one) Fauna Technician, a professional with a graduate degree in Zoology or similar;
11. 01 (one) Water Resource Technician, a professional with a graduate degree in Hydrology or similar;
12. 01 (one) Geology Technician, a professional with an undergraduate or graduate degree in Geology;

13. 01 (one) Geomorphology Technician, a professional with an undergraduate degree in Geography or graduate degree in Geomorphology;
14. 01 (one) Climatology Technician, a professional with an undergraduate degree in Geography or graduate degree in Climatology;
15. 01 (one) Pedology Technician, a professional with a graduate degree in Earth Sciences or similar;
16. 01 (one) Land use and occupation technician, a professional with a graduate degree in Rural Development or similar.
17. 01 (one) Coastal environment technician, a professional with a graduate degree in coastal management or similar;

8 Available Inputs

for the purpose of consultancy, the following documents shall be provided for the execution of activities:

- Environmental guidelines for the development of North coast municipalities/org. Fepam: Coastal Management program – Porto Alegre: Fepam: Coastal Management Program, 2000;
- thematic maps and zoning of the Mid coast region produced through the RS Biodiversidade Program, at a scale of 1:100,000;
- Data from the FEPAM water quality monitoring network, in reference to municipalities within the project area;
- Data from the Department of Water Resources in reference to the Regional Basin Plan under the scope of the study;
- Cartographic base at a scale of 1:50,000;
- Cartographic base at a scale of: 1:25,000;
- MMA Satellite image
- Images from the SPOT 11 satellite, encompassing the municipalities part of the priority area of the RS Biodiversidade Project - Mid Coast. Year 2010;
- Pertinent legislation (Annex I);
- survey of Guaíba Lake physical factor data.

9 Term of Execution

The project will be conducted in a period of 24 months starting from the date of signing the contract.

10 Consultancy Expenses

All consultancy expenses, including travel and accommodation, will be the full responsibility of the contracted party.

11 Consultancy Management

The study shall be structured in accord with the description above, adjusted during the course of the work in accord with the needs found, justified and agreed upon between the parties.

The contracted party shall participate in at least two on-site meetings in each of the 07 (seven) activities planned in the project (one action preparation meeting and another the presentation of the product of said action). In addition, the follow is foreseen:

- In Activity 03, at least 35 (thirty-five) trips for field research;
- In Activity 04, at least 105 (one hundred five) trips for field research; Further, at least 26 (twenty-six) trips for, at least, 02 (two) people, that is 52 (fifty-two) trips for participatory workshops;
- In Activity 05, at least 50 (fifty) trips for field research; Further, at least 12 (twelve) trips for, at least, 02 (two) people, that is 24 (twenty-four) trips for participatory workshops;

Thus, for the preparation of ZEE-RS, some 280 (two hundred eighty) trips have been foreseen for the purpose of field research, workshops and monitoring of the project. Note that the contracted party shall provide clarification to the Technical Team, designated by SEMA, whenever called for, until final approval of each product in accord with the planned deadline.

The products shall be delivered to the headquarters of the State Department of the Environment, located at Av. Borges de Medeiros, 261, Historic City Center of Porto Alegre, Rio Grande do Sul.

Once delivered, the products will be submitted to analysis by the ZEE Coordination Team for approval or review, with a term for analysis extending 10 (ten) business days. Products returned with review, once revised and submitted once again, shall be subject to a fresh analysis and a new deadline of 05 (five) business days.

The Final Ecological-Economic Zoning Report shall present the technical team responsible for preparation of the project, indicating the name of the coordinators and responsible parties for each area. Coordinators shall sign the last page and initial all the other pages of the document.

ANNEX I

1. Support Legislation

The preparation of ZEE-RS shall comply with the guidelines of the National Environmental Policy, National Water Resource Policy and the National Biodiversity

Policy, as well as that cited in the Cities Stature, and entire legal framework in the federal, state and municipal scope, with a highlight on the follow legislation:

1.1 Federal Legislation

Federal Law n° 6,938/81, which governs he National Environmental Policy, its purposes and mechanisms for formulation and application, among other provisos, which in Article 9 establishes Environmental zoning as one of the instruments of the National Environmental Policy.

Federal Law n° 12,651/12 (Forestry Code), which establishes in a number of articles the need for States to possess ZEEs, and Article 14, which highlights the importance of this instrument in the definition of legal reserves on rural property.

Federal Law n° 12,305/10, which instituted the National Solid Waste Policy.

Federal Law n° 11,428/06, which covers the use and protection of native vegetation from the Atlantic Forest Biome.

Federal Law n° 9,433/97, which covers the National Water Resource Policy and the National Water Resource Plan.

Federal Law n° 10,257/01, which deals with the Cities Statute.

Federal Law n° 4,504/64, which deals with the Land Statute.

Decrees

Federal Decree n° 4,297/02, which regulates Article 9, Clause II of Law ° 6938/81, establishing the criteria for Ecological-Economic Zoning of Brazil - ZEE.

Federal Decree n° 4,339/02,which institutes the principles and guidelines for the implementation of the National Biodiversity Policy.

1.2 State Legislation

State Law n° 11,520/00, Sate Environmental Code, that, among other aspects, in its Article 15, states that Ecological Zoning and zoning of diverse productive or projected activities are instruments of the State Environmental Policy and, Article 21 in terms of state ZEEs the cover the entire territory of the State, concluded prior to the expiry of this Decree, shall be adjusted to federal environmental legislation through the actual instrument signed between the Union and each of the States interested.

State Law n° 9,519/92, which instituted the State Forestry code, when defining Forestry Ecological-Economic Zoning as one of the instruments of the State Forestry Policy.

State Law n° 10,350/94, which instituted the State Water Resource System, regulating Article 171 of the State Constitution of RS.

State Law n° 11,560/00, which introduced alteration to Law n° 10,350/94, which instituted the State Water Resource System.

State Law n° 7,877/83, which covers Transport of Hazardous Loads in the State of Rio Grande do Sul and other provisions.

Decrees:

Decree n° 42.099/02, which declares the species of flora threatened with extinction in the state of Rio Grande do Sul.

Decree nº 42.047/02, which regulates the provisions of Law n° 10,350/94 with alterations relative to the management and conservation of underground water and aquifers.

Decree n° 41.672/02, which declares the species of wildlife threatened with extinction in the state of Rio Grande do Sul.

Decree nº 40.505/00, which regulates the granting of rights to sue water in the state of Rio Grande do Sul, set forth in Articles 29, 30 and 31 of Law n° 10,350/94.

Decree nº 38,814/98, which regulates the State Conservation Unit System Decree nº 38,356/98, which approves the Regulation of Law n° 9,921/93, which covers the management of solid waste in the State of Rio Grande do Sul.

Decree nº 38.355/98, which establishes the basic standards for handling native forest resources in the State of Rio Grande do Sul in accord with existing legislation (in modification).

Decree nº 37,034/96, which regulates Article 18 of Law n° 10,350, dated December 30, 1994, instituting the State Water Resource System.

Decree nº 37.033/96, which regulates the granting of rights to sue water in the state of Rio Grande do Sul, set forth in Articles 29, 30 and 31 of Law n° 10,350/94.

Decree nº 36.636/96, which limits the area of Atlantic Forests in reference to Article 38 of Law n° 9,519

Decree nº 36,055/95, which regulates Article 7 of Law n° 10,350, dated December 30, 1994, instituting the State Water Resource System.

Decree nº 34.573/92, which approves the Regulations of the Parks of the State of Rio Grande do Sul.

Decree nº 34.256/92, which created the State Conservation Unit System and other provisions.

Decree nº 23.082/74, which instituted the State Environmental Protection Policy.

ANNEXO II

Examples of Planning Unit categorization.

Example 1:

PU – 01

CHARACTERIZATION

Include the environments located around the main rivers and streams, that suffer frequent and occasional flooding through streams, rivers and lakes; the substrate includes sediments like clay, sand, gravel and recent peat. Alluvial forests along the fluvial channels is relatively well preserved

GOALS

Suitable management of agricultural soils and control of urban expansion areas. Stimulate agricultural and livestock farming activities suited to the natural conditions and planned urban actions.

GUIDELINES FOR THE SUE FO NATURAL RESOURCES

Maintenance of Biodiversity: Maintain native forest, especially alluvial forests and remnants of the Pampa biome.

Activity restrictions: Avoid solid waste disposal.

POTENTIAL – ACTIVITIES TO BE ENCOURAGED

· Mineral extraction.
· Livestock farming.
· Leisure and tourism.

Example 2:

PU -01 : 1336 km^2			
AREA km^2	*% of zone*	*Environmental unit (EU)*	
17	1.24	Permanent preservation	Protection section - 100 m of lakes > 20 ha
247	15.00		Remaining Pampa Biome
689	51.58	Conservation	Low fluvial lands
8	0.60		Deltaic deposits
22	1.66		Lakes over 20 ha
3	0.23		Fault protection range - 100 meters
47	3.55		High vulnerability
302	22.63	Development	Areas of development
46	3.5	Recovery	Degraded areas

ANNEX III

Hydrosedimentological Study of Guaíba Lake

1- Subject

Development of a study applied to the preview of post-mining scenarios for the Guaíba bed, with the employment of mathematic modeling methods for current and wave patterns. Generation of morphodynamic scenarios of the bottom and margins between the sections of Usina do Gasômetro and Ponta de Itapuã, at a short- and long-term scale. Analysis of existing data on sediments from the bottom and the suspended load, as well as a study on the circulation of water and the current flow of sediments from the Southeast drainage basin, for Lagoa dos Patos.

2- Objectives

Develop studies in the Guaíba basin to ensure future interventions, such as navigation channels, sand mining and water harvesting can be conducted sustainably, and maintain the balance of the body of water through the application of sediment transport principles.

1. Quantify the solid and liquid discharge into the Guaíba in average annual values, and the liquid discharge of Lagoa dos Patos.

2. Define the distribution of bottom sediments, the size, textural maturity and degree of sandy composition.

3. Detail the bathymetry of the Guaíba basin.

4. Establish the wave pattern of the Guaíba, as well as the pattern of currents induced by waves and wind.

5. Establish future scenarios for mining the bottom and margins of the Guaíba between Usina do Gasômetro and Ponta de Itapuã.

6. Analyze the morphodynamic evolution of the Guaíba basin associated to the evolution of the mining activity.

7. Establish operational scenarios for ordering mining activities from an environmental point of view.

3- Suggested Methods

3.1 - Hydrosedimentological Regime

Describe the current hydrosedimentological regime of the drainage network in the southeast of the state that runs into Guaíba Lake through a single section, next to Ponta do Gasômetro, applied to the description of the sediment flow potential – solid traction and suspension load, and their flows. Establish the second control section at Ponta de Itapuã. Samples shall be taken of sediments in suspension and at the bottom for analysis. Water levels shall be measured in the 04 seasons.

3.2 - Detrital Mineralogy

The analysis of the composition of sediments that form the bottom load shall be used for the interpretation of the average grain size, the textural maturity and the sand fraction composition. The employment of analytical techniques to define the mineralogical composition of the bottom load and the main chemical components and elements with traces of minerals shall be applied to the origin study. These analyses shall be conducted through electronic microprobe and by Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS). The minerals to be studied include: zircon, pyroxene, amphibole, epidote, tourmaline, garnet. A field study must be undertaken for sampling the bottom sediment. Laboratory analyses shall be conducted. Analytical techniques shall be employed to define the mineral composition (Physical-chemical analysis of sediments, granulometric and compositional analyses of the sediments that form the bottom load). The analyses shall decompose the sediment samples to determine the macro and micro nutrients and toxic elements, determining: Al, Sb, As, Ba, B, Cd, Cu, Cr, Fe, Mn, Hg, Mo, Ni, Se, V, Zn, Ag, Tl and Bi in the solutions obtained from the samples.

3.3 - Ecobathymetry and Seismic Reflection Profiling

Analysis of the bathymetry data conducted on Guaíba Lake, to study and analyze the morphological behavior of the bed and estimate of the thickness of deposit layers.

3.4 - Wave Pattern

The pattern of waves on the Guaíba shall be investigated and estimated using the cycle III SWAN (Simulating Waves Nearshore) mathematic model, in its 40.85 version. The SWAN numeric model is based on the equation of conversion of wave action and is completely spectral (that is, in all directions and frequencies) The model presents the process for the generation of waves through wind, whitecapping dissipation, friction with the bottom and break induced by death, as well as non-linear wave-wave interactions (quadruplets and triads), explicitly with the formulation that represent the state of art in wave modeling. Very important in coastal and port engineering studies are the processes of diffraction, transmission, blockage and reflection on obstacles, also included in the model formulation.

Used as the model entry are measured and modeled wind fields and the updated bathymetry of the Guaíba also obtained in the execution of this project. The surface wind field will have spatial and temporal variation on the computational grid. Wave measurements on the Guaíba shall be used for the calibration of the SWAN model. We will obtain the wave spectrum, orbital speed and integrated measurements of the spectrum such as significant height, peak period, and wave direction. Simulations shall also be conducted with different scenarios determined by different possible bathymetries caused by the mining activities planned on the Guaíba. Data on waves, temperature, conductivity and turbidity shall be obtained. At a later stage, the process for the generation of waves through wind, dissipation, friction with the bottom and breaking induced by depth shall be simulated using the obtained data.

3.5 Current Patterns

Modeling can be created through the 3D baroclinicity mode, with 3 to 10 vertical computational layers, so as to capture phenomenon of water column stratification and the transport of sediments in three dimensions. The numeric modeling study of waves and currents is aimed at answering the following questions:

a. What are the possible alterations in circulation (currents) and patterns of wave propagation on the Guaíba that may result from mining activities?

b. Will the possible alterations caused represent any type of risk to the navigation activities currently underway on the Guaíba?

c. Will the possible alterations cause an effect on the water quality of the Guaíba, such as alteration in the rate of water renewal?

3.6 Generation of morphodynamic scenarios

The following issues shall be approached specifically:

a. What are the effects of mining activity on the transport of sediments?

b. What are the possible alteration on the banks of the Guaíba? Are there risks of bank erosion?

c. What effects of the activity will be generated within the current navigation channel? Are there risks of silt deposits in the channel?

d. What is the rate of sedimentation in the affected areas after the implementation of mining? In other words, how much time is necessary for recomposition of the areas affected by the removal of sediments from the system?

3.7 Integration and viewing of data

Creating of a Geographic Information System aimed at:

a) organization of data and information generated by the project in single and safe environment;

b) allow the multidisciplinary steps and results to be viewed simultaneously;

c) production of thematic maps.

4- Results

- Develop models on the hydrological regime;
- Develop models on the textural and compositional maturity of the sediments;
- Physical modeling for the mode of sedimentary supply;
- Determine the wave patterns for all possible scenarios of interest;

- Mathematic models of the scenario of different configurations of the Guaíba lake bed.

5- Conclusion

The analyses generated in this study shall form a database generated in ZEE-RS, so that the IT tool to be implemented provides dynamic access to information generated in this Hydrosedimentological Study.