

1 **Urban Planning in the Context of Seatropolis City**
2 **through the Public-Private Partnership Scheme**

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8 **Abstract.** The rapid demand for goods shipping and increasing role of sea
9 transportation services make countries that have sea territory developed sea
10 transportation infrastructure. They do not only develop for transportation,
11 exploitation of marine products, and tourism, but also make seafront areas as the
12 potential development of the new city of Seatropolis. This research used the
13 qualitative and quantitative method through literature studies to identify
14 parameters as a minimum requirement for the development of marine areas that
15 can support the development of advanced new cities. After that, through a case
16 study on the country of Indonesia which is a maritime country with the largest
17 area of the sea obtaining the size of the initial investment cost of a city with the
18 concept of seatropolis. In the final stage of this research was in-depth interviews
19 for validating the results of data analysis results. The results of the case study
20 identify potentials in developing eco-town in the coastal area such as commercial
21 area, residential, power plant, and industries through sustainable development
22 concept. The total initial cost to develop seatropolis cities was US\$
23 1,974,070,053.85. This research observation divided the operational costs into
24 three phases of construction development. Each phase of 2023, 2025, 2027
25 consisted of US\$ 18,888,781.62, US\$ 33,872,403.81, and US\$ 51,974,650.82.
26 The government should include in the financing scheme for the initial cost of
27 59.38% and invest in operation and maintenance around 31.74% with obtained
28 revenue of 33.96%. This scheme generates optimum IRR of about 15.41%.

29 **Keywords:** Port-City, Public-Private Partnerships, Urban Development, Life
30 Cycle Cost.

31 **1 Introduction**

32 One of the major drivers that will lead the increasing need of sea transportation is the
33 Asean Economic Community (AEC). With the agreement between the countries in
34 Southeast Asia, the elimination of tariffs and trade restrictions will be carried out in the
35 Southeast Asian region. This will cause (1) the increase in the number of goods entering
36 and leaving in Asean Country, and (2) the availability of low-paying workers and highly

37 skilled workers [1]. With the increasing movement of people and goods, some of the
38 developing countries will respond to effectively utilize this potential.

39 The concept of coastal city planning is important, given the dependency relationship
40 between ports and cities in coastal areas. Studies show that effective planning and
41 implementation of policies will have a positive impact on cities and ports, where ports
42 will enjoy increased volume while cities will enjoy economic growth [2]. Successful
43 coastal cities can be formed with the existence of three main factors, namely (1)
44 competitive ports, (2) ports become the economic drivers of the city, and (3) by
45 mitigating the negative impacts of ports. Competitive ports will improve their status to
46 reach part of the global supply chain. By achieving these three critical factors, the
47 coastal city will achieve sustainable growth. In order to achieve these three factors, then
48 in urban planning can be implemented from three main economic policy models for
49 coastal cities: maritime clusters, industrial development, and urban waterfronts.

50 The maritime cluster is an area that has a role as a supporting port, where this cluster
51 can provide great added value to the city and the area around the port. Maritime clusters
52 are very sensitive to local needs, in terms of compiling these clusters, consideration
53 must be given to local needs. Industrial development in the area around the port will
54 also lead to increased economic relations. Finally, urban waterfront is the use of the
55 area around the sea as an area with various functions to make the economy effective.
56 For example, areas that can be developed include beaches, recreational areas, and
57 restaurants that must first be approved by the stakeholders involved. As an island
58 nation, Indonesia still places a low priority on its maritime capabilities. Based on the
59 World Bank's Logistics Performance Index released in 2010, Indonesia has a lower
60 value for port infrastructure than those in ASEAN countries and Australia, China, India,
61 Japan, New Zealand, and Korea South. Indonesia is fifth ranking in ASEAN and fifty-
62 third ranking in the world in terms of logistics performance.

63 Based on the above problems, the problem formulation in this study can be defined
64 as (1) answering the modeling needs of the development of the Dumai city area as a
65 Seatropolis, (2) determining the initial cost needed to achieve the realization of this
66 concept, (3) determine operational and nursing costs and (4) determine a sustainable
67 payment scheme in achieving the realization of this concept.

68 **2 Literature Review**

69 **2.1 Port-city**

70 The concept of the port city itself has existed from the beginning of civilization. Many
71 major cities began development from the port. With the existence of the port, the
72 development of the city is driven by trade and economic activity which encourages
73 rapid and modern development [2]. This can be seen from some of the world's largest
74 cities, such as Shanghai and Osaka-Kobe which are large metropolitan areas and have
75 ports which are among the largest ports in the world. Based on the types themselves,
76 the port city can be classified based on shipping traffic in this port and the size of the
77 city [3].

78 The benefit of the port area is that the first port becomes a facilitator of trade, where
79 regions with well-functioning ports will enjoy products at lower prices. For example, a
80 study shows that an increase in maritime transportation costs of 10% will cause a
81 decrease in product value by up to 8% [4]. The second advantage is adding value. The
82 added value due to ports and industrial port activities has substantial value. For
83 example, the added value of the Rotterdam port area per 2007 is EUR 12.8 billion,
84 which contributes to 10% of regional Gross Domestic Product (GDP). In brief, there
85 are four impacts of the existence of ports, namely direct, indirect, induction and direct
86 impact of the port. The direct impact is the work and income earned due to the
87 construction and operation of this port. Indirect impacts are work and the direct impact
88 of suppliers of products and services. The induced impact is work and income derived
89 from worker expenditure.

90 The impact of ports is income generated from ports as a driver of growth in
91 productivity and attractiveness of new companies. The next positive impact is the
92 creation of new jobs. The port area, along with the industry, requires local workers. The
93 greater the existing port and the surrounding area, the greater the number of jobs
94 produced. With the entry of the automation era, the port area did not absorb very high
95 numbers of jobs. Aspects that can absorb higher numbers of employment are industries
96 that are around the port and from the added value aspects that arise as a result of the
97 port. With companies building infrastructure and observation points in the port area,
98 this will lead to the creation of new jobs [5].

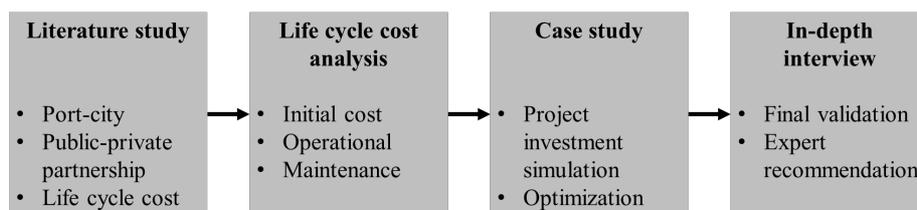
99 **2.2 Public-Private Partnership**

100 Based on the International Monetary Fund (IMF), the definition of Public-private
101 partnership (PPP) is an agreement where the private sector provides a supply of assets.
102 On the other hand, the government provides conventional services. Beyond this, there
103 are two important characteristics of PPP, namely (1) there is an affirmation in the
104 provision of services, and investment from the private sector; (2) the government
105 transferred significant risks to the private sector. The characteristics of the
106 infrastructure built affected the spectrum of PPP.

107 If infrastructure approaches pure private nature or can generate profits, as an airport
108 and port, the model used is build-own-operate-transfer. As for infrastructure that is at
109 the center of these two needs, for example, schools and universities, the model
110 commonly used is design-build-finance-maintain contracts. For infrastructure that
111 approaches pure public or does not generate profits, such as pedestrian bridges and
112 roads, the model used is build-transfer-operate. Many countries began to use PPPs
113 because the government was unable to build with traditional methods. In addition,
114 accelerated development with the PPP scheme will also encourage the availability of
115 funds from existing infrastructure [6].

116 3 Methodology and System Development Framework

117 A four phase methodology as shown in Fig. 1 was used to develop the proposed
 118 Seatropolis City Development. The methodology is based on both quantitative and
 119 qualitative method. Calculation of investment costs in the case study is part of
 120 quantitative and qualitative methods is a method for conducting final validation of
 121 calculation results through in-depth interviews with experts in infrastructure
 122 development in Indonesia [7]. In the early stages of the research, review the literature
 123 to obtain variables that are a measure of the feasibility of developing a port city. In
 124 addition, researchers also conducted a search of the models of the public-private
 125 partnership scheme that existed before. There are two main variables in this study,
 126 namely urban planning and forms of PPP funding collaboration. Whereas the dependent
 127 variable which is the result of financing simulation is the funding provider scheme and
 128 the value of Internal Rate of Return (IRR), while the variable can change the simulation
 129 conditions or moderate variable, Weighted Average Cost of Capital (WACC).



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Fig. 1. Research framework

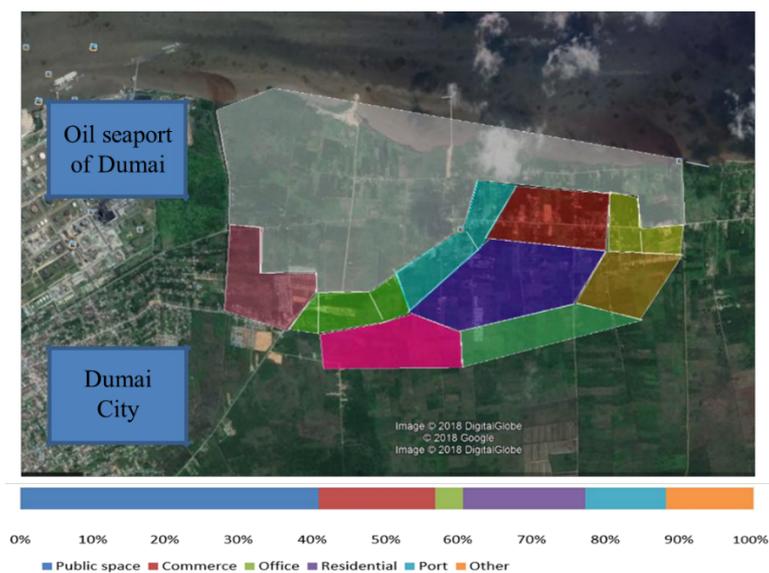
132 The area for this case study is limited to Dumai City, Riau Province, Indonesia. The
 133 calculations carried out are the initial investment, operational and maintenance costs
 134 for the development of the Dumai City area. The payment scheme that is the scope of
 135 this study is the Public-Private Partnership scheme (PPPs). Dumai City's Medium Term
 136 Development Plan (RPJMD) used is the period 2016 - 2021. The Indonesian Maritime
 137 Policy used in this study follows Presidential Regulation Number 16 of 2017. The PPP
 138 scheme considered in this study follows the Public Private Partnerships Book 2017 by
 139 the Ministry of National Development Planning (Bappenas). The inflation rate used is
 140 the average inflation rate of 2009-2016, which is 5.12%. Calculation of average
 141 economic growth will follow in 2010-2017. This study does not consider the regional
 142 regulations that apply to the Dumai city area which is related to the PPP scheme due to
 143 the absence of policies related to this matter.

144 Based on the research strategy, data validation will be carried out in this study to
 145 ensure that the research that has been carried out is a valid result in the expert's view.
 146 Experts are chosen based on their abilities in their fields and their relevance to the
 147 research being carried out. In this study, researchers will validate data to experts from
 148 PT. Sarana Multi Infrastruktur with interview method. In this case, the method used is
 149 a manual interview to synchronize the model proposed in this study with the views of
 150 experts regarding the theoretical possibilities and possible realization of this model in

151 the long run. In considering investment, a balanced comparison is needed to ensure that
 152 there are no incorrect estimates. In this study, all values that will appear in the future
 153 will be compared with the current value, namely by using the Net Present Value method
 154 [8]. The present value can be simply defined as the value that must be invested at this
 155 time to obtain the value expected in the next period [9].

156 4 Results

157 From the design of the area that has been carried out, it is necessary to review the existing area
 158 for other port cities in the world. In previous studies, it can be seen that the division of
 159 components does not have certain patterns or rules, but follows the needs of the existing
 160 region. For example, in the HafenCity, the public space and residential areas and offices
 161 have the widest contribution area. This is due to the location of the HafenCity which is
 162 in the developed urban center area. In Dumai Seatropolis, this development has also
 163 been carried out with consideration of the city to be built. In the case of Dumai city,
 164 this can be illustrated in Fig. 2.



165

166

Fig. 2. District of territory in the case study of port cities design

167 From the illustration above, it can be seen that the port will not take up extensive
 168 land, with open green space and public space as the dominant area, especially with the
 169 use of the Eco town concept in this study. This results in an area with wide public space.
 170 This makes the Dumai Seatropolis region in accordance with other regions where public
 171 space has high importance. With the existence of a wide public space, the negative
 172 impacts that generally arise as a result of the port will be negated. This has been applied
 173 to the Dumai city area. From the zoning design can be seen that the existing Dumai

174 Seatropolis area will be close to the existing Dumai city area, so this area will act as a
175 supporting area for the existing area.

176 The overall value of this new area is the US \$ 866,964,296.30. In its construction,
177 this area will be estimated to be built in 5 years, with a start time that coincides with
178 the port area. In this development period, inflation will occur in the value of
179 development, with an increase that follows inflation which has become a reference in
180 this study. Then, for the operation and maintenance values in the seatropolis area, it
181 will follow the initial assumptions described earlier. The total operational and
182 maintenance costs are the US \$ 27,826,173.33 per year and will continue to increase
183 following the reference inflation rate in this study, which is 5.12%.

184 Based on the design combination, the IRR value before the institutional scheme is
185 10.37%, which this scheme is not attractive to the private sector. So, the financial
186 scheme is needed to obtain an ideal PPP scheme to the design Dumai Seatropolis. After
187 the redesign process in this research, an attractive design has the potential to obtain
188 higher values if applied to PPP schemes. One area that boosts the IRR value is industrial
189 estates, especially in oil palm areas with relatively large incomes. With the capacity of
190 the city of Dumai as a palm oil producing region, this has encouraged the palm oil
191 industry to continue to grow and generate large revenues and contributions to the
192 region. Preparing institutional schemes is necessary to first compare with the standards
193 held by Bappenas as an institution that gives approval and status for PPP projects in
194 Indonesia. Furthermore, arrangements will be made to approach the standard ready-to-
195 offer or scheme that is ready to be offered to the private sector.

196 The first thing to do is to analyze the scenarios that can be done in this study.
197 Conducting financial analysis is necessary to consider the IRR value that would be
198 considered appropriate or attractive for the private sector in entering the PPP scheme
199 in Dumai Seatropolis. The Weighted Average Cost of Capital (WACC) is used
200 considering equity, debt, and the debt ratio of a company [10]. The WACC value of the
201 industrial, chemical, real estate, and health sectors respectively is 10.51%, 11.51%,
202 11.10%. and 10.31%. The results of simulations and validations conducted at IIGF
203 show that the private sector will bear 40.62% initial costs, while the government will
204 59.38%. In the operation and maintenance of infrastructure, the private sector is
205 responsible for 68.26% and the government is 31.74%. The acceptance of the
206 management of seatropolis will be accepted by the private sector amounting to 66.04%
207 while that of the government is 33.96%. The simulation shows the IRR value in the P3
208 scheme which is 15.41%.

209 **5 Discussion**

210 PT Dumai Seatropolis is a Regional Owned Enterprise that acts as the coordinator of
211 Seatropolis development from this region. The government will build the area in
212 accordance with the institutional scheme and the distribution of predetermined
213 components. In this region, PLN (national electricity company) is a state-owned
214 company that responds to energy management. In the port area, PT. Pelindo is the
215 representative of government in port management. In plantation areas, the institutional

216 scheme states that the government will have 30% of the total value of the oil palm
217 industry. In this case, the government and the private sector will not build the similar
218 factory, but the government will build a smaller capacity plant through PTPN (National
219 Plantation Company) as a government entity that has rights and responsibilities for
220 government-owned oil palm plantations.

221 Indonesia Infrastructure Guarantee Fund (IIGF) is a State-Owned Enterprise that
222 acts as a bank that can provide loans to infrastructure. In this area, IIGF will be
223 primarily a supporter of the government to meet debt needs in infrastructure
224 development. In addition, IIGF can also provide loans to the private sector on
225 infrastructure-related developments. Finally, Bank lenders are banks that will provide
226 loans to the private sector in developing areas around the port and in industrial estates.
227 In the operational phase, the institution that builds the existing area will also act as an
228 operator and has a fee for operating, selling and leasing from this region.

229 The researchers conducted in-depth interviews with relevant parties to determine
230 how to improve existing conditions and encourage PPP schemes compiled in this study
231 to become more attractive to the private sector and the government with good validity.
232 The following analysis results are obtained that the first involvement of IIGF in the PPP
233 scheme will have an impact felt significantly in the PPP scheme carried out on a
234 regional scale, with BUMD as the coordinator of this scheme. In projects carried out
235 on a national scale or by national governments, IIGF guarantees will not give a
236 significant impact. The second, IIGF will generally be a complement of banks,
237 increasing bankability, or the willingness of banks to provide loans, especially to the
238 private sector. The third, the tenants or private parties with large-scale business entities
239 in industrial areas, will increase the interest of other potential investors to be involved
240 in this PPP scheme. The last, industrial, ports, and their supporting area development
241 should be carried out simultaneously. By the completion of these three facilities
242 together, the private sector will get the benefit from the proximity to the port, besides
243 that the port will get benefit from the operation of the port in the region.

244 **6 Conclusions**

245 Urban waterfront design that has been carried out in accordance with the ecotown
246 design, achieves optimal design to ensure that existing designs meet the literature
247 standards. The concept of seatropolis in this study fulfills eco-town standards where the
248 concept of a solid city with high comfort and an environmentally friendly city. This
249 eco-friendly concept design is implemented through the use of wind power plants in
250 this region. In addition, this area will have occupancy for people from various classes.
251 This design shows a strong relationship between the city and the port, eliminating the
252 negative impact on the surrounding area, and providing mutually supportive relations
253 between the city and the port area. In this study, the ARCADIS Construction Cost
254 Handbook 2018 standard was used, which is a standard reference obtained from the
255 costs of development carried out in the Greater Jakarta area and major cities in
256 Indonesia. In this study, the Construction Expansion Index (IKK) was used for the

257 Dumai city area, so that the construction standards per square meter were obtained for
258 existing buildings.

259 The amount of operational and maintenance costs and income from Dumai
260 Seatropolis. This will be done by a different method. In determining the number of
261 operational costs in existing buildings and facilities, the researcher will use the standard
262 from the Ministry of Public Works. This will result in operational and maintenance
263 costs in the form of a percentage of the initial cost. From the determined values,
264 simulation is carried out through the application, taking into account the increase in
265 costs, both due to inflation and the appreciation of property values that occur in
266 Indonesia as a reference. In addition, consideration is also given to the occupancy rate
267 of property that refers to national data. By doing this, it will not be assumed that the
268 existing property will be occupied by 100% so that an accurate income can be obtained
269 from this region.

270 The Weighted Average Cost of Capital (WACC) simulation scenario is a moderate
271 variable. From the IC, OM, and R components that have been simulated, the initial IRR
272 value will be obtained which has a value below the WACC. From this value, the
273 financial model is engineered, before the most favorable scheme is chosen, where the
274 value of IC, OM, and R between the government and the private sector will be divided.
275 From the research carried out, an institutional scheme was produced with the division
276 of IC, OM, and R with an IRR value of 15.41% which is a higher IRR value than the
277 WACC in Indonesia in other schemes. This is evidenced by the achievement of this
278 IRR value with a different scheme than in general, where with the division of IC, OM,
279 and R, the IRR value achieved still exceeds the WACC value commonly used in
280 Indonesia.

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