

= Taiwan High Speed Rail =

Taiwan High Speed Rail (abbreviated THSR or HSR) is a high @-@ speed rail line that runs approximately 345 km (214 mi) (actual length in operation is 348 @.@ 5 km (217 mi)) along the west coast of Taiwan , from the national capital Taipei to the southern city of Kaohsiung . With construction managed by a private company , Taiwan High Speed Rail Corporation (THSRC) , which also operates the line , the total cost of the project was US \$ 18 billion . At the time it was built , this was one of the world 's largest privately funded rail construction schemes . The system is based primarily on Japan 's Shinkansen technology .

The line opened for service on 5 January 2007 , with trains running at a top speed of 300 km / h (186 mph) from Nangang to Zuoying in as little as 105 minutes , reaching almost 90 % of Taiwan 's population . Most intermediate stations on the line lie outside the cities served ; however , a variety of transfer options , such as free shuttle buses , conventional rail , and metros have been constructed to facilitate transport connections .

Ridership initially fell short of forecasts , but grew from fewer than 40 @,@ 000 passengers per day in the first few months of operation to over 129 @,@ 000 passengers per day in June 2013 . The system carried its first 100 million passengers by August 2010 and over 200 million passengers had taken this system by December 2012 .

In the initial years of operation , THSRC accumulated debt due to high depreciation charges and interest , largely due to the financial structure set up for the private company . In 2009 , THSRC negotiated with the government to change the method of depreciation from depending on concessions on rights to ridership . At the same time , the government also started to help refinance THSRC 's loans to assist the company so it could remain operational and profitable .

= = History = =

Taiwan 's rapid economic growth during the latter half of the twentieth century led to saturation of highways , conventional rail , and air traffic systems in the western transport corridor , which threatened to impede further growth . The idea of a new high @-@ speed rail line arose in the 1970s , and informal planning began in 1980 . In 1987 the executive branch of Taiwan 's government , the Executive Yuan , instructed the Ministry of Transportation to launch a feasibility study for a high @-@ speed rail line in the western Taiwan corridor , which was completed in 1990 . The study found that in a comparison of potential solutions to traffic problems in the corridor , a high @-@ speed rail line would offer the highest transit volume , lowest land use , highest energy savings , and least pollution . In July 1990 the Preparation Office of High Speed Rail (POHSR) was established and a route was selected in 1991 . Plans for the THSR were subsequently approved by the Executive Yuan in June 1992 and by Taiwan 's legislature , the Legislative Yuan , in 1993 .

= = = Build @-@ Operate @-@ Transfer = = =

In November 1994 , Taiwan passed a law regarding the use of private finance in infrastructure projects , which also applied to the up @-@ to @-@ then state @-@ run THSR project . Consequently , in 1995 , POHSR was transformed into the Bureau of High Speed Rail (BOHSR) , which started to tender THSR as a build @-@ operate @-@ transfer (BOT) scheme in October 1996 .

The bidding process pitted Taiwan High Speed Rail Consortium (THSRC) against the Chunghwa High Speed Rail Consortium (CHSRC) . THSRC 's bid was based on the high @-@ speed technology platform of Eurotrain , a joint venture between GEC @-@ Alstom , the main maker of the French TGV , and Siemens , the main maker of the German ICE , while CHSRC 's bid was based on Japanese Shinkansen technology supplied by Taiwan Shinkansen Consortium (TSC) , a joint venture of Japanese companies . THSRC , which submitted the lower bid and promised to build the line with zero net cost from the government , was chosen as preferred bidder in September 1997 . The group was renamed and formally established as the Taiwan High Speed Rail Corporation (

THSRC) in May 1998 . THSRC and the government signed the BOT agreement on 23 July 1998 .

However , controversy arose during rolling @-@ stock selection . In May 1999 , as THSRC faced difficulties in raising capital , the government of Japan promised soft loans if THSRC switched to TSC . Although Eurotrain promised to match TSC 's financial offerings , the Eschede train disaster in combination with TSC offered the newer 700 Series Shinkansen , convinced THSRC to reopen core system bid , and ultimately resulting in TSC selected as the preferred rolling @-@ stock supplier in December 1999 . Although Eurotrain eventually conceded in the bid , in February 2001 it filed for a US \$ 800 million damage claim against THSRC at the Singapore International Arbitration Centre . After a lengthy arbitration process , the court ruled in March 2004 that THSRC should pay a compensation for the US \$ 32 @.@ 4 million Eurotrain spent on development and US \$ 35 @.@ 7 million for unjust enrichment . THSRC agreed to pay US \$ 65 million (US \$ 89 million with interest) to Eurotrain in November 2004 .

= = Train and operation = =

= = = Train = = =

Taiwan High Speed Rail started operation with 30 THSR 700T trainsets supplied by a consortium led by Kawasaki Heavy Industries . In response to increasing ridership and new stations that would begin operation in 2015 , THSRC signed the contract for four new 700T trainsets with the Kawasaki consortium on May 2012 in Tokyo , Japan . The first (TR 31) trainset was delivered to Taiwan on December 23 , 2012 ; the second (TR 32) on January 21 , 2013 ; the third (TR33) on January 25 , 2014 ; the fourth (TR34) on August 12 , 2015 .

The THSR 700T trainset is based on the 700 Series Shinkansen trainset used by JR Central and JR West in Japan . This marked the first time Shinkansen technology was exported to a foreign country . Customization was focused on adapting to Taiwan 's climate and geography , and the nose shape was optimized for tunnels wider than those in Japan .

The maximum service speed of the trains was raised from the 700 Series Shinkansen 's 285 to 300 km / h (177 to 186 mph) . The 12 cars of a 700T train are grouped in three traction units with three power cars and one trailer each , providing 10 @.@ 26 MW of power ; both end cars are trailers to avoid slip on powered bogies . The train is 304 m (997 ft) long and has a mass of 503 t (554 short tons) when empty . The trains have a passenger capacity of 989 seats in two classes : 66 seats in 2 + 2 configuration in the single Business Car and 923 seats in 2 + 3 configuration in the eleven Standard Cars . The per capita energy consumption of a fully loaded 700T train is 16 % of that of private cars and half that of buses ; carbon dioxide emissions are 11 % of private cars and a quarter that of buses .

= = = Operation = = =

As the first high speed railway system in Taiwan , THSRC started operation in 2007 with a lot of foreign talents including French and German train drivers and operation controllers in the Operation Control Center (OCC) . At the same time , THSRC also started to train local drivers and controllers . Since May 2008 , all controllers working in the OCC have been Taiwanese , and since October 2008 , all train drivers have been Taiwanese .

The OCC 's main responsibility is to maintain safe train operations . THSRC has 132 controllers (July 2012) , of which about one quarter are female , working 24 hours per day and 365 days per year in the OCC . Requirements for becoming a Chief Controller (?????) include experience in all nine OCC positions , 300 @-@ hours of on @-@ job @-@ training and to acquiring qualification .

THSRC has 144 drivers (July 2012) , of which almost 10 % are female . All driver candidates must spend 8 months completing 1 @,@ 326 hours of professional training and pass the National Certification before they can drive the train . In addition , after becoming a certified high @-@ speed train driver , they undergo further on @-@ the @-@ job training at least three times each year in

order to guarantee they can drive the train safely .

== Events ==

Taiwan frequently faces multiple types of natural disasters including typhoons , earthquakes , heavy rainfall , floods and landslides . For this reason , a primary focus of THSRC 's infrastructure design was how to respond to natural disasters such as earthquakes and how to ensure safety for all passengers and trains in any emergency situation .

THSRC has established a system to respond to natural disasters and unexpected intrusion onto the right @-@ of @-@ way , called DWS (Disaster Warning Systems) . This system consists of a network of sensors installed along the rail route to detect unexpected situations such as earthquakes , strong winds , heavy rainfall , floods , landslides , and intrusions . In case of an unexpected situation , the DWS will send signals to the OCC (Operation Control Center) immediately ; it will also activate contingency measures to ensure the safety of the passengers and trains , including decelerating or stopping trains in the affected area .

The DWS has functioned successfully since its initial operation in 2007 . The most powerful earthquake that THSRC has experienced measured 6 @. @ 4 on the Richter Scale with an epicenter 17 km from Jiaxian , Kaohsiung that shook southern Taiwan on 4 March 2010 (????) . One operating train was slightly derailed in Xinshi Tainan (????) and six trains were stopped on the track . In spite of the temporary suspension of operations , there was no damage or casualties . All 2 @, @ 500 affected passengers were evacuated in two hours without injury . Service resumed the next day . Such a record was well noted , and provided valuable experience in operational safety to the global railway industry .

In April 2010 , it was reported that ground subsidence had been observed during construction on a 6 km (3 @. @ 7 mi) viaduct section in Yunlin County . The subsidence continued , reaching up to 55 cm (22 in) over seven years . By 2010 subsidence had slowed , which was ascribed to the closure of some deep wells operating in the region . Although the situation was deemed safe with differential settlement between adjacent piers along the viaduct at only a sixth of the permissible level , the BOHSR urged the closure of more wells . On 25 July 2011 , the government announced plans to close almost 1 @, @ 000 wells in Changhua and Yunlin Counties , reducing the amount of water pumped from deep wells by 210 @, @ 000 @, @ 000 tonnes (2 @. @ 1 × 10¹¹ kg) by 2021 .

== Service ==

According to THSR 's December 2013 timetable , there are 954 train services per week of operation , with operation times between 06 : 30 to 24 : 00 every day . Most southbound trains originate from Taipei station and most northbound trains originate from Zuoying ; however , a few trains operate just between Taipei and Taichung or between Taichung and Zuoying . Southbound trains are designated by odd train numbers , and northbound trains by even train numbers .

Each train consists of 1 Business Car (car 6) and 11 Standard Cars (including reserved seats and non @-@ reserved seats) . Since July 2010 , non @-@ reserved seats are available in cars 10 through 12 (some trains available in cars 9 through 12) . Car 7 of each train is fitted with 4 wheelchair accessible chairs and a disabled @-@ friendly restroom . Passengers can call THSR 's Customer Service Hot Line at (Taiwan) 4066 @-@ 3000 or visit any THSR station ticket window to reserve these seats .

By August 2012 , implementation of 4G WiMAX on @-@ board trains is expected to provide smooth wireless broadband services , making THSR the first high @-@ speed ground transportation system equipped with this service .

In 2012 , THSRC rated highly in the CommonWealth Magazine (????) ? Golden Service Award survey ? (?????) , not only far outpacing all rivals in the " long @-@ distance land transport " category , but also taking the top spot in the overall rankings of 300 industries .

== Stop Patterns ==

== Ticket fare and discount ==

In 2013 , for a one @-@ way Taipei ? Zuoying trip , a THSR Standard Car adult ticket is NT \$ 1 @, @ 630 , which was about US \$ 55 ; a Business Car ticket fare is NT \$ 2 @, @ 140 , which was about US \$ 72 . The cost of a non @-@ reserved seat is approximately 3 % less than the regular price . Business and standard car reserved ticket reservations are available 28 days prior to the date of departure (including the departure day) .

Senior citizens (Taiwan citizens above 65 years of age) , registered disabled persons plus one accompanying passenger (Taiwan citizens only) , and children (passengers under 12 years of age) are eligible for concession (half price) tickets .

A group discount is offered for groups of 11 or more . A group discount cannot be used in combination with other discount offers and does not include non @-@ reserved seats . Passengers eligible for multiple discounts can only choose one discount offer .

Since 1 July 2010 , a smart card system has provided frequent travelers with multi @-@ ride (eight trips) or periodic tickets . THSR 's contact @-@ less smart cards allow the cardholder to travel between specific stations within a given time period for a certain number of rides . The card is sold in either registered (name @-@ bearing) or non @-@ registered form . Only adult tickets are available in this format , and cannot be used for rides between Banqiao and Taipei .

After purchasing or adding value to a multi @-@ ride card , the card balance is valid for 45 days counted from the day of first use . The ticket is good for 8 rides . The multi @-@ ride card provides a discount of about 21 % off the full fare of a reserved Standard Seat . Non @-@ registered and registered multi @-@ ride tickets can be purchased at the ticket windows of all THSRC stations . Upon first purchase of a multi @-@ ride ticket , a card deposit fee of NT \$ 100 is required (refundable if the card is returned) . The registered multi @-@ ride ticket is limited to personal use by the registered cardholder . Since November 2012 , an Early Bird discount of 35 % has been offered for a limited number of tickets sold no later than 8 days before the departure date . If the 35 % off tickets sell out before the deadline , tickets with a discount of 20 % off are offered . If these tickets sell out before the deadline , tickets with a discount of 10 % off are offered . If all early bird tickets are sold out , then full fare tickets are offered .

== Train frequency ==

THSRC operates additional train services during national holidays . On 29 June 2011 , a proposal by THSRC to increase the maximum number of train services to 210 per day (compared to the existing 175 per day) passed an environmental impact assessment , increasing the number of possible services on " high @-@ load days " .

== Ridership ==

Original estimates predicted a daily ridership of 180 @, @ 000 after launch , growing to 400 @, @ 000 by 2036 . In view of a 50 % drop in airline passengers in the wake of the 1997 Asian financial crisis , forecasts were revised downwards . The final initial ridership estimate was 140 @, @ 000 passengers per day . Actual initial ridership did not match these projections . In September 2007 , six months after opening , THSRC carried 1 @. @ 5 million passengers monthly , translating to about 50 @, @ 000 passengers daily . In the second year , passenger numbers almost doubled . In the third year , average daily ridership continued to grow to 88 @, @ 000 passengers per day , jumping to over 120 @, @ 000 passengers per day in 2012 . (updated to September 2012) Seat occupancy was around 45 % in the first three years , with a modest improvement achieved in 2009 , and reached 53 @. @ 91 % in 2012 . (updated to September 2012) Punctuality is stable above 99 % .

The 10 @-@ millionth passenger was carried after 265 days of operation on 26 September 2007 ,

while the 100 millionth passenger was carried after 1 @, @ 307 days on 3 August 2010 , and 200 @-@ millionth by December 2012 . On 10 October 2011 , the Double Ten Day holiday , THSRC transported a single @-@ day record of 189 @, @ 386 passengers . On 5 February 2011 , the third day of Chinese New Year ? s celebration , a new record of 190 @, @ 596 passengers was achieved . The next single @-@ day record was reached on 25 January 2012 , also the third day of Chinese New Year ? s celebration , at 191 @, @ 989 passengers . The most recent record is 212 @, @ 000 passengers transported on 1 January 2013 .

The high @-@ speed trains have successfully out @-@ competed planes : by August 2008 , half of the air routes between Taipei and the country 's western cities had been discontinued , including all connections between cities with THSR stations except for a single daily connection between Taipei and Kaohsiung . Total domestic air traffic was expected to be halved from 2006 to 2008 , and actually fell from 8 @. @ 6 to 4 @. @ 9 million . In June 2012 , officials announced the discontinuation of the last remaining commercial flight between Taipei and Kaohsiung . The share for conventional rail between Taipei and Kaohsiung fell from 9 @. @ 71 % in 2006 to 2 @. @ 5 % in 2008 , while high @-@ speed rail became the most common mode of transport at 50 % of all trips by 2008 . The opening of THSR led to a 10 % reduction of traffic on the parallel expressway in 2007 . Despite cheaper ticket prices , long @-@ distance bus companies reported that passenger volumes had fallen by 20 to 30 percent by 2008 .

= = Infrastructure = =

Construction of the system took more than 2 @, @ 000 professional engineers from 20 countries and over 20 @, @ 000 foreign and domestic workers six years to complete . Construction work was broken into several specialized lots that were contracted separately . One group of contracts was for civil works , covering the construction of the superstructure of open line sections . Stations and depots were the subject of separate groups of construction lots . A fourth group of lots was for track work .

The Taiwan North @-@ South High Speed Rail Project was awarded the first prize for the ? Outstanding Civil Engineering Project Award ? by the Asian Civil Engineering Coordination Council (ACECC) in Sydney on 10 August 2010 . The project 's award indicates that Taiwan 's engineering standards are gaining international recognition , and THSRC , running through the northern and southern region of Taiwan , has overcome the problems of topography and other technical challenges .

In 2011 , the Public Construction Commission (???????) organized an on @-@ line voting campaign that garnered over 330 @, @ 000 votes , to select the 100 best infrastructure projects (????) in Taiwan to celebrate the centennial of the Republic ; Amongst all , Taiwan High Speed Rail top the list .

= = = Stations = = =

The construction of stations was contracted separately in 2001 and work started in May 2002 . The stations at Taipei and Banqiao are rent from TRA by THSRC . The Taoyuan , Hsinchu , Taichung , Chiayi , Tainan and Zuoying Stations are built in the first phase by THSRC . The second phase of the new stations planned for several years officially started in early 2013 . The construction of THSR new stations , Yunlin , Miaoli and Changhua , commenced on Jan.15 , January 28 and February @-@ 16 2013 . According to the plan , all the three stations could join the operation by the middle of 2015 . THSR also planned to extend its operation to Nangang , in the north part of Taipei City . The new THSR Nangang station is scheduled to join the operation in mid @-@ 2016 , which is a station refitted from an old TRA station .

The Parking facilities , station square , transport bus station , food and shopping service areas in each station were included in station design . Steel , glass , and reinforced concrete were used in the construction of all stations . Lighting systems for each station were contracted out to individual lighting designers . Stations were constructed with the possibility of connecting to future rapid transit

or rail lines .

The construction contract between the THSR and the government consists of two parts : part one is the THSRC 's construction and operation of the High Speed Rail over the next 35 year ; part two is THSRC 's keeping the right of development of the areas around five stations for 50 years , including Taoyuan , Hsinchu , Taichung , Chiayi , and Tainan .

= = = = Taoyuan Station = = = =

The Taoyuan Station serves not only passengers arriving or leaving Taoyuan , but also travelers going in and out the Taiwan Taoyuan International Airport . The entire station area is about 20 hectares . It is constituted by three buildings , namely the station itself , the operation center at northeast side and the parking tower at southwest side . The volume of the station is smaller than the other two buildings , but it is the focal point as it stands at the center of the site and provides most of the services and functions . Large pieces of glass screens and metal shoulder eaves extending horizontally , the station is lit and transparent . The specially designed lighting , the clear tempered glass , the insulating glass and the truss system have emphasized the functions of the space and brought a bright look of the building . The 6M high lobby in the ground floor is connected by the escalators coming up from the entrance hall and the platforms built underground .

= = = = Hsinchu Station = = = =

As the gateway of Hsinchu , a city nurturing high @-@ tech industries , Hsinchu Station integrates the images of high @-@ tech into its natural and cultural traits , and integrates global perspective into locality . The Hsinchu Station is an oval @-@ shaped space with a curved parallelogram roof . It is designed to respond to the sunlight and winds in Hsin @-@ Chu . The cladding of the roof is durable stainless steel . It keeps the maintenance easier and enhances the high @-@ tech image . The roof opens up over the platform and rail to avoid a piston effect and the style responds to the local environment . The station will be the new landmark of Hsinchu . Either gate can be the front gate or this symmetric building under the elevated railway . The lobby on the ground floor greets visitors entering or exiting the building . Entering the ticket gate , travelers can take escalators or stairs to the waiting areas on the second floor . Two waiting areas for passengers go to north and south respectively are connected by an air bridge . Two escalators and one stairway send passengers to the platforms . There are ten emergent exits around the platforms . To avoid causing directional confusion , two arch walls in the lobby are erected to break the symmetry . These two walls are designed by well- known artists with themes of ? The Past ? and ? The Future ? The past wall is designed by Taiwanese artist Tsai Ken . He stacked traditional building materials such as bricks , tiles , stones , wood and bamboo to present the Hakka culture of building . The Future wall is designed by Chinese American artist Shan @-@ Shan Sheng . She applied glass , a material used frequently in Hsin Chu for handcraft , to decorate the wall . A set of glass bar codes suggests how the future might be . Standing at the air bridge , one can clearly see the walls that connect our past to our future .

= = = = Taichung Station = = = =

Taichung Station has the biggest space of all THSR stations . It is located in Wu @-@ Ri (??) Village , 8 km from downtown . It is elevated . The development includes the High Speed Railway Station , Taiwan Railway Station , bus transit , parking lots , public squares , supporting facilities and the road system for the adjacent areas . The architectural image of the Taichung Station integrates the regional transit through middle Taiwan and a gateway to Taichung . It is the core of the future development and is to decide the image of the entire city . The planning sets out at three scales : regional , citywide and street @-@ level . The building group with vertical volume is designed in accordance with regional considerations ; the stations with the same structure are designed in accordance with city @-@ level concerns ; the supporting facilities are designed to respond to the

street @-@ level needs of the site . In addition to the images and local elements applied in design , the capacity of the buildings , the nature of the space , the potential of the neighboring districts , the convenience of the traffic square , and the contrast of vertical and horizontal volumes of buildings that constitute the skyline are all considered . The horizontal volume of the station is due to the conditions of the site , functions and development regulations . Therefore , the contrast created by the vertical volumes of the supporting structures can characterize the space and enhance the image of the architecture in the surroundings . The images of the supporting facilities are suggestive , and the image of the stations is revealing . The three stories above ground are constructed of SRC , and the structure is shared by the building and the rails . A foyer , bus transit area , generator room , parking lot and taxi waiting lines are in the ground floor . The lobby , shops and staff offices are on the second floor . Train platforms are on the third floor .

= = = = Chiayi and Tainan Station = = = =

Both the Chiayi and Tainan stations are located on the Chia @-@ Nan Plain (????) . The conditions of construction sites and the transportation needs of these two places are similar , but the architectural themes differ in order to reflect local characteristics . The oblique roof covering the eastern facade features a high @-@ tech image . The generator room is decorated with horizontal shutters that reflect a minimalist style . The columns and truss system in the station imitate trees ; as they extend toward the outside of the building , the artificial elements are integrated into nature . When night falls , the ceiling is lit with thousands of lights over the truss system , resembling a starry night over the branches of a forest . The pavement of the Chiayi Station ' s front plaza reflects the natural landscape of the clouds enveloping Ah @-@ Li Mountain (???) . The wall and the water feature design of the Tainan Station ' s plaza reflect the old city fence and the An @-@ Ping Wharf (????) . Chiayi Station is colored silver , gray and green to represent its well @-@ preserved surroundings . Tainan Station is colored reddish brown to represent its rich historical heritage . Art projects for Chiayi Station will respond to the natural landscape or the high @-@ tech images of the medical science park that will be constructed close by in the near future . Art projects for Tainan Station @-@ will respond to the city ' s long history and to a bright future expected to be brought by the high @-@ tech industrial park nearby .

= = = = Zuoying Station = = = =

The Zuoying Station is located near Half Screen Mountain and Lotus Pond . The station not only provides travelers with safe , comfortable and convenient transportation but also serves as the gateway and landmark of this area . Extending from the station , the two plazas serve as the interface between the station and its surroundings , and the pedestrian walks around them are open to the public for various activities . The station and parking tower are the main architectural structures . They are the landmarks of Zuoying , and their scale meets the conditions of the environment . As the major public construction in the city , the station applies glass screens to frame Half @-@ Screen Mountain in the backdrop , a technique referred to as ? scenery @-@ borrowing . ? The glass screens are supported by a colonnade on the ground floor . As one of the architectural characteristics of southern Taiwan , the colonnade here can relieve the pressure the building might bring to the streets . The station structures include the station itself , parking tower , transformer power station , duty command center and the affiliated facilities . The structure of the station is designed to address the needs for convenient maintenance , high loading and large span .

= = = Stations transportation = = =

To improve local public transit connections to THSR stations , the TRA built two new spur lines branching off from its Western Line .

Shalun Line for Tainan opened on 2 January 2011 @,@

Liujia Line for Hsinchu opened on 11 November 2011 .

=== Track ===

Reflecting a design speed of 350 km / h (217 mph) , track layout was designed with a minimum curve radius of 6 @, @ 250 m (20 @, @ 505 ft) , track @-@ centre distance of 4 @, @ 500 mm (177 @. @ 2 in) , right @-@ of @-@ way width of 18 m (59 ft) , and a maximum gradient of 2 @. @ 5 % , except for 3 @. @ 5 % at one location . All but 3 km (1 @. @ 9 mi) of track is ballastless , combining slab track of Japanese manufacture on open line sections with switches from a German supplier . Track laying began in July 2003 . The line was electrified with the 25 kV / 60 Hz AC system . The signalling and train control system was laid out for bi @-@ directional operation according to European specifications . Each track section has a checkpoint , and an automatic control system ensures that trains are spaced at least 1 km (0 @. @ 62 mi) apart to prevent collisions .

After four months of delays , trial runs using the first THSR 700T trains began on 27 January 2005 , on the Tainan ? Kaohsiung section . On 30 October 2005 , a day after a test run passed the planned top service speed of 300 km / h (186 mph) , the targeted maximum test speed of 315 km / h (196 mph) was achieved . The section between Banqiao (Taipei) and Zuoying (Kaohsiung) opened to the public on 5 January 2007 . The HSR platforms at Taipei Station opened on 2 March 2007 , bringing the entire line into operation .

=== Civil works ===

Most of the line is carried on superstructures . About 251 km (156 mi) or 73 % of the line runs on viaducts , mostly precast pre @-@ stressed concrete box girder spans , the first of which was put in place in October 2001 . A 157 @, @ 317 m (97 @. @ 752 mi) continuous section from Baguashan (???) in Changhua County to Zuoying in Kaohsiung was the world 's longest elevated rail line section at the time of opening . Viaducts were designed to be earthquake resistant to allow for trains to stop safely during a seismic event and for repairable damage following a maximum design earthquake . Bridges built over known fault lines were designed to survive fault movements without catastrophic damage .

About 61 km (38 mi) or 18 % of the line is in tunnels , including 14 km (8 @. @ 7 mi) of the TRUPO section in Taipei , as well as 48 tunnels with a total length of 46 @, @ 257 m (28 @. @ 743 mi) on the other sections , the longest of which is Paghuashan Tunnel , at a finished length of 7 @, @ 364 m (24 @, @ 160 ft) . Forty @-@ two of the tunnels included a total of 39 @, @ 050 m (24 @. @ 265 mi) of mined sections , all of which were bored with the sequential excavation and support construction method , with excavated tunnel faces of 135 ? 155 m² (1 @, @ 450 ? 1 @, @ 670 sq ft) , between November 2000 and July 2003 . The finished interior cross @-@ sectional area of 90 m² (970 sq ft) , set according to wider European standards , provides space for two tracks with safety walkways .

=== Environmental issues ===

Environmental mitigation measures in the line 's construction phase included the construction of animal bridges over the line , the planting and re @-@ planting of trees along the track as noise screens , and the purchase of farmland to create a preservation area for jacana birds (??) away from the line .

For more than 10 years , THSRC has been devoted to the preservation of the pheasant @-@ tailed jacana , a type of bird that is considered endangered in Taiwan . With NT \$ 50 million invested , the first artificial habitat recovery project was completed in collaboration with the local government , country development organizations and non @-@ profit organizations . The pheasant @-@ tailed jacana population in Tainan , Taiwan , which at one point numbered less than 50 , has increased to over 300 . In 2007 , the recovery habitat was officially renamed ? Pheasant @-@ tailed Jacana Eco @-@ Educational Nature Park ? and since then , it has opened to the public . To educate students

in matters concerning environmental protection , every year THSRC arranges for elementary and junior high school students to visit Pheasant @-@ tailed Jacana Eco @-@ Educational Nature Park (????? ?????????) , where they are able to learn about the beauty of Taiwan ' s natural habitats .

The other story about the balance between THSR construction and the environment is the protection plan of ? 300 @-@ year @-@ old camphor tree and the temple ? (?????????????) in the Hsinchu City for more than 10 years . The tree and the temple are located on the main route of the THSR , and both of them faced removal because of railway construction . The temple - ? Local Land God Temple ? (???) established just beside the old tree is the belief center of the people there . In 1998 , THSRC adjusted the line and design to keep the tree and temple in their original place and cooperated with local government and people to protect the old tree and the temple until today . Afterwards , together with the local government , the Environment and the Resources Protection Committee , and cultural and historical authorities , THSRC drafted the Hsinchu Old Camphor Tree Medical Plan , which called for the repair of decayed branches as well as measures designed to maintain the long @-@ term growth and the health of the tree .

= = Financial = =

= = = Revenue and cost = = =

Most of THSRC ' s revenue comes from ticket sales ; supplemental income comes from other activities such as advertising and renting spaces for standing shops and spots in plazas . Advertising spots on trains and station platforms have also been sold . Revenues grew along with ridership over the first three years , but ridership remained below expectations . In 2008 the second year of operation , revenues fell barely short of THSRC ' s expectations a year earlier of a doubling of first @-@ year results .

The cost of running the trains and infrastructure , or cash operating costs , was initially over NT \$ 1 billion a month , but was reduced to around NT \$ 0 @. @ 85 ? 0 @. @ 9 billion a month by 2008 . Revenues first exceeded this level , thus generating a positive operating cash flow , in the fourth month of operation (April 2007) .

For THSRC , the over heavy accounting of the fixed cost of fixed assets like rolling stock and infrastructure (depreciation) is a significant non @-@ cash element of total operating costs . In its first two years of operation , THSRC applied straight @-@ line depreciation , distributing costs evenly over a period of 26 @. @ 5 years . As a result , the balance of operating revenues and costs (operating income) showed a high loss in the first year of operation , which was only reduced as revenues grew in the second year . The depreciation period set for THSRC reflected the length of the B.O.T. concession rather than the much longer lifespan of the infrastructure , and it is the factor for the operating loss . After adopting an activity depreciation method which is variable in time , THSRC posted its first operating profit for 2009 , the third year of operation . The company reported its first annual profit of NT \$ 5 @. @ 78 billion for 2011 after five years of operation .

For the first time in its five @-@ year operation , the Company reported a net income of NT \$ 5 @. @ 78 billion , with earnings per share of NT \$ 0 @. @ 59 . Between 2010 and 2011 , revenues increased by 16 @. @ 65 % from NT \$ 27 @. @ 64 billion to NT \$ 32 @. @ 24 billion , with operating costs and expenses (excluding depreciation and amortization) rising by only 4 @. @ 98 % . Over the same period of time , gross profit totaled NT \$ 12 @. @ 98 billion (an increase of 30 @. @ 32 %) , income from operations totaled NT \$ 12 @. @ 06 billion (an increase of 32 @. @ 93 %) and EBITDA totaled NT \$ 22 @. @ 73 billion (an increase of 22 @. @ 34 %) . 2011 gross profit , income from operation and EBITDA were all record highs . Since commencing operations in 2007 , THSRC has had a significant influence on Taiwan ' s economy and on the lives of its people . In 2011 , the Company continued to pursue sustainable growth aligned with the interests of shareholders and society , achieving record profits even amid a challenging economic environment .

The interest cost is another major item of this company ' s financing . In the first few years of operation , interest rates were well above market rates . Interest expense stood at around NT \$ 1

@. @ 3 billion per month in April 2008 , when THSRC first achieved break @-@ even cash flow , with revenue and cash expenses (which exclude depreciation) both around NT \$ 2 @. @ 1 billion . Interest rates fell in the first half of 2009 , reducing interest expenses and contributing to a reduced net loss .

In 2010 THSRC put through a new syndicate loan , which alleviated the company ' s imminent financial burden . THSRC signed a NT \$ 382 billion refinancing contract with a consortium of 8 domestic banks led by Bank of Taiwan in January , 2010 ; and utilized the new loan to pay off the previous syndicated loan which with higher interest . As of 30 June 2011 , the long @-@ term debts totaling NT \$ 385 billion include NT \$ 26 billion corporate bonds and NT \$ 359 billion bank loans . In comparison with the terms and conditions of previous loans , the newly signed refinancing debts carried lower interest rates and longer tenors up to 22 years . The Company ' s financial burden is therefore largely reduced .

= = Financial and loan = = =

In cumulative figures , until July 2008 , depreciation and interest were equal to 95 % of THSRC ' s accumulated debt . Both THSRC and a September 2009 government report identified an unreasonable financial structure and the resulting high interest rates and high depreciation charges as the main causes of negative financial performance , while the government assessed THSRC to have performed well in its core business , as measured by earnings before interest , taxes , depreciation and amortization (EBITDA) . To reduce its interest load , THSRC sought to revise its loan structure in 2008 and again in 2009 . To reduce depreciation costs by increasing the amortization time , THSRC requested an extension of its 35 @-@ year concession period .

By the summer of 2009 , THSRC ' s cumulative losses were equivalent to two @-@ thirds of its equity capital . In response to global financial crisis and domestic economic recession , THSRC proposed to increase income and reduce expenditures in several aspects in the hope of raising operation performances . In February 2009 , THSRC announced to adjust train frequency , cut down salary payment by 10 ~ 20 % among management level , and measured to expand fare promotion to stimulate rider ship . While the media questioned whether the planned construction of three more intermediate stations and the extension to Nangang would be postponed , THSRC published press release on 26 September 2009 , stating that the company will comply with ? Taiwan High Speed . Rail Construction and Operation Contract ? , and the construction project of 3 intermediate stations , namely Miaoli , Changhua and Yunling will be initiated in July , 2012 , and is scheduled to start its operation from 2015 . By the time of completion , there will be a total of 12 stations along the THSRC operation route . The company was put under new management in September 2009 with the aim of turning around the company ' s finances with government help in arranging refinancing of the loans .

The government took majority control of the company after the election of its new board on 10 November 2009 . In January 2010 , when accumulated losses already exceeded NT \$ 70 billion , THSRC signed a government @-@ guaranteed refinancing deal in which eight government @-@ dominated banks provided NT \$ 382 billion at lower interest rates and longer maturity . The government also approved the company ' s new variable depreciation charge .

= = Incidents = =

On 12 April 2013 , suspicious luggage items were found inside the North bound train No. 616 toilet when it was heading towards THSR Hsinchu Station . The train was stopped at THSR Taoyuan Station and all of the passengers were evacuated . Later , it was determined the luggage contained an unidentified liquid in cans , alarm clock and white particulate matter . The items were dismantled by the bomb squad and taken for further investigation . Two KMT legislators , Hsu Hsin @-@ ying and Lu Shiow @-@ yen , were on board .

The train master on No. 616 received complaints from passengers at about 9 : 10am that the women ' s toilet in cabin No. 11 contained two pieces of luggage which emitted a strange odor .

THSRC informed the High Speed Rail Police Division , which later boarded the train when it stopped at Hsinchu station . The traffic control center decided to evacuate passengers after the train stopped at Taoyuan station at 9 : 45 am . More than 600 people were asked to disembark and continue their journey on another train . All passengers affected by the incident would be given a coupon allowing them to purchase a high @-@ speed ticket for their next journey at half price , even though the train company was not to blame for the incident .

Two bomber suspects were arrested in a hotel in Zhongshan City , Guangdong Province , China on 15 April and repatriated to Taiwan on 17 April 2013 .

Part of the tracks near Tainan were badly damaged during the earthquake on 6 February 2016 . All high @-@ speed rail services south of Chiayi Station were suspended until 7 February 2016 .

= = Public relation = =

= = = THSR Camp = = =

Since beginning operation , THSRC has planned a series of ? THSR Camp ? events together with the Railway Cultural Society of Taiwan , the National Chiao Tung University Railway Research Society and the China Youth Corps . Between 2009 and 2011 , 42 ? THSR Camp ? events have been organized , which include college / university , senior high school / vocational high school , junior high school , and elementary school students . Lectures are given at these gatherings to impart information about high @-@ speed rail in order to give pupils a better understanding of THSRC .

= = = Ride THSR and Join the Book Exhibition for Free = = =

In order to promote a national reading culture , since 2009 , THSRC have organized the ? Ride THSR and Join the Book Exhibition for Free ? event . Since then , THSRC have offered more than 39 @, @ 000 passengers free admission to the Taipei International Book Exhibition (TIBE) , which is held in February of each year . In 2012 , the ? THSR Reading Train ? was launched . This year ? s TIBE spokesperson , singer Crowd Lu , read the classic novel ? The Old Man and the Sea ? for children aboard the train , allowing these students from remote areas to experience both the joy of reading and the marvel of high @-@ speed rail travel .

= = = One Word Maxim ? ? Trustworthiness ? Exhibition = = =

In May 2011 , THSRC co @-@ organized the ? One Word Maxim ? Trustworthiness ? exhibition together with renowned calligrapher Dong Yang @-@ zi at the THSR Taichung Station . On public display was an enormous 2 meter tall by 3 meter wide calligraphy sculpture created by Ms. Dong using naturally weathered wood from Taiwan . This is the first calligraphy sculpture in Taiwan that allows the spirit of calligraphy and the connotation of words to transcend the constraints of the writing brush , and its cultural and artistic significance enriched Taichung Station as well as the journeys of passengers transiting through the station .

= = = Resplendent Spring Starlight ? International A Cappella Performance at THSR = = =

In 2010 , THSRC sponsored the Taiwan Choral Music Center (TCMC) to organize the ? Taiwan International A Cappella Festival , ? which featured performances by musical groups at THSR stations . The performances were well received by passengers , with fans even forming groups to catch a glimpse of the musicians at various stations . In 2011 , THSRC once again sponsored TCMC , this time to hold the ? 2011 Spring Performance ? Resplendent Stars Spring Concert , ? which gave THSR passengers the opportunity to view live performances by prominent international musical groups .

=== ROC Centennial ? Love at THSR ===

Owing to their unique architecture and design , THSR stations have become local scenic destinations , and they are also popular backdrops for wedding photos . To mark the ROC Centennial , THSRC organized the ? ROC Centennial ? Love at THSR ? event which awarded unique gifts to selected couples taking wedding photos at 6 THSR stations ? Taoyuan , Hsinchu , Taichung , Chiayi , Tainan and Zuoying .

=== Visits ===

In an effort to allow the general public to gain a deeper understanding about THSR , THSRC provides station tour guides who educate visitors about its operation and service . In addition , professional organizations are also permitted to visit the depots and OMC (Operational Management Center) to gain hands @-@ on knowledge about THSR . In 2011 , THSRC received 281 groups with a total of 10 @,@ 700 people . It also continues to actively conduct experience sharing with its fellow railway transportation operators to enhance the quality of public transportation and create better planning , design and service . By engaging with industry peers , THSRC can pinpoint areas of improvement , with the continual aim of providing high @-@ quality services to its passengers .

=== Deliver Love with THSR to Remote Village Children ===

Since 2010 , along with World Vision Taiwan , THSRC has offered a tuition assistance program to underprivileged children . The company invited passengers to support philanthropic effort , and raised over NT \$ 23 million which was used to help 7 @,@ 200 underprivileged students pay their tuition fees .

=== Corporate Social Responsibility (CSR) ===

This event creating a sustainable and reliable relationship with the general public is a significant part of THSRC ? s corporate vision and an important foundation of environmental and social sustainability . Therefore , it will continue making efforts to establish a good partnership with the general public as well as with the stakeholders , customers , employees , suppliers , communities and the government . To create greater value for each of these parties , it will move forward with its philosophy of ? Go Extra Mile ? to improve their lives through the provision of environmentally friendly high @-@ speed rail services , which play a central role in connecting the entire western corridor of Taiwan . Since operation in 2007 , THSRC has been dedicated to CSR initiatives , emphasizing environmental protection and giving support to all members of the communities served by THSRC . THSRC also published the first CSR Report in 2009 , which gave all stakeholders a better understanding of its CSR objectives and activities , and in 2011 , we received the 20th Annual Enterprises Environmental Protection Award , sponsored by the Environmental Protection Administration of Taiwan .

=== THSRC Smile Program ===

In cooperation with various nonprofit organizations , since 2008 the company has organized the THSRC Smile Program , which offers minority groups and families the chance to experience the comfort and convenience of high @-@ speed rail rides . THSRC Smile Program gave its first ride on 23 January 2008 to children , social workers and parents from the Fushan branch of the Taiwan Fund for Children and Families . As of the end of 2011 , 12 @,@ 231 people in total , comprising 229 underprivileged groups and families , have participated in the THSRC Smile Program .

= = = In popular culture = = =

The ? National Geographic ? website chose travel by high speed rail in western Taiwan as the ? Best Winter Trip 2013 ? . The first film to feature THSR prominently was the 2007 Taiwanese movie Summer 's Tail , directed by Cheng Wen @-@ Tang . A group of teenagers , one of whom is the son of a Japanese engineer working on the high @-@ speed railway , hang out at a vacant lot under the elevated tracks of THSR in Liuying , Tainan . In Leg 10 of Season 12 of the internationally aired reality television game show The Amazing Race , which was watched by 11 @.@ 65 million Americans , competing teams travelled from Taipei to Taichung and back on the THSR .

Railfan : Taiwan High Speed Rail , a train simulator video game developed jointly by the Taiwanese company Actainment and the Japanese company Ongakukan on the basis of the latter 's Train Simulator series , was the first Taiwanese game for Sony Computer Entertainment 's PlayStation 3 system . The game features real video and was made with the help of THSRC 's European train drivers . It was first released in a Chinese / English language version in Taiwan , Hong Kong , and Singapore , in July 2007 , with the Japanese version released in November 2007 .