



**CEOS Recovery Observatory
NEPAL DEMONSTRATOR – October 2016**

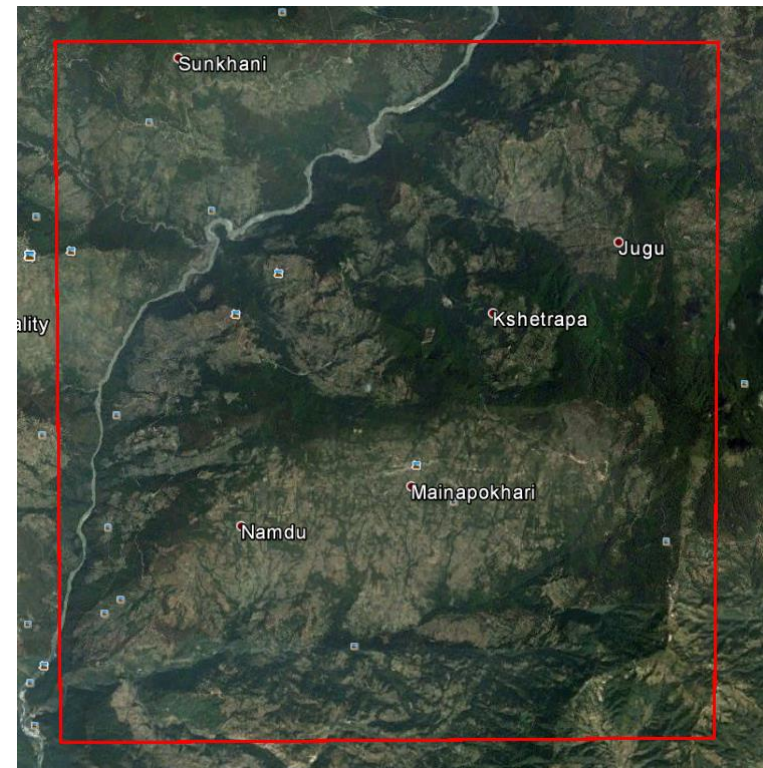
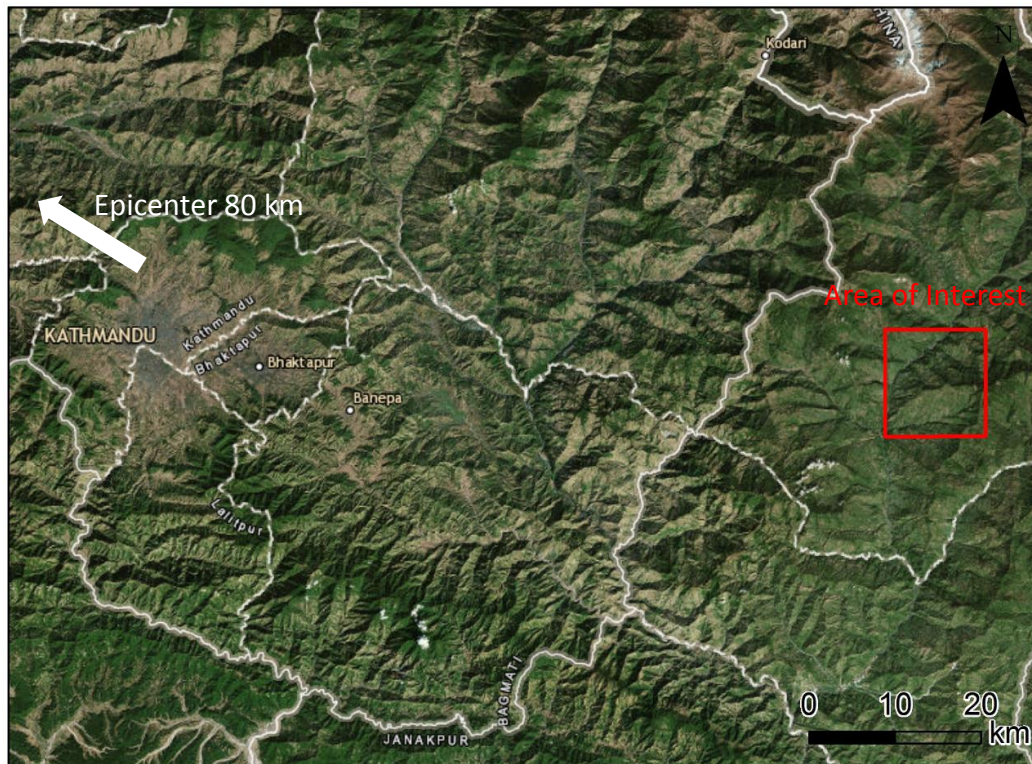
**Progress on the monitoring of the reconstruction after the 2015 earthquake in
the area of Mainapokhari**



1. Context and overview of the study

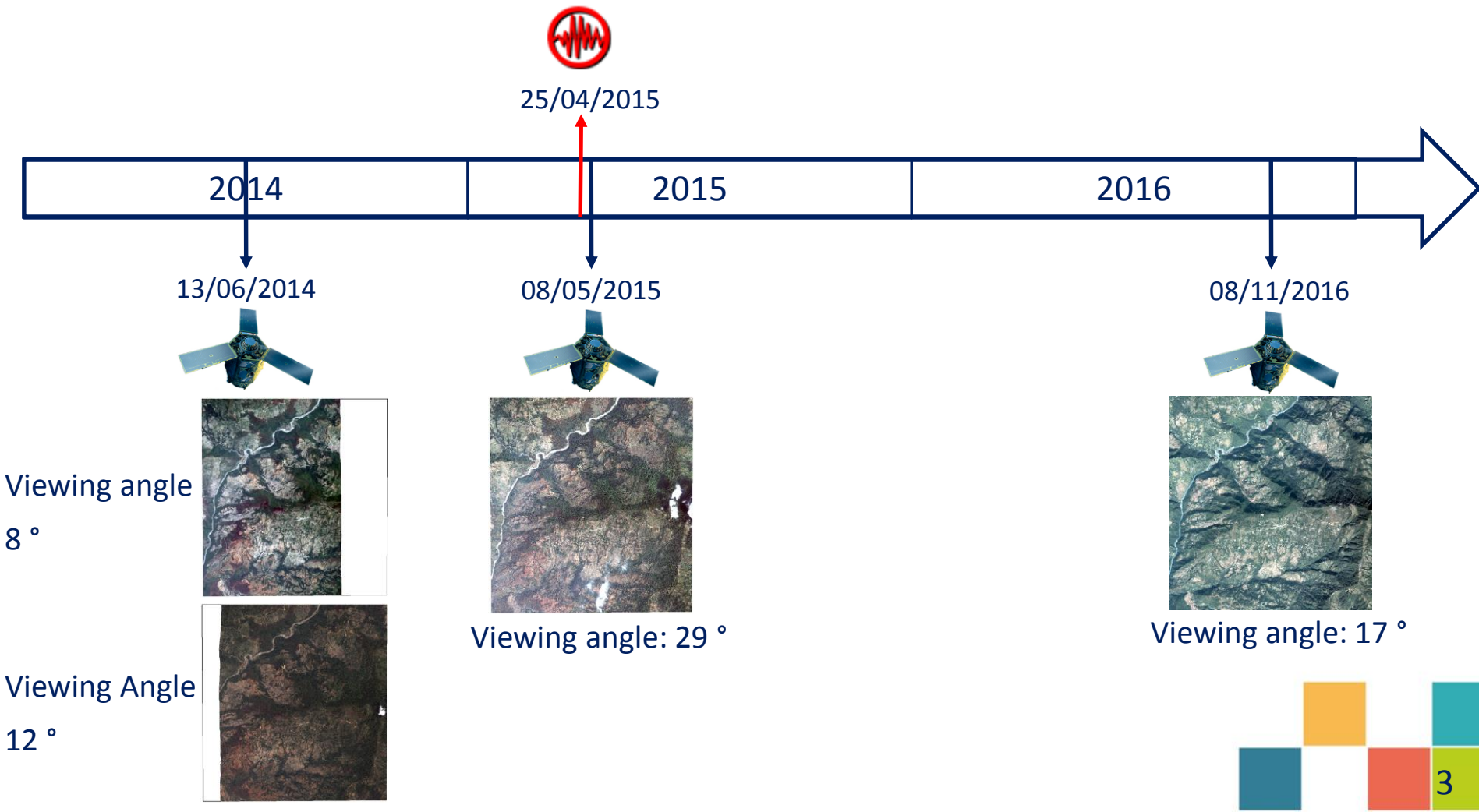
Area of interest

- 25th of April 2015, 11:56, Earthquake with a magnitude of 7.2
- Heavy casualties as well as extensive building damages
- The International Charter has been triggered the 25th of April 2015 the by the Disaster Management Support (DMS) Programme Office of the Indian Space Research Organisation (ISRO) and UNITAR/UNOSAT on behalf of UNICEF
- RO demonstrator : area 10 km x 10km, 80km east of Kathmandu

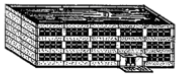






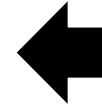
2. Data

- 2 Pleiades images acquired the 13th of June 2014 (10 months before the earthquake)
- 1 Pleiades image acquired the 8th of May 2015 (13 days after the earthquake)
- 1 Pleiades image acquired the 7th of November 2016 (19 months after the earthquake)



3. Building grading Examples

EMS98			RO <u>grading</u>
Grade 1		Negligeable to <u>slight</u> damage	1
Grade 2		Moderate damage	
Grade 3		Substantial to <u>heavy</u> damage	2
Grade 4		<u>Very heavy</u> damage	
Grade 5		Destruction	3

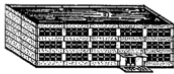






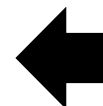
13/06/2014



08/05/2015

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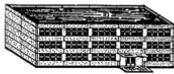




13/06/2014

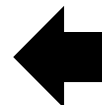


08/05/2015



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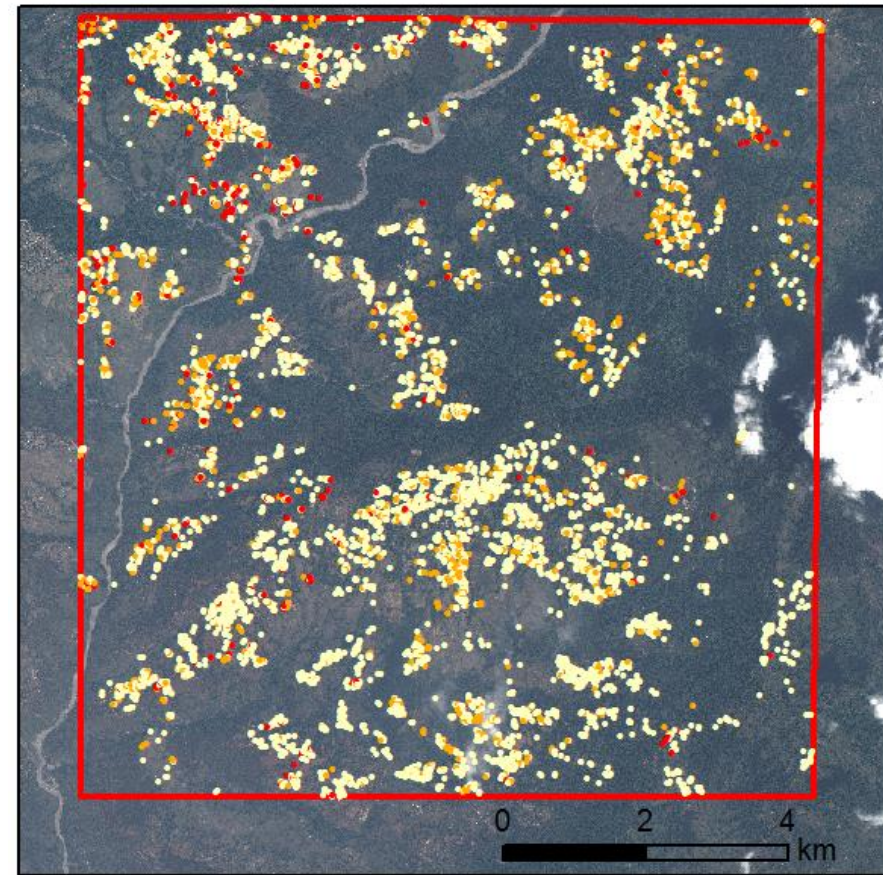
13/06/2014



08/05/2015

4. Damage assessment map

Number of buildings	9246
Buildings constructed between the 13/06/2014 and the 08/05/2015	287 (3 %)
Grade 1 (Negligeable to moderate damage)	6747 (73 %)
Grade 2 (Substantial to very heavy damage)	1786 (19 %)
Grade 3 (destruction)	426 (5 %)



These figures should be taken with caution. the interpetation on the post-event image is delicate due to :

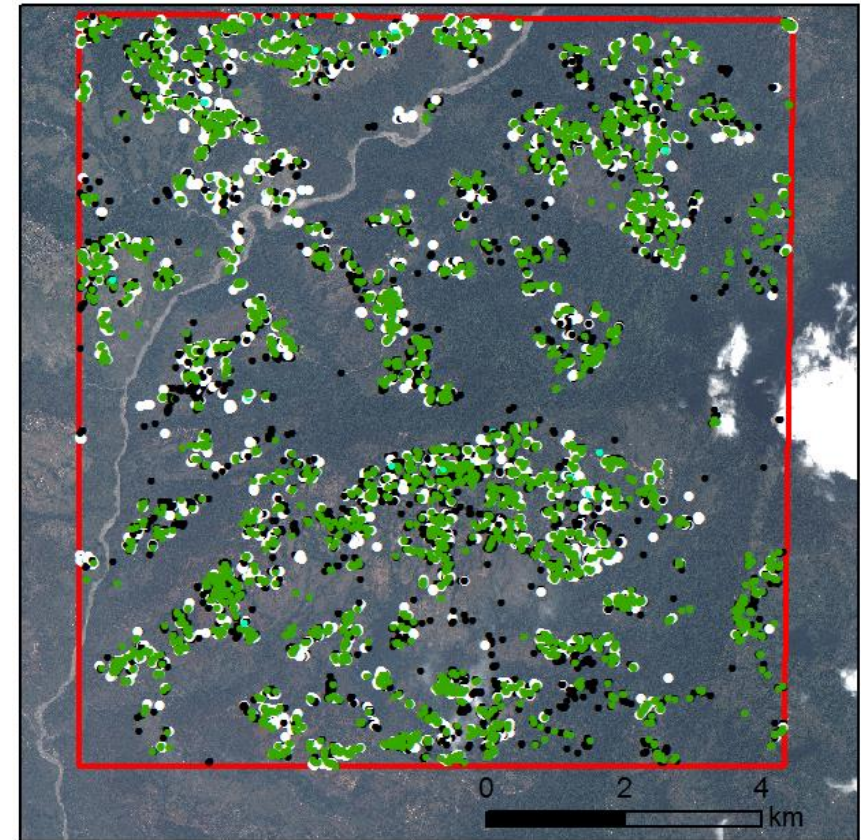
- the angle of the post-disaster image
- the size of the buildings

5. Recovery map

Total number of buildings the 07/11/2016 (19 months after the EQ)	9655	
- Number of buildings cleared up	2787	
- Number of buildings without visible changes	6338	
- Buildings re-constructed identically between the 08/05/2015 and the 07/11/2016	134	100 %
- stage "foundations excavated"	2	1.5 %
- stage "walls erected"	49	36.6 %
- stage "construction complete" (roof visible)	83	61.9 %
- New buildings constructed between the 08/05/2015 and the 07/11/2016	3183	100 %
- stage "foundations excavated"	2	0.1 %
- stage "walls erected"	13	0.4 %
- stage "construction complete" (roof visible)	3168	99.5 %

These figures should be taken with caution. the interpretation on the post-event image is delicate due to :

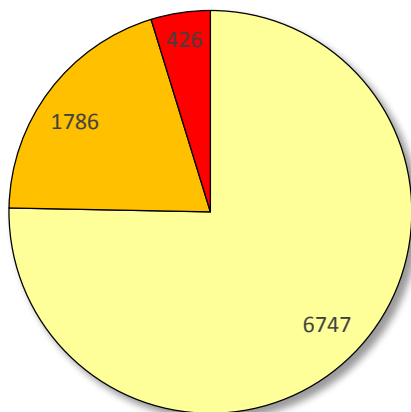
- the angle of the post-disaster image
- the size of the buildings



- Stage "foundations excavated"
- Stage "walls erected"
- Stage "construction complete (roof visible)"
- Unchanged building
- Cleared-up building

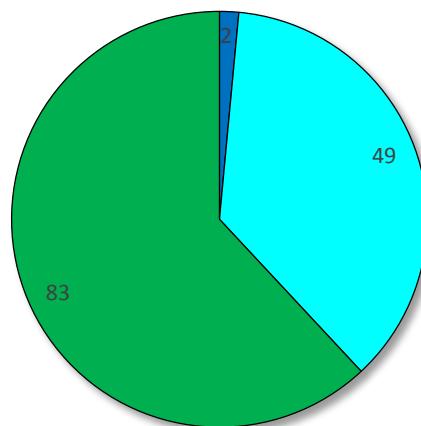
6. Recovery map

Building grading



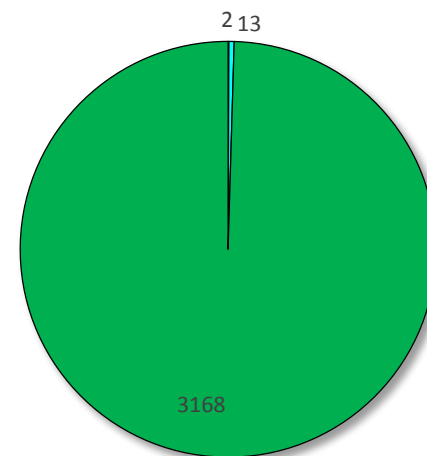
- Buildings with no visible damage
- Potentially damaged buildings
- Destroyed buildings

Buildings re-constructed identically



- stage "foundations excavated"
- stage "walls erected"
- stage "construction complete" (roof visible)

Newly constructed buildings



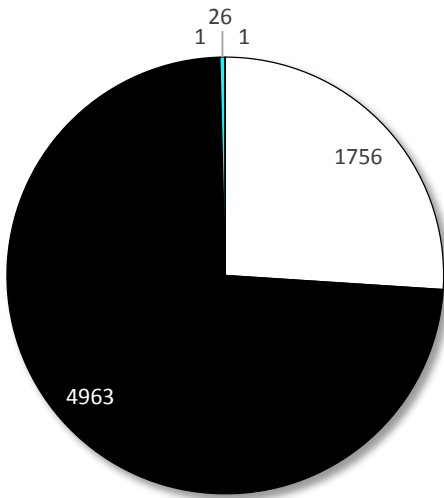
- stage "foundations excavated"
- stage "walls erected"
- stage "construction complete" (roof visible)

7. State of the reconstruction by grading level

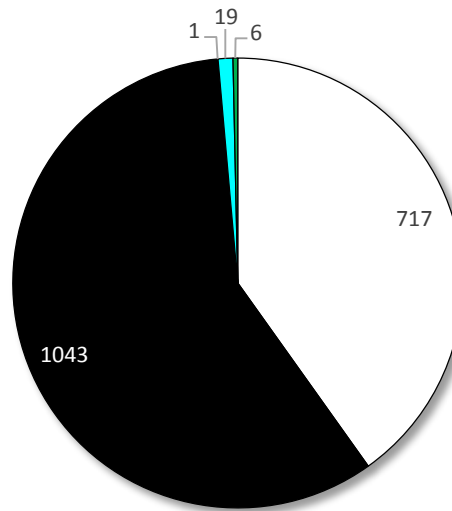
	Number of buildings cleared up	Number of buildings without visible changes	Under re- construction Foundations visible	Under re- construction Walls erected	Re- construction complete	Total
Level 1 Negligeable to moderate damages	1756 (26.0 %)	4963 (73.6 %)	1 (0.0 %)	26 (0.4 %)	1 (0.0 %)	6747 (100 %)
Level 2 Substantial to very heavy damages	717 (40.1 %)	1043 (58.4 %)	1 (0.0 %)	19 (1.2 %)	6 (0.3 %)	1786 (100 %)
Level 3 Completely destroyed	284 (66.7 %)	63 (14.8 %)	0 (0.0 %)	3 (0.7 %)	76 (17.8 %)	426 (100 %)

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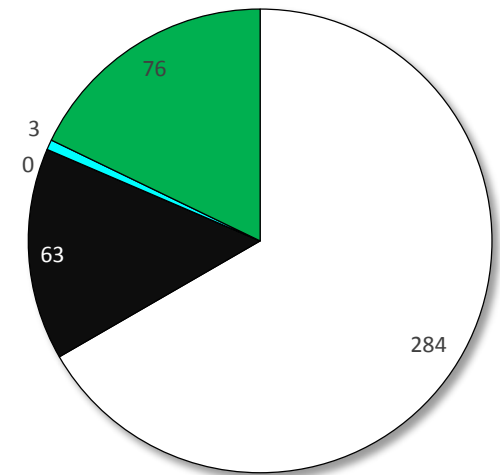
Negligeable to moderate damages



Substantial to very heavy damages



Completely destroyed



- Number of buildings cleared up
- Number of buildings without visible changes
- Foundation excavated
- Walls erected
- Construction complete