Social

Creating "Social Value" —Social—

The Chuo Shinkansen Project Using the Superconducting Maglev System ~Drastic enhancement of main transportation artery~

Operating speed **500**km/h

Travel time (maximum)

Tokyo (Shinagawa) - Nagoya	Tokyo (Shinagawa) - Osaka
40 minutes	**67** minutes

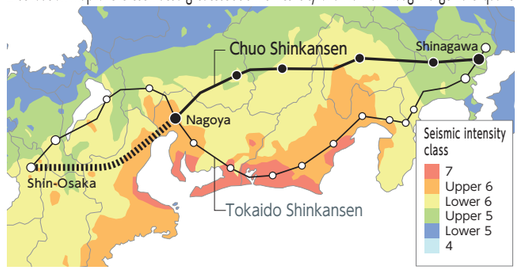
The Chuo Shinkansen Project using the Superconducting Maglev System is a project to duplicate our artery transportation system linking Tokyo, Nagoya and Osaka, which is the lifeline of our business, and drastically prepare for risks, such as aging in the future of and large-scale disasters affecting the Tokaido Shinkansen. This project will allow us to further reduce management risk and thus stabilize our management base and to continue to carry out our founding mission of undertaking high-speed, large-capacity passenger transport between Tokyo, Nagoya and Osaka. This project will also dramatically improve convenience by greatly reducing travel time due to its high-speed operations, bring significant benefits to and potential for development of the Japanese economy and society, and ensure the long-term interests of shareholders and all other stakeholders over a long period of time.

Outline and Significance of the Chuo Shinkansen

We are promoting the Chuo Shinkansen Project using the Superconducting Maglev System based on the Nationwide Shinkansen Railway Development Act (hereinafter, "the Act") to continually carry out our mission of operating a high-speed railway linking the Tokyo Metropolitan area and the Chuo and Kansai regions (from Tokyo through Nagoya to Osaka), which is the lifeline of our business, and to ensure the future foundation of the Company.

The Tokaido Shinkansen has been in operation for more than half a century, and while we have been carrying out large-scale renovation, there is the risk of suspension of services due to major facility replacement caused by future aging. Furthermore, Japan is prone to earthquakes, and although we have taken earthquake resistance measures for the Tokaido Shinkansen, there is the risk of potential major disasters, including the undeniable possibility of long-term disruption to Japan's main transportation artery due to a possible major earthquake. Therefore, as a drastic measure to prepare for these future management risks, we decided to complete the Chuo Shinkansen as quickly as possible, under the assumption that we bear the cost of its construction, utilizing the Superconducting Maglev System that we have developed. The Chuo Shinkansen will turn Japan's main transportation artery into a dual system, and JR Central will operate it in an integrated manner along with the Tokaido Shinkansen.

Distribution map of the estimated greatest seismic intensity of a Nankai Trough Large Earthquake



Source: Prepared by JR Central based on "Countermeasure against a Nankai Trough Large Earthquake (Final Report)" (May 2013)

Chuo Shinkansen Project as a national project

The Chuo Shinkansen is being constructed in accordance with the Act, which is a legal system for developing infrastructure essential to the nation in order to contribute to the development of the national economy, the expansion of the area of Japanese people's lives, and the development of local communities. Based on the Act, we received designation as the operator and an order for construction from the Minister of Land, Infrastructure, Transport and Tourism in May 2011, and then the construction implementation plan was approved by the Minister of Land, Infrastructure, Transport and Tourism in October 2014. In the meantime, we have conducted environmental assessment procedures and published the final environmental impact assessment report between Tokyo and Nagoya, which is promoted as the first stage.

On the other hand, in order to confirm that the principles of a privately owned company, such as freedom of management and autonomy of capital investment, would not be hindered by application of the Act, we referred fundamental clauses regarding application of the Act to the Ministry of Land, Infrastructure, Transport and Tourism (hereinafter, "MLIT") and received a reply in January 2008 indicating that those principles would not be hindered.

In order to take steady steps towards the successful completion of this project, we will maintain sound management and stable dividends, sufficiently examine costs and demonstrate our flexibility, and make necessary investments to ensure safe and reliable transportation and to enhance the competitiveness of the Tokaido Shinkansen and conventional lines. We will first realize the project between Tokyo and Nagoya, where we have received approval for the construction plan, and strive to further extend the project to Osaka.

Flow of work based on the Nationwide Shinkansen Railway Development Act

[Entities involved] ●:JR Central ▲:Minister of Land, Infrastructure, Transport and Tourism ■:Transport Policy Council ◆:Japan Railway Construction, Transport and Technology Agency

Article 4	Basic Plan	Decided in November 1973▲
Article 5	Research and Reports	Topological and geological surveys Ordered in February 1990▲ →Reported in October 2008●◆ Research on the 4 residual items *Ordered in December 2008▲ →Reported in December 2009●◆
Article 14-2	The Transport Policy Council	Consulted on February 24, 2010▲ →Replied on May 12, 2011■
Article 6	Designation of Operator and Constructor	Consented on May 18, 2011● →Designated on May 20, 2011▲
Article 7	Development Plan	Consented on May 23, 2011● →Decided on May 26, 2011▲
Article 8	Instruction to Construct	Instructed on May 27, 2011▲
Article 9	Construction Implementation Plan	Construction Implementation Plan (Part 1)Submission on August 26, 2014● →Approved on October 17, 2014▲ Construction Implementation Plan (Part 2)Submission on September 25, 2017● →Approved on March 2, 2018▲

Environmental Impact Assessment

Start of Construction

* Research on the 4 residual items
・Items related to transportation capacity in response to transportation demand
・Items related to the development of facility and rolling stock technologies
・Items related to construction costs

Content of Development Plan

Construction line	Chuo Shinkansen	
Section	Tokyo - Osaka City	
Technology used for running	Superconducting magnetic levitation technology	
Maximum design speed	505 km/h	
Approximate amount necessary for the construction (including rolling stock costs)	9,030 billion yen	
Other necessary items	Main areas passed through	Kofu City area, south-central Akaishi Mountains (Southern Alps), Nagoya City area, Nara City area

* The approximate amount necessary for the construction does not include interest.

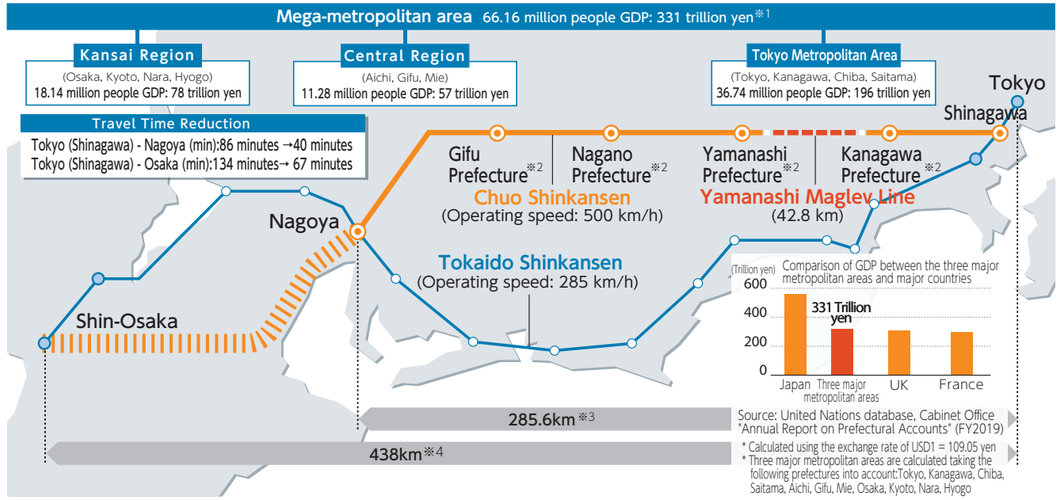
Outline of the Construction Implementation Plan (Part 2) of the Chuo Shinkansen section between Shinagawa and Nagoya

Section	Between Shinagawa and Nagoya
Station Location	Shinagawa Station, Kanagawa Prefecture Station (tentative name), Yamanashi Prefecture Station (tentative name), Nagano Prefecture Station (tentative name), Gifu Prefecture Station (tentative name), Nagoya Station
Line extension	285.6km
Construction costs	4,853.6 billion yen [Total construction costs of 5,523.5 billion yen* (Includes rolling stock costs. Excludes the construction costs for the existing Yamanashi Maglev Line.)]
Expected completion year	2027

* In the "Notice Concerning Total Construction Costs for the Chuo Shinkansen Section between Shinagawa and Nagoya" (April 2021), we announced that the total construction costs are expected to increase to 7.04 trillion yen.

New Value Provided by the Chuo Shinkansen

The realization of the Chuo Shinkansen using the Superconducting Maglev System will contribute to the vitalization of Japan's economic and social activities, turning Japan's main transportation artery between Tokyo, Nagoya and Osaka into a dual system and merging the three major metropolitan areas into a "Super Mega Region."



* 1 Population: Ministry of Internal Affairs and Communications "Population, Demographics and Number of Households Derived from Basic Resident Registration" (January 1, 2023) GDP: Cabinet Office "Annual Report on Prefectural Accounts" (FY2019)* 2 Intermediate station names are tentative.* 3 The Construction Implementation Plan (Part 2) of the Chuo Shinkansen section between Shinagawa and Nagoya (March 2018)* 4 The Survey Report of the Chuo Shinkansen section between Tokyo and Osaka (December 2009)

We will continue to fulfill our mission into the future by reducing management risks and stabilizing our management base by completing the Chuo Shinkansen Project. Furthermore, by adopting the Superconducting Maglev System for the Chuo Shinkansen, we can expect a drastic reduction in travel time between cities, and the three major metropolitan areas will be transformed into one mega-metropolitan area, the so-called "Super Mega Region," where the interaction of people will be highly activated and economic and social activities will be energized, which is expected to have a significant positive effect on our business.

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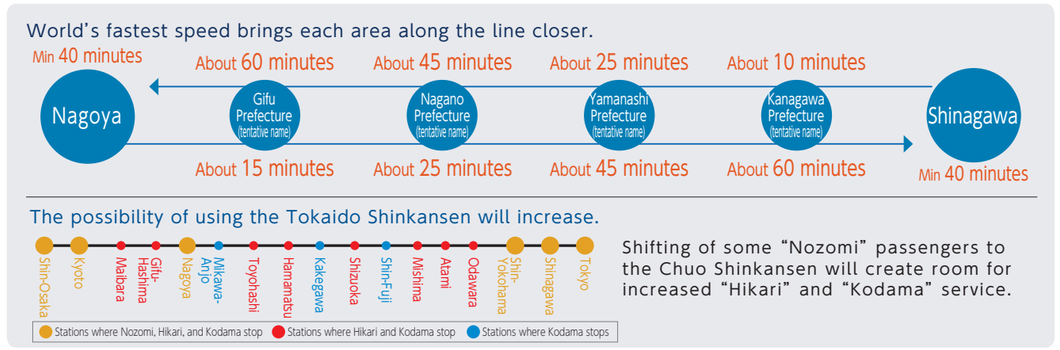
❶ Creation of new demand

In the competition between the Shinkansen and air travel, the shorter the travel time of the Shinkansen, the greater its share. Demand is therefore expected to shift from air travel to the Chuo Shinkansen due to the time reduction effect of the Superconducting Maglev System. In addition, the dramatic time reduction will greatly stimulate the flow between metropolitan areas, which is highly expected to generate new demand.

Furthermore, in addition to the anticipated new use of intermediate stations in Kanagawa, Yamanashi, Nagano and Gifu Prefectures, the opening of the Chuo Shinkansen will shift some of the current "Nozomi" passengers on the Tokaido Shinkansen to the Chuo Shinkansen, creating room for additional "Hikari" and "Kodama" services when there is more room in the Tokaido Shinkansen schedule. This may improve travel times and frequencies between cities along the Tokaido Shinkansen line and each of the three major cities, thereby increasing the flow of people.



Shifting of some "Nozomi" passengers to the Chuo Shinkansen will create room for increased "Hikari" and "Kodama" service.

❷ Broad ripple effects on the economy and society

Due to the overwhelming time reduction effect of the Superconducting Maglev System, Tokyo - Nagoya - Osaka will be connected in about one hour, and the three major metropolitan areas will become a "Super Mega Region" with a total population of about 66 million, or over half of Japan's total population.

This "Super Mega Region" is expected to become the core driving new growth for Japan, which is experiencing a declining population, by broadening the scope of activities and thereby significantly changing lifestyles, such as the way people do business and spend their leisure time, as well as expanding various possibilities. The final report of the "Super Mega Region Concept Study Group" established by MLIT titled "Creating a Super Mega Region to Overcome a Declining Population: Creating New Value through Liberation from Time and Place" (May 2019) presents the following as "impacts of the Linear Chuo Shinkansen."

From the Final Report of the "Super Mega Region Concept Study Group" (May 2019)

- Opportunities for face-to-face interaction between people will increase, and the time for interaction will expand, which will lead to opportunities to create new innovation.
- It is expected to bring about changes in business styles and lifestyles by liberating people from "time" and "place," which have been factors that restrict working and living styles, and providing a variety of options.
- Due to the integration of the three major metropolitan areas, the entire Super Mega Region will create new value and growth industries, which will increase the attractiveness of the region in inviting people and investment from overseas.
- By organically connecting the Linear Chuo Shinkansen, Shinkansen and expressway networks, it is expected that the multiplicity and substitutability of the high-speed transportation network, which forms the framework of the national land policy, will be enhanced, and a sustainable flow of people and goods will be secured.
- It is expected that new regional revitalization will begin in the areas around the intermediate stations located between the three major metropolitan areas and that the effects of the Super Mega Region will spread widely beyond the areas along the Linear Chuo Shinkansen.

* Extract and summary by JR Central of the final report of the "Super Mega Region Concept Study Group" established by MLIT (May 2019)

Furthermore, according to the "National Land Policy Simulation Model" compiled by MLIT, the productivity improvement effects of the formation of the Super Mega Region as a result of the opening of the Chuo Shinkansen are estimated※ to be 3.5 trillion yen per year for the opening of the line up to Nagoya and 6.5 trillion yen per year for the opening of the line up to Osaka."

In this way, the dramatic reduction in travel time brought about by the opening of the Chuo Shinkansen will have a major impact on the entire country and will lead to the creation of new value and the sustainable growth of Japan as a whole.

* National Spatial Planning and Regional Policy Bureau of MLIT "FY2017 Survey Report on the Development of National Land Policy Simulation Model" (July 2018)

Promotion of Construction

We are steadily carrying out the planned construction work in areas along the Shinagawa-Nagoya section for which we obtained approval of the Construction Implementation Plan, placing priority on safety at work, environmental conservation, and cooperation with local communities and examining costs sufficiently. Capital investments have totaled 1,526.8 billion yen in the period from FY2014, when we obtained approval of the Construction Implementation Plan, to FY2022. The total length of construction areas that have already been contracted out reached about 90% of the Shinagawa-Nagoya section, including the Yamanashi Maglev Line, totaling about 286 km, at the end of September 2023.

In the Southern Alps Tunnel Shizuoka construction area, we have yet to convince Shizuoka Prefecture and other parties, due to which we have not been able to begin tunnel drilling work. In such circumstances, with regard to impacts on water resources of the Oi River, based on the "Interim Report on Oi River Water Resources" compiled by the "Linear Chuo Shinkansen Shizuoka Construction Area Council of Experts" of MLIT, we strive to provide easy-to-understand explanations to the local community, to implement specific risk responses and monitoring, and to implement measures to send water back to the Oi River in the amount equivalent to water that leaks inside the tunnels and exceptionally flows outside the prefecture for a specified period. Since June, we have discussed with the power generation company on how to reduce water withdrawal for power generation and return it to the Oi River. And discussions have been underway at the expert council on ways to conserve the environment of the Southern Alps, including ecosystems. Furthermore, a meeting was held in September to exchange opinions with the leaders of the cities and towns in the Oi River basin. We will remain committed to take measures in a sincere manner to win understanding and cooperation of local communities while placing importance on two-way communication.

Progress of effort to acquire land (at end of September 2023)

Land acquisition rate※2= number of landowners from whom land is acquired※3/ total number of landowners

* 1 The percentage figure is rounded down to be shown in increments of 5 percentage points.
* 2 The figure may decrease due to a change in the number of landowners as a result of changes in the scope of land being acquired, inheritance, etc.
* 3 The number of landowners from whom land is acquired represents the number of landowners with whom a contract has been signed.

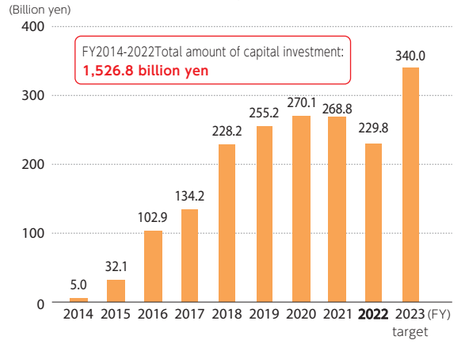
Progress of finding entities that use excavated soil (at end of September 2023)

Progress of finding entities that use excavated soil※5: approx. 80% of the amount of excavated soil※6
In addition to the entities already enlisted to use about 80% of excavated soil, we are in negotiations with multiple candidates regarding acceptance of excavated soil.

* 4 The percentage figure is rounded down to be shown in increments of 5 percentage points.
* 5 The entities already enlisted to use excavated soil are entities, etc. with whom we have signed agreements, etc. on the acceptance of excavated soil.
* 6 The amount of excavated soil is the target figure as of August 2014, the month in which we published a corrected environmental impact assessment report.

Total amount of capital investment

Historical total capital investment



Locations of construction work (at end of September 2023)

* This map is copied from a Japanese map (with a scale of 1 to 1,000,000) published by the Geographical Survey Institute with their authorization. (Authorization number: H25 Jo Fuku, 310)

* See our website for the latest information on the progress of the construction work.
▶ Publicly released materials regarding the Chuo Shinkansen Project (The progress of construction work in each prefecture can be viewed in "Construction safety, environmental preservation, and cooperation with local communities.") https://company.jr-central.co.jp/chuoshinkansen/
▶ Summary of Consolidated Financial Report https://company.jr-central.co.jp/ir/brief-announcement/ ▶ Investor Meeting Presentation Handout https://company.jr-central.co.jp/ir/investor-meeting/

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Implementation of Environmentally Conscious Construction

Construction of the Chuo Shinkansen is proceeding, taking the surrounding environment into consideration. The main environmental conservation measures being implemented are as follows.

Atmospheric environment (air quality, noise and vibration)

The use of low-noise and low-vibration construction machinery with low exhaust emissions reduces the generation of nitrogen dioxide and suspended particulate matter, as well as noise and vibration.

Water environment (water quality, water resources and groundwater)

Wastewater and turbid water generated by construction work are discharged into public waters after measures are taken, such as treatment and neutralization to reduce turbidity as necessary, by means of turbid water treatment facilities, in accordance with wastewater standards, etc., based on laws and regulations, thereby reducing the impact on public waters.

Animals, plants, and ecosystems

In the detailed planning of construction, we avoid places where important plant species grow as far as possible, and if Construction in such places is unavoidable, we compensate for the influence on the growing environment of important species by transplanting and seeding in places with similar environments.

Reducing the impact of vehicles used to transport materials and machinery

We reduce the generation of dust by cleaning and watering the entrances, exits and surrounding roads for vehicles used to transport materials and machinery and by cleaning their tires. In addition, there is a construction area where we reduce the number of vehicles used in construction work by using freight trains to transport excavated soil.

Overview and Development History of Superconducting Maglev System Technology

The Superconducting Maglev System is an advanced technology unique to Japan. Instead of using the friction between wheels and rails like conventional railways, it runs in a non-contact manner due to the magnetic force between the Superconducting Magnet mounted on the vehicle and the coils mounted on the ground. In addition, to obtain the strong power of the magnets, the technology uses a superconducting magnet utilizing "the 'superconductivity' phenomenon, whereby electrical resistance vanishes when a particular substance is brought below a certain temperature," which enables the vehicle to levitate about 10 cm, making it possible to operate safely in earthquake-prone Japan. These features make it possible to travel at an ultra high speed of 500 km/h in a stable manner, unlike conventional railways.

The level of the Superconducting Maglev System Technology has been evaluated in multiple stages since running tests began on the Yamanashi Maglev Line in April 1997. In July 2009, the Superconducting Magnetic Levitation Technological Practicality Evaluation Committee of MLIT (hereinafter, "Evaluation Committee") confirmed that the Superconducting Maglev System Technology had already achieved levels sufficient for commercial operation, and the Minister of Land, Infrastructure, Transport and Tourism established technological standards for the Superconducting Maglev in December 2011. Subsequently, in February 2017, the Evaluation Committee confirmed its evaluation that the technology development required for commercial lines was completed, and in March 2023, the Evaluation Committee assessed that steady progress has been made in brushing up the technology.

We will continue to make efforts to reduce the cost of construction, operation, and maintenance of the commercial lines and further brush up Superconducting Maglev System Technology while conducting running tests using the Series L0 improved version and developing commercial vehicle specifications.

Progress on the Superconducting Maglev System Technology

Jun-90	JR Central applies to the Minister of Transport for approval of the construction plan of the Yamanashi Maglev Line and gains approval.
Apr-97	Running tests start on the Yamanashi Maglev Line.
Mar-00	The Superconducting Magnetic Levitation Technological Practicality Evaluation Committee of the Ministry of Transport (hereafter, the "Evaluation Committee") acknowledges that "there is potential from a technological standpoint that the technology could have practical applications."
Nov-04	JR Central performs exercises of trains passing each other at 1,026 km/h relative to one another.
Mar-05	The Evaluation Committee of MLIT acknowledges that "the core technologies for practical application have been established."
Jul-09	The Evaluation Committee of MLIT acknowledges that "the technologies required for commercial lines have been established from a comprehensive and systematic standpoint and it is possible to move forward with detailing the specifications for commercial lines and the technical standards."
Dec-11	The Minister establishes technical standards for Superconducting Maglev.
Aug-13	Work to extend the Yamanashi Maglev Line to 42.8 km and update facilities are completed.
Apr-15	JR Central records a travel distance of 4,064 km in one day. JR Central records the world speed record for a manned rail vehicle at 603 km/h.
Feb-17	The Evaluation Committee of MLIT acknowledges that "the technology development required for commercial lines has been completed."
Aug-20	Running tests start using the Series L0 improved version.
Mar-23	The Evaluation Committee of MLIT acknowledges that "steady progress has been made in brushing up the technology."

History of Maglev Vehicles

MLX01-1 | MLX01-901 | Series L0

In order to establish commercial vehicle specifications, in August 2020 we started running tests using the Series L0 improved version, which further brushed up the Series L0 based on the results of the running tests so far.

Series L0 improved version

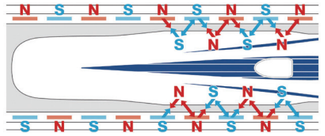
Superconducting Maglev test rides

While steadily conducting running tests, we have offered Superconducting Maglev test rides using the Series L0 improved version from 2022 in order to foster a sense of anticipation for the opening of the Chuo Shinkansen.

Principles of the Superconducting Maglev System

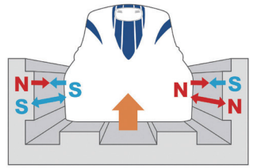
Propulsion System

By passing current through the Propulsion Coils on the ground, a magnetic field (north and south poles) is produced, and thus the vehicle is propelled forward by the attractive force and repulsive force of the opposite poles acting between the ground coils and the Superconducting Magnets built into the vehicles.



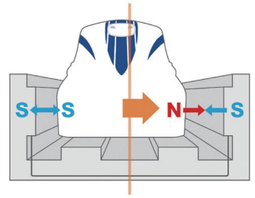
Levitation System

The Levitation and Guidance Coils are installed on both sides of the guideway (track). When the on-board Superconducting Magnets pass through at high speed, an electric current is induced in the Levitation and Guidance Coils, causing them to become electromagnets. This generates a force that both pushes and pulls up the vehicle.



Guidance System

The Levitation and Guidance Coils on both sides of the guideway keep the vehicle in the center of the guideway at all times by exerting an attractive force on the far side of the vehicle and a repulsive force on the near side when the vehicle moves off center to either side.



Total Construction Costs for Shinagawa-Nagoya Section

In the "Notice Concerning Total Construction Costs for the Chuo Shinkansen Section between Shinagawa and Nagoya" (April 2021), we announced that the total construction costs for the Shinagawa-Nagoya section are expected to increase from 5.52 trillion yen estimated at the time of the "Construction Implementation Plan (Part2) of the Chuo Shinkansen Section between Shinagawa and Nagoya" (March 2018) to 7.04 trillion yen. The reasons for the increase in construction costs include responding to challenging construction work, enhancing earthquake countermeasures, and securing utilization sites of excavated soil.

We will prioritize sound management and stable dividends with regard to future management just as always and will fund the construction costs mainly through operating cash flows and the remaining amount through repayable borrowings. If we anticipate that it can no longer ensure sound management and stable dividends, we will aim to complete the construction by adjusting the pace of construction and fully restoring its management strength.

As a reference, in order to confirm that the funds necessary for completion of the construction are secured, we calculated the operating cash flows based on certain reasonable assumptions in the event that the revenue recovers at a realistically expectable pace from the impact of the COVID-19 pandemic, and it confirmed that, if approximately 1 trillion yen of new financing is added to such operating cash flows, the cumulative amount of the funds available for construction of the section between Shinagawa and Nagoya would exceed the total construction costs of 7.04 trillion yen in FY2028. It should be noted that this does not mean that a new target time for opening is set; however, a trial calculation of the status of securing funds under certain assumptions was made for reference purposes only.

Thus, we have confirmed that we will be able to secure the level of funds necessary to complete the construction even after incorporating the increase in construction costs. We will continue to proceed with the Chuo Shinkansen Project with the aim of early realization of the Chuo Shinkansen while ensuring sound management and stable dividends.

Estimates to confirm construction costs are secured (as of April 2021).(For confirmation, etc.)

Transportation revenues (Shinkansen and conventional lines)	Transportation revenues will recover gradually to 66% in FY2021, 80% in FY2022, and 90% in FY2023, and after FY2024 to 100% by FY2028.
Expenses	Essentially, personnel expenses will be maintained at the current scale of personnel required for railways, and non-personnel expenses will be recorded at the five-year average of the results from FY2015 to FY2019. In addition, cost reductions pursued through "reform of business operations" are considered to a certain extent.
Capital investments (Chuo Shinkansen)	7.04 trillion yen
Capital investments (Shinkansen and conventional lines)	Essentially, necessary capital investments will be accumulated, considering the cost reductions through "reform of business operations," and capital investments will remain unchanged at approximately 220 billion yen per year in and after FY2028.
Other	Interest rate on financing: 3%

Note: The recovery in transportation revenues from the Shinkansen and conventional lines is compared to FY2018.

(For reference: Results of confirmation)

Period in which the cumulative amount of the funds available for construction of the Chuo Shinkansen exceeds the total construction cost*※	FY2028
Operating revenues for the fiscal year following the above period	1,530 billion yen
Ordinary income for the fiscal year following the above period	240 billion yen
Long-term debt outstanding for the fiscal year following the above period	6.0 trillion yen

Note: In and after the period marked with an asterisk (*) above, in calculating the operating revenues and ordinary income, it is assumed that transportation revenues will increase by around 5% compared to previous periods and that depreciation expenses and maintenance and operation costs will be recorded for assets related to the Chuo Shinkansen. This does not mean that a new target time for opening is set; however, a trial calculation was made for reference purposes only.

(For reference: Changes in ordinary income and long-term debt)