Game analysis of the interest subject of marine environmental pollution charge

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Abstract: Marine economy booming in recent years, and the marine environment continues to deteriorate, Marine Environment is the material carrier of marine economic development, it suffers The pollution and destruction of will inevitably result in the development of marine economy. The effective implementation of the sewage charge system is very important to the effect of the marine environment Control, row The effect of the dirty charge system is affected by a variety of factors, both internal and external, This paper is based on the marine environmental pollution charge system Research Perspectives on stakeholders during execution, Establish game theory model, through the game of behavior between different stakeholders analysis, It is concluded that the effect of sewage charge implementation and economic growth are complex, with multiple interests, proposed improved current evaluation mechanism, from pros and cons measures such as incentive mechanism and audit increase to promote interest balance of stakeholders, How to optimize the implementation of sewage charges in the marine environment.

Keywords: Marine Environment; Sewage Charges; Stakeholder; Game Analysis Figure category number: S 937.0 document Marker: A

2015 Year, SOA releases 2014 Year China Marine Economic Statistics Bulletin (under abbreviation Economic Duke report " and 2014 Year China Marine Environment Bulletin (The following abbreviation " Environment Bulletin "), is based on the Economic Bulletin and Environment Public The information provided by the report "is displayed 2014 The development trend of marine fisheries in the year potential continues to slow down, A large part of the reason is precisely because of the sea Foreign environmental pollution did not improve, other, under ring Border Bulletin information published by the displays, Local area of our offshore coast The sea environment of the is still quite serious, Spring, Summer and Fall The sea area of four types of sea water quality standards in the quarter up to 52280, 41140 and 57360 sq km. vs .., The total amount of pollutants discharged into the sea by our inland rivers remains high no more, the target rate for land-based pollution outfall is only 52%, current, the estuary and Gulf ecosystems monitored are still in Yajian karg or unhealthy status. various conditions for, marine Environment as a material carrier for marine fishery development, In recent years due to ocean The booming economy has caused havoc, Land source pollution as major source of pollution of marine environment, has caused the ocean environment is saturated with pollutants, Can no longer be followed by continue to host more damage and pollution from the development of the marine economy.

1. Research Status
Sewage Charges, refers to the emissions by emission unit How much of the is charged to units that emit pollutants.

The purpose of the sewage charges is to solve the external economy of the pollution behavior The problem of being passed on to the community as a whole to share the cost of the issue. sewage The toll system is currently used in many countries in the world to areas of governance for environmental pollution, at the same time our submission and reality Line One of the earliest environmental governance economic policy instruments, with the ability enough to motivate an enterprise cost - revenue Analysis “” Active to reduce emissions, and short term benefits. China year revised People's Republic of China Marine Environmental Protection Law []. Tenth one rule 2 [un]its that emit pollutants directly to the ocean and a "" person, must pay sewage charges in accordance with state regulations. dumping to the sea waste, The must pay the dumping fee in accordance with the State regulation. The legal set out the purpose of the sewage charging system, by, Scope and imposing, Manage and use, This system has implemented 10 in our country years, initially, If sewage is levied, and in a lot of practice procedure vs. Billng experience, as research progresses, China The concept of sewage charges gradually changed to the standard of pollutants into the line charges and fines, the Application of this system in the marine environment and the implementation greatly promoted the Marine environmental protection of our country, one To a degree effective coordination between the environment and the marine economy relationship, but, This does not completely curb our marine environment continue to suffer damage. game theory, also called Countermeasures ( game theory ), is the study of decision-making interaction between participating principals An economic theory of, is intended to reveal the behavior of Inter-entity The mutually restrictive relationship of the results that the can cause is. so, Blog

The theory model is very useful for government entities and Relationship Analysis of behavior between government and enterprise principals.

At present, there are many scholars from the perspective of game theory to the ring The borders on resource issues. Wang Zi departure from the rationale for, explains the cause of pollution, from government The perspective of Control game analysis of government and Enterprise behavior; The severity of the pollution problem is briefly described by scholars such as the Wei, and a game decision on both pollution and governance and its all? The related pollution prevention countermeasures built; ChaoHongmei, Lu Yuan, Zhang Xiangang, Wang Bin, Scholars such as Mr. yuan Select the relevant interests of environmental pollution issues from different angles main body for research object, Analyzing mutual interests in environmental regulation Choice of, to improve environmental pollution problems provide reference to the to; Gu Yu, Zhang Jiping and other scholars start with system improvement, use shutdown Analysis of utilization of marine fishery resources, to China Sea Optimizing configuration of fishery resources propose reform proposals; Zheng Dongmei from Business Insurance Perspective, Responsibility for marine environment for game analysis, Highlights the choice between the insurance company and the government and the Enterprise The behavior between, provides a for solving marine environmental problems New Perspective. The game Analysis of environment and resources in academic circles most concentrated in land area environment, and marine environment is distinct from for Independent Terrestrial environment, has integrity, any sea The environmental changes of can cause proximity to the sea or even the whole of the anti-should, Therefore, the game of terrestrial regional environmental problems cannot be fully applied analysis, Given this point, This article is based on the existing research, Select The interest subject of the marine environmental pollution charge system is the object of study, Set up a game theory model, Shadow of the effect of the sewage charge implementation Sound factor analysis, and propose countermeasures and suggestions ^[19].

2. between the government bodies of the marine environment sewage charges game Analysis
different government entities in the marine environmental pollution control side. There is an interest-seeking conflict on the surface, because of a Local government, there are different values between the central government and the local government. Target seek, Individual and individual interests, Individual Benefits vs. set. There is also a game of incomplete information between the interests of the body. The central government is primarily a macro-global perspective for the environment pollution control, focus on the overall balance of interests across the country, whose Goal is to achieve sustainable economic development and Marine environmental protection harmony and Unification; but, because local governments focus more on its Economic interests within jurisdiction, put their own economic interests in the first, the expense of the region and even near the ocean ring Border cost. How to appeal to the interests of the Government the the line game equilibrium, Sewage Charges for the marine environment are also closed. Important, so, This section is from the central government and local government The game between, and the interests of local governments. Play two aspects of the analysis.

2.1 Central and local governments of marine environmental pollution charges game Analysis

The central government controls the entire marine environment, balancing environment and economy across regions, and rows overall planning and design of the dirty charge system, Its goal is to make Economic gain is compatible with marine environmental protection. The implementation of the sewage charges system although in the long run, Necessarily benefits for economic growth, But local government officials in the period of time by the economic growth is still the most important indicator of their performance review, therefore, no whether to complete economic growth and to govern the marine environment during the period has a distinct effect comparison, Harnessing the marine environment for economic growth is far more important than protecting the marine environment, Local governments in the row Dirty charge system implementation targets if there is a contradiction with economic growth, Local governments will inevitably choose to effect the sewage charging system Ignore, and after the end of term the marine environment charges are closed The problem with the row is left to the next official. This results in a violation of the There is a Conflict between the Government and the central governmental goals, Local government can for the implementation of sewage charges in the marine environment to the central government Hide the truth, Local government may for the economy of this region Development while ignoring the implementation of marine sewage charges, so, Central and The game between local governments requires great attention.

century is the century of ocean development and utilization, Local Government as rational economic person, Its goal is to implement from Maximize benefits, due to past GDP Supreme View of achievement and The evaluation mechanism determines the game between the central government and the local governments. No, to avoid, and in recent years, Green GDP The reference to the already shows a change in the “Central government's transition to the traditional evaluation mechanism [indb], Green GDP means green gross domestic product is a country or region economic activity after taking into account natural resources and environmental factors final results, It is in the existing GDP calculated on the basis of, or, Green GDP Accounting is the in economic activity resource consumption cost and environment demotion cost from GDP in to deduct. Green GDP proposed, for Local governments developing economy when developing and utilizing marine environment, also considers Environment's hosting cost, Encouraging local governments to implement sewage charging system The degree emphasizes its effect. in reality, Our country face Marine Environmental Pollution Yue Grim today, need to implement central Effective cooperation between government and local governments, that's better play the advantage of the Sewage Charging system, The promotion of marine environmental pollution by the

effective Governance, ultimately makes the health of the marine economy, continue to develop guarantees.

2.2 game between local governments of marine environmental pollution charges analysis

Our country has a vast marine environment, the provinces and cities of Linhai and from Zone Total one (does not include Taiwan Province and Hong Kong and Macao. Local governments need to consider the economic policy of
marine fishery. The rationality of the to the regional division of Labor. Because of the resource distribution between regions, and Local governments strive for their own benefits. Benefits Maximum, Therefore, if the production of different regions is not reasonably developed, industry policy, is likely to cause industry duplication between regions set, appear Less and all Behavior. Marine Environment is a public Items Resource, Its non-exclusive decision to have the will to use its development. The local governments of the marine fishery economy are all access to the, and with this The problem of externality is not compared with self-interest, cases, causes pollution to the marine environment.

Assumes A, B Two sides of the same sea area, both governments option to rely on the development of the marine environment can bring huge fiscal receipts into, but polluting the ocean environment, for A,B Two political House all have "Development", No development "two options", assumption A, B The economic benefits to be derived from the development of the industry are NA, nB, The cost of administering pollution at the same time is C - a, the income matrix for both places is like the table 1.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>Region A</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Development</td>
<td>does not develop</td>
</tr>
<tr>
<td>Region B</td>
<td>Developed</td>
<td>Not developed</td>
</tr>
<tr>
<td>Development</td>
<td>a - C A'</td>
<td>a' - C B</td>
</tr>
<tr>
<td>Developed</td>
<td>A - C'A</td>
<td>- C'B</td>
</tr>
<tr>
<td>does not develop</td>
<td>- C'B</td>
<td>0,0</td>
</tr>
<tr>
<td>Not developed</td>
<td>- C'A</td>
<td>a' - C B</td>
</tr>
</tbody>
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Table 1. The beneficial matrix of two Governments (A and B)

The above income matrix represents the A, B Two governments implementing the true benefits under different selection policies. Assuming that The benefits are mainly reflected in revenue and marine environmental spending difference. Then we can make the following analysis:

1. A, B Both develop the marine high polluting industry, A,B The final yield of both places is nA - C A, nB - C B;
2. A develop the marine high polluting industry, and B not development, then A to return to -C', where C > 0;
3. B develop the marine high polluting industry, A does not send
   Show., B benefits are % - Cb', A to return to -Ca, where C'a > 0;
4. A, B does not develop the marine high polluting industry, then A, The benefits for the B two places are 0.

From the game analysis above we can see that, A, B two Regional game Nash equilibrium point to (nA - Ca, % - Cb), A,B Two regional governments have developed the sea in pursuit of fiscal revenue. Ocean High polluting industry, Although the result of this is to cause the ocean ring border violated, And even caused the adjacent ocean environment area chain reaction, is the Commons tragedy. Government Development. Dirty The marginal benefits of dyeing marine industries are less than their governing ocean rings border marginal costs, The government will pay more attention and protect the ocean. Environment, the Executive body of the sewage charging system is more likely to consciously focus on its effect; and when developing the marine industry the marginal benefit is greater than the marginal cost of governing the marine environment, The government would prefer to sacrifice the marine environment for economic growth in the region long, You need to reform your existing system of achievement now, or introducing a phase off incentives prompting governments to protect the marine environment.

3. Government and sea-related enterprises for marine environmental pollution charges game Analysis
A typical delegate between government and sea-involved enterprises^ proxy Relationship, General, Delegate has more information than client, This article delegate -agent relationship generic: The government as the client, To make and implement the marine environmental pollution charges system, and sea-related enterprise is Accept the agent of this system, The behavior determines that the system is No to achieve the expected effect, government revenue is based on SEA-related Enterprise Behavior, so, can say government departments and sea-related enterprises is the most important effect of the marine environmental pollution charges system implementation effectTwo external factors, at the same time, Sea-related enterprise mastered than government More pollution information, So this is a game of in the case of incomplete information.

assume that governments and sea-related enterprises are rational economic people , Government pursues the goal of maximizing social benefits, Sea-related enterprise's eyes to take advantage of the marine environment for pollutant capacity, reap benefit Run and Enterprises do not have to pay sewage costs, to Social wholebody assume, imposing a sewage charge on an enterprise is an external issue. To process, because the enterprise may exist " opportunist ic " , richest Lucky Mind, government needs to monitor and check enterprise emissions And assume that the government's supervision of the enterprise is valid, at the same time, The house needs to pay the corresponding supervision and execution cost, at this time, Government The choice of whether the enterprise discharges pollutants as required " Supervision", no monitor " two choices, Supervision cost Cp Government to Enterprise no The penalty for Blowdown is L, While the government protects the marine environment The profits for the enterprise also for whether the government made the pollution Dye emissions standards have take action, does not take action two options

Select, the cost for the enterprise to take action is C_2, Enterprise Take action to obtain profit margin n_2, Table 2 revenue moment for government and sea-related enterprises array , Former for government benefit, The latter is a sea-related enterprise benefit.

by the above matrix we can do the following analysis:

from the matrix we can see that Monitor, take action not Nash equalization, because given conditions not supervised by the government under, the best option for a sea-related enterprise is not to take measures; and in the case of enterprise taking action, Best choice for government is no Supervision, So the game between the government and the sea-involved enterprises no more. Pure Strategy Nash equilibrium.

The expectation of the Government to supervise the enterprises concerned is U_i, does not supervise profit expectation is u '+', revenue period for actions taken by the Enterprise look for U2, Do not take measures revenue expectations for U' 2, Corporate take steps The probability of applying is p, The probability of not taking action is i_p, Government The probability of monitoring is q, the probability of not being supervised is I _q then: U_i = (n_i _C_i ) p+ "L+ N _ i C_i ] (i _ p ) U'_i = n_ip _ n_i (I _ P )

U_2 = (n_2 _C_2 ) q + (n_2 _C_2 ) (i_q )

U'_2 = Lq

because the above matrix does not exist a pure strategic Nash equilibrium, at this time We need to get a mixed strategy Nash equilibrium, then separate U_i = U'^^ SUVp=i - C_i U ^ + L,)q = (C_2 _n_2 )/ L, This is what we get mixed strategy Nash balanced, to see the probability of an enterprise taking initiatives p and The government's penalties are relevant, penalty Greater, Enterprise industry is willing to take the initiative to deal with pollutants; and when sea-related The cost of dealing with pollutant measures is greater than the benefit of the gains Run-time, Government Supervision effective, And with the government's punitive force degree increase, The lower the probability of its supervision, at this time the government can be appropriate to the incentives for enterprises to handle pollution.

4. Policy recommendations

An analysis of the game between the above stakeholders, can The result of the pollution charge system for the
marine environment is that the effect is from The multiple game results between the behavior modes of each interest subject determines the . Implementation effects of marine environmental effluent charges and marine Fisheries The interrelationship between economic growth is complex , it is related to the interests of all parties to the the benefit subject , different interests in different subject A game process that has an impact on each other . so say , just follow make it difficult to implement the marine environment resources by the market's own provisioning optimized and reasonable configuration, so we need to row in the marine environment How dirty charges are executed design incentive mechanism to motivate parties benefit The beneficial subject actively cooperated with the effective execution of the system .

4.1 reform The current evaluation mechanism , Implementing the Marine industry's Green GDP thought for governments , because of the current performance appraisal mechanism, the line GDP index , makes local governments more concerned about the economy growth ,if green GDP can really be practiced , is not The performance appraisal of the has been changed from the traditional GDP growth to minus sea Ocean Fishery resource cost and marine environment cost Green GDP , this will be more able to cause local governments to the environmental protection of the sea attach to . other , Accountability for evaluation , even if The departing officials are still within a certain period of time to the geographical marine environment The sewage charging system assumes part of the responsibility .

4.2 Design More reasonable incentives , Promote Enterprise initiative with the implementation of the sewage charges system
The government can take the pros and cons of the sea-related enterprises incentive , for SEA-involved enterprises , on the one hand , If handing out sewage charges or non-handling contaminants receive less penalty than cost of excessive pollutants , then the sewage charging system is the to Achieve the desired effect , therefore , the government can raise The standard of sewage charges by increasing , Increasing penalties , making illegal costs above sea-related enterprise compliance costs ; On the other hand „ if turned in The cost of pollution is greater than that of handling excess pollutants . , Enterprise Possible proactively governs pollutant emission , but to compensate for sea-related Karma „ at the same time the government may appropriately give the corporate governance behavior to the A certain subsidy , encouraging enterprises to govern the marine environment reason .

4.3 enforce auditing , Reduce the interest body's Lucky Heart reason ” existing
On the one hand , Central Government can strengthen audits of local governments Force , Reducing local governments ‘ excessive pursuit of political performance , and the Land-related enterprises enforce protectionism , Hide the illegality of a sea-related enterprise

Behavior ; On the other hand , The government can increase its involvement with the sea Enterprises check , checking to Correct the untrue phenomena in the pollution declaration of the Sea-related enterprises , and increase penalties to motivate enterprises to take measures to govern pollution excess emission .

In summary , The implementation of the marine environmental effluent charges optimization , not determined by one or several individual factors , and is required for collaboration between stakeholders , Joint effort , "" to promote a stakeholder pair " cost - revenue Rational Analysis , only to make the policy work ,, implement to our ocean ring Protection of the environment .

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