



# Installed Base of GNSS Devices and Total Revenue of GNSS Device Sales in Different Modes of Transport

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## ABSTRACT

Since many years the most frequently method used for position fix in transport are global satellite navigation systems (SNS) as GPS and GLONASS and Satellite Based Augmentation System as EGNOS, GAGAN, MSAS and WAAS. Next global SNS (Galileo and BeiDou) and SBAS (SDCM) and KAAS) are under construction. The generic name given to all these mentioned above systems is Global Navigation Satellite System (GNSS).

Since 2010 GNSS Market Report, edited by the European GNSS Agency (GSA), takes a comprehensive look at the global GNSS market providing detailed analysis per market segment (currently 9 segments) and application type (currently depending on segment 4, 8, 11 or 13). In order to show the different distributions of these two parameters in different continents the world was divided into six regions (European Union, Russia and Europe without European Union, North America, Asia-Pacific, Middle East and Africa, South America and Caribbean). The distributions of installed base of GNSS device and total revenue of GNSS devices sales by region and application in selected years for all four modes of transport (area, maritime, rail and road) are presented. In these analysis new and emerging GNSS trends by all these modes and the population numbers in each region was taken into account also.

**KEYWORDS:** satellite navigation system, GNSS, GNSS devices, mode of transport

## 1. Introduction

Since many years the most frequently method used for position in all modes of transport are satellite navigation systems (SNS). At the time of this writing (January 2018) two global SNSs, American GPS and Russian GLONASS, and four Satellite Based Augmentation Systems (SBAS), EGNOS in Europe, GAGAN in India, MSAS in Japan and WAAS in USA, are fully operational. Two next global SNSs, Galileo in Europe and BeiDou in China, and two next SBASs, SDCM in Russia and KAAS in Korea are under construction. Additionally there are two regional SNSs, one already operational – NAVIC (NAVigation Indian Constellation) in India, one still under construction – QZSS (Quasi-Zenith Satellite System) in Japan. The generic name given to all these mentioned above systems is Global Navigation Satellite System (GNSS) [1-6].

Since 2010 GNSS Market Report, edited by the European GNSS Agency (GSA), takes a comprehensive look at the global GNSS market providing detailed analysis per market segment. The number of these segment increases continuously, in first issue of this Report (2010) it was four segments only, in last issue (May 2017) it was nine already, four segments of transport, area, maritime, rail and road, and Agriculture, Drones, Location Based Service (LBS), Surveying and Timing Synchronization [7-8].

In order to show the distributions of installed base of GNSS devices and total revenue in different continents the world was divided into six regions:

- European Union,
- Russia and Europe without European Union,
- North America, USA and Canada,
- Asia-Pacific without Middle East but with Australia and New Zealand,

- Middle East and Africa,
- South America, Middle America with Mexico and Caribbean.

**Table 1. Status of global, regional and augmentation systems in different years [own study based on [3, 6, 9]]**

System		2015	2020	2025
global	BeiDou	operational in China	operational	operational
	Galileo	under construction	operational	operational
	GLONASS	operational	operational	operational
	GPS	operational	operational	operational
regional	NAVIC	under construction	operational	operational
	QZSS	under construction	under construction	operational
augmentation	EGNOS	operational	operational	operational
	GAGAN	under construction	operational	operational
	KAAS	under construction	under construction	operational
	MSAS	operational	operational	operational
	SDCM	under construction	operational	operational
	WAAS	operational	operational	operational

The distributions are presented for three selected years: 2015 and forecast for 2020 and 2025. For each of these years the status of all global, regional and augmentation SNSs is showed in the Table 1 [3, 6, 9]. In 2015 BeiDou was operational in China just and six systems were under construction, five years later two systems only, in 2025 all systems mentioned in this table will be fully operational. It means that the greater number of the integrated receivers will be available for the users in all modes of transport [10].

**Table 2. Aviation transport, the distribution (in thousands units) of installed base of GNSS devices by region in different years [own study based on [7-8]]**

Region	2015		2020		2025	
	number	%	number	%	number	%
European Union	148	17	180	16	188	16
Europe without EU	8	1	8	1	13	1
North America	588	66	749	65	773	64
Asia + Pacific	98	11	150	13	161	13
Middle East + Africa	12	1	8	1	26	2
South America + Caribbean	36	4	45	4	47	4
Total	890	100	1140	100	1208	100

**Table 3. Maritime transport, the distribution (in thousands units) of installed base of GNSS devices by region in different years [own study based on [7-8]]**

Region	2015		2020		2025	
	number	%	number	%	number	%
European Union	1941	22	2470	20	3089	20
Europe without EU	176	2	274	2.2	397	2.5
North America	4427	51	5785	46.3	5957	38
Asia + Pacific	1795	20	2823	23	4574	29
Middle East + Africa	368	4	824	6.5	1132	8
South America + Caribbean	118	1	250	2	441	2.5
Total	8825	100	12426	100	15590	100

## 2. The distribution of installed base of GNSS devices by region

The distributions of installed base of GNSS devices by region in different years for all four modes of transport, aviation, maritime, rail and road are presented in the Tables 2, 3, 4 and 5, respectively. We can resume that:

**Table 4. Rail transport, the distribution (in thousands units) of installed base of GNSS devices by region in different years [own study based on [7-8]]**

Region	2015		2020		2025	
	number	%	number	%	number	%
European Union	38	30	160	24	370	23
Europe without EU	16	12	110	16	232	15
North America	13	10	145	21	320	20
Asia + Pacific	50	38	225	33	560	35
Middle East + Africa	-	-	36	5	63	4
South America + Caribbean	13	10	4	1	55	3
Total	130	100	680	100	1600	100

**Table 5. Road transport, the distribution (in millions units) of installed base of GNSS devices by region in different years [own study based on [7-8]]**

Region	2015		2020		2025	
	number	%	number	%	number	%
European Union	88	29	162	30	263	31
Europe without EU	12	4	30	6	56	6
North America	79	25	130	24	179	21
Asia + Pacific	95	31	162	30	270	31
Middle East + Africa	9	3	16	3	28	3
South America + Caribbean	24	8	40	7	67	8
Total	307	100	540	100	863	100

- the number of installed base of GNSS devices between 2015 and 2025 year will increase in all four modes of transport, in the case of aviation 36%, maritime 77%, road 2.8 times and rail 12 times,
- in aviation transport the part of North America is and in 2025 will be significantly dominant (64%), the part of European Union and Asia-Pacific is dozen or so, the part of all other three regions is between 1 and 4%, incessantly,
- in maritime transport the biggest part is and will be in the case of North America but its part decreases, from 51% in 2015 to 38% in 2025, the part of Asia-Pacific region increases also, from 20% in 2015 to 29% ten years later, for all three other regions this percentage is and will be no greater than 8,
- in rail transport the biggest part is and will be in the case of Asia-Pacific, the part of European Union decreases while in North America and in Europe without EU increases, the part of two rest regions is less significantly,
- in road transport the part of European Union and Asia-Pacific is and will be almost the same (about 30%), the part of North America region decreases (from 25% to 21%), the part of three others regions is and will be significantly lower (no more than 8%).

**Table 6. Aviation transport, the distribution (in thousands units) of installed base of GNSS devices by application in different years [own study based on [7-8]]**

Application	2015		2020		2025	
	number	%	number	%	number	%
Commercial Aviation	33	4	40	3	37	3
Regional Aviation	16	2	16	1	17	1
General & Business Aviation	233	26	293	26	308	25
Search and Rescue (ELT)	57	6	98	9	114	9

Surveillance	29	3	94	8	81	7
Search and Rescue (PLB)	114	13	151	13	191	17
General Aviation VFR	408	46	448	40	460	38
Total	890	100	1140	100	1208	100

### 3. The distribution of installed base of GNSS devices by application

The distributions of installed base of GNSS devices by application in different years for all four modes of transport, aviation, maritime, rail and road are showed in the Tables 6, 7, 8 and 9, respectively. The number and kind of the application depend on the mode of transport. The biggest number (13) and the lowest (4) is in the case of maritime transport and rail transport, respectively. In maritime transport the dominant application is and will be recreational navigation (more than 83%), in rail transport it is asset management, the part of this application increases (82% in 2025). In road transport the biggest number of GNSS devices is in the case of application in vehicle systems (about 25%), in aviation transport it is general aviation (about 40%).

**Table 7. Road transport, the distribution (in millions units) of installed base of GNSS devices by application in different years [own study based on [7-8]]**

Application	2015		2020		2025	
	number	%	number	%	number	%
Personal Navigation Devices	111	36	98	18	69	8
Road User Charging	-	-	5	1	23	3
Insurance telematics	21	7	66	12	82	10
In-Vehicle Systems	150	49	273	51	425	49
eCall	18	6	71	13	200	23
Smart Tachograph	-	-	7	1	2	-
Advanced Driver Assistance Systems (ADAS)	-	-	9	2	29	3
Fleet Management Systems	7	2	11	2	33	4
Total	307	100	540	100	863	100

**Table 8. Rail transport, the distribution (in thousands units) of installed base of GNSS devices by application in different years [own study based on [7-8]]**

Application	2015		2020		2025	
	number	%	number	%	number	%
Asset Management	86	66	537	79	1303	82
Passenger Information	33	26	55	8	82	5
Signaling and train control applications	3	2	72	11	135	8
Driver Advisory Systems	8	6	16	2	80	5
Total	130	100	680	100	1600	100

**Table 9. Maritime transport, the distribution (in thousands units) of installed base of GNSS devices by application in different years [own study based on [7-8]]**

Application	2015		2020		2025	
	number	%	number	%	number	%
Search and Rescue (PLB)	277	3.1	390	3.1	512	3.2
Search and Rescue (EPIRB)	182	2.0	233	1.8	287	1.8
Search and Rescue AIS-MOB)	80	0.9	241	1.9	354	2.2
Search and Rescue (AIS-SART)	30	0.3	28	0.2	56	0.3
Traffic Management	59	0.7	113	0.9	146	0.9
Homeland Security	85	0.9	95	0.8	113	0.7
IWW Traffic info	108	1.2	167	1.3	233	1.5
Ports	–	–	67	0.5	143	0.9
Marine Engineering	21	0.2	26	0.2	33	0.2
Fishing vessels	80	0.9	118	0.9	141	0.9
IWW Navigation	233	2.6	195	1.6	266	1.7
Merchant Navigation	175	1.9	327	2.6	406	2.6
Recreational Navigation	7730	85.3	10660	84.2	13120	83.0
Total	9060	100	12660	100	15810	100

## 4. The distribution of the number of installed base and total revenue of GNSS devices by region

The distributions of the number of installed base (in units) and total revenue of GNSS devices in euro (bln = 10<sup>9</sup>) by region in 2015 and 2025 year are presented in the Table 10. We can say that:

- the part of installed base GNSS devices and total revenue is and will be the biggest in the case of Asia-Pacific, more than 46% and nearly 35%, respectively,
- the part (in percentage) of European Union and North America in the world market of installed base GNSS devices and total revenue is and will be almost the same, in the case of GNSS devices (a dozen or so), both revenue more than 20%,
- the part of the rest three regions is and will be less than 10%,
- the number of installed base GNSS devices will increase from 4.1 bln to 9.2 bln (220%), also the value of revenue will increase significantly from 95 bln euro to almost 270 bln euro (about 280%),
- the part of three regions (Europe Union, Europe without EU and North America) unlike other three in the world market of installed base of GNSS devices and total revenue in 2025 will be less than in 2015

If the population numbers in 2015 in three regions of the world – Europe with Russia (745 mln), Asia-Pacific (4.3 bln) and North America, USA and Canada (356 mln) will be taken into account the biggest number of GNSS devices per person is in North America (1.9) and Europe with Russia (1.2), in Asia-Pacific region 0.4 only. The biggest revenue per person is in the case of North America (80 euro) and Europe with Russia (38 euro), an Asia-Pacific it is 7 euro only.

**Table 10. The number of installed base of GNSS devices (in units) and total revenue (in euro), the distribution by region in different years [own study based on [7-8]]**

Region	Parameter	2015		2025	
		value	%	value	%
European Union	installed base	666 mln	16.0	1.2 bln	13.2
	revenue	21.9 bln	23.1	59.4 bln	22.2
Europe without EU	installed base	264 mln	6.3	570 mln	6.2
	revenue	6.3 bln	6.7	15.8 bln	5.9
North America	installed base	683 mln	16.4	1.2 bln	13.3
	revenue	24.3 bln	25.6	61.9 bln	23.1
Asia + Pacific	installed base	1.9 bln	46.1	4.3 bln	46.8
	revenue	32.7 bln	34.5	96.8 bln	36.1
Middle East + Africa	installed base	322 mln	7.7	1.1 bln	11.7
	revenue	3.8 bln	4.0	18.5 bln	6.9
South America + Caribbean	installed base	312 mln	7.5	818 mln	8.8
	revenue	5.8 bln	6.1	15.7 bln	5.8
Total	installed base	4.147 bln	100	9.188 bln	100
	revenue	94.8 bln	100	268.1 bln	100

## 5. Conclusion

- the number of installed base of GNSS devices increase and will increase in all six regions and in all four modes of transport, in rail transport in particular. In the case of road transport this number in 2025 can be greater than 860 millions,
- the dominant applications in maritime and rail transport, greater than 80%, is recreational navigation and asset management, respectively,
- the part of the region Asia-Pacific in the world market of the installed base and total revenue of GNSS devices is and will be the biggest,
- in all modes of transport the part of North America, European Union and Asia-Pacific is the dominant, in the case of maritime and road transport, in particular.

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