

# Mid-term management plan

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# Mid-term management plan

(FY2022–FY2024)

## DANTOTSU Value

Together, to "The Next" for sustainable growth

To the next stage for the workplace of the future

Ensuring a sustainable future for the next generation

A new chapter of value creation to the next 100 years

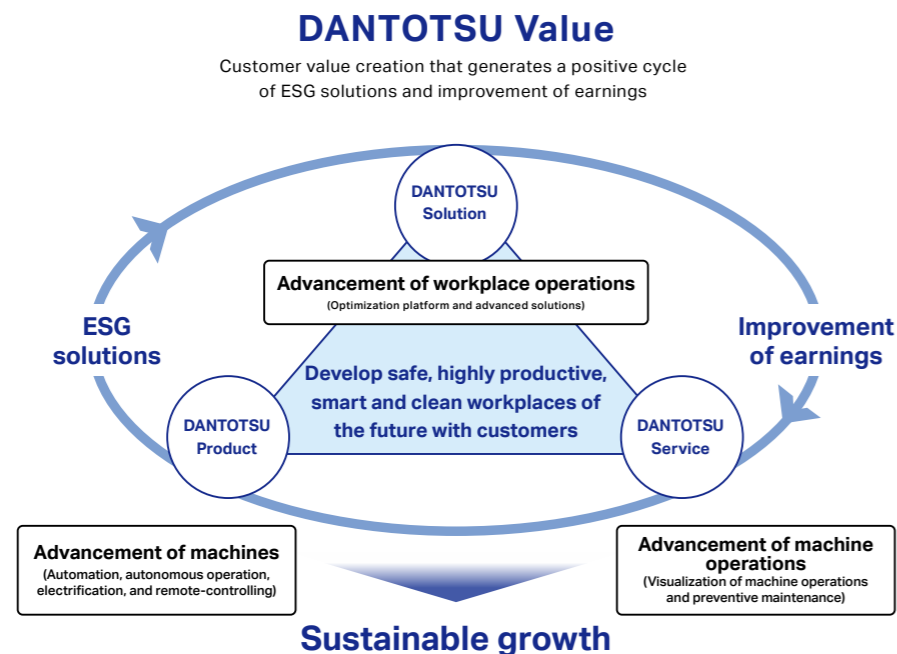
We have defined our purpose to be "creating value through manufacturing and technology innovation to empower a sustainable future where people, businesses, and our planet thrive together." Our basic approach to achieving this is to pursue "Quality and Reliability" and to maximize the total trust from society at large and all stakeholders surrounding us.

In our mid-term management plan that has been formulated as a strategy to implement this management principle, we are striving to create safe, highly productive, smart and clean workplaces of the future with customers, in order to achieve our long-term vision of creating a positive cycle of solving ESG issues and improving profitability through the creation of customer value, thereby achieving sustainable growth.

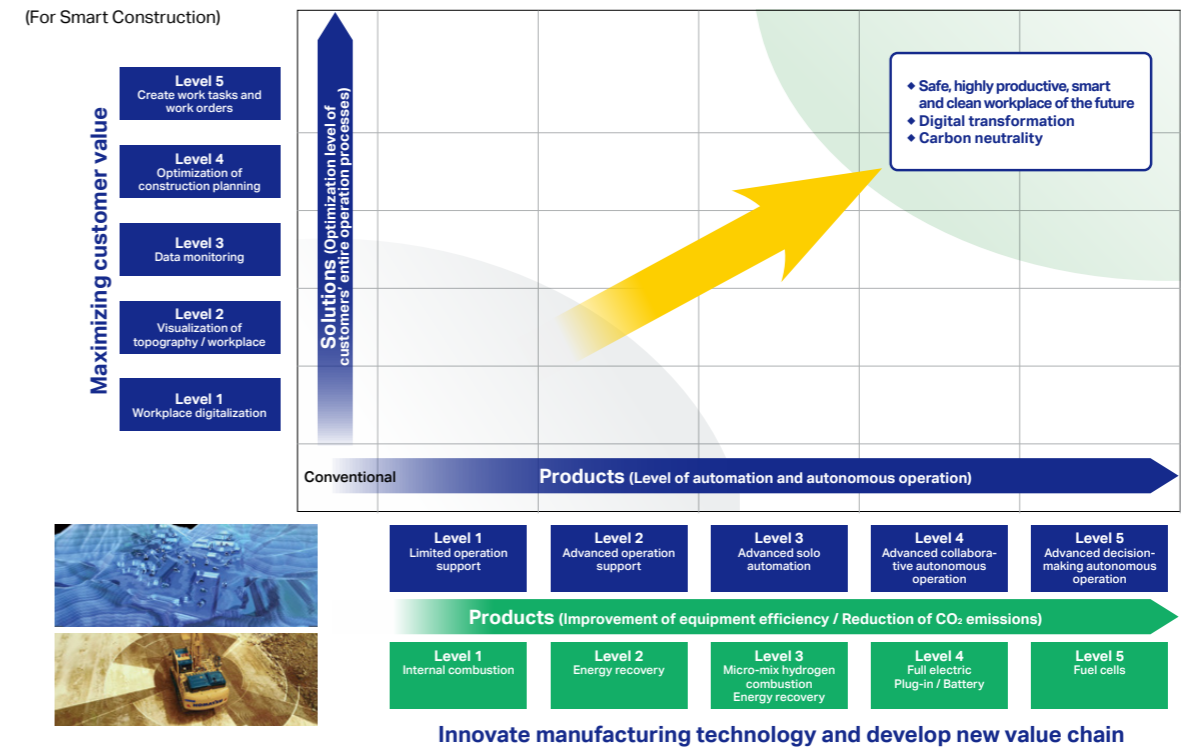
### Toward achievement of our vision— DANTOTSU Value and Roadmap to workplace of the future

In order to achieve our vision, we are working to create DANTOTSU Value (New Customer Value) which integrates DANTOTSU Products (advancement of machines), DANTOTSU Service (advancement of machine operations), and DANTOTSU Solutions (advancement of workplace operations).

Our roadmap to workplace of the future shows such a value proposition toward creating the workplaces of the future and achieving carbon neutrality, resolving our customers' issues with a sophisticated combination of solutions that optimize their entire operation processes and products that are highly compatible with those solutions.



### Roadmap to workplace of the future

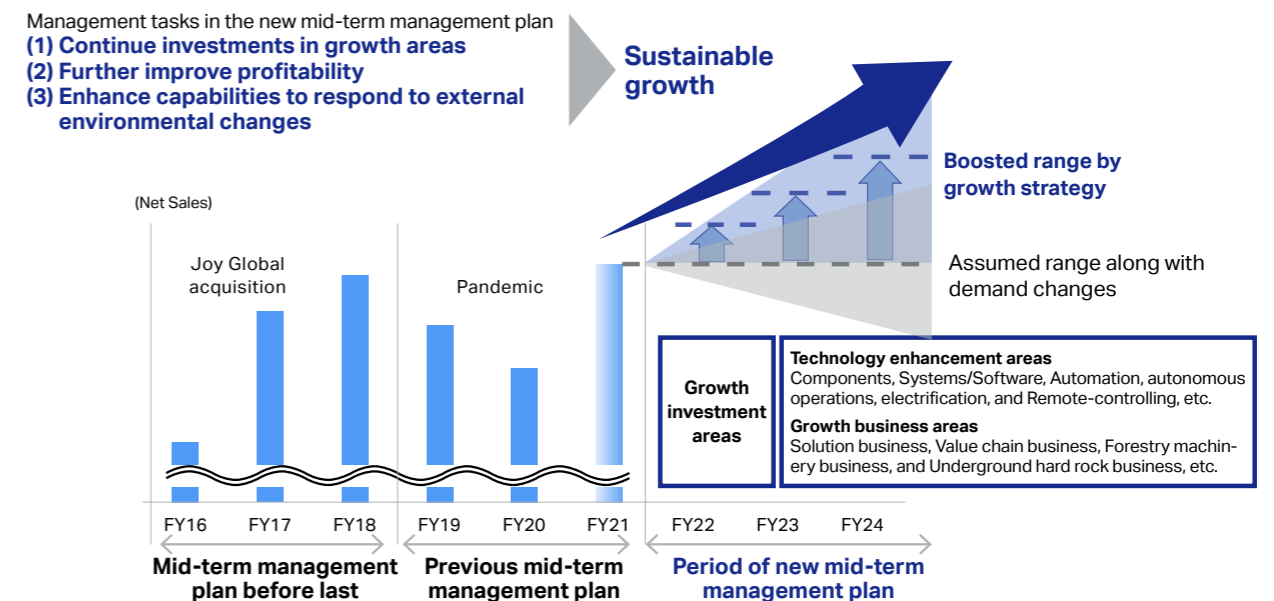


### Approaches to growth strategy

As we march toward achievement of our vision, the current external environment has been becoming increasingly volatile and uncertain.

The market environment for our mainstay construction and mining equipment business is expected to experience moderate growth in the medium to long term as a result of population growth and urbanization, primarily in emerging countries, together with steady investment in infrastructure renewal in developed countries. In the short term, however, demand is expected to be highly volatile due to various external environmental risks.

In order to achieve sustainable growth in this environment, we recognize that a key point of the growth strategies will be responding to three management tasks: 1) Continuing investments in growth areas such as electrification, automation, forestry equipment, and underground hard rock mining, 2) Further improving profitability in our existing businesses, and 3) Enhancing corporate resilience less susceptible to the changes in the external environment such as demand fluctuations.



## Three pillars of growth strategies

The three pillars of growth strategies defined in the mid-term management plan were formulated in light of the achievements and challenges from the previous mid-term management plan, backcasting from our vision and roadmap to workplace of the future, and the management issues arising from changes in the external environment.

We are enhancing our foundation for sustainable growth by positioning trends like digital transformation (DX), carbon neutrality, and diversity and inclusion as business opportunities, and incorporating these opportunities into growth strategies.



## 3. Enhance corporate resilience

With regard to the management foundation supporting business activities in the uncertain external environment, we are working on structural reforms such as company integration and operational integration, as well as building a supply chain that is resilient to environmental changes by further strengthening cross-sourcing structure and increasing multi-sourcing ratio of parts. Through these efforts, we are continuously improving the efficiency of our business operations and enhancing our ability to respond to external environmental risks.

In human resource measures, we are actively working to deploy talent management measures centered on the promotion of diversity and inclusion and developing human resources with digital knowledge and technologies.



Global HANSEI Operation Center

As a common theme among the three pillars of growth strategies, we are working on M&A and open innovation activities. In FY2022, we have entered into an agreement to acquire three companies in the forestry machinery business and underground hard rock mining business. We will explore further growth opportunities with these companies by creating synergies in future.

In addition, we are working on business reform and productivity improvement by promoting DX in all areas, from the digital solutions for customers, to the internal processes including R&D, production, procurement, sales, marketing, services, and administration functions.



The GHH MK-42 truck manufactured by GHH Group GmbH of Germany (acquired in June 2023)

## 1. Accelerate growth by means of innovation

In our pursuit of future growth, we continue to focus investment on strategically critical technology and business areas as it accelerates initiatives to achieve practical application and commercialization of new innovations therein.

We are making steady progress in the promotion of DX Smart Construction and other digital solutions for construction workplaces and in the development and market introduction of electrified construction equipment, which is being advanced together with partners like Proterra Inc. of the United States. In the mining equipment business, meanwhile, the aggregate number of units equipped with our Autonomous Haulage System (AHS) is showing smooth growth. We are also moving forward with the automation of mining equipment and development of mining open technology platforms. Through these efforts, we are forging ahead with a full-fledged rollout of digital solutions for optimizing mining workplaces.



PC210LCE-11 electric hydraulic excavator (to be introduced to market in FY 2023)

## 2. Maximize earnings power

In order to achieve further growth and improve profitability, we will maximize profit-earning opportunities in our existing businesses by expanding our presence in growth markets and evolving our value chain business.

Impressive growth is being seen in sales of the hydraulic excavators with urban civil engineering specifications (CE series) introduced mainly in Asian markets. In order to build a business structure less susceptible to fluctuations in demand, we are also strengthening our aftermarket business by expanding extended warranties incorporating maintenance contracts that draw on our strengths in in-house manufactured components and IoT (Komtrax) use, and expanding the product lineup including attachments, etc.



PC200-10M0 hydraulic excavator with urban civil engineering specifications (CE series)

## Management targets

Concerning management targets in the mid-term management plan, we have set the same targets from the previous plan, that is, industry-leading "Growth," "Profitability," "Efficiency," and "Financial position" in light of the market environment that is highly volatile in the short term. In the retail finance business, we have also maintained the targets of financial position and efficiency. In ESG targets, we have set the prior targets of reduction of environmental impact and a new target of "Carbon neutral by 2050" as challenging goal. With respect to shareholder returns, while placing priority on focusing investments in growth areas, we will continue to work for stable dividends for shareholders and maintain the policy of keeping a consolidated payout ratio of 40% or higher.

Item	Index	Target	FY2022 result
<b>Growth</b>	Sales growth rate	Growth rate above the industry's average	+26.4%
<b>Profitability</b>	Operating profit ratio	An industry's top-level profit ratio	13.8%
<b>Efficiency</b>	ROE	10% or higher	13.7%
<b>Financial position</b>	Net D/E Ratio	Industry's top-level financial position	0.30
<b>Retail finance business</b>	ROA	1.5% to 2.0%	2.6%
	Net D/E Ratio	5 times or less	3.77
<b>ESG</b>	Reduction of environmental impact	<ul style="list-style-type: none"> <li>• CO<sub>2</sub> emissions: Decrease by 50% in 2030 from 2010</li> <li>• Reduction of CO<sub>2</sub> emissions from product use</li> <li>• Reduction of CO<sub>2</sub> emissions from production</li> <li>• Become carbon neutral by 2050 (Challenging goal)</li> <li>• Renewable energy use: Increase to 50% of total energy use in 2030</li> </ul>	21% reduction 43% reduction 17%
	Evaluation by external organizations	<ul style="list-style-type: none"> <li>• Selected for DJSI* (World &amp; Asia Pacific)</li> <li>• Selected for CDP** A List (Climate Change and Water Security)</li> </ul>	Selected for DJSI Selected for CDP A List (Climate Change and Water Security)
<b>Shareholder return</b>	Consolidated payout ratio	<ul style="list-style-type: none"> <li>• Keep a fair balance between investment for growth and shareholder return (incl. stock buyback), while placing main priority on growth investment</li> <li>• 40% or more</li> </ul>	40.3%

\* Dow Jones Sustainability Indices: SRI indices generated by S&P Dow Jones of the United States and RobecoSAM of Switzerland

\*\* International non-profit organization that advocates the reduction of greenhouse gas emissions and protection of water resources and forests by companies and governments

# ESG solutions through growth strategies —KPIs of mid-term management plan

Based on its Sustainability Policy, Komatsu seeks to contribute to society through its business. Under the current mid-term management plan, we have selected 10 new goals from among the 17 goals of the United Nations Sustainable Development Goals that are highly related to the Komatsu Group's material issues (materiality).

Moreover, key performance indicators (KPIs) have been defined to guide efforts for resolving ESG issues aligner with Komatsu's three pillars of growth strategies, and progress toward accomplishing the targets for these KPIs will be tracked and disclosed through the integrated report.

	SDGs	Materiality	Key activity themes	No.	KPI	FY2022 Results	FY2024 Targets	
With people		<ul style="list-style-type: none"> <li>Occupational safety and health and well-being</li> <li>Employee engagement and job satisfaction</li> <li>Diversity and Inclusion</li> </ul>	Build workplaces that are safe and secure	1	Frequency rate of lost work time accidents (per 1 million hours)	0.80	Ongoing decrease from three-year average frequency rate of 0.65 from period of previous mid-term management plan (Performance disclosed)	
			Increase employee engagement	2	Engagement survey scores	Implementation of action plan based on FY2021 survey results	1. Domestic score: 75 or more (69 in FY2021) 2. Global score: 85 or more (79 in FY2021) Notes: 1. Score represents rate of favorable responses. 2. Global engagement surveys are conducted once every two years (next survey to be conducted in FY2023).	
			Promote diversity and inclusion	3	Indicators related to female employees 1. Ratio of full-time female employees (consolidated) 2. Ratio of female managers (consolidated)	1. 14.1% (as of March 31, 2023) 2. 10.3% (as of March 31, 2023)	1. 17.0% or more (13.9% as of March 31, 2022) 2. 13.0% or more (10.0% as of March 31, 2022)	
			Ratio of employees with disabilities (surpassing legally mandated rate)	4	2.42%	2.5% or more (domestic, single fiscal year basis, legally mandated level of 2.3%)		
		<ul style="list-style-type: none"> <li>Skills development and workplace retention</li> <li>Respect for human rights</li> </ul>	Develop individuals' skills and achieve business growth	5	Succession plans	Definition of global key positions and formulation of succession plans	Increased succession planning for senior management positions at overseas Group companies	
			Development of human resources with digital transformation and AI skills	6	Development of human resources with digital transformation and AI skills	1. Digital transformation: 5,341 for entry level*, 44 for practical 2. AI: 30 for entry level, 10 for practical * Entry level digital transformation course administered to a wider range of employees via video lectures	Numbers of training recipients (three-year aggregate) 1. Digital transformation: 900 for entry level, 180 for practical 2. AI: 90 for entry level, 30 for practical	
			Cultivation of Smart Construction consultants	7	867	1,000 (aggregate)		
			Promote human rights due diligence	8	Human rights due diligence activities	1. Internal: Online survey targeting all Group companies 2. Procurement supply chain: Online survey targeting major suppliers 3. Sales: On-site impact assessment in South Africa	Due diligence activities conducted for following three areas 1. Internal 2. Procurement supply chain 3. Sales	
With business		<ul style="list-style-type: none"> <li>Product safety and quality</li> <li>Provision of solutions</li> </ul>	Enhancement of product safety	9	Development of safety devices and expansion of range of marketed models equipped with safety devices (KomVision, etc.)	Completion of introduction in three small sized wheel loader models	Expansion of range of marketed models equipped with safety devices	
			Improve productivity of construction workplaces by promoting Smart Construction	10	Overseas sales of ICT-intensive models	2,448	2,700 units (single year)	
			Provision of products and solutions that enable sustainable resource development (mining equipment)	11	Number of workplaces using Smart Construction (global total)	8,955	13,000 workplaces (single year)	
				12	Enhancement and optimization of processes	20%	Ratio of workplaces using Smart Construction that employ Solution Level 3 or higher: 15% (single year)	
				13	Aggregate number of AHS units deployed	643	790 units (aggregate, upward revision from prior target of 740 units)	
			Solutions for improving safety and productivity at customer workplaces (automation, autonomous operation, remote operation)	14	Optimization of mining operations	Completion of phase 1 development and commencement of trials at customer workplaces	Introduction and promotion of open technology platforms	
				15	Augmentation of hard rock mining product lineup	• Load haul dump machines: Completion of development of one model • Mechanical cutters: Advancement of trials at customer workplaces and launch targeting specific customers • Mining Tunnel Boring Machine: Production of trial units underway	Expansion of product lineup and execution of trials including those for new methods (mechanical cutting)	
			Building of value chain adaptable to environmental and demand changes	16	Expansion of hard rock mining business	Net sales: US\$100 million	Net sales: US\$300 million (threefold increase)	
				17	Development of automated construction and mining equipment	• Hydraulic excavators: Tests conducted on equipment jointly developed with customers • Mining bulldozers: Remote control trials at customer workplaces completed, automated operation trials underway	Expansion of number of marketed models (including new developments)	
		Ethics / Governance	<ul style="list-style-type: none"> <li>Corporate governance</li> <li>Compliance</li> </ul>	Strengthen governance and ensure thorough compliance	20	Enhancement of governance and entrenchment of compliance	• Enhancement of disclosure based on Japan's Corporate Governance Code (business portfolio, skill matrix) • Global e-learning program on Komatsu's Worldwide Code of Business Conduct (conducted in 12 languages)	Disclosure of initiative results
				Contributions to local communities	21	Ongoing social contribution activities	• Continuation of demining project • Provision of ¥30 million in relief support following earthquake in Turkey and Syria • Continuation of forest restoration projects at former mine sites in North America • Ongoing provision of support for regional human resource development programs with Cummins Inc. (Chile, Peru, South Africa, and Australia)	Disclosure of activity results
With the planet		<ul style="list-style-type: none"> <li>Reduction of energy usage and GHG emissions</li> <li>Development of low-carbon/low-emissions products, solutions, and business models</li> </ul>	Plants with zero environmental impacts	22	CO <sub>2</sub> emissions from production (compared with FY2010)	43% reduction	45% reduction (compared with FY2010)	
			Reduction of CO <sub>2</sub> emissions at customer workplaces	23	Water consumption (compared with FY2010)	69% reduction	70% reduction (compared with FY2010)	
				24	Rate of renewable energy use	17%	20%	
		Provision of solutions that support sustainable, cyclic forestry businesses	25	CO <sub>2</sub> emissions from product use (compared with FY2010)	21% reduction	24% reduction (compared with FY2010)		
			26	Electrification of construction and mining equipment	• Launch of one model • Completion of development of one model	Expansion of models in development phase and on market		
		Resource recycling and remanufacturing	<ul style="list-style-type: none"> <li>Forest conservation through business activities</li> </ul>	Growth of forestry machinery business (process mechanization)	27	1. Sales growth rate: 22.1% (compared with FY2021, foreign exchange rates fixed) 2. 5 units	1. Sales growth rate: 50% (compared with FY2021, foreign exchange rates fixed) 2. Number of tree planting machines introduced: 30 (single year)	
				Promotion of forest management solutions (Development of business model combining forestry and decarbonization)	28	Completion of proof of concept test for remote sensing solution and selection of partners	Forest area: 60,000 ha (forest management solutions applied)	
Expansion of Reman business	29	Expansion of Reman business	Sales growth rate: 16.5% (compared with FY2021, foreign exchange rates fixed)	Sales growth rate: 25% (compared with FY2021, foreign exchange rates fixed)				

Special feature

# Growth strategies of the mid-term management plan

## Solution for creating new customer value through workplace optimization DX Smart Construction

Smart Construction was embarked for addressing various issues surrounding the construction industry in Japan such as serious labor shortages with digital technologies.

Smart Construction has been improving operation efficiency on customers' sites through the combination of 3D data surveyed and generated by drones and other IoT devices and applications with high-quality operations performed by ICT-intensive construction equipment. This solution is now evolving into DX Smart Construction that organically connects customers' entire operation processes to achieve further improvements in customers' productivity.

We are globally expanding DX Smart Construction in order to resolve our customers' issues with a sophisticated combination of solutions that optimize their entire operation processes and products that are highly compatible with those solutions.

### DX Smart Construction solutions with a digital twin of a job site

DX Smart Construction provides integrated cloud-based management of digital data collected from construction equipment and IoT devices, which it then uses to create a digital twin that faithfully reproduces the topography of a job site in a digital space. Through reflecting the results of various analyses and simulations performed on the digital twin in a real job site, DX Smart Construction achieves safe and highly productive next-generation job site management.

The devices that connect job site data of land features, people, equipment, and materials to a digital twin as well as the applications that analyze such digital data are developed and provided by EARTHBRAIN Ltd., established as a joint venture, together with NTT DOCOMO (currently NTT Communications Corporation), INC., Sony Semiconductor Solutions Corporation and Nomura Research Institute, Ltd. in 2021. Combining the four companies' expertise, know-how, and technologies, EARTHBRAIN is working on development emphasizing non-conventional approach of backcasting from its vision "creating safe, highly productive, smart and clean workplaces of the future."

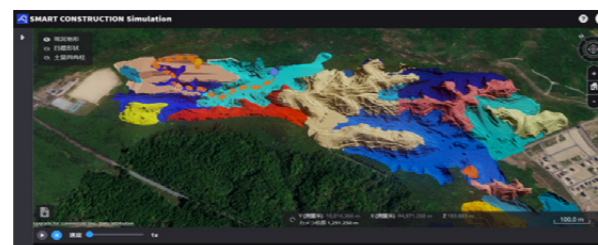
The core application of DX Smart Construction solution is Smart Construction Dashboard, which was introduced to market in November 2021, a visualizing application connecting job site data generated by various devices to a 3D viewer on a digital twin. Its functions as a digital twin platform are constantly being expanded to allow it to link data from devices and applications developed after it. Smart Construction Simulation which was released in September 2022 provides AI optimization for formulating and managing construction plans. These offerings have contributed to further improvements in the safety and productivity on customers' sites.



Concept diagram of DX Smart Construction solution with a digital twin



IoT devices and applications for visualising job sites



Smart Construction Simulation application for optimizing construction plan

### Global expansion of DX Smart Construction

Since Komatsu first began offering Smart Construction solutions in 2015, we have proceeded to introduce solutions at more than 20,000 job sites in Japan, demonstrating its values to numerous customers. In the Japanese market, we will continue to grow our business by supporting customers who endorse the concept of Smart Construction going forward.

Overseas, Smart Construction is being deployed in markets such as North America, Europe, Australia and Southeast Asia, and support systems are being put in place in these regions by EARTHBRAIN and local distributors. Especially in the North American market, we are actively working to expand the number of job sites using Smart Construction by taking advantage of the fact that the majority of bulldozers in this market are ICT-intensive models.

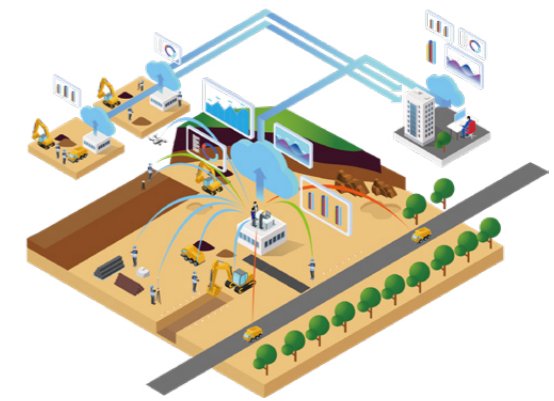


Image of a job site where Smart Construction has been introduced

### Together, to "The Next"

#### Expansion of Smart Construction solutions in the North American market

The construction industry in North America has traditionally lagged behind in terms of technology innovation, but within the last few years the industry has been undergoing rapid change, and the market is now demanding new and better technologies. Many drivers have contributed to this changing environment including worker shortages, high inflation, and increased expectations to reduce CO<sub>2</sub> emissions, improve operation efficiency and keep costs low. During the COVID-19 pandemic, companies forced to adopt new technologies were surprised by some of the benefits of these technologies, so now they are seeking out even greater technological advantages. All these factors mean that the North American customers are now more open and proactive than ever to embracing innovative technologies to achieve their goals.

Komatsu is well positioned to help our customers in this area with digital solutions such as Smart Construction, a collection of brand-agnostic solutions that help customers operate their job sites more efficiently and address their various issues. Smart Construction focuses not only on improving equipment productivity, but on optimizing customers' entire job site processes, which differs from the traditional Komatsu way of thinking. While lots of companies offer similar solutions,

**Michael Gidaspow**  
VP, Products, Service and Solutions  
Komatsu America Corp.



Komatsu differentiates itself by also providing other technology focused on equipment, such as My Komatsu, which can offer integrated management of both their Komatsu and non-Komatsu fleets and a 24-hour connection to Komatsu.

While customers greatly appreciate the values that Komatsu's solutions bring, this doesn't mean we don't have any challenges. Moving from an equipment-centric to a job site-centric mindset is not easy for both Komatsu and our distributors. Many of our talented sales representatives can professionally communicate value when it comes to equipment but may struggle to talk about value in technologies. In addition, our customers don't typically think of Komatsu as a digital solutions provider optimizing job site processes. However, we are seeing some success. In North America, we have sold more than 10,000 ICT-intensive construction equipment, which bring technology innovation to the market. In FY2022, we also introduced Smart Construction at over 1,000 job sites and My Komatsu service has been used by a wider range of customers. These successes are merely a prelude to a long but exciting journey to create more value for our customers.

Special feature // Growth strategies of the mid-term management plan

# Toward further enhancement of customers' job site safety and productivity Automation development of construction and mining equipment

Creating new customer value by solutions that optimize customer' entire operation processes, the products that are highly compatible with those solutions are essential.

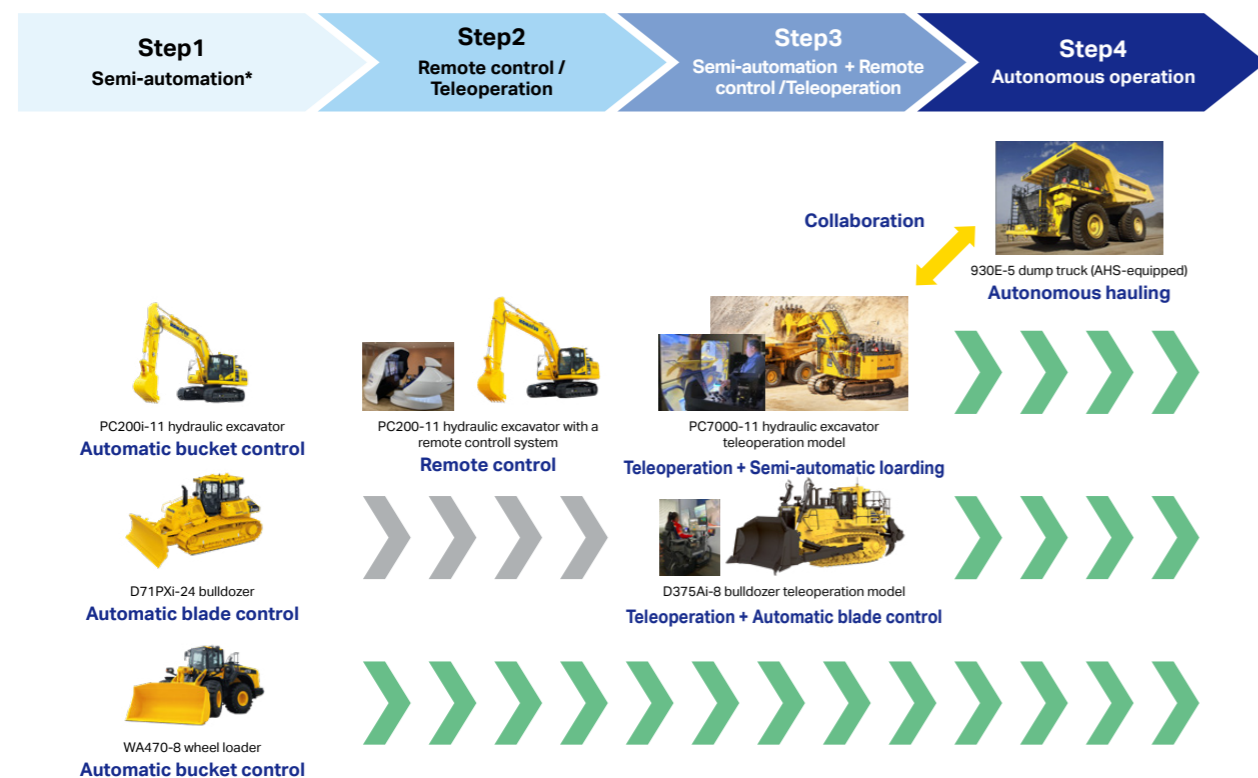
We succeeded in the world's first commercial deployment of Autonomous Haulage System (AHS) in 2008 and launched the world's first ICT-intensive equipment in 2013. Komatsu's automation development efforts of construction and mining equipment are steadily marching toward the next stage in pursuit of further enhancement of customers' job site safety and productivity.

We are rapidly approaching the job sites of the future, where one might see a hydraulic excavator operated from an office hundreds of kilometers away excavating and loading earth and sand into an autonomous dump truck as if it is being operated by a skilled operator.

## Roadmap for automation development of construction and mining equipment

There are four steps to our automation development of construction and mining equipment: semi-automation functions, remote control / teleoperation models, remote control / teleoperation models equipped with semi-automation functions, and autonomous equipment. In ultra-class dump trucks for mining, unmanned trucks with high-precision GPS and obstacle detection sensors are controlled remotely from the central control room. In addition, we have finished development of remote control models of a hydraulic excavator with automatic bucket control functions and a bulldozer with automatic blade control functions. These are just some of the milestones on the path toward higher levels of automation and autonomy in equipment.

By deploying its automation technologies to various models of various classes of equipment, We will expand our lineup of automated construction and mining equipment, contributing to improvements in workplace safety and productivity.



\* Automation functions for certain tasks performed by construction or mining equipment

## Automation of Construction Equipment

The need for automation of construction equipment is increasing as the labor shortage and aging of operators at construction sites in Japan become more serious.

We have been developing equipment that enables high-precision operation without relying on skilled operators such as bulldozers and hydraulic excavators equipped with functions for automatically controlling their blade or bucket. In addition, we have jointly developed a remote control system for construction equipment and begun offering it to customers with EARTHRAIN in March 2023.

Going forward, we are working to combine this remote control system with the automatic control technologies accumulated over the years via the development of ICT-intensive bulldozers and hydraulic excavators. Through this merging technologies, we are going to help customers improve the safety and productivity of their workplaces.



Hydraulic excavator with a remote control system (top) and remote control cockpit (bottom)

## Automation of Mining Equipment

Since we launched the world first commercial application of AHS in 2008, we have deployed over 650 trucks at twenty-two sites in five countries (as of June 30, 2023). Komatsu AHS has entered a high reputation for its safety and productivity from major global resource companies. Recent efforts to expand our lineup of AHS products have been the development of an autonomous water truck based on AHS. We have also launched a joint project with Toyota Motor Corporation to develop an Autonomous Light Vehicle (ALV).

In addition to AHS-equipped dump trucks, we are also advancing a number of other initiatives to improve safety and productivity across the mining operation. Examples of these initiatives include development of ultra-class hydraulic excavator, PC7000-11 teleoperation model and the commercial operation of large-scale ICT bulldozers for mining, D375Ai/475Ai-8 teleoperation model.



Komatsu autonomous haul truck and Toyota concept ALV

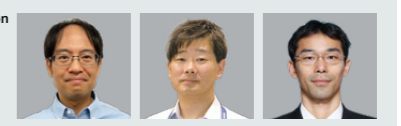


Large-scale ICT bulldozer for mining, D375Ai-8 teleoperation model

## Together, to "The Next"

### United effort for customers— Development of teleoperation system for mining bulldozer

Project members of teleoperation bulldozer development and introduction  
Yuuichi Kadono (left)  
Yasuhiro Kawamoto (center)  
Takanobu Tanimoto (right)



The large bulldozers used at mines are constantly exposed to hazardous environments, such as when pushing ore materials in a stockpile with the potential to collapse or when ripping the ground on rocky areas subject to intense vibration. Given these realities, ensuring the operator safety and improving productivity are important issues for our customers, and many of them have been requiring the development of teleoperation technologies.

The teleoperation model of D375Ai/475Ai-8 large-scale ICT bulldozer for mining application was developed with involvement by members from product planning, system development, and marketing from the planning phase. This approach was taken to guarantee that we

could find the most ideal product specification. Even though this model is put into commercial operation following trial at customer site, we continue to provide technical support in collaboration with support teams in each region of the world, in accordance with the site network infrastructure, the dozer application and use case, and the operation rules that differ from site to site.

Moreover, customers who have cooperated with the teleoperation trial have requested for additional dozers and development of new functions. Komatsu therefore will continue to enhance its teleoperation and automation technologies in order to help customers meet the challenge of optimizing mining operations.

Special feature Growth strategies of the mid-term management plan

# New value creation for realizing a decarbonized society Challenges to carbon neutrality

To achieve carbon neutrality by 2050, we are advancing various initiatives, especially in the area of electrification of construction equipment.

In addition to conventional efforts for reducing CO<sub>2</sub> emissions from products due to optimal combination of components developed and produced in-house, we are striving to focus on development new products and technologies by expanding our partnerships.

"Providing many options developed to meet the unique requirements of a diversity of customers' environmental needs."

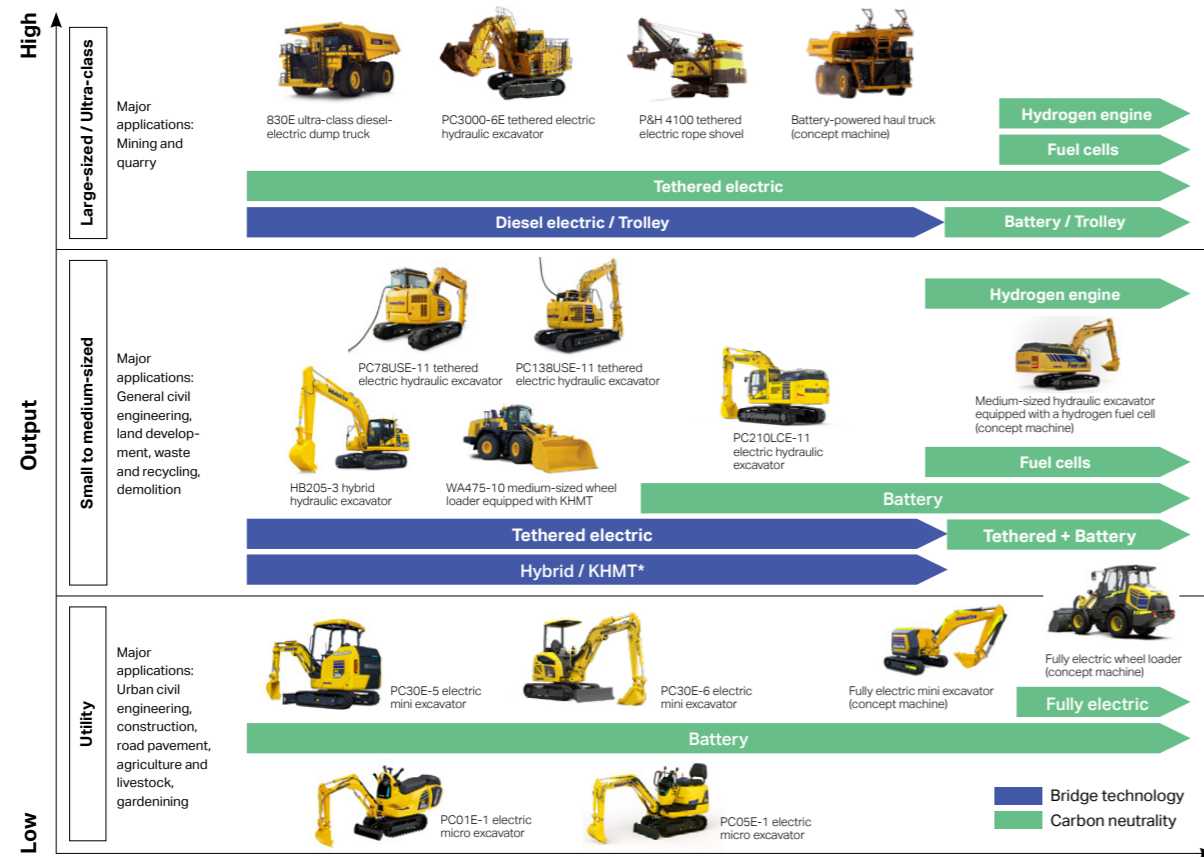
We have positioned FY2023 as the first year for the market introduction of electric construction equipment, and we are steadily working to create a market for the impending era of electrification.

Electrified equipment exhibited at bauma 2022

## Development roadmap for carbon neutrality by products

Roughly 90% of Komatsu's CO<sub>2</sub> emissions are attributable to product in use. We have therefore been making efforts to reduce CO<sub>2</sub> emissions from product use through the development of highly fuel-efficient products, including hybrid hydraulic excavators. With the goal of achieving even greater reductions in emissions, we are now developing construction and mining equipment that uses batteries and other new power sources.

The customer needs for products with regard to output and operating time vary based on the size and application. To address these varied customer needs, we are advancing phased R&D approach of equipment models that use new power sources such as batteries, fuel cells, and hydrogen engines.



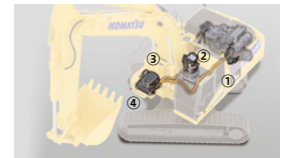
\* Komatsu Hydraulic Mechanical Transmission: Transmission system that realizes a 30% improvement over conventional systems by combining a high-efficiency mechanical transmission with a hydro static transmission that is capable of continuously variable transmission and that uses a motor and a variable capacity hydraulic pump

## Utilization of bridge technologies and carbon-neutral fuels

While next-generation equipment models are being developed, it is important to utilize existing technologies to accommodate market needs. We are currently deploying models using bridge technologies that have already been brought to practical application, such as hybrid, diesel electric, tethered electric, KHMT, etc. We thereby are working on rapid reductions in CO<sub>2</sub> emissions from product use. In this area, the hybrid hydraulic excavators, the world's first equipment launched in 2008, have been rated higher than standard models.

Furthermore, we are actively embracing carbon-neutral fuels in our efforts to reduce CO<sub>2</sub> emissions such as a shift of factory-fill fuel from diesel oil to hydrotreated vegetable oil (HVO) for equipment produced in Europe.

Utilization of carbon-neutral fuels Page 65



Components in hybrid equipment

- ① Electric generation motor
- ② Electric rotation motor
- ③ Inverter
- ④ Capacitor

## Latest models and status of market introduction

In utility equipment, we introduced the PC05E-1 electric micro excavator to the Japanese market, which uses the same system as the PC01E-1 introduced in FY2022 as a rental model, and the PC30/33E-6 electric mini excavator equipped with a lithium-ion battery, a fully remodeled version of the PC30E-5 introduced in FY2019, to the Japanese and European markets.

In medium-sized equipment, we plan to introduce PC200LCE/210LCE-11 electric excavator into the European and Japanese markets in FY2023. This model features long operating times and performance similar to the conventional model made possible through a combination of large-capacity batteries and high-efficiency hydraulic systems.

Battery-powered equipment requires chargers and other peripheral equipment, meaning that it is crucial to introduce the equipment itself and tools needed for its operation as a set. To expand our range of options for such sets, we are working on research and development of a mobile battery bank with storage battery functionality for use in mountains and other areas where power sources might not be available.



PC210LCE-11



Mobile battery bank

## Toward further energy efficiency

A major challenge faced regarding battery-powered equipment is extending operating times. One way we are working to tackle this challenge is through the PoC (Proof of Concept) tests on a medium-sized hydraulic excavator that is equipped with a hydrogen fuel cell, which has greater energy density than a standard battery.

We also exhibited concept machines of fully electric equipment with high-efficiency electric cylinders (excavator and wheel loader) at the international construction equipment trade show (bauma2022, CONEXPO-CON/AGG 2023). Bringing these concepts to practical application, we are advancing research and development to further extend operating times and improve operability.



Fully electric wheel loader (concept machine)

## Together, to "The Next"

### Toward carbon neutrality— Development of fully electric equipment

In the European Union, there is a high awareness of reducing CO<sub>2</sub> emissions and cities in Europe already strongly recommend to use zero emission machines for inner city construction sites.

At bauma 2022, we exhibited a concept machine of our first fully electric wheel loader. The machine generated a strong response and its fast and fine controlled movements impressed several customers. When I got aware of electric actuators presented by Moog Inc. in October 2021, I immediately realized their capability to move high loads at high speed to be a core technology that can eventually be used to replace hydraulic cylinders on electrified machines.

#### Joerg Hermanns

GM, R&D Construction / EUTC 2  
Komatsu Germany GmbH - Construction



There are a lot of benefits to fully electric machines, like extending operating cycle indoors and at a wide range of other work places, providing operators with a "fatigue-proof" and comfortable environment, and lowering burden of everyday management tasks. We are currently advancing the joint test with Moog aimed at proving these benefits and improving the concept machine's productivity further.

Envisioning a future in which Komatsu's fully electric machines are working all over the world, thereby contributing to CO<sub>2</sub> reduction in society, we will continue to push forward with the development of electrified machines toward accomplishing this vision.

Special feature // Growth strategies of the mid-term management plan

# Lifecycle-long value provision through digital technologies

## Evolution of value chain strategies

We provide our customers with various service and solutions throughout the entire lifecycle of their equipment. This lifecycle support (value chain business) is founded on highly reliable products equipped with components developed and produced in-house, operating data collected and visualized by our unique digital technologies represented by Komtrax, and our skilled service engineers.

In this section, we will look at the initiatives that support our value chain business, which account for roughly half of sales in the construction, mining, and utility equipment business, and the current state of our evolving value chain strategies.

### Together, to "The Next"

#### Evolving value chain business through integration of data, tools, and people

Construction and mining equipment is used for around 10 to 15 years, and periodic maintenance and repairs are imperative over this period. From the moment they purchase to the day they give away, we provide a wide range of services throughout the entire lifecycle of our customers' equipment. These services include periodic maintenance, supply of spare parts, repairs, overhauls, and instructions on machine operation. The mission of the Construction Equipment Solution Division is to support our customers' business providing such lifecycle-long services, which leads to safe and highly productive workplaces, and our customer satisfaction with the indispensable values of our products, service, and solutions.

Over the years, we have responded to the needs of customers with various services that utilize the machine operating data collected from around the world as represented by Komtrax data accumulated over two decades. Our data-driven solutions such as diagnosis of equipment failures, overhaul proposal, and optimization of machine operation are only viable when skilled service engineers add their insight to the collected and analyzed data. In other words, a major strength of our service is that we possess a wealth of operating data from around the world and numerous service engineers proficient at transforming that data into solutions. Our competitors have a long road ahead of them if they look to replicate this strength.

However, it is definitely not the case that we are able to exercise this strength anywhere in the world. There are disparities in the rate of digitalization between regions

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Senior Executive Officer  
President, Construction  
Equipment Solution Division



with and without appropriate ICT infrastructure. The digitalization needs themselves also vary from region to region. For example, service engineers are basically supposed to visit customers' job site actually for now, but in regions where they may not be able to make frequent visit due to inadequate base network, the priority must be given to urgently put in place systems enabling them remote failure detection and diagnosis.

In terms of people, the growing complexity of ICT systems used at construction job sites is increasing a demand for "bridge engineer" who is able to balance gaps between ICT systems and job site operations. Therefore, it is of the utmost importance that we provide service engineers who are proficient in digital technologies with opportunities to gain experience both at job sites and in the ICT project that aims to improve operations of our customers and distributors early in their career. Both of the experiences are essential to foster ideal leaders who can drive innovation at customers' job sites.

Collecting and analyzing the data that helps generate value, developing support tools for effectively utilizing the data, and cultivating service engineers who can transform the data into value, thereby, sophisticatedly integrating these three initiatives, we will provide comprehensive "Lifecycle Reliable Support" solutions that allow customers to keep using their equipment with peace of mind. Going forward, we are striving to evolve our value chain business with the goal of making Komatsu an indispensable partner to customers.

### Lifecycle support

In order to maintain the performance of our customers' equipment over a longer period of time, we are expanding the extended warranty program with maintenance contracts upon the purchase of a product. The extended warranty program with maintenance contract that draw on our quality and reliability of in-house developed and produced components, enable our customers to ensure stable equipment operation at ideal costs.

We also focus on this service program as the starting point for our lifecycle support. The frequent interactions with customers that come from providing this service program leads to our deep understanding of their issues and enable us to offer a variety of service to resolve their issues effectively.

In addition, we are advancing our "Lifecycle Reliable Support" solutions through providing new customer experiences, including a machine-condition-based predictive maintenance utilizing the operating data collected by our next-generation Komtrax.



### Enhancement of global service operations

We are enhancing our global service operations through the development of service tools to improve the efficiency of on-site work and training of service engineers around the world including our distributors'.

In the area of on-site work efficiency, we are promoting the digitalization of various service operations to improve the productivity of service engineers. One tool we offer with this regard is "Machine Touch App," which supports service engineers reporting to customers. Based on the data from machine maintenance, it allows service engineers to issue reports of machine checkup results immediately on site. Timely proposals for parts replacement, etc. with data-based reports will help customers use machines with peace of mind by keeping them in good condition and preventing breakdowns before they occur. This also contributes to increasing service revenues.

In terms of human resource development for distributors, we offer a variety of training programs at training centers in major regions, including lectures on service techniques and machine operation training for customers. In recent years, the training programs have become more digital and remote, as travel has restricted by COVID-19. In addition, the development of programs utilizing the latest technology, such as AR and simulators, has enabled more efficient and detailed training.

As for in-house service engineers, we established Komatsu Human Resources & Development Center (currently Komatsu Philippines Corp.) in the Philippines in 2008, and started training locally hired engineer as "Global Engineers" armed with both technological insight and field experience. There are currently over 100 Global Engineers working at customer sites and in a various other function such as quality assurance, digital solutions, and Smart Construction.



Machine Touch App



Safe machine operation training by simulator