Primary Analysis about the Harness Status, Problems and Countermeasures of the Yellow River Estuary

Sun Yuankuo

Yellow River Shandong Bureau

[Abstract] Based on the analysis of the status and problems of the harness of the Yellow River Estuary such as the capital shortage of the physical model, not suitable management system, not smooth investment channel, not perfect node projects，grim flood prevent position and eroding coastline etc, this paper try to puts forward several countermeasures such as fulfilling the construction of physical model of the Yellow River mouth in good quality and quantity, put the system of harness and management in good order, strengthen integrated father to stabilize the river route to the sea and quicken the construction speed of digital river mouth and so on.

[Key words] Yellow River Estuary, Harness，Status, Problem, Countermeasure

The Yellow River Estuary is one part of the Yellow River. Since 1946, especially with the rapid development of society and economics in the Yellow River Estuary and the embeded exploitation of Shengli Oil Field, our nation has been paying much more attention to the harness of the Yellow River Mouth taking such measures as changing the main river channel by manpower, highening and thickening the dykes, harnessing the riverway and dredging up the river trough etc to set up elementarily flood-prevention engineering system of the Yellow River Mouth. Therefore the present Yellow River way to the Bohai Sea has been lasting more than 31 to support the sustainable development of the Yellow River Estuary. But many new circs are coming out and some important problems are urgently awaiting to be studied and solved.

1 The existing harness status of Qingshuigou Yellow River way

As you know, the existing Qingshuigou Yellow River way formed in 1976,whose life is 12-14 years according to the former plan. But after several measures metioned above together with less water and sediment these years, the extending rate of the Qingshuigou Yellow River way has been decreasing. Thus this river way has last more than 30 years already.

1.1 Harness experiments of dredging up

In order to prolong the river-last life of the Qingshuigou Yellow River way, approved by YRCC in April 1988, Dongying government, Shengli Oil Field and Yellow River Estuary Management Bureau started the harness experiment of dredging up at the river mouth taking the measures as follows: block up branches to strengthen the trunck, guide the water to enter the Sea directionally, clear barrier and drag silt to dredge up the river mouth, use cunningly tide to transport sediment, strengthen dikes by wide river and stablize the

river regime to insure safety. Thus many branches goes into one and the situation of flood-prevent is becoming better and better.

1.2 The No. 1 father of the Yellow River river way to the Sea

With the rapid development of society and economics in the Yellow River Estuary and the embeded exploitation of Shengli Oil Field, the Yellow River river way to the Sea need to keep relative stable. In 1989, YRCC and Shengli Oil Field worked out “programming report of the Yellow River river way to the Sea” which was approved by the former State Plan Commission IN 1992. “The item proposal report of the No. 1 father of the Yellow River river way to the Sea” was approved by the former State Plan Commission in 1996.By the end of 2003, many items of this report have been finished already.

1.3 Change river way at Qing 8 cross section

In order to relax the flood-prevent pressure of the river estuary and prolong the river-last time of the Qingshuigou Yellow River way combining to meet with the need of Shengli Oil Field, aprroved by YRCC, in May 1996, near the Qing 8 crossection, the river way was changed into another direction. The gradient of river bed increased from $0.06^{0}/_{000}$ to $1.03^{0}/_{000}$.

1.4 The harness of the Yellow River Estuary

In order to keep the continuity of the harness of the Yellow River Estuary, “The implement project of construction items of the harness of the Yellow River Estuary” was approved by the Ministry of Water Resources in 2001, which includes such constructions as path of dikes, dike strengthening by colmation,river improvement, observation and study of river mouth, the construction of special mobile wrecking crew, and the construction of special hydrological station at Dingzilu etc. Most of the items mentioned above have finished by now.

1.5 River-dig to strengthen dikes

The projects of river-dig to strengthen dikes were carried out for 3 times from 1997 to 1998, from 2001 to 2002 and in 2004 seperately. Analysis shows that river-dig has a distinct action for sedimentation-decrease. Scour of trace to the source and linear Scour happened on the upper and lower reaches of river-dig reach, the water level decreased greatly with the same discharge, the bank high flow increased obviously, the conformation of cross-sections was changing towards a good direction. But it has an evident time effect about 2 years.

1.6 The construction of the physical model of the Yellow River mouth

The construction of the physical model of the Yellow River mouth has been paying much more attention from MWR, YRCC, local goverments and Shenli Oil Field Management Bureau. Through the great efforts of all levels, the construction item of experiment hall of the physical model of the Yellow River mouth was approved by YRCC as the file of Huangguiji 〔2006〕31. and the model started to construct in due form from October 2006. The construction of the model has been all right at present.

2 Existing main problems

2.1 Because the construction capita from Shenli Oil Field hasn't given, the capital shortage of the physical model of the Yellow River mouth has touched the construction schedule. Suggest to arrange special person to supervise and urge the arriving of capital to insure the complete before September 2007 and put into use during the Third Yellow River Forum.

By now, only the experiment hall of model is constructing, the other scientific research establishments such as basic experiment hall, integrated engineering hall, proving ground in the open air etc hasn't been arranged into construction plan. Only the capital of scientific research building has arrived, the other basic establishments such as science and technology building, Yellow River exhibition hall, the apartment block for experts and relative attachments haven't arranged into plan yet.

2.2 Not suitable management system

Now there are many management companies and departments in the the Yellow River mouth. As we know, YRCC is in charge of the construction and management task from Cuijia to the Fourth Segment in the south bank and standby river ways, the oil management department is in charge of the construction and management task below Cuijia in the north bank, but local government is in charge of the development and management of fields. Thus the management responsibility and outlay of both the dikes below the Fourth Segment in the north bank and the dikes and their additional projects below Twenty-one Hu in the south bank haven't put into effect and they are out of management. Obviously the existing management system goes against the harness of Yellow River mouth.

2.3 Not smooth investment channel

Fixed investment channels for the harness of the Yellow River mouth hasn't formed by now."The item proposal report of the No. 1 father of the Yellow River river way to the Sea" approved by the former State Plan Commission in 1996 nailed down that MWR, Shandong Provincial Government and the Oil Management Department are in charge of investment, construction and management. As you know, Shenli Oil Field has come into the market from a state-owned enterprise and is incapable to pay this outlay, and it's also quite difficult for local government to pay again.

2.4 The trail riverway goes on fill up and extends and the flood preventposition is grim

2.4.1 A great deal of sediment deposits at the river mouth, and the trail riverway goes on fill up and extends. Since the riverway was changed in 1996, the riverway presents in a deposit situation in general in spite of fierce scour from July 1996 to September 1997.

2.4.2 The horizontal gradient of bottomland is increasing increase the pressure of flood-prevent.

2.4.3 Enginneering layout isn't so reasonable and node projects are not perfect still.

2.5 The coastline is eroding back and marsh is degenerating

The amount of water and sediment into the river mouth has decreased a great deal for these years, thus the coastline of the Yellow River Estuary is eroding back to impact the development of oil field and fresh water marsh is degenerating.

2.6 Pinched water resources and frail ecosystem has restricted the development of economy and society

3 Countermeasures and suggestions

3.1 Fulfill the construction of physical model of the Yellow River mouth in good quality and quantity to offer technique support for the purpose of the stabilization of the route to the sea

According to the programming, complete the construction of the medel as soon as possible. Model experiment can open out internal orderlines and support technique data for the workout of integrated fathering and development scheme.the model can also provides an intercommunion flat for experts domestic and abroad, and attract more and more experts and scholars to study the harness of the river mouth to promote the level of science and technology. Therefore much hard work need to do to push the construction of the model to insure to fulfill the construction task of model hall before September 2007.

In the light of the principle of urgent in advance, according to the request of the harness, the conditions of capiatal and technique, start to build in succession basic experiment hall, science and technology experiment building, proving ground in the open air, integrated engineering hall,Yellow River exhibition hall, the apartment block for experts and relative attachments. Aiming at the present urgent harness requests to start model experiment and study. Try to build tp-ranking physical model in the world to provide a platform for the harness and development of north rivers and large rivers domestic and abroad.

3.2 Take the harness of the river mouth as one part of the whole Yellow River

The harness of the river mouth is one important part of the whole Yellow River, which is career of social commonweal coming down to all levels. So such things as the harness and engineering management of present and standby riverways should be brought into the united plan ang management of YRCC, and their outlay of harness, management and emergency-prevent should be list into national investment plan.

3.3 Strengthen integrated father to stabilize the river route to the sea

3.3.1 Continue to excavate sand to lower the river to decrease the feedback from deposition of riverway. The 3 times of river-dig have shown its powerful life, so suggest to carry out the project of sand-excavate to lower the river and make use of hundred of ships to dig the river year after year.

3.3.2 Continue to harass the sand at the river mouth to reduce the silt and extending rate of riverway.

3.3.3Perfect the node projects to to stabilize the river trough and river regime.

3.4 Take engineering measures to contain the eroding back of seacoast and degeneration of marsh

The main reason for the eroding back of seacoast and degeneration of marsh at the river mouth of Diaokouhe is that the stop of water and sediment from the Yellow River since 1976. Suggest constructing Xihekou hinge project and let Qingshuigou and Diaokouhe riverway flow in turn. Thus the sea area near these two river mouths can continue to gain the supplement of freshwater and sediment to contain the eroding back of seacoast and degeneration of marsh maintaining the balance between the rush and deposition of the coastline.

3.5 Try to strengthen the united management and regulation by YRCC to insure the water-require amout of ecosystem and sediment-transport to keep a healthy life of ecosystem of the Yellow River Estuary.

3.6 Quicken the construction speed of digital river mouth. combining 3-D math model with advanced GIS technology based on the physical model. Set up digital platform through the image data from the remote sensing of satellite. Track the evolvement process of the river mouth and implement dummy simulation to analyze and study the evolvement rules to support the technique for the harness of the Yellow River mouth.

3.7 Try to strengthen the capacity-building of the research institute of the Yellow River Estuary.

Introduction to the author: Sun Yuankuo, Born in Aug 1971，Graduated from Unesco-ihe in Sept 2005，Master of Enginnering，Yellow River Shandong Bureau , Sennior enginner, No.157# Heihuquan North Road Jinan PRC. Telephone: 0531-86987147，Email:sunyk@sdhh.gov.cn.

黄河口治理现状问题及对策浅析

孙远扩

山东黄河河务局

[摘　要]本文在分析黄河河口治理现状的基础上，针对存在的黄河河口物理模型试验基地建设资金尚未到位、管理体制不顺、投资渠道不畅、河道节点工程不完善、防洪形势严峻、海岸线蚀退等问题，提出了保质保量完成河口物理模型建设、理顺河口治理管理体制、加强综合治理相对稳定入海流路、建设数字河口等对策建议。

[关键词] 黄河口　治理　现状　问题　建议

黄河河口是黄河的重要组成部分，人民治黄以来，特别是随着河口地区社会经济的迅速发展和胜利油田的深入开发，国家高度重视河口治理，相继采取人工改道、加修堤防、整治河道、疏浚河槽等措施，初步建成了河口防洪工程体系。在新的形势下，维持黄河健康生命新理念和山东黄河哑铃战略的提出，对治理河口提出了更高的要求；水沙条件的急剧变化使得黄河河口出现诸多新情况、新问题；对河口的一些治理措施认识还不一致等，关系河口地区安全、发展的重大问题亦亟待研究解决。

1 黄河清水沟流路治理现状

现行清水沟流路是 1976 年人工改道形成的，原计划行水 12～14 年。但由于加大了治理力度，先后实施了河口疏浚治理试验、河口治理一期、人工出汊、挖河固堤等工程，加之受黄河流域降雨偏少和引用水量增加等因素的影响，黄河入海水沙量大幅度减少，尾闾河道淤积延伸速率大大减慢。因此，清水沟流路得以行河达 30 多年。

1.1　疏浚治理试验

为延长清水沟流路行水年限，经黄委同意，1988 年 4 月，东营市、胜利油田和黄河部门联合在河口进行了疏浚治理试验，采取“截支堵汊、强化主干，束水导流、定向入海，清障拖淤、疏浚河门，巧用潮汐、以潮输沙，护滩保槽，稳定河势，宽河固堤、确保安全”等措施，进行河口疏浚治理，尾闾河道众流归一，河口河段的防洪形势好转。

1.2　入海流路治理一期

随着黄河三角洲地区经济社会的发展和石油开发，要求黄河入海流路相对稳定，1989年黄委会同胜利油田等单位编制了《黄河入海流路规划报告》，国家计委于1992年批复，山东河务局又依据批复意见，编报了《黄河入海流路治理一期工程项目建议书》， 1996年国家计委对此批复，总投资为3.64亿元。其中，中国石油天然气总公司负担2.10亿元，并负责北岸崔家控导工程以下项目的建设与管理；水利部1.04亿元、山东省0.5亿元，负责南岸工程的建设与管理。到2003年底,除北汊1改道引河开挖和南防洪堤延长等个别工程未实施外，其他项目已基本建设完成。

1.3 清8改汉

为了缓解河口地区防洪压力，延长清水沟流路使用年限，结合胜利油田造陆采油的需要，经山东河务局报请黄委会批准，于1996年5月在清8断面附近实施了人工出汉造陆采油工程，1996年7月14日汉河过流，清8改汉工程实施后河口段河道呈溯源冲刷。1997年利津至西河口河段发生淤积，西河口以下河道仍受溯源冲刷影响，发生冲刷，河床比降为1.03‰，比出汉前增大了0.06‰。

1.4 2000年黄河河口治理

为保证河口治理的连续性，2001年水利部批复了《2000年黄河河口治理建设项目实施方案》，主要有：堤防道路、放淤固堤、河道整治等工程以及河口观测研究、黄河口专业机动抢险队建设、丁字路口专用水文站建设等项目。大多数项目均已按期完成。

1.5 挖河固堤

1997-1998年、2001-2002年和2004年分三次在河口河段实施了挖河固堤工程。据分析，挖河工程减淤作用明显，挖河工程在挖河段上下游河段引起了溯源和沿程冲刷，同流量级的水位均有大幅度的降低，平滩流量增大明显，断面形态向着有利方向变化，但挖河工程在减少河道淤积作用方面具有明显的时效性，约2年。

1.6 河口物理模型建设

黄河口物理模型基地建设受到了水利部、黄委会、地方各级人民政府和胜利石油管理局的高度重视，在各级领导的关心指导下，经过各方的共同努力，黄河口物理模型试验厅建设项目黄委以黄规计〔2006〕31号批复初步设计，并于2006年10月正式开工建设，目前河口模型建设进展较为顺利。

2 存在的主要问题

2.1 黄河河口物理模型试验基地建设，由于胜利油田建设资金尚未到位，建设资金短缺，已影响到施工进度。因此，应安排专人，进一步加大工作力度，督促建设资金应尽快到位，强力推进河口物模建设，确保2007年9月前保质保量完工，黄河第三届国际论坛期间投入运用。

目前只有模型试验厅正在建设中，其他科研设施，如基础试验厅、综合工程厅、露天试验场等尚未列入建设计划；基础设施中，只有科研业务用房落实了投资,其他基础设施，如科技楼、黄河展览馆、专家公寓楼以及模型基地的相关附属设施尚未列入建设计划。

2.2 管理体制不顺

目前，河口地区存在着多头管理的问题，涉及到的管理单位与开发主体主要有：黄河三角洲自然保护区管理局、东营市海洋与渔业局、中石化胜利油田、济南军区黄河三角洲生产基地。黄河部门负责四段以上、崔家以下南岸河道工程的建设管理以及刁口河备用流路的管理职责，石油部门负责崔家以下北岸河道工程的建设管理，地方政府负责河道及备用流路的土地开发与管理。北岸四段以下大堤和南岸二十一户以下大堤及其附属工程至今没有落实管护责任、管护 经费，出现了严重的失管现象，现行管理体制不利于河口治理。

2.3 投资渠道不畅

长期以来，河口治理一直没有固定的投资渠道。1996 年国家计委批复的河口流路治理一期工

程，明确由水利部、山东省政府和石油部门三家共同投资建设与管理。目前，油田作为国有企业已改制为上市公司，无法再支付这部分经费，地方政府继续出资建设也存在很大困难。

2.4 尾闾河道持续淤积延伸，防洪形势严峻

2.4.1 大量泥沙堆积在河口，尾闾河道不断淤积延伸。清 8 改汉之后，尽管 1996 年 7 月-1997 年 9 月尾闾河道冲刷强烈，但由于水沙条件的变化，自 1997 年 10 月以后，清 4 以下河道冲淤交替变化，但总体呈淤积状态。

2.4.2 滩地横比降加大，防洪压力增加。近十几年来水较小，漫滩淤积多是滩唇淤积，滩面淤积较少，形成滩唇高于堤根、横向比降较大等严重问题。若遇大水漫滩，即使是中常洪水，也极易发生河势骤变，形成横河或者顺堤行洪的防洪被动局面，严重时对堤防还有造成冲决的危险。

2.4.3 河道工程布局不尽合理，节点工程不完善。

2.5 岸线蚀退，湿地退化

进入河口水沙大幅度减少，导致三角洲海岸线蚀退，不仅影响了油田的开发，而且使得淡水湿地退化。

2.6 水资源匮乏，生态系统脆弱，经济社会的发展受到严重制约。

3 对策与建议

3.1 保质保量完成河口物理模型建设，为实现稳定入海流路的目标提供技术支撑

要按照规划尽快完成黄河河口物理模型试验基地建设，通过模型试验，揭示河口内在的规律，为综合治理开发方案提供技术基础数据，为国内外专家提供更好的交流平台，吸引更多的仁者志士加入河口治理研究行列，推动科学研究工作。因此，需加大工作力度，强力推进河口物模建设，确保 2007 年 9 月前完成河口模型试验厅建设，并在论坛期间投入运用。

按照先急后缓的原则，根据黄河口治理的具体需求、资金条件及技术条件，陆续开工建设基础试验厅、科技试验楼、露天试验场、专家公寓、黄河河口展览馆、模型基地景点工程、模型配套设施、模型辅助设施以及控制室建设等，针对当前最为紧迫的河口地区防洪工程建设方案论证等治黄需求，启动河口模型试验研究工作，开展河口河道演变、河口生态和海岸侵蚀等方面的模型试验研究。争取把黄河口物理模型基地建成世界一流的科研基地，为众多北方河流和国内外大江大河的治理开发提供模型试验平台。

3.2 黄河口治理纳入黄河部门统一管理

河口的治理是黄河整体治理的重要组成部分，涉及到方方面面，纯属社会公益性事业。建议将河口治理、工程管护以及现行河道、故道和备用流路等纳入黄河部门统一规划和管理，其治理、管护以及抢险经费应列入国家投资计划。

3.3 加强综合治理，相对稳定入海流路

3.3.1 加大工作力度，督促有关部门尽快批复黄河河口综合治理规划，并认真研究黄河口治理开发和管理中存在的重大问题，力争列入国家新一轮的黄河流域综合规划之中。

3.3.2 加大挖沙降河力度，减少河道淤积对黄河下游的反馈影响。三次挖河实践已经显现出其强大的生命力，应继续实施挖沙降河工程，利用百船计划配备的设备，年年挖河不止。

3.3.3 开展口门泥沙扰动疏浚，减缓尾闾河道淤积延伸速率。

3.3.4 完善节点工程，稳定主槽，归顺河势。

3.4 采取工程措施，遏制海岸蚀退，湿地退化

刁口河河口附近海岸线蚀退、湿地退化的主要原因是黄河改走清水沟流路之后，断绝了水沙资源，在海洋动力因素的作用下海岸线发生演变，并逐渐后退。为此，建议在西河口建设枢纽工程，让清水沟流路和刁口河流路轮换使用，使两口门海域不断得到淡水和泥沙的补充，遏制海岸蚀退，湿地退化，以保持海岸线冲淤平衡。

3.5 加大水资源统一调度管理力度，确保河口生态需水量，促进三角洲生态系统的良性维持。研究结果表明：利津站全年的最低流量应保持在 230m3/s 以上，每年 4-6 月份为保证河口近海鱼类产卵季节需水，应保持流量在 300m3/s 以上，全年生态环境最小需水量需要 73-93 亿 m3。

3.6 加快数字河口建设步伐。在河口模型的基础上，将先进的地理信息技术和三维数学模型相结合，通过卫星遥感影像资料观测收集、分析整理，建立数字平台，跟踪河口演变过程，实施虚拟仿真模拟，分析研究河口演变规律，为河口治理提供技术支撑。

3.7 进一步加强河口院能力建设，充分发挥其人才技术优势，利用河口物理模型，采取内引外联、强强联手等有效形式，对关乎河口治理开发和管理的关键和重大问题进行技术攻关，为黄河口治理开发和管理提供强有力的技术支撑。

作者简介：孙远扩，1971.8，2005 年 9 月毕业于荷兰国际水利学院，硕士学位，山东黄河河务局高级工程师，济南市黑虎泉北路 157 号，250011，0531-86987147，sunyk@sdhh.gov.cn。