



# Round-Pacific Japan-Mexico Port Hydraulic Research Network Starting with Mexico Port Hydraulic Center Project

Project Equipment Donation Completion Ceremony (November 1987)

## Reasons for Taking Up This Project

Ports are important infrastructure for economic development and coastal disaster prevention. And for the improvement of ports, knowledge related to the generation, propagation and deformation of waves and tsunamis are extremely important. Thus, the Mexico Port Hydraulic Center project was carried out between the Japan International Cooperation Agency (JICA) and the Ministry of Communications and Transport of Mexico (SCT) from 1984 to 1988 to improve hydraulic research activities in Mexico. This project was subsequently followed by third-country training and research cooperation between related institutes. Those activities have continued to contribute to the development of ports and coastal disaster prevention activities in Mexico to this day.

The features of this project are as follows.

- 1) Long term transfer activities between engineers in Japan and Mexico related to Japan's port hydraulic technology.
- 2) Dissemination of technology to Mexico and neighboring countries through the compilation of Spanish texts.
- 3) Technical support for port development in Mexico.
- 4) Contribution to the formation of subsequent projects such as the Turkish Port Hydraulic Center Project.
- 5) Systematic and long-term exchanges between the Port and Airport Research Institute and the Mexican Transport Research Institute.
- 6) Contribution to Pacific Rim coastal disaster prevention for events such as tsunamis and storm surges.

# 1 Project Background

Mexico is an oil-producing country and an important ally in Latin America for Japan. It is also the most populous Spanish-speaking country in Latin America. For many years, technical cooperation in the field of port technology has been actively carried out, such as by continuously dispatching long-term experts from Japan to support the formulation of port development plans.

Under these circumstances, the Mexico

Port Hydraulic Center Project was started with the aim of modernizing and upgrading Mexican institutes. This project was carried out within the framework of JICA's project-type technical cooperation, through the cooperation of Port and Harbor Research Institute of the Ministry of Transport of Japan (PHRI) and Port and Harbor Bureau of the Ministry of Communication and Transport (PHB of SCT) of Mexico.

# 2 Project Chronology

## 2.1 Project Formation Phase (Prior to the launch of the Mexico Port Hydraulic Center Project in July 1984)

August 1981	Dispatch of the survey team (Current Situation Survey)
September 1983	Dispatch of research team (research of technical cooperation system)
October 1983	Dispatch of individual long-term expert
After July 1984	The expert continued to stay in Mexico as long-term project expert (field of on-site wave observation) for the Project
July 1984	Start of the Mexico Port Hydraulic Center Project

## 2.2 Port Hydraulic Center Project Execution Phase (July 1984 to June 1988)

October 1984	Dispatch of Chief Advisor / long-term expert Dr. Shoji Sato (ex-Director General of PHRI, and chief advisor of the project and expert of field of littoral drift study) stayed in Mexico until the end of the project (June 1988)
June 1985	Dispatch of a long-term expert of the field of hydraulic model experiment, Mr. Toshihiko Nagai, for 3 years until May 1988
December 1985	Center opening ceremony
October 1986	Change of long-term expert (field of the on-site wave observation). He stayed in Mexico until the end of the project (June 1988)
November 1987	Ceremony on the occasion of completing the provision of equipment
June 1988	Completion of the Project

## 2.3 International Technical Transfer Phase for the Third-Country Engineers (July 1988 to March 1998)

October 1988	Conducted the 1st third-country training course
October 1989	Conducted the 2nd third-country training course (Held every year thereafter)
October 1997	10th third-country training course

## 2.4 Joint International Workshop and Phase Change for New Stage (From April 1998 to June 2004)

During this period the Mexico Port Hydraulic Center moved from the suburb of Mexico City to the suburb of Queretaro City, about 300 km northwest of Mexico City.

Equipment provided from Japan also was moved and re-installed at the new research institute at the expense of the Mexican side.

November 2003	Joint workshop on up-to-date Port Hydraulics research among Japan-Mexico-Turkey institutions at Port and Airport Research Institute in Japan (PARI). In 2001, PHRI's related research organization was reorganized into PARI due to the restructuring of the Japanese administrative system.
June 2004	Memorandum of understanding for research cooperation concluded between the PARI and the Mexico Transportation Research Institute (MTI)

## 2.5 Research Cooperation based on Agreement between Two Institutes (July 2004 up to present)

December 2005	Conclusion of a research cooperation agreement between the PARI and MTI.
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# 3 Project Features

## 3.1 What is the Port Hydraulics Center Project?

Project-type technical cooperation by JICA consists of three types of technical cooperation activities, such as the provision of equipment, the dispatch of Japanese experts, and training for counterparts, in an integrated manner during a several year project period. Project-type technical cooperation is intended to concentrate and achieve effective technology transfer. The implementation period of the Mexican Port Hydraulic Center Project was four years



Photo 1: Project commencement signing ceremony (July 1984)

from July 1984 to June 1988, and technical cooperation was to be provided to the partner

organization, the Research and Design Department of PHB of SCT.

## 3.2 Activities of the Mexican Port Hydraulic Center Project

### (1) The following equipment was provided by Japan:

- Experimental equipment such as irregular wave generators, wave height gauges for model experiments, and data recorders, in order to conduct hydraulic model experiments using irregular waves.
- Wave gauges to carry out field wave observations and clarify the wave characteristics of the coast of Mexico.
- Computer system for carrying out numerical simulations that contribute to the planning and design of port structures.

Buildings, water tanks, air conditioning system, and other auxiliary equipment needed to make full use of the equipment provided by Japan were developed with the Mexican side's budget.

### (2) Three Japanese long-term experts were assigned permanently during the project term, and short-term experts were dispatched as needed

As a long-term Japanese expert team, the following persons were stationed during the project period and they covered three fields (on-site wave observation study, littoral drift study, and hydraulic model experiment

study):

- Dr. Shoji Sato, former director general of the PHRI, was in charge throughout the project period.
- Mr. Toshihiko Nagai was in charge for three years from June 1985 to May 1988.

In addition, as short-term experts, a total of nearly 20 experts were dispatched during the project period.

The Mexican side arranged for the establishment of offices, assignment of counterparts, assignment of typists, etc. for the activities of the Japanese expert team.

### (3) Technology transfer through the provision of training to counterparts

In addition to technical transfer activities such as training and on-the-job guidance by long-term and short-term experts in Mexico, the counterpart engineers were invited to Japan every year during the project period, where they were accepted at the PHRI.

When providing technical guidance on-site in Mexico, Japanese experts made efforts to compile as many lecture materials and research results reports in Spanish as possible with the support of counterpart engineers. The collection of those materials



Photo 2: Port Hydraulics Center Opening Ceremony (December 1985)

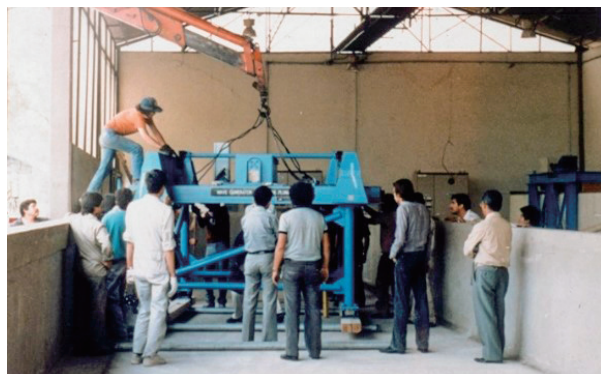


Photo 3: Installation status of wave generator in a wide tank under the guidance of a Japanese expert (July 1987)



Photo 4: Texts and reports compiled in Spanish (November 1987)



Photo 5: Hydraulic model experiment at Mexico Port Hydraulic Center (November 1987)

became the textbooks for the third-country training course in the next stage.

Some of the counterparts invited to Japan had a long training period of up to six months, and it was not always easy for

them to adapt to the different lifestyle and culture of Japan. However, thanks to the kind support of the researchers at the PHRI, the host organization, they were able to achieve the expected results of training in Japan.

### 3.3 Spread to neighboring countries through third-country training

The Mexico Port Hydraulic Center Project achieved the expected results and was completed at the end of June 1988 as scheduled. After the completion of the project, Japanese and Mexican governments worked together to spread the Japanese technology transferred to the Mexico Port Hydraulics Center to the neighboring Spanish-speaking Latin American countries for a period of 10 years. The international third-country training course was held at the Mexico Port Hydraulics Center. For the

training course, the Spanish textbooks and research reports prepared during the project-type technical cooperation period were utilized.

In addition, while third-country training was underway in Mexico, a new Port Hydraulics Center Project was established between JICA and the General Directorate of Railway, Port and Airport Construction of the Ministry of Communications and Transport of Turkey (DLH) from 1995 to 1999. The project period was set for 5 years.



Photo 6: First third-country training course opening ceremony (September 1988)



Photo 7: Opening ceremony of Port Hydraulic Center in Turkey (September 1997)

In 2014, 10 days of follow-up meetings on the littoral drift research, irregular wave model experiment facility maintenance, and numerical calculation program development

were carried out at PARI in Japan.

It is worth noting that the Port Hydraulics Center project was also requested by the Turkish government.

### 3.4 Launching a new stage cooperation through the Japan-Mexico-Turkey Port Hydraulics Research Workshop

In 2000, the Mexico Port Hydraulics Center was relocated to the suburb of Queretaro City, about 300 km northwest from the original site in the suburb of Mexico City, in accordance with the decentralization policy of the government of Mexico. During the relocation, the equipment provided by Japan was also relocated to the new site at the expense of SCT of Mexico. At the time of the relocation, the organization was also changed, and the Port Hydraulics Center was positioned as Coastal and Port Department of MTI under the direct control of the SCT, and its position in the administrative organization was greatly improved.

In November 2003, the PARI held a Japan-Mexico-Turkey Port Hydraulics Research Workshop at the PARI with the support of JICA. This workshop was held as a follow-up of the successful two Port Hydraulics Center projects with Mexico and Turkey. The purpose of this event was to

invite researchers and technical officials in charge of the Port Hydraulics Center Project to exchange the latest information.

Photo 8 is a group photo of this workshop. From right to left in the front row are Ms. Dora Luz Avila and Ing. Jose Miguel Montoya, who were the counterparts of the Mexico Port Hydraulics Center Project. Next to them is Dr. Shoji Sato, who was the chief advisor of the project.

Based on the exchange of information at the Japan-Mexico-Turkey Port Hydraulics Workshop in 2003, preparation works were started to build a new framework for cooperation in research activities between the PARI and MTI.

In June 2004, Dr. Toshihiko Nagai was invited by the Institute of Transport Technology of Mexico to visit the Institute in the suburb of the Queretaro City, Mexico for about two weeks to provide the latest research information of the field in Japan and to discuss with Mexican engineers



Photo 8: Japan-Mexico-Turkey Port Hydraulics Research Workshop (November 2003)



Photo 9: Experimental wave tank of the MTI (June 2004) (The wave generators in the front were provided from Japan)

about the basic agreement framework of the future research cooperation. As a result of the meeting, it was decided that personnel exchanges between the two institutes would be active again in the future.



Photo 10: Information exchange with counterparts  
(June 2004)

### 3.5 Research cooperation phase between institutes based on research cooperation agreements (July 2004 to present)

Since there were many port development projects in Mexico during this phase, the budget of the MTI seemed to be more ample than that of the Japanese PARI. In fact, travel expenses for subsequent personnel exchanges between the two institutes were covered by the Mexican side, including cases in which Japanese engineers visit Mexico in order to give lectures, and where Mexican engineers come to Japan to collect necessary technical information.

Since December 2005, the exchange between the two institutes has been active up to the present. Almost every year, researchers from the PARI are invited to Mexico to serve as training instructors. In addition,

Dr. Jose Miguel Montoya and Ms. Dora Luz Avila also frequently come to Japan to collect information at the PARI and other organizations in Japan.

In the presentation by Dr. Jose Miguel Montoya at this seminar, he explained that Mexico continued a maintenance contract with Mitsui Engineering & Shipbuilding Co., Ltd. of Japan for the maintenance of the irregular wave generators provided by Japan in the 1980s. He also stated that the wave generators are still being used today and that he is working on the development of a new research facility equipped with Japanese serpent-type wave generators.



Photo 11: Investigation of Yokohama Port by the Mexican research team (March 2016)



Photo 12: Japan-Mexico Joint Seminar  
(October 2017)

## 4 Lessons Learned

Lessons learned from this project for future technical cooperation activities are as follows:

### (1) Japan's port hydraulic technology transfer activities through long-term personnel exchanges

Long-term human exchanges are important in international cooperation. From this point of view, the fact that the long-term experts were able to continue the follow-up during the implementation period of the Mexican Port Hydraulic Center project led to the improvement of the results of the project.

Dr. Shoji Sato, who continued to be the chief advisor during the project period, repeatedly stayed in Mexico as a long-term or short-term JICA expert during the 10 years after the completion of the project and supervised the third country training. He contributed greatly to the subsequent further development of the Mexican Port Hydraulics Center. In addition, after the Port Hydraulics Center of Mexico was relocated to the suburb of Queretaro City and developed into the MTI of SCT, Dr. Toshihiko Nagai, one of the long-term experts during the project period, made efforts to promote exchanges between the Japanese and Mexican research institutes, as head of Marine Information Division of the PARI, Japan. Looking at the counterparts on the Mexican side, researchers such as Dr. Jose Miguel Montoya and Ms. Dora Luz Avila, who were counterparts during the project period, have been promoting research on port hydraulics in Mexico for a long period of time.

### (2) Dissemination of technology to Mexico and neighboring Latin-American countries through compilation of Spanish texts

Mexico is large and is the most populous country of the many Spanish-speaking countries in Latin America. Therefore,

technology transfer to Mexico had the potential to spread to neighboring Spanish-speaking Latin American countries. For this reason, after the completion of the Port Hydraulics Center Project, it was possible to conduct third-country training jointly between Japan and Mexico 10 times over a period of 10 years.

It is important to prepare textbooks for the implementation of training. Various textbooks and research reports compiled in Spanish by the Japanese expert team together with counterpart engineers during the project period could be used, almost as they were, as textbooks for training in a third country. In technology transfer, it is important to leave materials in the local language, and this is especially true in the case of Mexico, which can be said to be the leader of Spanish-speaking countries in Central and South America. This not only contributed to the improvement of the level of port hydraulics research in Mexico, but also had a large ripple effect on neighboring Spanish-speaking countries.

### (3) Technical assistance for port development in Mexico

From the 1980s, when project-type technical cooperation was carried out, to the present day, Mexico has achieved great economic development. In terms of economic development, the development of infrastructure such as ports has played an extremely important role. Investment in port development in Mexico is more active than in Japan. The Port Hydraulics Center of Mexico has made great strides by developing into the MTI of SCT.

### (4) Contribution to the formation of new projects, such as the Turkish Port Hydraulics Center Project

A new technical cooperation project, named the Port Hydraulics Center Project in Turkey, was implemented in the period of



5 years from 1995 to 1999 between Japan (JICA) and Turkey (DLH). Also, in 2014, 10 day meetings were held as a follow-up to the littoral drift study, irregular wave experiment facilities, and the numerical simulation programs. It is worth noting that the technology transfer on port hydraulics that was conducted in Mexico was also requested by Turkey and contributed to the formation of a new project.

**(5) Realization of organizational and long-term exchange between Port and Airport Research Institute and Mexican Transport Research Institute**

As mentioned previously in this paper, the systematic and long-term exchange between the PARI and the MTI has continued from the initial stage of the project to the present day. In addition to the sincere efforts of both institutes as organizations, the personal connections between researchers were also

essential for the continuation of such long-term exchanges.

**(6) Contribution to disaster prevention along the Pacific Rim such as tsunamis and storm surges**

Since the beginning of the 21st century, large tsunamis caused by huge earthquakes and huge typhoons (hurricanes) have caused many disasters worldwide. For this reason, information exchange and international cooperation regarding coastal disaster prevention among Pacific Rim countries, including Japan and Mexico, have become important. Research exchanges between the PARI and MTI are continuing actively as introduced in this paper. International cooperation activities that started with the Mexican Port Hydraulics Center Project have developed into the Pacific Rim Japan-Mexico Port Hydraulics Research Network.

## Biography

**Dr. Shoji Sato**

1952 Started working for Ministry of Transport  
 1982 Director General of PHRI  
 1984 Retired from Ministry of Transport  
 1984 JICA Mexico Port Hydraulics Center Long-term Expert (Chief Advisor)  
 1988-1997 Dispatched to Mexico multiple times as a JICA individual expert (Third country training guidance)  
 2014 Passed away

**Dr. Toshihiko Nagai**

Advisor of ECOH Corp.  
 1977 Started working for Ministry of Transport  
 1985-1988 Long term expert of JICA Mexico Port Hydraulic Center Project  
 1988,1989,1993. Short term expert of JICA (Third country training guidance)  
 1999 Chief Advisor of JICA Turkey Port Hydraulic Center Project  
 2003 Japan-Mexico-Turkey Hydraulic research workshop holding secretariat  
 2004 Invited to visit MTI  
 2011 Retired from PARI  
 2012 Started working for ECOH Corp., up to present

**Dr. Katsuya Hirayama**

Head of Wave Group, Coastal Hydraulic Engineering Department, PARI  
 1996 Started working for Ministry of Transport  
 2009, 2014 Short term expert of JICA (Project of Caldera Port Rehabilitation Plan in Costa Rica, Follow up Port Hydraulic Research Center Project in Turkey)  
 2011 Invited to visit MTI (Lecturer for Nonlinear wave transformations)