Group Safety Plan 2023

“Evolution” and “Move Up”

Aiming for “Ultimate Safety Levels”
Starting with the “Safety Actions”
of Each Person

East Japan Railway Company
General Principles of Safety

I. Safety is the most important mission in transportation.
II. Ensuring safety is based on exact observance of rules and procedures, and is achieved through constant practice.
III. Enforcement of confirmation and complete contact is most important for ensuring safety.
IV. For ensuring safety we should cooperate together and go beyond our official responsibility.
V. When we have questions or must choose among several options, we should remain calm, think by ourselves, and take the safest course after thorough consideration.

Top Message

Aiming to Achieve JR East “Group Safety Plan 2023”

Ever since JR East was founded, we have considered safety to be the top priority for management, and have continued to carry out initiatives with the entire company united as one to enhance safety. Up to this point we have formulated six “JR East’s Five-year Safety Plan”, and have invested a total of over 4 trillion yen into safety. Under the policy “From ‘reactive safety’ to ‘proactive safety’”, we have fostered a company culture where our employees think about safety on their own and take independent action. This has allowed us to drastically reduce the number of railway accidents which have occurred since JR East was first established.

In July 2018, JR East formulated “Move Up” 2027, the management vision for JR East Group. We are determined to take on the challenge of shifting from “services focused on railways” to “the creation of values and services focused more on people”. At the same time, we will carry out active initiatives to achieve “ultimate safety levels”. By pursuing “ultimate safety levels”, we will further deepen “the trust” we have gained from customers and people in communities, which is the foundation of JR East Group’s business.

Meanwhile, the environment surrounding JR East Group is in the midst of drastic changes which include population declines, technological innovations centered on ICT (information and communications technology), and the intensifying severity of natural disasters, with expectations for even greater acceleration in the future. In particular, the systems and equipment that support railways are changing significantly, so we must thoroughly consider the risks of previously-unimagined accidents or events occurring without warning. If we think and act only as an extension of the past, it will be difficult for us to respond to such conditions. It will become even more important to accurately recognize the changing types of risks that could occur and address them in advance, while continuing to gain an understanding of the rapid changes occurring in the environment.

Based on this background, newly-formulated JR East “Group Safety Plan 2023” has the subtitles of “Evolution” and “Move Up”, to respond to these great environmental changes. Rather than simply continuing to execute JR East Group’s past safety improvement measures as they are, we will “evolve” them in proper response to environmental changes, and will “move up” through new initiatives such as promoting open innovation and actively utilizing new technology.

Specifically, all of JR East Group’s employees should not only execute matters which have been decided on, but should deepen their own understanding of the “essence of work”. This will involve thinking about the operating principles of equipment being used, how their own work will vary in response to system changes, and how it is connected to others within the larger view of work overall. Then, we will be able to further evolve our “safety actions” by making exhaustive efforts to discover risks on our own and responding with initiative according to the situation. Furthermore, we should proactively indicate rules which have fallen out of alignment with actual work conditions, or facility environments which make it difficult to work safely, and make improvements in rules or facilities while collaborating with those around us and obtaining the cooperation of related parties, to bring about business reforms and improve safety even further.

The safety of JR East Group is supported by JR East Group companies, partner companies, affiliated companies, and JR East company itself united as one. Starting with the “safety actions” of each person, let us all plan to move up our rules and mechanisms to respond to environmental changes, dramatically improve the safety level of the entire Group, and pursue the goal of “ultimate safety levels.”

President and CEO
East Japan Railway Company
Yuji Fukasawa
Overview of “Group Safety Plan 2023”

Aiming for “Ultimate Safety Levels”
Starting with the “Safety Actions” of Each Person

Basic concepts
- Bring out the strengths of each employee
- Actively promote and deploy technological innovations
- Safety measures which predict future conditions
- Enhancement of safety measures related to Shinkansen
- Promotion of railway system changes
- Place greater focus on safety measures and accident prevention measures for platforms, level crossings, disasters

“Conditions” that should be pursued continually
- Zero accidents involving passenger injuries or fatalities and zero accidents involving employee fatalities*

* Includes all people involved with railway-related work, including JR East, Group companies, and partner companies

5 Pillars of “Group Safety Plan 2023”

1. Evolution and moving up of each person’s “safety actions”
2. Evolution and moving up of “safety management”
3. Maintenance of safety equipment by actively utilizing new technologies
4. Training personnel to respond to environmental change
5. Detecting new risks and moving up rules and systems

3 Year targets
- Zero railway accidents attributable to JR East Group companies, partner companies, and affiliated companies join together
- Protecting lives
- “Ultimate Safety Levels”

5-Year targets
- Railway accidents: 20% reduction
- Totally eradicating accidents caused by JR East
- Zero railway accidents involving passenger injuries or fatalities and zero accidents involving employee fatalities
- Numerical targets are compared to FY2019

Further evolution of our safety culture

Goal
- Zero serious incidents
- Steady reduction of risks associated with natural disasters
- Steady reduction of level crossing accidents
- Steady reduction of personal injury accidents at platforms

Protecting lives
- 30% reduction of personal injury accidents at platforms
- Steady reduction of risks associated with natural disasters
- Railway accidents: 20% reduction
- Totally eradicating accidents caused by JR East
Evolution and moving up of each person’s “safety actions”

Railway safety is supported by the specific actions of each employee toward safety, including “basic procedures”, “following rules”, and “learning from past accidents”. With even greater environmental changes expected in the future, each person must not only execute past initiatives as they are, but must “evolve” them in response to environmental changes, such as by making exhaustive efforts to discover potential risks while understanding the “essence of work.” They must also “move up” through new initiatives, such as re-examining familiar work environments which have deviated from actual conditions, and conducting measures for work reforms.

“Safety actions” of each person

While understanding the “essence of work”, such as understanding one’s own work while keeping the question “Why?” in mind

- Reliably and independently execute matters that have been determined
- Independently make exhaustive efforts to discover risks, and respond properly

Examples of specific initiatives for each person

For example, each person can:
- Use various types of data to accurately analyze actual situations
- Discover risks and weaknesses
- Not only learn from failures, but also focus on successful points
- Re-examine familiar work content
- Thoroughly utilize educational training facilities
- Promote technological innovations at the frontlines

Knowledge obtained through specific initiatives
- Signs of accidents and events
- Risks and weaknesses
- Ineptitude and know-how leading to success
- Rules which have fallen out of alignment with actual work situations
- Insufficient functions, etc.

Work reforms

Move up rules and manuals

Improve equipment, systems, etc.

Independently indicating, sharing, and discussing

Goals for each person

Strong motivation
- “Protecting lives”: Taking care of customers, oneself, colleagues, and other important people
- “Evolving and moving up”: Practicing “safety actions” independently

Pride toward work
- Taking the lead on one’s own, and “protecting lives” through proper work
- Achieving happiness for employees and their families through a sense of achievement and job meaningfulness

Work satisfaction
- Being satisfied with work that “protects lives” and work reforms

Strong skills
- Not only learning from failures, but also focusing on successful points
- “Safety actions”: All actions taken to improve the level of safety

Starting with the “safety actions” of each person, let us aim as an entire Group to improve our level of safety even more!!

Knowledge obtained through specific initiatives

Independently indicating, sharing, and discussing

Work reforms which unifies the “safety actions” of each person and “safety management”

Evolution and moving up of each person’s “safety actions”

Improvement of motivation and skills (further initiatives)

Specific initiatives of each person

Independently indicating, sharing, and discussing

Work reforms

- Improve each person’s motivation and skills
  - For example:
    - Moving up rules and systems, starting with each person’s initiatives
  - Moving up based on an understanding of actual work situations and the origins and history of rules
  - Achieving work reforms by applying budgets for CS Activity

Apply the PDCA cycle

We must indicate, share, and discuss problem points and other information which have been identified through the specific initiatives of each person, achieve work reforms in unison with “safety management” such as by applying budgets for CS Activity, and improve safety even further.
Evolution and moving up of “safety management”

To evolve and move up the “safety actions” of each person, the “safety management” of field sites, branch offices, and of our culture safety, “training personnel to respond to environmental change”, and “detecting new risks and moving up companies, and affiliated companies to work safely”, and “implementing further safety measures related to Shinkansen”.

Further evolution of our safety culture

The safety culture which JR East Group has continually placed great value on, including the “5 Cultures”, “CS Activity”, and “Three Actualities Principle”, is the foundation of various safety initiatives. Through the practice of each person’s “safety actions”, specifically initiatives such as “discovering risks” and “focusing on successful points”, let us evolve our safety culture even further while responding to environmental changes.

A Firm Code of Behavior for JR East Group

“Safety” means protecting the lives of people, while “stability” means ensuring the proper operation of trains. Both are essential points for railways. However, we must not neglect procedures to confirm safety due to our wishes to avoid delays in train operation.

If you believe that there is danger, stop the train without concern for delays.

If something makes you stop and think “This is a little different from usual”, pause and take a brief step such as mentioning it to a controller or superior.

Stop the train if you feel something is dangerous.

(1) Further ingraining the 5 Cultures

Additional training

・ Notice: A culture of proper action

・ Learn: A culture of knowledge

・ See what others are doing: A culture of cooperation

・ Do: A culture of action

・ Reflect: A culture of improvement

We must understand the original purpose of CS Activity, incorporate various viewpoints, and promote them starting from familiar initiatives.

(2) Further energization of CS Activity

CS Activity and presentations alone do not constitute CS Activity, and there are considerable risks for further initiatives. These should be initiatives for all employees, not the CS Committee. While keeping the 5 Points for CS Activity in mind, we must have a broad perspective and promote safety initiatives without being bound by rules.

We must understand the original purpose of CS Activity, incorporate various viewpoints, and promote them starting from familiar initiatives.

(3) Further evolution of the “Three Actualities Principle”

The Three Actualities Principle

- Actual locations: Visiting actual locations to understand actual conditions
- Actual objects: Viewing actual objects (rolling stock, equipment, machinery, tools, etc.) in order to understand actual conditions
- Actual people: Meeting face to face with people involved to understand actual situations

We must go to field sites where serious accidents have occurred in the past, and continue to promote initiatives such as instilling the tragedy and danger of accidents into us.

Also, we must visit field sites regularly, discover potential risks in everyday work, and take measures to address them in advance, to further evolve the “Three Actualities Principle”.

Further evolution of the 3 Actualities Principle

Further expansion of revenue management

・ WiMAX equipment has been improved to keep field sites in operation even in poor weather
- Provide measures to prevent accidents and environmental issues
- Build the tragedy and danger of accidents into us

For example, “Jr. Safety Experts” will coordinate with “Key Safety Leaders” to promote and facilitate understanding of the “essence of work” in cooperation with each employee.

Improvement of knowledge, leadership skills, and technical expertise related to safety

For each person to practice “safety actions” in proper response to environmental changes, we must aim to promote training personnel to improve the “motivation” and “skills” of each person.

(1) Work reforms, with each person joining together with managers and “people to become the core of safety initiatives”

We must properly understand each person’s suggestions and ideas, and achieve work reforms while working together with each person, such as by resolving issues in cooperation with branch offices and our head office.

(2) Through recognition and deployment of each person’s positive actions and initiatives

We will thoroughly recognize and deploy positive initiatives by holding events such as presentation of the locations which have received awards for safety actions.

(3) Arrangement of environments where each person can learn and act independently

By providing initiatives to “explore new accidents into training” (holding visits by all employees to accident exhibition hall, etc.) we will arrange environments where each person can learn and act with greater independence.

(4) More systematic development of employees with knowledge, leadership skills, and technical expertise related to safety

All employees involved with railways are responsible for railway safety. Under conditions where work methods can change significantly due to systemization or a lack of personnel, it will be critical to develop employees who have greater knowledge, leadership skills, and technical expertise related to safety. To do this, we will expand the development of “people to become the core of safety initiatives” who can understand safety mechanisms and hold discussions not bound by system, while focusing on such core personnel to enlarge the number of employees with safety-related knowledge and skills.

Systematic “development of personnel responsible for safety”

1. Expand “people to become the core of safety initiatives”

In addition to “Key Safety Leaders”, “Safety Professionals”, and the “General Training Centers and Skill Training Centers”, we will develop “Safety Experts” and “Jr. Safety Experts” who can understand safety mechanisms and hold discussions not bound by system, into “people to become the core of safety initiatives”, and expand their number.

“Safety Experts” will be developed with a focus on our head office, while “Jr. Safety Experts” will be developed with “Safety Professionals” and “Safety Experts” at each branch office and other locations playing a main role.

2. Develop personnel responsible for safety, with a focus on “people to become the core of safety initiatives” (expansion of range)

By promoting initiatives to improve safety with a focus on “people to become the core of safety initiatives”, we will expand the number of employees with safety-related knowledge and skills.

For example, “Jr. Safety Experts” will coordinate with “Key Safety Leaders” to promote and facilitate understanding of the “essence of work” in cooperation with each employee.

Improvement of motivation toward further safety initiatives

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Evolution and moving up of “safety management”

Training personnel to respond to environmental change

1. Facilitate understanding of the "essence of work"
   - To properly respond to large environmental changes, it is important to understand the "essence of work". Rather than merely learning the procedures and methods of work, we must be conscious of the "7 Guidelines" which include the purposes of work, the origins of rules, and the operating principles of equipment, to deepen our understanding of the "essence of work."

2. Improvement of each person’s skills
   - The head office, etc.
   - Improvement of "ability to make indications" from the frontlines
   - Improvement of ability to respond according to circumstances
   - Facilitate understanding of the "essence of work"
   - Training facilities and implement training based on practical application.

3. Managers and other personnel must accurately understand the suggestions and ideas of each person, and indicate them to branch offices, etc.
   - Scenarios that cause by thoroughly implementing structural measures or rules based on the lessons learned from them.

4. Complementary effects of both sides
   - Promote initiatives to not only learn from failures, but also focus on successful points
   - By understanding the "essence of work", and gaining the skill to detect and avoid risks in our everyday tasks, we can respond properly to risks even as they continue changing!

5. Understanding purposes of work, origins of rules, and operating principles of equipment
   - Learn about the overview of work through role-play training
   - Utilize actual objects for practical learning
   - Learn about the structures and mechanisms of equipment through practical training
   - Examine work at field sites and share individual ingenuity and know-how for accident prevention
   - Experienced and new workers join together to anticipate risks and visualize ingenuity and know-how

6. Promote initiatives focusing on successful points
   - Apply My Hiyatto viewing them as “successful points”
     - Do not only treat My Hiyatto as “possible seeds of accidents”, but examine them as “successful points” from the new perspective of “why they did not result in accidents or undesirable events”. Indicate, share, and discuss “reasons and procedures for successful work”, and thoroughly apply them as materials to detect and avoid risks.

7. Promote initiatives by communicating their purposes and specific examples
   - Convey them thoroughly at various opportunities such as “CS Activity, work research, My Project, and committee activities”.

8. Moving up rules and systems, starting with each person’s initiatives
   - Starting with various initiatives by each person, move up rules, equipment, training facilities, etc. which have fallen out of alignment with actual work conditions.

   - Each person
     - Independently indicating, sharing, and discussing
     - Proper understanding of problem points identified by each person
     - Sharing problem points and arranging environments that encourage discussion (support others to make indications), etc.

   - Managers, etc.
     - Rules and manuals
     - Equipment and systems
     - Other improvements or renewal
     - Moving up rules and systems

   (Examples of equipment improvement)

   - Anti-condensation measures for safety mirrors used in “one-man operation” on Suigun Line
   - Preparation of work paths on premises of Kazusa-Ichinomiya Station

(2) Moving up based on an understanding of actual work situations and the origins and history of rules

   - With the assurance of safety as the main premise, we will incorporate the opinions of those at the frontlines, and will carry out company-wide work reforms by re-examining existing rules and providing support by using systems.

   - Understand actual work situations, and the origins and history of rules

   - With the assurance of safety as the main premise, incorporate the opinions of those at the frontlines
     - Company-wide inventory and re-examination of rules
       - (such as to confirm that past measures are not simply rules added on top of each other)
     - Support by using systems
       - Use these and other measures to reduce burdens on front line workers

   - Improvement of safety by preventing human error
Further arrangement of systems which can allow Group companies, partner companies, and affiliated companies to work safely

The safety of JR East Group is supported by JR East Group companies, partner companies, affiliated companies, and JR East united as one. In order for JR East Group to join together and improve safety even further, each of them must recognize its role and take the lead to promote initiatives. Furthermore, we must coordinate with each other such as to share values related to safety, and proceed with the enhancement of systems allowing safe work.

Promotion of safety measures which predict future conditions

- Enhance collection of data at all steady conditions
- Deploy CBM* and utilize various types of sensors, such as for image detection, temperature detection, and abnormal sound recognition
- Various types of monitoring data
- Practically implement technology to identify unusual signs in rolling stock or equipment, or at platforms or level crossings
- Proper understanding of signs which may lead to serious accidents caused by new risks which were not previously anticipated

(1) Detect risks before system changes, and build mechanisms to address them

Before introducing new systems or other elements, investigate risks which have the potential to occur after the start of their operation, and build mechanisms to address them.

(2) Promote safety measures which predict future conditions, utilizing big data, AI, IoT, or other resources

In order to properly identify signs which may lead to serious accidents caused by new risks which were not previously anticipated, utilize big data, AI, IoT, and other such resources to promote safety measures.

- Enhance collection of data at all steady conditions
- Detect risks before system changes, and build mechanisms to address them
- Practically implement technology to identify unusual signs in rolling stock or equipment, or at platforms or level crossings
- Proper understanding of signs which may lead to serious accidents caused by new risks which were not previously anticipated

(3) Introduce risk assessment methods, and examine safety measures and capital investment

Results of risk analysis performed on railway accidents with a 10-year forecast:
- Strengthen durability of rolling stock, equipment, etc.
- Safety measures for platforms and level crossings
- Response to natural disasters
- Safety measures related to Shinkansen
- Response to terrorism or other threats

With particular focus on these points, we will steadily reduce the level of risks.

Further safety measures related to Shinkansen

- New production of test cars to realize the next generation of Shinkansen (ALFA-X)
- Properly responding to changes unique to Shinkansen
- Improved production of test cars to realize the next generation of Shinkansen

Further reduction of risks

- To achieve “zero railway accidents attributable to JR East Group”
- To achieve “90% reduction of personal injury accidents at platforms” and “steady reduction of level crossing accidents”
- To properly respond to changes unique to Shinkansen
- To achieve “zero railway accidents attributable to JR East Group” and “steady reduction of level crossing accidents”
- To achieve “50% reduction of personal injury accidents at platforms”
- To properly respond to changes unique to Shinkansen

Specific examples of initiatives

- Re-examine the provision of required information, and educational support and rules
- Arrange environments allowing mutual application of the “Safety Portal”
- Company-wide inventory and re-examination of rules

Further safety measures related to Shinkansen

If a serious accident involving Shinkansen should occur, it is predicted that the resulting damage will be enormous. While properly identifying the changes unique to Shinkansen such as the arrival of concurrent times for equipment renewal, higher speeds, and expansion of networks, we will promote initiatives to understand signs which may lead to serious accidents, and will strengthen our safety measures related to Shinkansen even more thoroughly than before.

Enhancement of railway construction management and other initiatives

- Re-examine the provision of required information, and educational support and rules
- Arrange environments allowing mutual application of the “Safety Portal”
- Company-wide inventory and re-examination of rules

Further improvements of safety at Shinkansen platforms

- Properly responding to changes unique to Shinkansen
- Improved production of test cars to realize the next generation of Shinkansen
- Properly responding to changes unique to Shinkansen

Promotion of Shinkansen platform door installation plans

- Strengthening responsiveness to the natural environment
- Implementation of countermeasures to address snow accretion and snow dropping
- Strengthening systems specialized for Shinkansen businesses

*Estimated level of damage
- [Estimated level of damage]
- Represents the extent (quantity) of injured customers and employees, harm and extent of damages to JR East Group
- Properly responding to changes unique to Shinkansen
- Improved production of test cars to realize the next generation of Shinkansen
- Properly responding to changes unique to Shinkansen

JR East and Group companies, partner companies, and affiliated companies must:
- Properly responding to changes unique to Shinkansen
- Improved production of test cars to realize the next generation of Shinkansen
- Properly responding to changes unique to Shinkansen

Promotion of Shinkansen platform door installation plans

- Strengthening responsiveness to the natural environment
- Implementation of countermeasures to address snow accretion and snow dropping
- Strengthening systems specialized for Shinkansen businesses

In particular, JR East will strengthen coordination with Group companies and partner companies, for management which will allow work with even higher safety.
Since the establishment of JR East, we have continued to focus on carrying out safety investments to maintain safety equipment. As we continue to emphasize the maintenance of safety equipment from here on, we will utilize even newer technology in order to respond to new risks.

The 5-year amount of our safety investments is: **roughly 1.2 trillion yen.**

### Zero railway accidents attributable to JR East Group

**Strengthening the durability of key facilities**

- Strengthen conventional line equipment and Shinkansen equipment, and respond to their degradation
  - Strengthen electric power facilities, structures, and station facilities, and respond to their degradation
  - Complete reinforcement work to prevent power poles and signal poles from falling
  - Complete measures against high-resistance ground faults
  - Continue to proceed with preventive maintenance by strengthening equipment for bridges and tunnels of concern
  - Continue to proceed with measures to prevent roof collapses at stations and depots
  - Expand the installation of bearing base plates for turnouts
  - Renew and strengthen Shinkansen equipment
  - Continue to proceed with Shinkansen rail renewal work
  - Continue to proceed with Shinkansen building facility repair and improvement work (roofs, exterior walls, etc.)

**Measures against SPAD (signal passed at danger) conditions and overspeed of operation and rolling stock**

- Continue the installation of ATS-P on local line sections
- Continue the implementation of rolling stock improvements to install ATS-P and other equipment
- Continue to investigate the installation of train radicals in sections where they are not yet provided

**30% reduction of Personal injury accidents at platforms**

- Accelerate the installation of platform doors to conventional line (including smart platform doors)
- Install tactile dots with inside lines
- Complete installation at stations with volumes of entrainment and detrainment of 3,000 to less than 10,000 people (installation at stations with volumes of entrainment and detrainment of 10,000 people or more has been completed)
- Arrange CP lines
  - Consider platform door installation plans, etc., and continue their installation at stations in the metropolitan area
  - Continue to proceed with installation of high-resolution TV
  - Proceed with Shinkansen platform door installation plans, with a focus on principal terminal stations
  - Continue the installation of platform and fences at Shinkansen stations
  - Develop technology to improve door catching detecting functions on rolling stock and platforms, and aim for practical application
  - Develop technology to detect anomalies on platforms, and aim for practical application
  - Utilization of image recognition technology, sensing technology, etc.

**Steady reduction of level crossing accidents**

- Proceed with discussions held with local communities on the discontinuance and combination/reorganization of crossings
  - Continue to proceed with the improvement of Class 4 and Class 3 crossings to Class 1 crossings
  - Continue to proceed with the measures against crossing non-interruption
  - Measures against obstacle detectors
  - Continue the installation of 3DLR (3-dimensional laser radar) equipment at locations which are not equipped with obstacle detectors
  - Replace large-scale obstacle detectors with 3DLR equipment at crossings with high traffic volume
  - Installation of level crossing alarm system
  - Complete installation on principal main lines, and expand installation on local lines
  - Accelerate the installation of omnidirectional warning lights
  - Continue the installation of crossing snow melting devices (road heating)
  - Continue the installation of maintenance car collision prevention support devices
  - Develop and introduce new types of obstacle detectors
  - Develop and introduce obstacle detectors with higher functionality (higher-functionality 3DLR devices, etc.)
  - Develop technology to detect anomalies at crossings, and aim for practical application (utilization of image recognition technology, sensing technology, etc.)
  - Utilization of ITS and other technology in coordination with the automobile industry
  - Promote crossing accident prevention measures which utilize automobile-side ITS (Intelligent Transport Systems), navigation systems, etc.

**Future state of railways**

- Automation of train operation and systemization of work
- Further improvements to safety at platforms and level crossings
- Successful early identification, detection, and understanding of disasters

Instead of simply continuing as an extension of the past, we will anticipate the future state of railways while proceeding with railway system changes.

**Railway system changes using new technology**

- Active deployment of monitoring including CBM (rolling stock, railway tracks, overhead wires, etc.)
  - Introduce rolling stock monitoring in the E235 series
  - Expand the introduction of track equipment monitoring on local line sections
  - Equip rolling stock with overhead wire monitoring equipment and carry out monitoring
  - Proceed with the development of Shinkansen bogie monitoring, and aim for practical application
  - Proceed with the development of next-generation Shinkansen ATC and third-generation COSMOS, and introduce them
  - Carry out new production of test cars to realize the next generation of Shinkansen (ALFA-X)
  - Promote technological development aimed at large-scale repairs and improvements of Shinkansen
  - Investigate expanded introduction of ATACS
  - Proceed with the development of automatic train operation technology aimed at realizing driverless operation
  - Proceed with technological development aimed at robotizing and automating work and construction
  - Proceed with the development of technology which utilizes big data, AI, IoT, and other resources to identify signs which may lead to serious accidents, and aim for practical application
  - Proceed with the development of systems which utilize big data, AI, IoT, and other resources to visualize risks in everyday work, and aim for practical application

**Steady reduction of risks associated with natural disasters**

- **Measures against large-scale earthquakes**
  - Implement further seismic reinforcement measures with consideration for earthquakes centered directly under the capital, etc.
  - Expand the areas of measures which have been implemented in the past
    - Relied bridge columns, mountain tunnel lining, power poles
    - Foundation embankments, height of 5m or more, unforced bridge piers, and other measures
    - Promote new measures
      - Mountain tunnel roadbeds, beam supporting points, power poles, platforms, platform sheds, and other measures
    - Early earthquake warning systems
      - By expanding sea areas utilizing information from ocean bottom sensors
      - By improving early-detection seismometers, shorten the time required from the detection of earthquakes to train stops
    - Expand measures to prevent Shinkansen derailment
    - Expand the installation scope of rail roller prevention devices
  - **Countermeasures to prevent rainfall disasters**
    - Introduction of operation control according to weather radar rainfall
    - In response to localized heavy rainfall, introduce operation control of short-term emergency weather information (weather radar-rainfall) which can be observed over the entire area
    - Continue to proceed with measures against scouring at bridge piers and embankments, and promote measures against rockfall and landslides

- **Countermeasures for gale damage**
  - Evaluate the force exerted on rolling stock by wind more accurately, and expand the range of line sections for application of methods to carry out operation control
  - Investigate the expansion of areas for the implementation of operation control against gales of wind using Doppler radar
  - Aim to introduce gale warning systems for Shinkansen

- **Countermeasures for gusts of wind**
  - Investigate the expansion of areas for the implementation of operation control against gusts of wind using Doppler radar
  - Installation of ground coil protective frames, etc.

- **Countermeasures for snow**
  - Implement measures against snowfall
    - Reinforce snow melting devices for bogies at Okama Station of the Aizu Shinkansen
  - Complete reinforcement work to prevent damage to signal equipment caused by fallen snow and ice
  - Installation of ground coil protective frames, etc.

- **Develop and introduce new detection and inspection technology**
  - Develop new rail flaw detection technology and scavenging detection technology, and aim for practical application

- **Measures against terrorism or other threats**
  - Install security cameras in stations and trains, at important facilities, etc.