

\Orchestrating a brighter world NEC

# **Orchestrating** a brighter world

NEC creates the social values of safety, security, fairness and efficiency to promote a more sustainable world where everyone has the chance to reach their full potential.

### "Seize the Future Together" to Realize a Sustainable Society

We are seeing increasing uncertainty in the global outlook. And with that uncertainty, we recognize that people around the world ask themselves, "what is the right path forward?"

In response to those questions, we have asked ourselves, what does NEC need to do to ensure that it continues to show a path forward to tomorrow? Our conclusion was that we must present a vision for the future of society and take the lead in realizing that vision. Of course, no one company can do this alone. And so we are committed to work with different stakeholders to build consensus and support.

Our first step was to create the NEC 2030VISION, setting out our ideas on the kind of society that people will want to live in in 2030. As we work towards the realization of the NEC 2030VISION, we will focus on the business pillars set out in our Mid-term Management Plan 2025, including Digital Government / Digital Finance, Global 5G, and Core DX. We will also build up new healthcare and life sciences business segments and the carbon neutrality-related business segment. These new drivers of our future growth are increasingly important from a sustainability perspective.

As a technology company, NEC focuses its energies on research and development that will create social value in the society of 2030. Our technology focus includes digital twins, AI, 5G and Beyond 5G, all of which will support our business pillars.

NEC's Purpose is to create the social values of safety, security, fairness and efficiency to promote a more sustainable world where everyone has the chance to reach their full potential. Inspired by the NEC 2030VISION, the embodiment of our Purpose, we will work with our various stakeholders to "Seize the Future Together" and shape it in the image we envisage, by maximizing the power of technology. In so doing, we will also contribute to the creation of sustainable societies and the realization of the Sustainable Development Goals.

Takayuki Morita President and CEO (Representative Director) NEC Corporation



### Contents

People are always the starting point of social value. When formulating our future vision for society, we started by contemplating global megatrends in 2030 and how the needs of people will have changed.

People's needs change based on different life scenarios, whether it is time spent with friends and family, or their interaction with society and the environment through their work. This is why our future vision for society is formulated in terms of the distinct life scenarios in which people find themselves.

This booklet describes the NEC 2030VISION, setting out our future vision for society in 2030 and the role that NEC will fulfil in that society, together with our Technology Vision. We hope you will enjoy reading it.

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## How will our society and people change in 2030?

#### Social value creation starting from people

In order to realize our future vision for society, we thought ahead to the megatrends of 2030 and the changes in people's needs.

Responding to global warming and climate change is a shared challenge for all of humanity. The international initiatives focusing on the environment and resources are being urgently implemented. The world is now headed towards a full-scale transformation to a green economy, working together with financial markets, including on initiatives aimed at carbon neutrality and expanded ESG investment.\* With the public and private sectors working together to reimagine conventional economic models based on mass production, consumption and disposal, our society will power forward with green transformation initiatives that will inspire sustainable models for society and the economy.

The repeated waves of the COVID-19 pandemic have given us a mighty wake-up call, prompting many of us to reconsider not just our daily lives, but also the way society and business function. The restricted movement of people and goods around the world, such as lock-downs and other restrictions on movement, global supply chain disruptions, and working from home, have exposed the various vulnerabilities that exist in systems we have relied on until now. There are high hopes that the key to developing new and resilient mechanisms will be digital transformation, which is gaining pace globally.

Looking ahead, as people experience life in a world where the real and the virtual converge, their mindsets and lifestyles will become even more diversified. They will likely no longer focus exclusively on material things and economic affluence but seek lifestyles where individual diversity and values are respected, including ones in tune with the environment and self-actualization through social contributions. International collaborations and technological developments are among the various initiatives being expedited towards 2030, the deadline for achieving the Sustainable Development Goals (SDGs). Thanks to digitalization, the global environment, society, business, communication and human life are in a period of great change. Co-creation among industry, government, academia and civil society will accelerate the development of solutions for various social challenges and value creation, generating opportunities to transform social systems.

\* ESG investment: A form of investment in which companies are evaluated based on environmental, social and governance perspectives.

#### Megatrends in 2030

Realization of a life in which diversity is embraced Integration of society and technology Support of safety and security through transparency International cooperation and power struggles Revitalization of environmental and resource initiatives

#### **Changing needs**

Choosing a lifestyle based on one's own values

Selection of residence based on safety, security and individual lifestyles

Self-actualization through a shared sense of creating value by contributing to society

Communicating with a diverse range of people on a foundation of mutual understanding

Changing one's behavior to be conscious of one's environmental impact

### **NEC 2030VISION**

NEC aims to realize social value creation based on our Purpose. To accomplish this, we need to think deeply about how society can ensure that everyone has the chance to reach their full potential. In our view, people find themselves in a three-layered domain, consisting of the Environment layer, the foundation for all activities; the Society layer, where national and local governments operate and economic activity takes place; and the Life layer, which covers our daily lives. Society is further subdivided into three scenarios: City, the setting for people's activities; Communication, which links people and things; and Business, which supports industry and society and provides people with a means to fulfil their purpose. Together with Environment and Life, this gave us five future visions of society to aspire to.



This booklet details five future visions of society that NEC aspires to realize, as well as the Technology Vision that will support their realization. Through the NEC 2030VISION, we will "Seize the Future Together" with our stakeholders and achieve our Purpose.





# Living harmoniously with the earth to secure the future

By 2030, the global population will have reached 8.5 billion, and with various planetary boundaries having been exceeded, humanity will face an ever-lengthening list of social challenges caused by global warming, natural disasters, and depletion of biodiversity and resources.

The realization of a sustainable global environment is therefore a mission for the whole of humankind. So, how can society and people future-proof our precious planet?



# Reduce environmental burden and more effectively utilize limited resources for a future where people live harmoniously with the earth

The year 2030 will be part of a transitional period in the transformation to a sustainable society, and the global environment, which sustains all human life and endeavors, will remain in a critical condition. Abnormal weather events and natural disasters will have become a part of life, which, coupled with a loss of biodiversity, will have a serious impact on human life, posing a challenge for society. Continued population growth will also have exacerbated food supply, resource and water shortage issues.

Seeking to live in harmony with a sustainable earth, people will have started to change their behavior, paying more attention to the environment, and switching from owning goods to using goods as part of a sharing economy. Across society, stakeholders from industry, government, academia and civil society will need to work together, for example in implementing energy reforms for a decarbonized society or realizing a shift to a circular economy involving the efficient use of resources.

In supply chains and communities, visualized environmental information will be shared beyond individual companies and local government organizations. Meanwhile, co-creation among industry, government, academia and civil society will power the shift to green business models and the development of new environmental technologies. Answering the call to make behavioral changes at both the individual and societal level, people will use energy and limited resources efficiently and cyclically. Environmental contributions will be recognized and valued, creating a positive cycle between the economy and the environment, and ensuring the future of our planet. That is the kind of sustainable society we aim to realize.

NEC is visualizing environmental impact to realize efficient utilization of energy and resources By creating the necessary social mechanisms, we are contributing to the realization of a sustainable global environment

## Visualizing environmental impact to encourage behavioral change

To tackle environmental issues, it is important to first understand and analyze the current state of the global environment. Only if we can identify causes and issues can we then take effective response measures. NEC is using satellite and IoT sensing technologies to measure global-scale climate change and CO<sub>2</sub> distributions. By visualizing and sharing information on the global environment, corporate production activities and consumer behavior, we are making people realize the need for behavioral change, which in turn helps reduce the burden on the global environment across society as a whole.



Impact: Increasing behavioral choices to reduce environmental impact

# Establishing the structure for a circular economy

To use limited resources more efficiently and effectively, it is imperative to maximize the use of existing products, components and materials, and have systems in place to reuse and recycle resources. NEC aims to link product and component traceability with multiple AI technologies to enhance supply-demand coordination and optimize resource circulation. Working together with companies and governments, we are striving to create the infrastructure for realizing the transformation to a circular economy across the entire supply chain.

Impact: Reducing food loss, Improving resource recycling rates, Boosting product reuse rates

## Energy management contributing to a decarbonized society

The realization of a decarbonized society requires the effective utilization of multiple resources, including the combination of renewable energies with existing power generation systems. NEC is contributing to the transition to renewable energies by building virtual power plants that optimize supply-demand balance through a combination of multiple distributed power sources. We will also work to improve lives in unelectrified areas by building solar power generation systems.

Impact: Spread of renewable energies, Decrease in unelectrified areas



# Nurturing prosperous cities with inclusive and harmonious societies

Sustainable city management and safe, secure and efficient city operations, coupled with optimal mobility services and finely tuned city services that fulfill a wide variety of needs and bring people together. Cities will play an increasingly important role as the infrastructure that supports society, and as the base for services that support and sustain the daily lives of all people.

So how should cities evolve in response to people's diverse needs?

# Realizing sustainable cities that bring people together in inclusive and harmonious societies

By 2030, the urban environment will be undergoing significant changes, with some cities becoming overcrowded and others experiencing depopulation. Taking into account their individual characteristics, each city will advance efforts to boost disaster resilience and create attractive cityscapes, while simultaneously reducing environmental impact, through, for example, decarbonization efforts. Financially efficient city management will thus become ever more important.

People living in the cities of 2030 will enjoy diverse lifestyles and will want to be able to select and utilize services according to their own personal preferences. More people will choose to base themselves in cities that match their own particular set of values. Cities will need to be able to provide mobility services that offer universal access and comfort and are safe in times of normalcy and emergency, as well as public services that are tailored to individual needs.



People living in efficient cities will be able to move around comfortably with mobility services they desire and be free to choose what suits them best from a range of integrated urban services such as sports, entertainment and community activities. Cities that are managed based on visualized data and simulations collected from the cyber world will be able to make progressive improvements to urban challenges utilizing insights and technology gained from industry-government-academia-civil society co-creation. NEC's aim is to realize just such inclusive, harmonious, convenient and sustainable cities that are full of life and endlessly evolving.

Expanding the possibilities of data utilization, NEC is contributing to sustainable city management, efficiency in mobility and other city operations, and city services optimized for individual

#### Trusted "City as a Service"

For people to be able to freely choose and utilize the best services for them, cities must safely and seamlessly link and integrate various public services. NEC is working with stakeholders in industry, government, academia and civil society to build a digital trust infrastructure to manage personal authentication and data distribution. By doing so, we are helping to not only optimize cities as a whole, but also to provide safe, secure and trusted services for individual people and enrich their daily lives.

Impact: Democratization of data utilization, Enhanced convenience and safety



#### **Control of mobility services**

If mobility services could be controlled on a city-wide basis, this would not only boost the convenience of those services, but also help to reduce the burden on the environment by enhancing the efficiency of logistics and transportation. NEC provides various types of mobility management platforms, working with national and local governments and transport operators to comprehensively control transport on land, sea and air. In so doing, we will contribute to reducing traffic accidents and traffic congestion and realizing safer and more comfortable mobility.

Impact: Fewer traffic accidents, Less traffic congestion, Reduced environmental burden

#### **Data-driven city operation**

Digital twins that can visualize and analyze real-world data in the cyber world and perform simulations is a technology that holds great promise. Through city operating systems (OS), NEC is collecting various kinds of data and providing data-driven city operation infrastructure that will be capable of supporting the utilization of digital twins. In this way, we will contribute to speedy, evidence-based policy formulation and implementation, as well as the smart management and operation of cities.

Impact: Efficient city operation, Enhanced QoL



# Sharing hopes that transcend time, space, and generational boundaries

People around the world will be able to connect with one another with ease, transcending space, language and generational boundaries. The real and virtual worlds will be seamlessly integrated. These interactions will achieve new value creation and inspire ideas to solve society's challenges.

How will communication in 2030 change society and people, when humans and machines will have become part of multiply and deeply connected networks, sharing both contexts and experiences?



# Looking to a society where people around the world share hopes and insights that transcend time, space, language and generational boundaries

In 2030, advances in virtual and augmented reality (VR/AR) will have brought about highly sophisticated, high-definition content. What is more, communication will not just be between people—networked and AI-equipped objects, as well as interactions between avatars performing activities on people's behalf, will be a normal part of everyday life, and communication volume will have increased dramatically.

As people spend more time in virtual spaces, even in the online world, they will seek communication that fosters deeper connections and creates new value. However, while globalization and diversity will make great strides forward, people may face more situations where society feels divided, which will in turn amplify the need for mutual understanding with others from different cultural backgrounds. Global-scale collaborations that transcend various boundaries, such as language, culture, religion and values, will offer ways forward to solve social challenges and create new value. Even though people may not be in the same space and time zone physically, they will be able to transmit their contexts to one another, including their sensations, situation and background, and share in others' experiences and thoughts. This will promote a deeper level of mutual understanding for one another's ideas and emotions, across cultures and generations, creating a sense of togetherness. This evolution of communication and the overwhelming volume of information being exchanged will be constantly supported by an environmentally friendly, safe and reliable information infrastructure.

NEC aims to realize a society where people around the world find common causes that transcend language and diverse divisions, and who actively engage in various discussions and forums, looking to create new value and solve social challenges.

By realizing communication that ensures both comfort and safety, NEC is supporting co-creation through mutual understanding and collaboration among people around the world

#### **Achieving Beyond 5G infrastructure**

In a Beyond 5G world, besides ultra-high speed/capacity, ultra-low latency, and massive connectivity, ultra-safety/reliability and ultra-low power consumption will also be of vital importance. In order to make these a reality, NEC is working to enhance safety and security through quantum cryptography and to achieve ultra-low power consumption through optoelectronic fusion technology, including collaborative efforts with telecommunications carriers. We aim to achieve a society where anyone in the world can access the internet securely and for free.

Impact: Democratization of communications, Reduction in CO<sub>2</sub> emissions



#### **Communication infrastructure integrated** with AI, avatars and VR

Acting on people's behalf and being deeply involved in various aspects of their lives, avatars must be capable of accurately ascertaining people's feelings and intentions. Based on our track record of developing many of the world's most advanced AI technologies and ICT, NEC provides integrated communication infrastructure that will be able to use cutting-edge AI to support deep communication between people and avatars. By providing such high-quality support for people, we will contribute to enhancing their quality of life and work.

Impact: Creating free time, Enhanced creativity

#### Next-generation means of communication

New and unprecedented means of communication are needed to help all people communicate freely, regardless of language or ability/disability, and enable them to bond deeply with each other. NEC is working on developing communication tools that convey people's five senses and feelings, and technologies that enable non-verbal communication. By overcoming communication barriers and eliminating communication gaps, we are contributing to fostering mutual understanding and shared hopes among the people of the world.

Impact: More inclusive societies, Providing collaborations that transcend language barriers



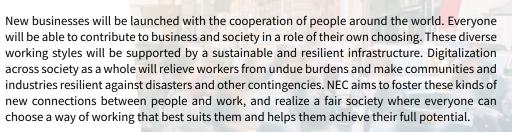
# Creating sustainable societies by shaping new industries and workstyles

People's workplaces will have expanded beyond real spaces to include also virtual spaces. People will find fulfilment from workplaces and workstyles that best suit them. What kinds of industries and workstyles will be needed to create flexible, resilient and sustainable societies, where everyone can reach their full potential?

# Creating a society with diverse and flexible working styles, where everyone is engaged

In 2030, the advancement and spread of technology will make working with AI and robots increasingly common. There are expected to be fewer constraints on workplaces and working hours than ever before and having people from around the world working together in a virtual office space will be entirely normal.

More people will seek self-actualization by actively learning new technologies and skills to get the jobs they want, and by contributing to society through their work. More and more companies and individuals will seek to solve social challenges that were previously thought to be insurmountable through co-creation that transcends the boundaries of the public and private sectors. Humanity's experience of COVID-19 will also heighten the need for sustainable societies that are resilient to disasters and pandemics.





NEC is linking government, finance and industry, helping to shape industries and workstyles that enable people to unlock their potential

#### Support for work in remote or virtual spaces

Societies where workplaces have shifted to primarily remote and virtual spaces will need to create digital environments that enhance productivity, enable the remote/virtual monitoring of worksites in the same way as in the real world, and ensure that remote operations can be done safely. NEC is facilitating diverse working styles by providing comfortable, safe and resilient remote tools and virtual offices. In this way, we are supporting work opportunities and environments that ensure everyone can work at their full potential from any location.

Impact: Improved productivity, Eliminating disparities in working opportunities



#### **Digital Government / Digital Finance**

If people are to achieve their goals in work and in life, it is essential to eliminate complicated procedures and ensure quick and timely government services and safe and secure financial services. NEC is promoting safe, secure and convenient administrative procedures and digital settlement through the utilization of digital IDs, biometric authentication and anonymization, among other technologies. We aim to not only boost operational efficiency, but also realize a society that continually generates people-oriented services and innovation.

Impact: Citizen-centric transformation of government services, Social stability through democratization of data

#### **Creating co-operative work environments** with AI and robots

As remote work becomes increasingly common, it will also become important to find new workstyles for the essential workers who support society, such as those in the medical, welfare, manufacturing, logistics and retail sectors. Utilizing AI and robot technologies, NEC is supporting the safe control, automation and autonomy of complex and diverse tasks. Combining remote, automated and autonomous operations, for example in store operations or at warehouses and construction sites, we aim to achieve sustainable and highly productive working environments.

Impact: Eliminating labor shortages, Minimizing risk of emergencies



## Bringing people together and filling each day with inspiration

In 2030, AI and digital technologies will have permeated all aspects of our lives, and experiences that seamlessly fuse together the virtual and real worlds will be part of everyday life. In a world where remote operations and robotics have advanced, people will have a wide variety of choices available to them. As lifestyles and values diversify, how can society bring people together and fill each day with excitement and inspiration?



#### Seeking a life where all people's values are respected, and everyone enjoys healthy and fulfilling lives, both physically and mentally

In the world of 2030, lifestyles based on remote operations and coexistence with AI and robots will be increasingly common and widespread. As digitalization progresses, people will enjoy ever greater freedoms in the virtual world, such as shopping, entertainment and learning, while making the most of their individual choices and lifestyles.

People will want to meet their self-actualization needs and achieve a sense of fulfilment based on their diverse values, such as being healthy in mind and body, having ready access to knowledge, and so on. They will therefore want services and experiences that support self-actualization and are optimized to their individual needs and life scenarios, including age, gender and interests. All services and experiences will be provided in a timely way and suited to individual needs, thanks to the interlinking of different people-centric services and data, for example in healthcare, education and entertainment. Ever better experiences, accounting for diverse perspectives and feelings, will continually be created. People will be able to enjoy better lives filled with inspiration, as well as health in mind and body, long into the future. That is the kind of society that NEC aims to realize.

NEC respects the diverse values consumers seek and supports fulfilling and healthy lives, in both mind and body

#### **Inclusion in education**

With the spread of the internet, people are seeking wisdom and knowledge that are best suited to a diverse society and individual values. NEC is providing cloud-based education services with the aim of helping everyone to obtain learning opportunities for life according to each individual's proficiencies and life stages, as well as technology-related educational content. We are working to provide free, open and fair learning opportunities to people around the world.

Impact: Eliminating education disparities across different communities, Enhancing digital literacy



#### Contributing to individualized medical care

No matter where people live, they will desire access to the medical care and treatment they need. Besides treatment, care will also be increasingly focused on prevention. NEC is striving to implement highly reliable, safe and secure remote medical care and realize AI-assisted drug discovery and development, thereby contributing to establishing next-generation healthcare involving the integration of medicine, prevention and life sciences.

Impact: Providing care optimized for individuals, Improving hospital bed usage rates

# Support for maintaining physical and mental health in the digital era

For people who hop between real and virtual worlds every day, maintaining not only their physical but also their mental health is highly important. NEC is working to visualize feelings and stress, utilizing AI and IoT. By enabling people to easily check their everyday physical and mental well-being, we are contributing to personalized health management.

Impact: Extending healthy life expectancy, Maintaining well-being, Improving daily habits

## Technology Vision for realizing the NEC 2030VISION

#### Trends in technology needs and NEC initiatives

NEC is engaging in three initiatives for realizing our future vision for society.

#### Adapting swiftly to challenges and diverse needs in rapidly changing societies and cities

Amid rapid changes in everything from the global environment and the way society functions to people's values and their ways of working, such changes need to be identified quickly and social activities adapted accordingly. All this will require technologies capable of visualizing and simulating various real-world changes and making the necessary optimizations.

#### Enhancing the intellectual and physical creativity and productivity of human activities

Increasingly complex societies need services that match individual values, as well as further improvements to overall productivity and safety. Looking to the future, there will be a need for AI that brings people together, interacts with them, and is trusted and accepted, thereby enabling the creation of ideas that are suited to people's diverse needs and complex and advanced decision-making that transcends human knowledge.

#### Supporting the realization of a sustainable global environment

The spread of IoT is producing rapidly increasing amounts of data. This will create various challenges, including increased communication volumes and power consumption in the computers and networks of the future, issues of data security, and the increasing complexity of system construction and operation. Platforms will need to be able to combine integrated and optimized security, highly reliable data protection, and environmental friendliness.

## **NEC Technology Vision**

#### Digital twins for co-creation and trials of the future

Providing a foundation to support the convergence of the real and cyber worlds

NEC aims to adapt, in real-time, to rapid real-world changes and take a holistic approach to optimization. To that end, we will achieve digital twins that can rapidly identify all real-world information in the cyber world collected from such sources as biometrics, real-world understanding, and system modeling, integrate information across industries, and thereby forecast the future.



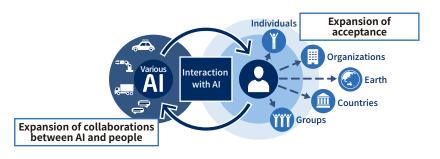
**Overlay digital twins** 

- ····· Human digital twins
- Industry and community digital twins
- Real world

### AI that works with people and permeates society

AI that people can trust, AI that people can accept

Looking to enhance the intellectual and physical creativity and productivity of human activities, we will realize AI that interacts with people and proposes ideas that are tailored to their needs and that they can accept. Furthermore, we will realize AI and robots that are capable of understanding environmental changes in the same space as humans and that work together safely and autonomously on complex and diverse tasks.



#### Platform to support environmental friendliness, high reliability and high efficiency

Integrated apps/IT/networks, security, and secure data platforms

To realize our future vision for society, we will provide environmentally friendly and sustainable infrastructure by utilizing technologies such as quantum computing that can find the optimal solution from an enormous set of potential choices at high speed, AI-powered resource-optimized communications, and secure systems that respond autonomously to system failures and threats.



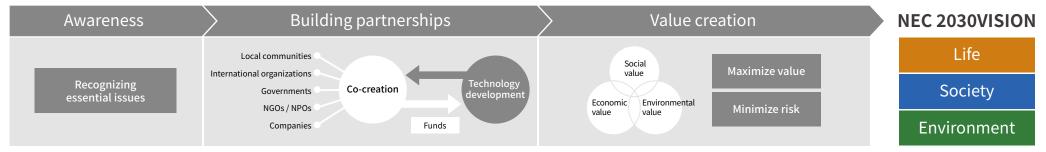


Thank you for taking the time to read the NEC 2030VISION. NEC will give shape to the value of future experiences and create a vision of society, through dialogue and co-creation with all our stakeholders. We will work to realize this vision while evolving it further. Together, let us create a sustainable and fulfilling world, where everyone has the chance to reach their full potential.

## Realizing the NEC 2030VISION

NEC is working together with a diverse set of stakeholders to develop the necessary "awareness" for identifying essential issues, "build partnerships" based on empathy and trust with the right people for solving these issues, "create value" from a people-oriented perspective, and solve social issues that no single company can tackle alone.

#### Value creation processes



#### **Ecosystem-type R&D initiatives**

NEC is working to accelerate and advance social transformation through co-creation efforts that include research and business development at BIRD INITIATIVE, Inc. (BIRD), which was established by six different companies from business, finance and academia, and also the establishment of the new NEC Orchestrating Future Fund, an ecosystem-type corporate venture capital (CVC) fund that promotes investment aimed at the evolution of network technology and the transformation of digital services.



OBAYASHI CORPORATION Japan Industrial Partners, Inc. Japan Investment Adviser Co., Ltd. ITOCHU Techno-Solutions Corporation UTokyo Innovation Platform Co., Ltd. NEC Corporation

#### NEC initiatives for achieving the SDGs

NEC is working with international organizations and various other partners to promote solutions to society's challenges and <u>contribute</u> to achieving the SDGs. One key example is the partnership with Gavi, the Vaccine Alliance and Simprints Technology Ltd. to boost immunization rates in developing countries by deploying the world's first scalable child fingerprint identification solution.



## NEC 2030VISION

https://www.nec.com/vision/

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