

On the Use of GPS CORS for Cadastral Survey in Indonesia

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GPS CORS In Indonesia

◉ Government Agencies

- Bakosurtanal CORS (IPGSN)
- BPN CORS (SRIKANDI network)
- LIPI CORS (SUGAR network)

◉ University

- ITB (with GSI, ERI Tokyo Univ and Bakosurtanal)
- UGM
- UI

◉ Private Sector

Abidin et al. (2010)

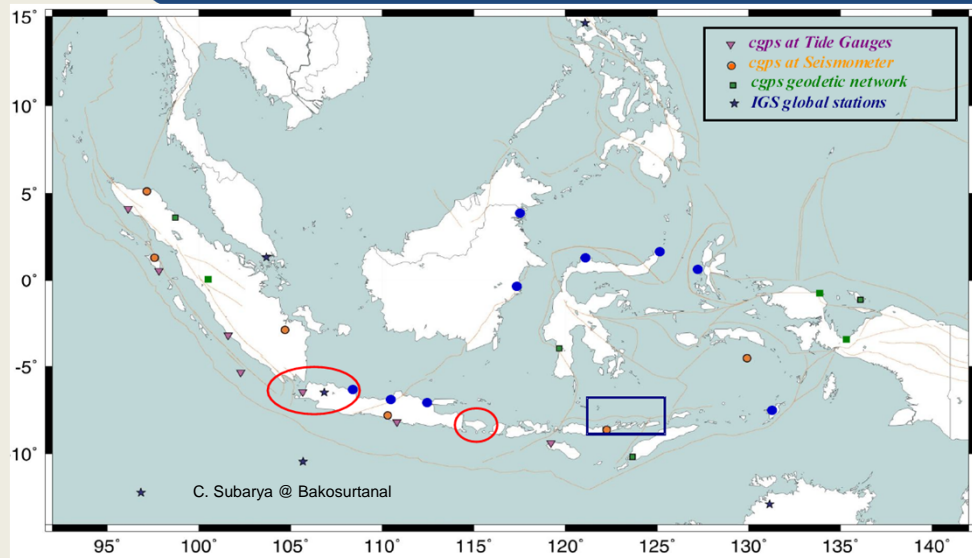
IPGSN : National GPS CORS of Indonesia

- **The Indonesian Permanent GPS Station Network (IPGSN)**
- **Maintained and operated by Bakosurtanal (the National Coordinating Agency for Surveys and Mapping)**
- **All stations of IPGSN use the high precision L1/L2 geodetic type GPS receivers with choke ring antennas and radomes.**
- **GPS data is recorded at 1Hz rate and streamed in real time or near real time of 1 hour latency to the data processing center at Bakosurtanal office in Cibinong, West Java.**

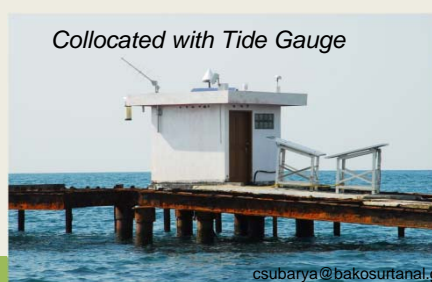
Abidin et al. (2010)

Current Status of IPGSN (99 stations)

April 2011



IPGSN Station Types



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GPS for Cadastral Surveys in Indonesia



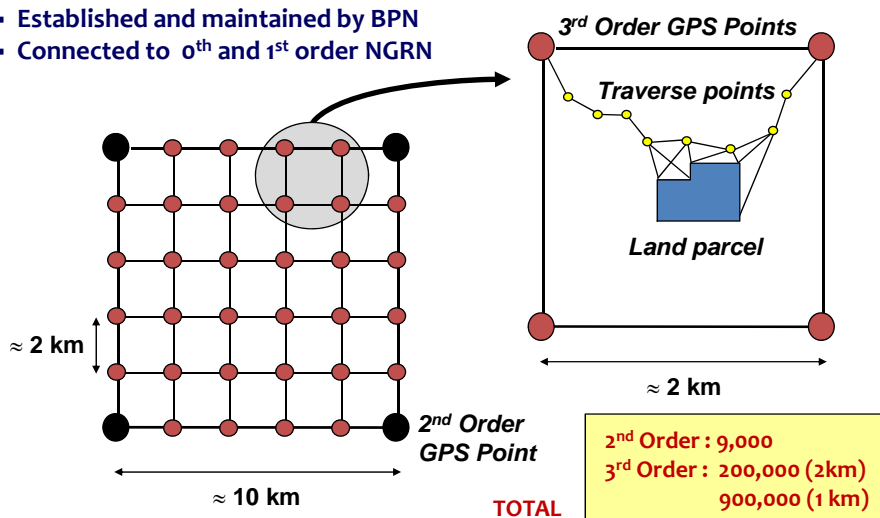
- (1) establishment of the cadastral control network,
- (2) determination of parcel boundary coordinates, and
- (3) reconstruction of parcel boundary points.

Although GPS CORS are starting to be established, GPS is usually implemented in GPS survey static or in a single station GPS RTK modes.

Hasanuddin Z. Abidin, 2009

National Cadastral Reference Networks (NCRNs)

- Established and maintained by BPN
- Connected to 0th and 1st order NGRN

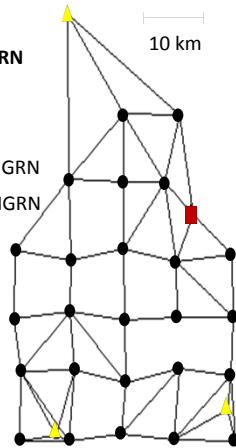


Hasanuddin Z. Abidin, 2010

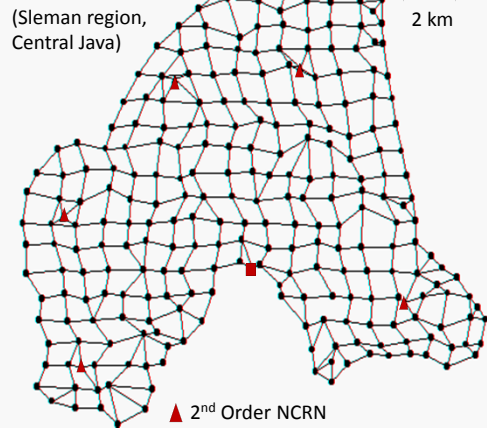
Examples of 2nd and 3rd order NCRN realization

2nd Order NCRN
(East Java)

■ 0th Order NGRN
▲ 1st Order NGRN



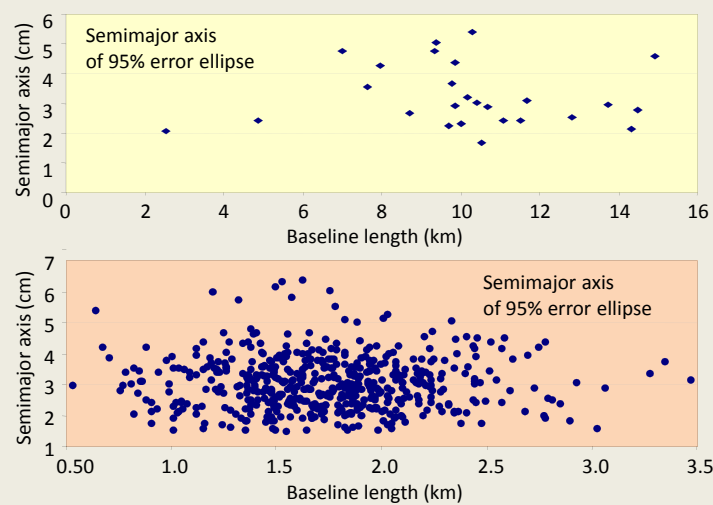
3rd Order NCRN
(Sleman region,
Central Java)



Hasanuddin Z. Abidin, 2010

Typical relative accuracy of 2nd and 3rd order NCRNs

These results are associated with the networks shown in previous slide



Hasanuddin Z. Abidin, 2010

Realization of NCRNs

2nd Order :

- 10 km interval
- 9,000 GPS points
- Realization up to 2010 : 70% (6,699 points)

3rd Order:

- 2 km interval
- 200,000 GPS points
- Realization up to 2010 : 7% (14,085 points)

GPS CORS System is urgently needed to speed up land registration process in Indonesia

Up to 2010, from about 87 million land parcels in Indonesia, only about 46% has been registered.

Hasanuddin Z. Abidin, 2011

BPN GPS CORS Plan in 2009



- To speed up the land administration process in Indonesia.
- GPS CORS of BPN consisting of Class-A and Class-B type stations.
- The Class-A type stations will be established on the ground and have specification and performance comparable to the IPGSN stations
- The Class-B type stations will usually installed on the building, preferably in the land office building in the corresponding areas

Ref : F. H. Adiyanto (2009)

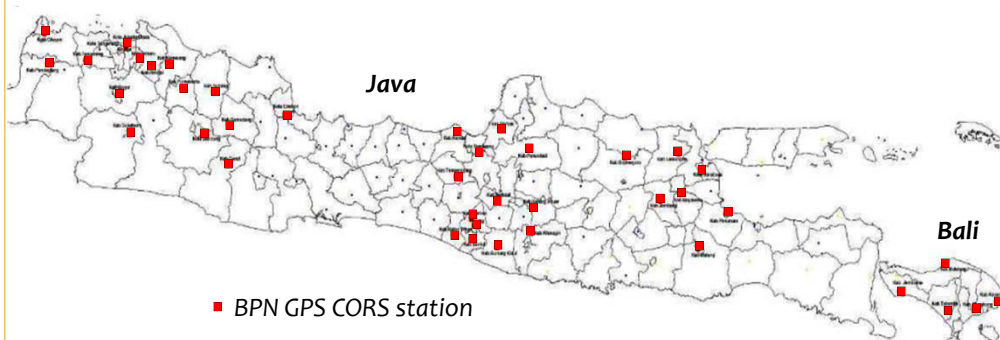
GPS CORS of BPN (National Land Agency)



- All stations of BPN GPS CORS will be equipped with dual-frequency geodetic-type GPS receivers.
- 3 stations around the capital city of Jakarta, i.e. Tangerang, Bekasi and Bogor, have been established and tested.
- In 2010, other 33 CORS stations will be established in Java and Bali and other strategic areas outside Java and Bali.

Ref : F. H. Adiyanto (2009)

BPN GPS CORS Status in 2010



Up to the end of 2010,
40 GPS CORS stations have been established in Java and Bali

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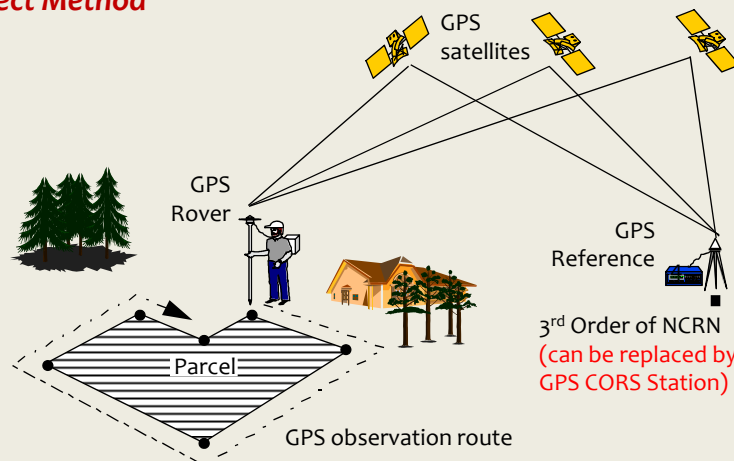
BPN GPS CORS Plan for 2011

- (1) Establishment of other 30 CORS stations in Java,
- (2) Establishment of 23 CORS stations outside Java, i.e. Sumatera, Nusa Tenggara, Kalimantan and Sulawesi;
- (3) Development of BPN GPS CORS website;
- (4) Development of web-based CORS data processing system,
- (5) Determination of new national reference system for cadastral applications (in cooperation with Bakosutanal), and
- (6) Cooperation with CORS users.

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Determination of Parcel Boundary Coordinates

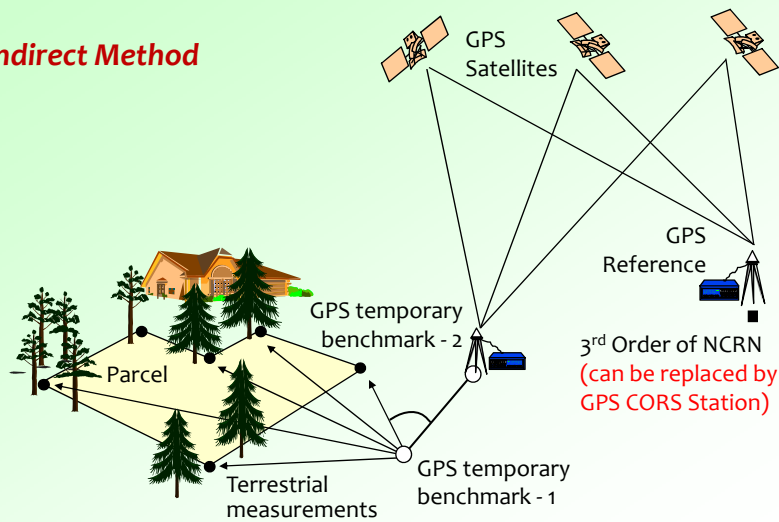
Direct Method



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Determination of Parcel Boundary Coordinates

Indirect Method



Hasanuddin Z. Abidin, 2010

Results of Determination of Parcel Boundary Coordinates

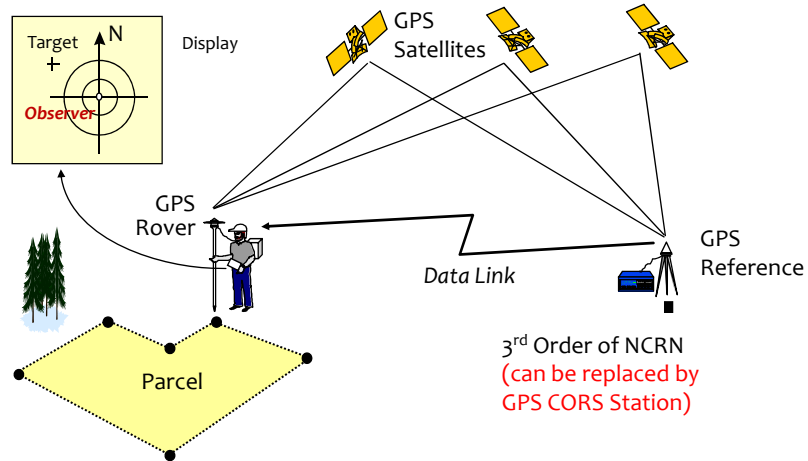
from test cases in Jakarta and Bali involving 40 land parcels with areas less than 10,000 m²

Method	Urban Areas (distance to NCRN benchmark < 5 km)		Rural Areas (distance to NCRN benchmark < 13 km)	
	Parcels per day	Relative Accuracy	Parcels per day	Relative Accuracy
CORS-RTK	30	1-5 cm	20	10-20 cm
GPS rapid static	5	1-5 cm	5	1-5 cm
GPS rapid static + ETS measurement	6	1-5 cm	6	1-5 cm

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Reconstruction of Parcel Boundary Points

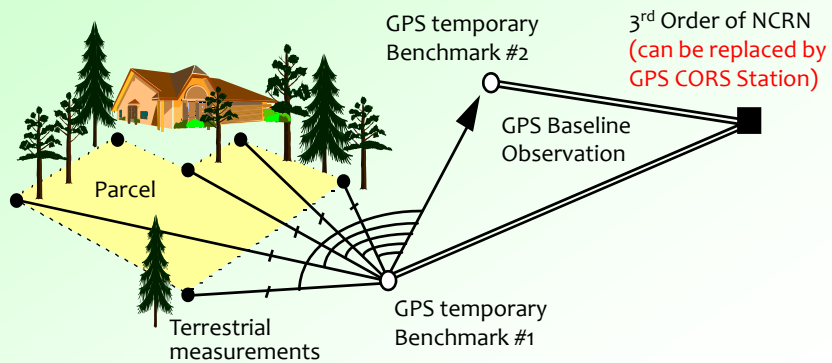
Direct Method



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Reconstruction of Parcel Boundary Points

Indirect Method



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BPN GPS CORS in Indonesia : Challenges and Limitations

1. Communication Link and Infrastructure
2. Continuous Support for Maintenance and Operation
3. Working Culture & Human Resources
4. Capacity Building and Human Resource Development
5. Multi Purpose Utilization

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Closing Remarks

1. Up to 2010, from about 87 million land parcels in Indonesia, only about 46% has been registered. In order to speed up this land registration process, BPN should established as soon as possible the GPS CORS system that can fully support the cadastral surveys all over Indonesian region.
(Speeding up the land registration process)
2. The synergism of this BPN GPS CORS system with the Bakosurtanal IPGSN system should also be realized, both in conceptual and operational domains.
(National Geodetic and Cadastral GPS CORS)

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GPS = Great Places to Smoke

Thank you very much for your attention

