

Contents

Preface

Nine Years of Building Up Various Cooperations	1
Seigo Kuzumaki (SIP-adus Program Director)	
Toward Solving Social Issues Through Automated Driving, and Achieving a Mobility Society for the Future	2
Takafumi Kakudo (Deputy Director General for Science, Technology and Innovation, Cabinet Office)	
Role as Management Agency and Results	3
Tomoyasu Nishimura (Executive Director, New Energy and Industrial Technology Development Organization (NEDO))	
For Publication of Final Results Report	4
SIP-adus Final Results Report Editorial Committee	

The Second Phase of SIP–Automated Driving for Universal Services Final Results Report: Introduction ... 6

Section 1 The Second Phase of SIP-Automated Driving for Universal Services 11

The Second Phase of SIP-Automated Driving for Universal Services (Overview)	11
Kotaro Sugiyama, Hiroaki Kimura (Cabinet Office)	
Overview of Activities of the National Police Agency	16
Hisaaki Ikeuchi (National Police Agency)	
Overview of Activities of the Digital Agency	19
Jun Usami (Digital Agency)	
Overview of Activities of the Ministry of Internal Affairs and Communications	22
Takanori Mashiko (Ministry of Internal Affairs and Communications)	
Overview of Activities of the Ministry of Economy, Trade and Industry	25
Shigekazu Fukunaga (Ministry of Economy, Trade and Industry)	
Overview of Activities of the Road Bureau, Ministry of Land, Infrastructure, Transport and Tourism	28
Masamitsu Waga (Road Bureau, Ministry of Land, Infrastructure, Transport and Tourism)	
Overview of Activities of the Road Transport Bureau, Ministry of Land, Infrastructure, Transport and Tourism	31
Yoshitaka Tada (Road Transport Bureau, Ministry of Land, Infrastructure, Transport and Tourism)	

Section 2 Establishment and Utilization of Traffic Environment Data 34

(1) Technological Development Concerning the Generation of Traffic Environment Data 34

Establishment and Utilization of Traffic Environment Data and the Tokyo Waterfront Area Field Operational Tests (Overview)	34
Satoshi Hiyama (Honda Motor Co., Ltd.), Masato Minakata (TOYOTA MOTOR CORPORATION)	
1) The Tokyo Waterfront City Area Field Operational Tests	41
Yoshiaki Tsuda, Takahiro Yoshino (MITSUBISHI ELECTRIC CORPORATION), Shinya Muroyama, Kentaro Isobe (AISAN TECHNOLOGY CO., LTD), Kosuke Watabe, Katsuya Akimoto (Nippon Koei Co., Ltd.)	
2) Technological Development to Provide Traffic Signal Information to Automated Vehicles Connected to Infrastructures (V2N) ...	47
Yukiko Hatazaki (NIPPON SIGNAL CO., LTD.), Yuichi Takayanagi (Panasonic Connect Co., Ltd.), Toru Mabuchi (OMRON Social Solutions Co., Ltd.), Shunichi Kawabe (UTMS Society of Japan)	
3) Technological Development for Lane-level Road Traffic Information Using Probes Vehicle Data	54
Hirokazu Ichikawa, Atsushi Takenouchi, Naoki Funakawa, Naohiro Uchiyama, Akio Mori (PACIFIC CONSULTANTS CO., LTD.), Yukimasa Morisaki, Ryuki Oshima (Mitsubishi Research Institute, Inc.)	
4) Technological Development and Establishment of Simulation Environment for Lane Merging Assistance	61
Nobuhiro Araki, Kenta Shintoku (KOZO KEIKAKU ENGINEERING Inc.), Koichi Miyashita, Satomi Aiko (Mitsubishi Research Institute, Inc.)	
5) Improvement of Data Accuracy of Traffic Regulation Information	67
Moto Baba (JARTIC), Makoto Maeda (TOSCO CORPORATION), Ryo Sakaguchi (Dawn Corporation)	
6) Technological Development for Traffic Signal Control and Emergency Vehicles Information Using GNSS (Location Information) and Other Technologies	73
Kenji Sumi (KOITO ELECTRIC INDUSTRIES, LTD.)	

(2) Technological Development Concerning the Transmission of Traffic Environment Data 80

Research for V2X Communication for Cooperative Driving Automation (Overview)	80
Hideaki Sukanuma (TOYOTA MOTOR CORPORATION)	
1) Research on Communication Methods to Realize Cooperative Automated Driving Use Cases	85
Satoshi Kimura, Takeshi Nunomoto (NEC Corporation), Masato Ogawa, Tomoaki Konishi (KYOCERA Corporation)	
2) Development of New Technologies, V2X and Others, for Communication	94
Kinya Asano, Shoichi Nakabayashi (Oki Electric Industry Co., Ltd.), Satoshi Kimura, Masahiro Ohtsuka (NEC Corporation)	
3) Research and Development Concerning the Collection and Transmission of Mid-Scale Network Information	99
Tomohiko Saito, Shota Taki (NTT Communications Corporation)	

Section 3 Ensuring the Safety of Automated Driving 104

Technological Development and Education for Enhanced Safety (Overview)	104
Osamu Hosaka, Hiroaki Kimura (Cabinet Office)	
1) Development of Driving Intelligence Validation Platform (DIVP®) for Automated Driving Safety Assurance	108
Hideo Inoue (Kanagawa Institute of Technology)	
2) Research on the Recognition Technology Required for Automated Driving Technology (Levels 3 and 4)	121
Naoki Suganuma, Keisuke Yoneda, Ryo Yanase, Akisue Kuramoto (Kanazawa University), Takayoshi Yamashita, Hironobu Fujiyoshi (Chubu University), Junichi Meguro (Meijo University)	
3) Research of New Cyberattack Techniques and Countermeasure Technologies	130
Ken Okuyama, Naohide Waguri, Shinichi Kan, Yuki Imagawa (PwC Consulting LLC)	
4) Research of Education Methods for Advanced Automated Driving Systems	135
Makoto Itoh, Huiping Zhou (University of Tsukuba), Yoshiko Goda, Masashi Toda (Kumamoto University), Maki Arame, Junko Handa (Polytechnic University of Japan)	
5) Research on Communication between Low-Speed Automated Transportation and Logistics Services Vehicles and Surrounding Traffic Participants	139
Tatsuru Daimon, Masahiro Taima, Jieun Lee, Tomoyuki Furutani (Keio University)	
6) Research of HMI for Advanced Automated Driving Systems	145
Toshihisa Sato, Kunihiko Hasegawa, Yanbin Wu, Ken Kihara (National Institute of Advanced Industrial Science and Technology (AIST)), Kimihiro Nakano, Yang Yo (The University of Tokyo)	

Section 4 A Society with Automated Driving 150

(1) Automated Driving Mobility Services in Regional Communities	150
Automated Driving Transportation Services in Rural Areas (Overview)	150
Yoshiyuki Kato (Highway Industry Development Organization)	
1) Establishing the Environment for the Deployment of Transportation Services Relying on Automated Driving ...	154
Yoshiyuki Kato (Highway Industry Development Organization)	
(2) Public Acceptance of Automated Driving	162
Initiatives for Fostering Public Acceptance (Overview)	162
Yuichi Araki, Hiroaki Kimura (Cabinet Office)	
1) Research and Evaluations for Fostering Public Acceptance	166
Yukiko Miyaki (DAI-ICHI LIFE RESEARCH INSTITUTE INC.)	
2) Development of Assessment Methodology for Socioeconomic Impacts of Automated Driving Including Traffic Accident Reduction	173
Yoshihiro Suda (The University of Tokyo), Hiroaki Miyoshi (Doshisha University)	
3) Projects to Foster Public Acceptance	180
Tadashi Hirota (DENTSU MEITETSU COMMUNICATIONS INC.), Hiroshi Kimura (SC-ABEAM AUTOMOTIVE CONSULTING)	
4) Research for Automated Driving Bus Friendly to Persons with Disabilities or Reduced Mobility and Orientation	189
Keiji Adachi, Soichiro Shibata, Ai Ikenaga, Ryo Tachikawa (NTT DATA INSTITUTE OF MANAGEMENT CONSULTING, Inc.)	

Section 5 Data Connection and Use to Achieve Society 5.0 195

Building and Designing a Geographic Architecture (Overview)	195
Raita Hiraoka, Hiroaki Kimura (Cabinet Office)	
1) Design of Geographical Data Architecture — Building and Promoting a Traffic Environment Data Portal Site ...	199
Naoki Iso (NTT DATA Corporation)	
2) Resolving Social Issues in Cities Popular with Tourists	207
Noriyuki Hayashi, Naohisa Komiyama, Yurie Toyama, Takahiro Kashiwa, Hiroki Ozu, Wataru Uchida (Mitsubishi Research Institute, Inc.), Kazuhiro Noguchi, Taro Morita, Natsuha Makino, Taigo Mitsuhara (MRI Research Associates, Inc.)	
3) Research to Realize More Effective Logistics System with Probe Vehicle Data	211
Yukihiko Akao, Masaaki Kanazawa, Daijiro Sato (NX Logistics Research Institute and Consulting, Inc.)	
4) Utilization and Application of Probe Data to Road Maintenance and Management	218
Hirokazu Ichikawa, Atsushi Takenouchi, Naohiro Uchiyama, Shinichi Nedu, Kazuki Tokunaga (Pacific Consultants Co., Ltd.)	

Section 6 Promoting International Cooperation 222

Overview	222
Manabu Umeda (The University of Tokyo, Collaborative Research Coordinator for SIP-adus)	
1) SIP-adus Workshop	227
Megumi Funahashi (New Energy and Industrial Technology Development Organization (NEDO))	

2) Japanese-German and Japanese-European Cooperation	230
Manabu Umeda (The University of Tokyo, Collaborative Research Coordinator for SIP-adus)	
3) Dynamic Maps	234
Satoru Nakajo (The University of Tokyo)	
4) Human Factors	238
Satoshi Kitazaki (National Institute of Advanced Industrial Science and Technology (AIST))	
5) Safety Assurance	242
Hideaki Sato (TOYOTA MOTOR CORPORATION)	
6) Connected Vehicles	247
Masanori Misumi (Mazda Motor Corporation)	
7) Cybersecurity	251
Yasumasa Hirai (TOYOTA MOTOR CORPORATION)	
8) Socioeconomic Impacts	254
Takashi Oguchi (The University of Tokyo)	
9) Service and Business Implementation	257
Yurie Toyama (Mitsubishi Research Institute, Inc.)	

Section 7 Other Achievements and Activities 260

Other Achievements and Activities	260
Takahiro Tanaka (New Energy and Industrial Technology Development Organization (NEDO))	

Section 8 Conclusion and Outcomes through SIP-adus to be Inherited 264

1) Looking Back upon SIP-adus History	264
Seigo Kuzumaki (SIP-adus Program Director, TOYOTA MOTOR CORPORATION)	
2) SIP-adus and Mission Oriented STI Policy	268
Tateo Arimoto (National Graduate Institute for Policy Studies)	
3) SIP-adus Achievement as Heritage and Next Step	
RoAD to the L4	271
Toshio Yokoyama (National Institute of Advanced Industrial Science and Technology (AIST))	
Next Phase of SIP	274
Kenji Ueki (Cabinet Office)	
4) Final Summary of SIP-adus Program –For the Next Generation of Engineers–	277
Seigo Kuzumaki (SIP-adus Program Director, TOYOTA MOTOR CORPORATION)	

References 285

About Japanese National Laws Related to Automated Driving	
The Act for Partial Amendment of the Road Traffic Act	285
Hisaaki Ikeuchi (National Police Agency)	
The Act for Partial Amendment of the Road Act	288
Road Bureau, Ministry of Land, Infrastructure, Transport and Tourism	
The Act for Partial Amendment of the Road Transport Vehicle Act	290
Yoshitaka Tada (Road Transport Bureau, Ministry of Land, Infrastructure, Transport and Tourism)	
Projects List and Publication Status of the Second Phase of SIP Automated Driving for Universal Services	292