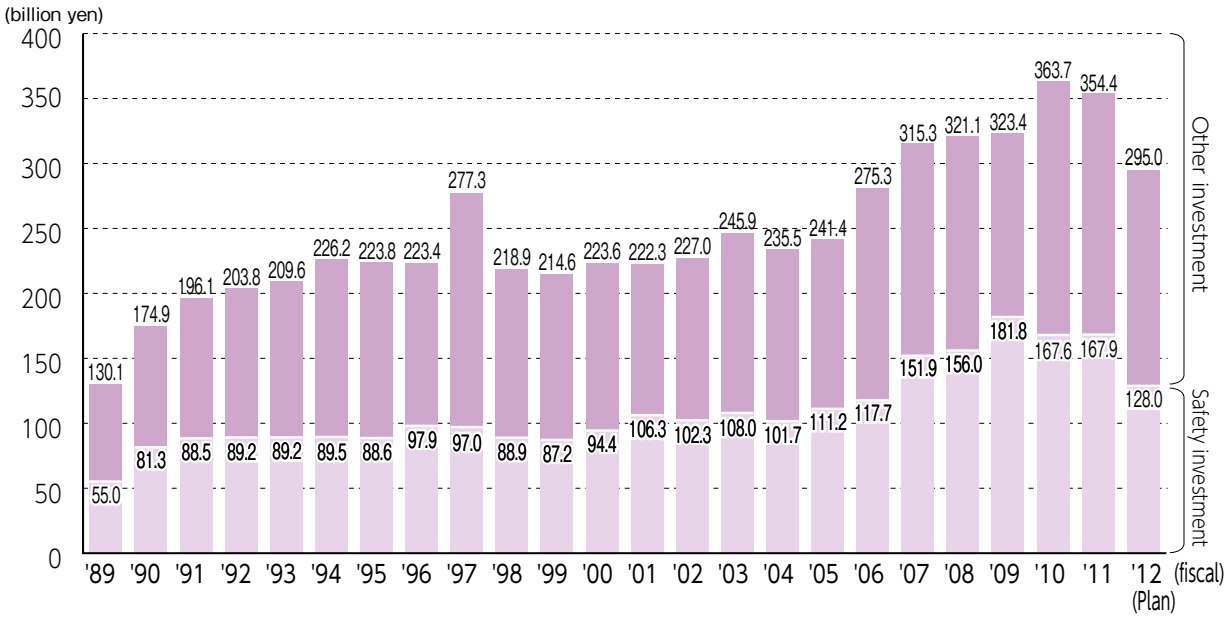
Improvement of safety equipment

■Investment in safety equipment for "ultimate safety levels"

To achieve a more assured level of safety in railway operations, weak points in the current systems must be identified and reviewed from a safety standpoint. Furthermore, safety equipment must undergo intensive and effective assessments in order to prevent the occurrence of accidents in the future. To date, our countermeasures have been primarily focused on preventing any reoccurrence of accidents that have happened in the past. However, additional risks also exist, such as the very realistic threat of a major earthquake in the Tokyo metropolitan area, which would result in major damage to our railways. As such, in addition to measures we have taken so far, JR East will implement concrete countermeasures through the analysis and evaluation of all potential risks before they actually evolve into accidents.

Regarding our improvements to safety equipment, and based on our four previous 5-year Safety Plans leading up to FY 2009, JR East has invested more than 2.2 trillion yen for the 20 years since the company's establishment. In our 2013 Safety Vision, JR East's 5th 5-year Safety Plan which began in FY 2010, JR East plans to invest approximately 750 billion yen on safety measures for the 5-year period between April 2011 and March 2014, with a cumulative safety investment amounted to approximately 2.5 trillion yen by the end of FY 2011.

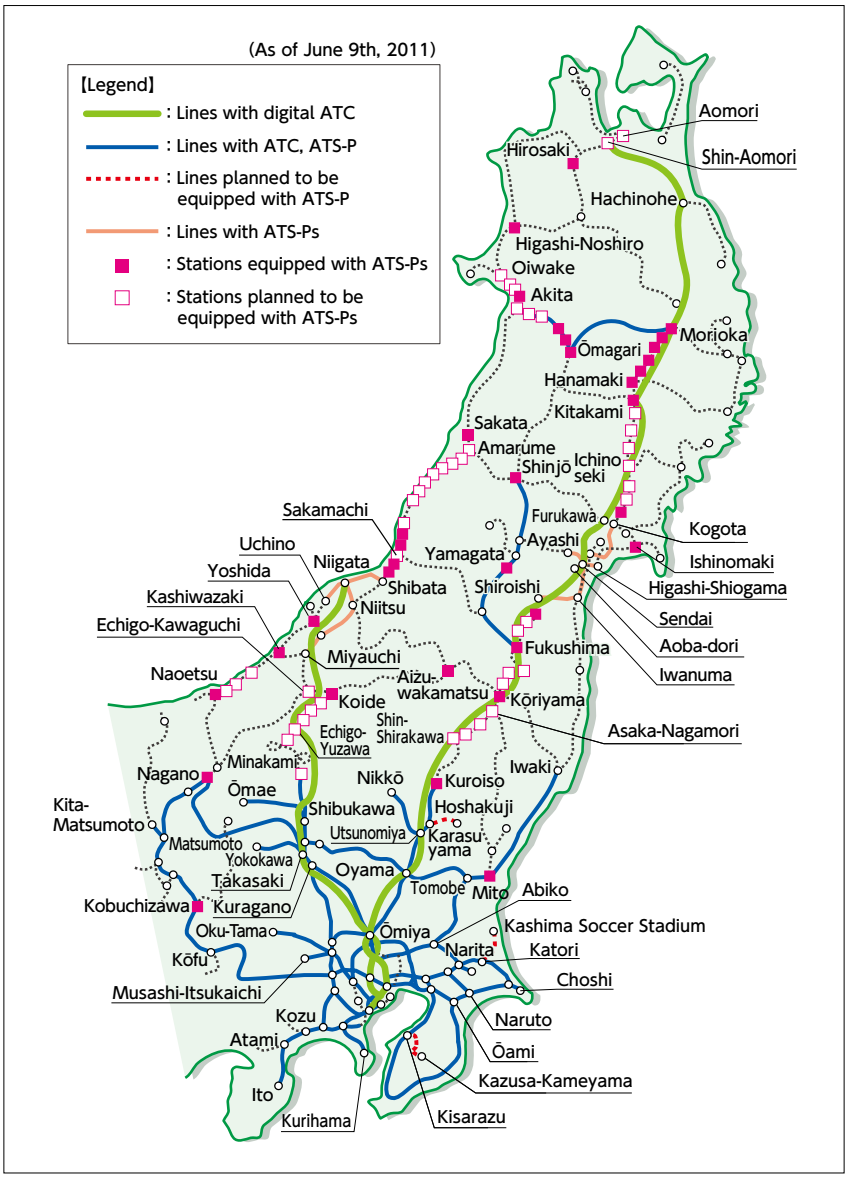
■ Trends in safety investment



■Installing safety equipment

To prevent collisions between trains, JR East has installed ATS (automatic train stop) and ATC (automatic train control) systems on all of its railway lines. To heighten the current safety level of train operations even further, we are installing ATS-P and ATS-Ps systems, which employ continuous speed monitoring functions. The number of installations is steadily increasing; mostly in the Tokyo metropolitan area. By the end of March 2011, the ATS-P system had been installed on 2,336.1 km of railway line. The ATS-Ps system is currently installed on 227.7 km of line in the Sendai and Niigata regions and at 34 stations.
In addition, in response to revisions to the Ministry Ordinance for technological standards for railways in July 2006, we are working on measures to prevent excessive train speeds at turnouts, at terminals, and on descending grades. Planned improvements at all curves that had been targeted for action were completed by the end of March 2010.

■ Railway lines and stations with ATC, ATS-P and ATS-Ps systems



■ Measures to prevent excessive train speeds

	Target locations	Installations as of the end of March 2011	Planned completion
Curves	1,468 locations	1,468 locations	Fiscal ending March 2010 (completed)
Turnouts	816 stations	699 stations	Fiscal ending March 2016
Line terminals	63 stations	61 stations	Fiscal ending March 2016
Descending grades	1,528 locations	861 locations	Fiscal ending March 2016

* Including locations improved prior to July 2006

■Systemization of maintenance work

Safety during maintenance work has been improved with the use of TC-type wireless alarm systems. The systems warn employees working on railway tracks when a train is approaching. JR East has also introduced a safety system that enables workers performing maintenance to turn signals red from a handheld device, ensuring that trains are stopped whenever necessary. The system is already in use on all major lines in the Tokyo metropolitan area and is being introduced to other railway divisions.

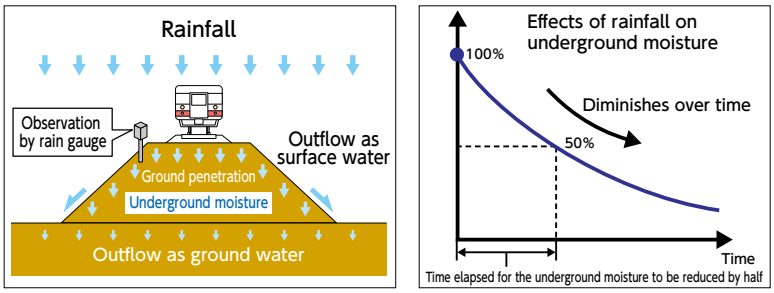
Track closure procedure by a handheld device for maintenance work

■Practical application of the Advanced Train Administration and Communications System (ATACS): train control system with radio transmission

ATACS is a train control system utilizing radio transmissions. By using radio communications for the transmission of information between ground and on-board facilities, the system enables the trains to be mainly controlled by on-board equipment, permitting reductions in traditionally required facilities such as signals, connecting cables, and track circuits, which are currently used for the detection of trains.
Eliminating these facilities is expected to reduce the number of facility failures and the number of subsequent transport disruptions. JR East plans to introduce this ATACS to the Senseki Line for practical operation the end of March 2012.

■Introduction of effective rainfall as a new indicator

When there is heavy rainfall, we ensure train safety through operational restrictions such as limits to train speed and, when necessary, by suspension of operations. For operational restrictions on conventional lines, we have been using hourly rainfall*1 and continuous precipitation*2 as our indices. Since June 2008, we have been using “effective rainfall” as a new indicator that is effective in prevention of landslide disasters due to rainfall. Effective rainfall is the amount of underground water remaining after changes over time in ground penetration and outflow. Using this indicator, we can more precisely predict the occurrence of landslide disasters, improving the safety and reliability of our train operations.



Use of effective rainfall as an index

*1: Hourly rainfall: the total rainfall over a one-hour period
*2: Continuous precipitation: the total continuous rainfall over a 12-hour period

■Completion of reinforcement work for disaster prevention against heavy rainfall in the Tokyo metropolitan area

JR East has completed its planned reinforcement work to railway lines to protect against heavy rainfall. The measures are intended to reduce operational restrictions due to heavy rain and minimize any effect on train operations. JR East began reinforcement work for disaster prevention against rainfall in April 2004 on 12 routes, mainly in the Tokyo metropolitan area and with high levels of traffic, and this work was completed in June 2008.

Concrete lattice frame protection work

■Lessons learned from the past earthquakes

Learning from earthquakes in the past, JR East has employed the following three anti-earthquake measures:

① The immediate stoppage of trains in operations (emergency train stop measures)
② The prevention of structural damage (seismic reinforcement measures)
③ The minimization of secondary accidents following derailment (preventative measures against trains deviating from tracks)

①Early Earthquake Alert System

JR East has installed seismographs along coastal and Shinkansen railway lines for the detection of primary tremors (P-waves). Our present system allows us to stop trains as soon as primary tremors are detected. For conventional lines, our Early Earthquake Alert System was introduced for the Tokyo metropolitan area in December 2007 and in all other areas in April 2009. The system enables trains in any section of track to be stopped in the case of a major earthquake, utilizing information obtained from our Shinkansen seismographs and from any advance announcements given by the Japan Meteorological Agency.

②Seismic reinforcement of elevated bridges

In response to the 1995 Great Hanshin-Awaji Earthquake, JR East has been taking a number of seismic reinforcement measures on rigid-frame elevated bridge columns which were susceptible to shear failures. By the end of March 2008, we had reinforced all of our elevated Shinkansen viaduct support columns and Shinkansen bridge columns. On our conventional lines, by the end of March 2009 we had reinforced all other columns except in places that required additional construction work in the Southern Kanto and Sendai areas. Currently, we are reinforcing elevated bridge columns susceptible to failure due to bending by strong earthquake motion, aiming to further improve our safety levels against earthquakes.

③Prevention of secondary accidents after derailment

During the Niigata Chuetsu Earthquake in 2004, one of our Joetsu Shinkansen trains was derailed while running. Fortunately, this derailment did not lead to any injury to either our passengers or our train crews. Learning from the events surrounding this earthquake, JR East has taken numerous measures aimed to improve our Shinkansen trains and tracks. For our railcars, we have installed an L-shaped car guide on the bogies to restrict lateral movement of the car body. For ground facilities, we are improving the shape of joint bars to lessen the impact of wheels on rail joints in the case of a derailment and implementing countermeasures to prevent the overturning of railcars and the lateral movement of rails in the case that metallic rail fasteners are damaged in derailment. Furthermore, early detection of earthquake occurrence by seismographs and of interruptions of electric transmission have enabled us to more promptly detect earthquakes and start emergency braking about one second earlier.
Nevertheless, at the time of the Great East Japan Earthquake in March 2011, one of our trains in test operation derailed after its regular inspection. As such, further investigations are needed in order to improve our safety measures.

■Measures to prevent railway crossing accidents

When the company was established in 1987, there were 247 accidents during the year at level crossings. In the fiscal year ending March 2011, the number had been drastically reduced to 36. Approximately 60% of all level-crossing accidents involve automobiles. We have installed devices such as obstacle detectors, which are capable of detecting an obstacle such as an automobile stalled on a crossing and stopping trains, and we have put crossing warning devices in a higher position for better visibility. More large red and white crossing gates have been installed; the barrier arms are thicker than usual and have red and white reflective plates that cover the whole bar. These are expected to provide better visibility day and night. Studies are currently being carried out on the effectiveness of these bars. In addition, we are presently promoting a wide range of public relations activities for the prevention of level crossing accidents, appealing to drivers for their cooperation and understanding.

Furthermore, we are trying to increase the number of overhead crossings to eliminate level crossings with roads, and are doing this with the cooperation of local governments, neighboring residents, and the police. In addition, for countermeasures against secondary accidents caused by derailments at level crossings, we are installing derailment prevention guards at level crossings.

■Station platform safety

In the fiscal year ending March 2011, there were 76 accidents in which customers fell from platforms onto tracks or came into contact with trains. JR East is installing protection-related devices, including emergency train-stopping systems, on our platforms to ensure the safety of its customers. In addition, since customer awareness and cooperation are also vital to safety on our platforms, we are implementing our “Zero Platform Accident Campaign” through posters, as a measure to heighten the safety awareness of our customers.

Furthermore, as an additional accident prevention measure for customers on platforms, JR East is introducing automatic platform gates on the Yamanote Line. In FY 2011, JR East introduced automatic platform gates at Ebisu and Meguro Stations. From this fiscal year, FY 2012, we will install gates at all remaining stations, applying the knowledge we accumulated through the analyses of technical issues and the impact on train operations observed at the first two stations. In FY 2013, we plan to introduce these automatic platform gates to Osaki and Ikebukuro Stations, and, in FY 2014, to Otsuka, Sugamo, Komagome, Shin-Okubo, Mejiro, Takadanobaba, and Tamachi Stations. With the exception of the 4 stations of Shimbashi, Shibuya, Shinjuku and Tokyo, which require large-scale improvement work, we plan to complete installations in all stations on the line by March 2019.

Automatic platform gates on the Yamanote Line