ICG WG B:
Enhancement of GNSS Performance, New Services and Capabilities

Application Subgroup (AppSG)

Report on AppSG Activities
"GNSS Applications: for Present and Future"

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AppSG Co-chairs

Seventeenth Meeting of the International Committee on Global Navigation Satellite Systems
October 14-20, Madrid, Spain

International Committee on Global Navigation Satellite Systems

From the ICG-15 Joint Statement

18. The Working Group recognized the efforts made by its application subgroup. *Based on the joint statement of the fourteenth meeting of ICG, the application subgroup proposed to start a new initiative entitled "GNSS applications: for present and future", to survey GNSS applications that identify challenges and facilitates the development of solutions that serve society. These actions were intended to provide assistance, lessons learned and guidance to GNSS users. This initiative would lead to a research report entitled "GNSS applications for sustainable development: case studies".*
19. Further enhancements were identified to create opportunities for greater participation and to attract new contributions to the application subgroup. All members of the working groups were encouraged to take a proactive role in support of this new initiative of the application subgroup.
20. The application subgroup intended to participate in important GNSS conferences and events to promote GNSS application development and to obtain information about trends in GNSS applications in line with the new initiative. *The subgroup also intended to support the workshops on the applications of GNSS of the Office for Outer Space Affairs.*

Major AppSG Activities

- Since ICG-15, AppSG has
  - Rebuilt AppSG which include 20+ active experts.
  - Hold its monthly virtual meetings, at which various issues were discussed, presentations from AppSG members were made. China, Japan, EU, and India were among active participants of the meetings.
  - Supported "*the workshops on the applications of GNSS of the Office for Outer Space Affairs" (2021, 2022)"*.
  - Participated in the MGA Conference.
  - Attended ICG-16 and the WG-B interim meetings.
  - Been working together intensively to issue the first edition of the booklet by early 2024.

An AppSG Monthly Meeting

Record of AppSG Activities

Activity	When	Who	Major Result
Workshop on GNSS Applications of Office for Outer Space Affairs	Oct 29, 2021	Co-chairs*, C, E, I, J	• Introduce AppSG activities and • 5 presentations of GNSS applications were made
AppSG planning meeting	Dec 2021 -Mar 2022	Co-chairs	• Set up interstate rotational role of the AppSG annual meeting arrangement • The study area selection method was investigated.
Meeting #1	Apr 11, 2022	J*, C, E, I, K	• Discussed focused study areas of GNSS applications towards SDGs, select the initial focused area to mitigate global warming effect • 6 presentations made
Meeting #2	May 3, 2022	C*, E, I, J, K	• Discussed how to define narrower study areas at cross of SDGs and global warming • 1 presentation made
Meeting #3	Jun 29, 2022	E*, C, I, J, K	• Continued to investigate the potential study areas, 6 presentations made
Meeting #4	Aug 3, 2022	I*, C, E, J, K	• Discussed and agreed on study area for SDGs +global-warming, basic booklet template and depth of description • 3 presentations made
Meeting #5	Sep 9, 2022	J*, C, E, I, K	• Agreed to include GNSS+EO app and GNSS applications not on the market but under final development • 2 presentations made

*: Meeting host; C-China, E-EU, I-India, J-Japan, K-Korea

Record of AppSG Activities

Activity	When	Who	Major Result
Meeting #6	Oct. 12, 2022	Co-chair A,C, E, I, J, K	• Introduced AppSG Interim Report at WG-B in ICG-16 • 2 presentations of GNSS applications were made by India and Japan
Meeting #7	Nov. 24, 2022	C*, E, I, J	• Wrap up the result of ICG-16 and AppSG report at WG-B • Discussed and agreed to have Mr. Giovanni from UESPA joins UNOOSA's Workshop as AppSG representative and make report.
Meeting #8	Jan. 10, 2023	E*, C, I, J	• Discussed share holder for the booklet manuscript and its management to be set by EUSPA • 2 presentations of GNSS application were made by Japan and China
13th MGA in Chiang Mai	Jan. 31, 2023	Co-chair, C, I, J	• Introduced ICG, WG-B and AppSG activities and contribution to GNSS enhancement • 2 presentations of GNSS application were made by China and Japan
Meeting #9	Feb 14, 2023	I*, C, E, J	• Wrapped up AppSG contribution at 13th MGA • 1 presentation on BDS short massage service wad made by China • Reported that NASA had agreed to review and brush up booklet manuscript.
Meeting #10	Mar. 23, 2023	J*, C, E. I	• Discussed on revised table of contents and agreed co-chairs to propose members' assignment to lead each chapter. • 2 presentations of GNSS applications were made by China and Japan.
Meeting #11	Jun 19, 2023	C*, E, I, J	• Discussed and agreed on revised table of contents, leader/sub-leader assignment for each chapter, and action/time schedule for manuscript preparation up to 1st edition issue.

*: Meeting host; C-China, E-EU, I-India, J-Japan, K-Korea

Record of AppSG Activities

International Committee on Global Navigation Satellite Systems

Activity	When	Who	Major Result
WG-B Interim Meeting	Jul. 17, 2023	Co-chairs	• Introduced AppSG Interim Report at WG-B
Meeting #14	Aug. 3, 2023	C, E, I, J*	• Debriefed the WG-B Interim Meeting • Refined the structure of the booklet
Meeting #15	Sep. 14, 2023	C*, E, I, J	• Further refined the structure and WBS of the booklet
ICG-17	October	Co-chairs, C, I, J, E	• Presented the AppSG Activity Report

*: Meeting host; C-China, E-EU, I-India, J-Japan, K-Korea

The Booklet - Table of Contents

Cover Page of the Booklet

GNSS Applications for Sustainable Development : Case Studies

The cover page

Insert a picture

Concrete Image of Major Chapters

- **Introduction**
  1. **The 2030 Agenda for Sustainable Development and ICG AppSG Attempt**
  2. **The 17 goals**

Focus on:

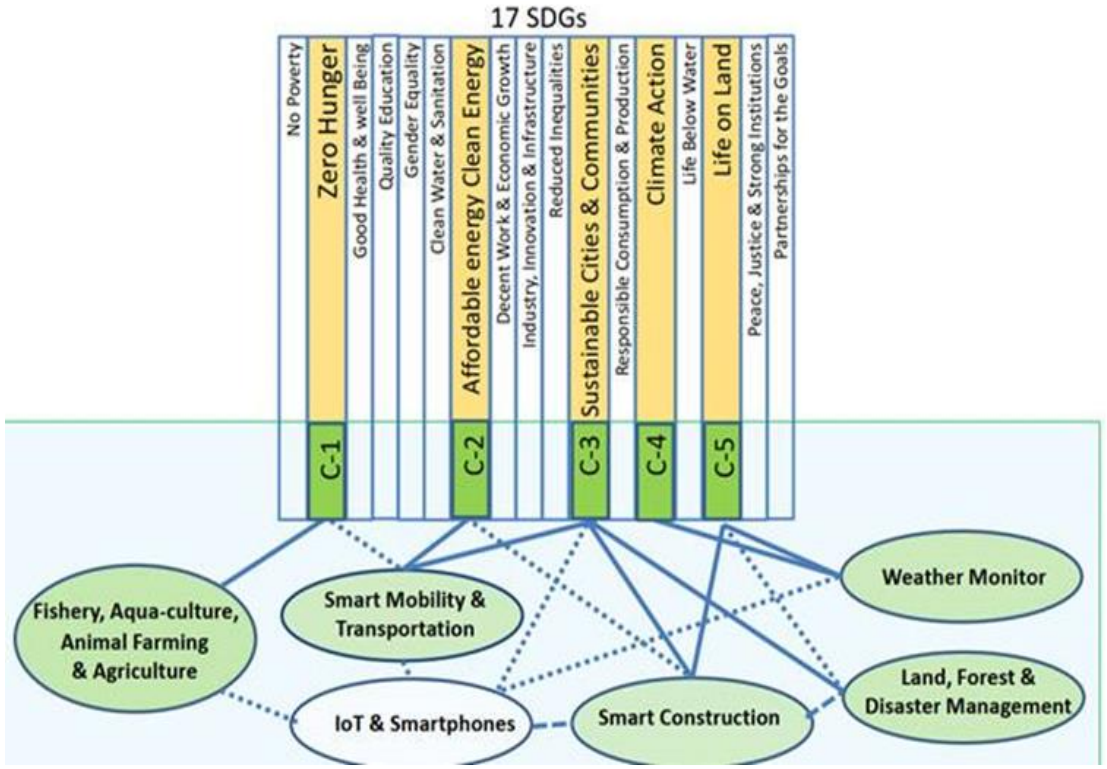
1. Zero Hunger
2. Affordable and Clean Energy
3. Sustainable cities and communities
4. Climate Action
5. Life on land

Concrete Image of Major Chapters

1.2 ICG AppSG Attempt

1.2.1 Introduction of AppSG Activity

1.2.2 Purpose of the booklet

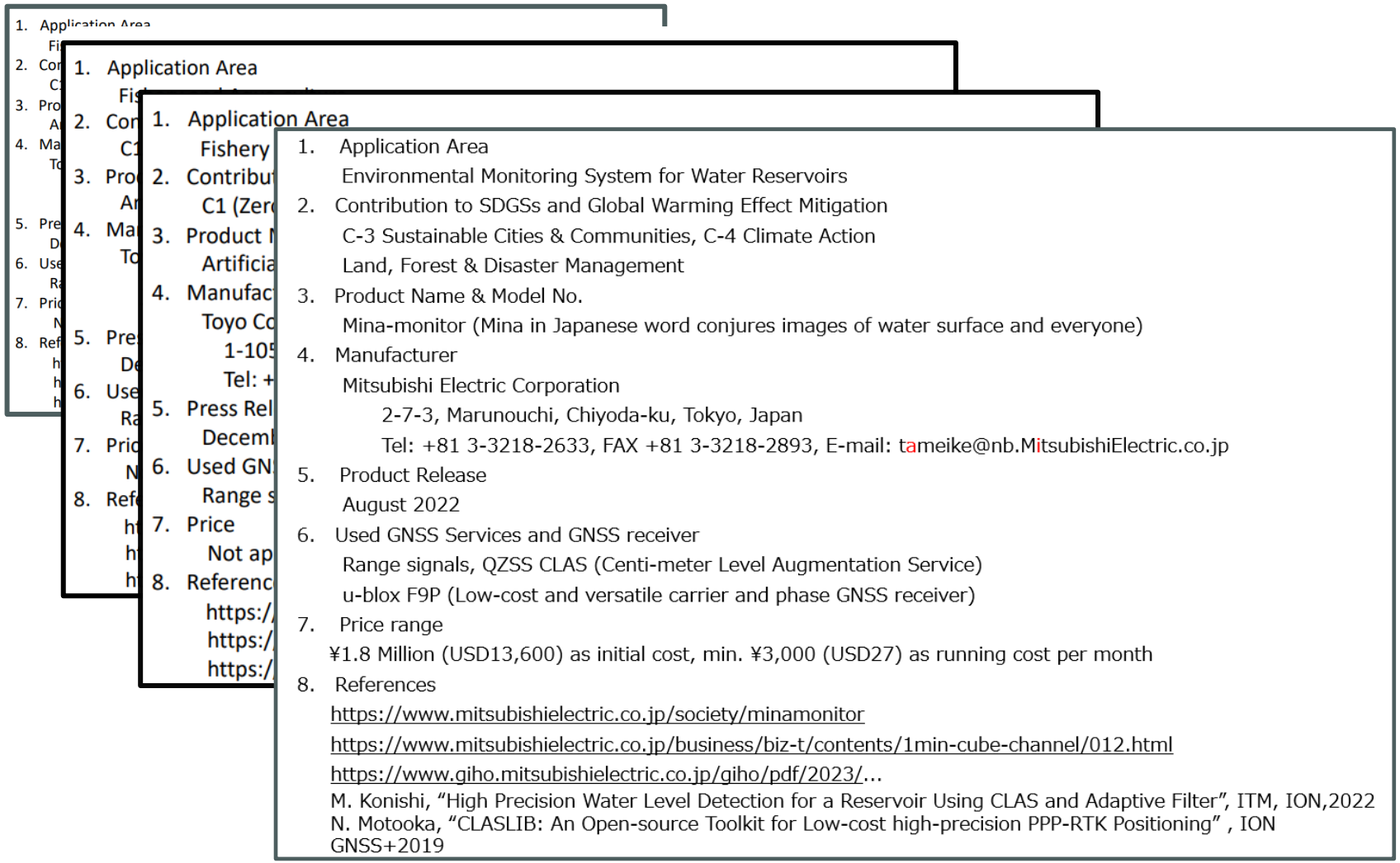


SDG's	GNSS Applications for Global Warming Threat Mitigation	
Zero Hunger	Fishery	Direct link
Zero Hunger	Aqua-culture	Direct link
Zero Hunger	Animal farming	Direct link
Zero Hunger	Agriculture	Direct link
Zero Hunger	IoT & Smartphones	Indirect Link
Zero Hunger	Smart mobility & Transportation	Indirect Link
Affordable and Clean Energy	Smart mobility & Transportation	Direct link
Affordable and Clean Energy	Smart Construction	Indirect Link
Affordable and Clean Energy	IoT & Smartphones	Indirect Link
Sustainable cities and communities	Smart mobility & Transportation	Direct link
Sustainable cities and communities	Smart Construction	Direct link
Sustainable cities and communities	Land, Forest & Disaster Management	Direct link
Sustainable cities and communities	IoT & Smartphones	Indirect Link
Climate Action	Weather monitor	Direct link
Life on land	Weather monitor	Direct link
Life on land	Smart Construction	Direct link
Life on land	Land, Forest & Disaster Management	Indirect Link
Life on land	IoT & Smartphones	Indirect Link
Life on land	Smart Construction	Indirect Link
Life on land	IoT & Smartphones	Indirect Link

Concrete Image of Major Chapters

3. CASE STUDIES

3.1 Table of GNSS Application Cases



1. Application Area
   Environmental Monitoring System for Water Reservoirs
2. Contribution to SDGSs and Global Warming Effect Mitigation
   C-3 Sustainable Cities & Communities, C-4 Climate Action
   Land, Forest & Disaster Management
3. Product Name & Model No.
   Mina-monitor (Mina in Japanese word conjures images of water surface and everyone)
4. Manufacturer
   Mitsubishi Electric Corporation
   2-7-3, Marunouchi, Chiyoda-ku, Tokyo, Japan
   Tel: +81 3-3218-2633, FAX +81 3-3218-2893, E-mail: tameike@nb.MitsubishiElectric.co.jp
5. Product Release
   August 2022
6. Used GNSS Services and GNSS receiver
   Range signals, QZSS CLAS (Centi-meter Level Augmentation Service)
   u-blox F9P (Low-cost and versatile carrier and phase GNSS receiver)
7. Price range
   ¥1.8 Million (USD13,600) as initial cost, min. ¥3,000 (USD27) as running cost per month
8. References
   https://www.mitsubishielectric.co.jp/society/minamonitor
   https://www.mitsubishielectric.co.jp/business/biz-t/contents/1min-cube-channel/012.html
   https://www.giho.mitsubishielectric.co.jp/giho/pdf/2023/...
   M. Konishi, "High Precision Water Level Detection for a Reservoir Using CLAS and Adaptive Filter", ITM, ION,2022
   N. Motooka, "CLASLIB: An Open-source Toolkit for Low-cost high-precision PPP-RTK Positioning" , ION GNSS+2019

WBS up to the 1st Draft Issue

International Committee on Global Navigation Satellite Systems

						Jul	Aug	Sep	Oct	Nov	Dec	Jan
Preparation					Google File Holder by China ▽							
Chapt.	Title	Estimated Volume (sheets)	Leader	S-leader	Information Provider							
Executive summary		2	Co-chairs						Manuscript	group check	C&R by NASA	
1	Introduction											
1.1	The 2030 Agenda for Sustainable Development and ICG AppSG	3	EC	Co-chairs		Manuscript	group check	C&R by NASA				
1.1.1	The 17 goals	3	EC	Co-chairs		Manuscript	group check	C&R by NASA				
1.2	ICG AppSG Attempt	3	Co-chairs	all		Manuscript	group check	C&R by NASA				
1.2.1	Introduction of AppSG Activity	2	Co-chairs	all		Manuscript	group check	C&R by NASA				
1.2.2	Purpose of the booklet	2	Co-chairs	all		Manuscript	group check	C&R by NASA				
1.3	Overview of global and regional satellite constellations for PNT in service											
1.3.1	Services per each constellation	6	Co-chairs	all	each state per	Sample Manuscript	Manuscript	group check	C&R by NASA			
1.3.2	Principles of each service: One page per service(Const. PNT, Message, Augment.,SAR, Others	16		all	each state per constallation	Sample Manuscript	Manuscript	group check	C&R by NASA			
1.3.3	How to use each service	8		all	each state per constallation	Sample Manuscript	Manuscript	group check	C&R by NASA			
2	**Benefits to Users** – with a focus on the Global warming reduction and **enhancement of GNSS users and Business developers**	3	Co-chairs		AppSG meeting				Manuscript	group check		Final consoridation & 1st Edition Complete (Electrical)
3	Case Studies											
3.1	Table of GNSS Application Cases: Tables already made as per format	15	Co-chairs		each state per constallation				Manuscript	group check	C&R by NASA	
3.2	Major Applications in China	20	C	Co-chairs			Manuscript	Manuscript	group check	C&R by NASA		
3.3	Major Applications in EC	20	EC	Co-chairs			Manuscript	Manuscript	group check	C&R by NASA		
3.4	Major Applications in India	20	I	Co-chairs		Sample Manuscript	Manuscript	Manuscript	group check	C&R by NASA		
3.5	Major Applications in Japan	20	Japan	Co-chairs			Manuscript	Manuscript	group check	C&R by NASA		
3.6	Major Apllications in Unite States of America	?	Japan	Co-chairs			(Manuscript)	(Manuscript)	(group check)	C&R by NASA)		
4	Conclusions and recommendations	3	Co-chairs	all	AppSG meeting				Manuscript	group check	C&R by NASA	
5	Potential Future Evolutions of This Booklet	2	Co-chairs	all	AppSG meeting				Manuscript	group check	C&R by NASA	
Acknowledgments		1	Co-chairs	all					Manuscript	group check	C&R by NASA	
Annexe 1	Methodology	2	TBD	TBD					Manuscript	group check	C&R by NASA	
Annexe 2	List of Sources	3	TBD	TBD						Manuscript	group check	
Annexe 3	List of acronyms	3	TBD	TBD						Manuscript	group check	
Annexe 4	About the authors	2	TBD	TBD					Manuscript	group check	C&R by NASA	

Summary

1. AppSG have been working together intensively to issue the first edition of the booklet by early 2024.
2. All member states have started to make manuscripts of the booklet pursuant to WBS up to 1st Electrical issue.
3. The total volume of the booklet will be about 125 pages in total.