

Management of 2011 Floods in Pakistan



Imran IQBAL



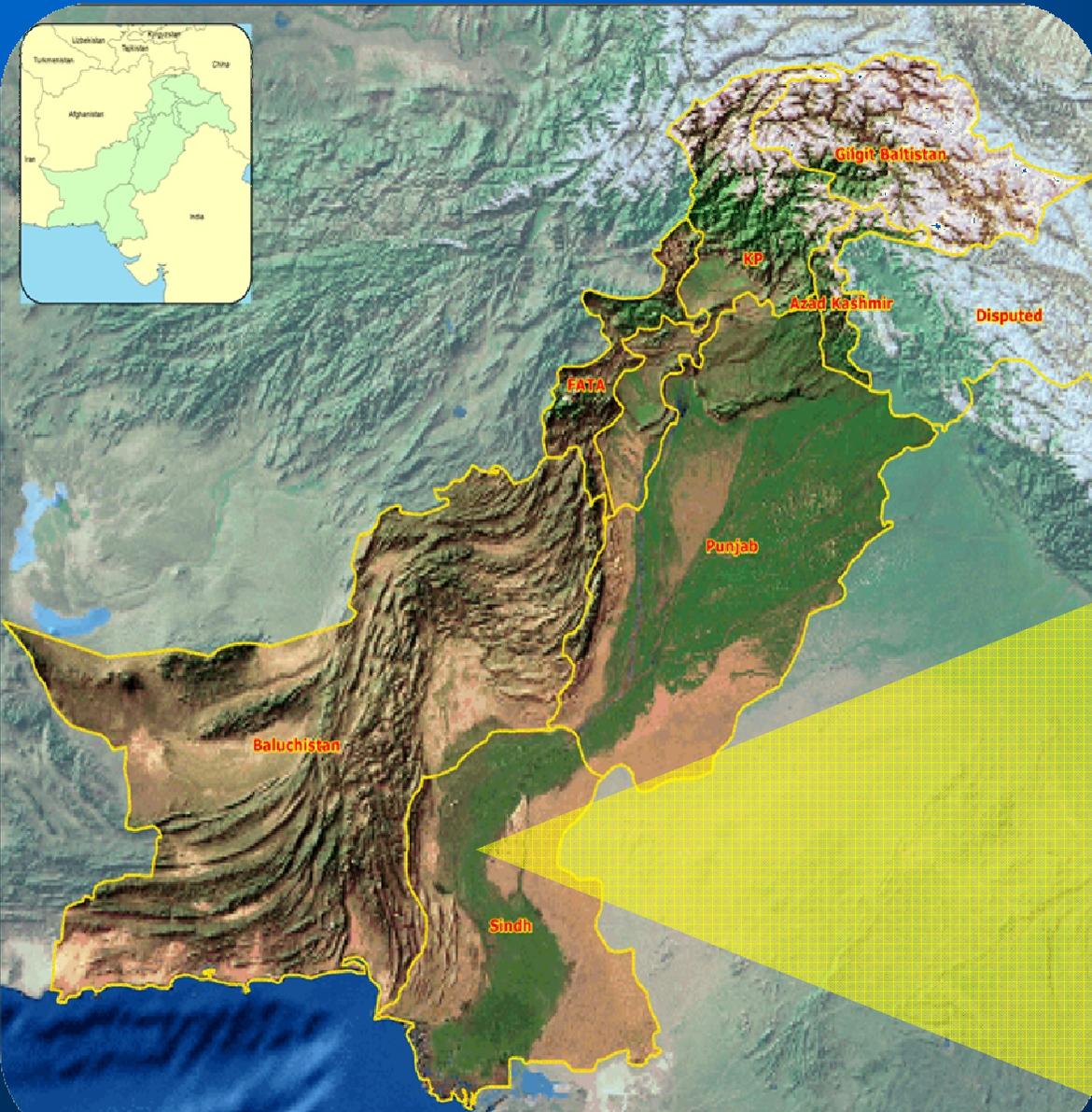
**Presentation to
Forty-Ninth Session of the S&T Subcommittee**

PAKISTAN SPACE AND UPPER ATMOSPHERE RESEARCH COMMISSION

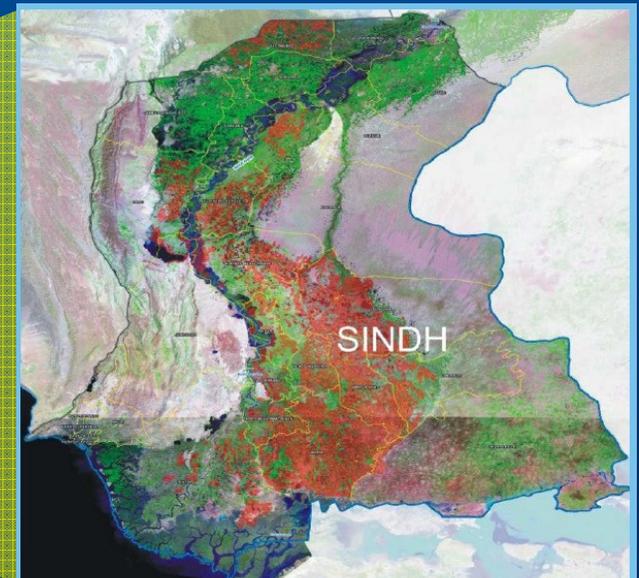
Sequence of presentation

- Pakistan Floods - 2011
- Floods Preparedness
- Monitoring of Floods
- Recommendation
- Conclusion

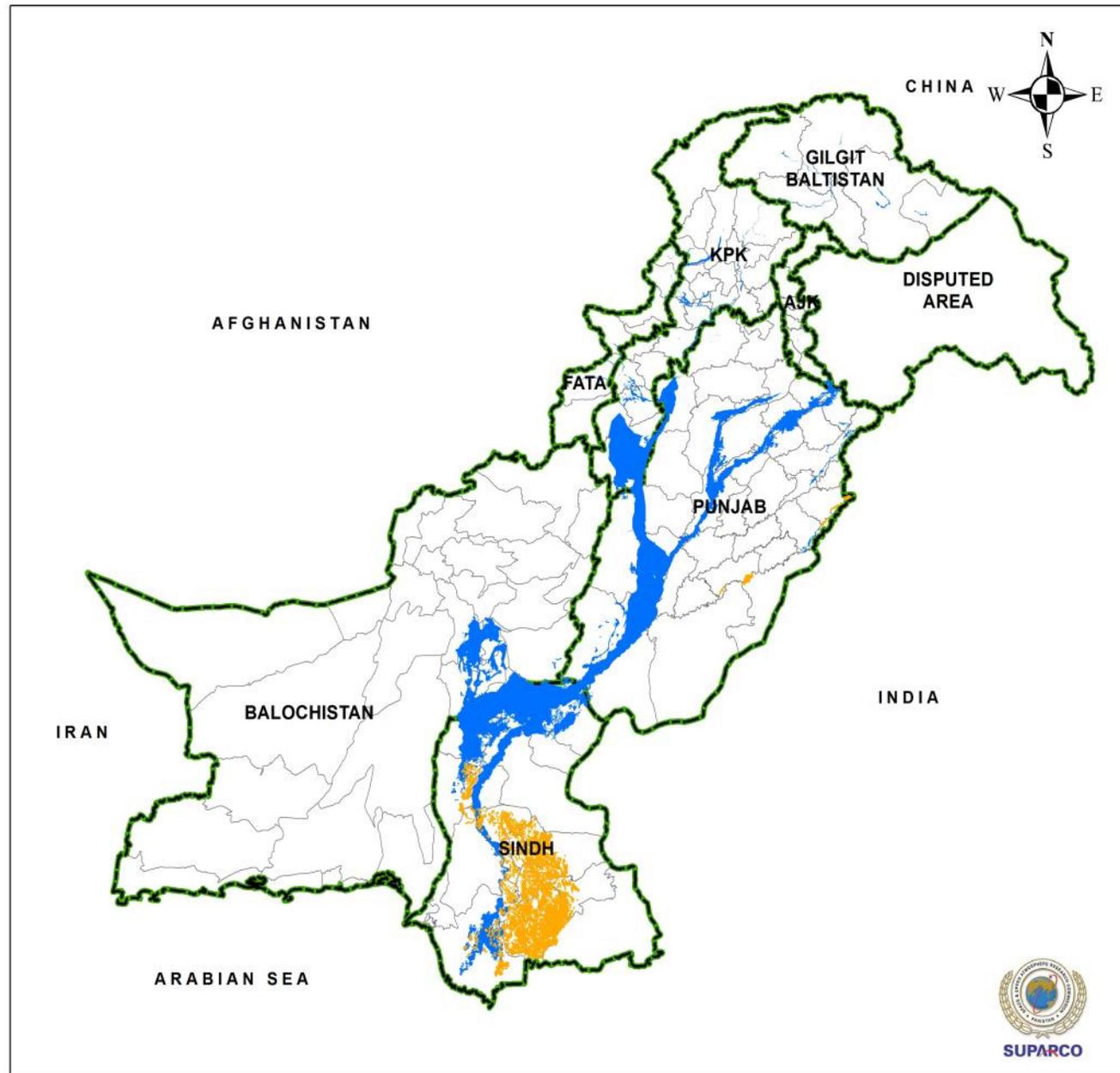
Pakistan Floods - 2011



Province Affected:	SINDH
Population Affected:	5.1 million
Area Affected :	14000 Sq Km
Deaths:	233
Household Damaged:	923,754
Damaged Crop area:	9603 Sq Km
Livestock dead:	116,000
Irrigation damage:	400 structures



Floods 2011 compared with 2010



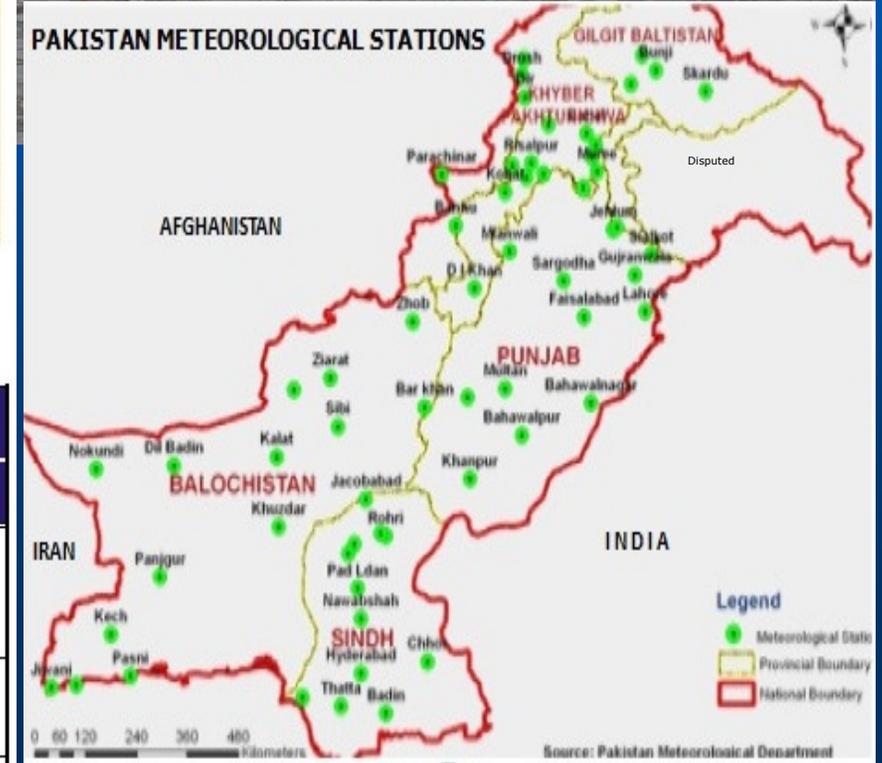
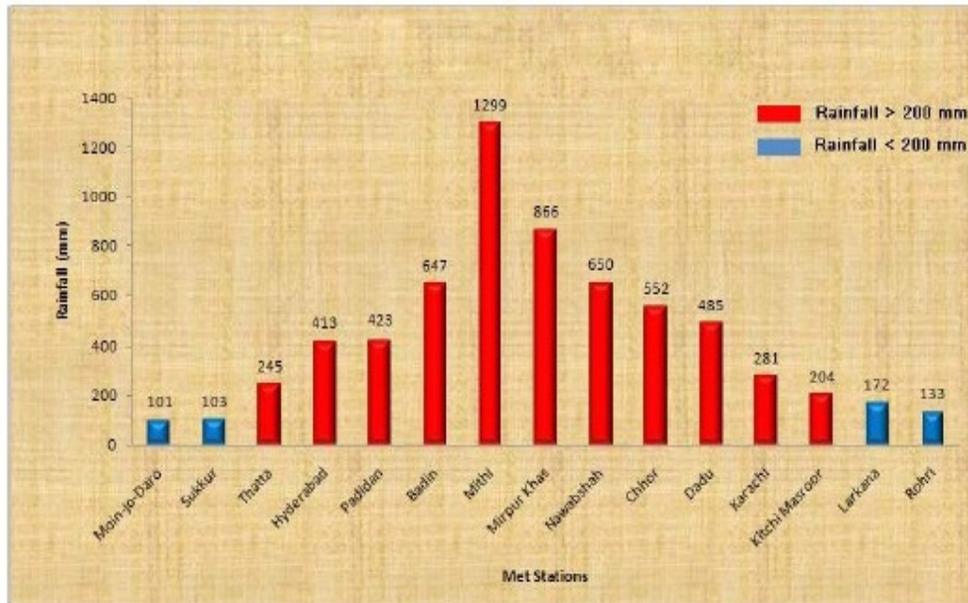
Legend

- Flood Extent 2011 (14091 sq km)
- Flood Extent 2010 (59753 sq km)
- Province Boundary
- District Boundary

Statistics based on rapid mapping
 Data extracted from pre & post Flood Imagery
 acquired from SPOT Satellite Series at
 SUPARCO, Islamabad
 Projection: UTM Zone 42 N
 Spheroid: WGS 84



Sindh: Rainfall from 1-July to 30-September 2011



Sindh: Rainfall from July 1 to September 30, 2011

Rainfall range	No. of Met Stations	Met Stations
More than 200 mm	11	Thatta, Hyderabad, Chhor, Padidan, Badin, Mithi, Nawab Shah, Mirpur Khas, Dadu, Karachi, Kechi Masroor
More than 300 mm	08	Hyderabad, Padidan, Badin, Mithi, Nawab Shah, Mirpur Khas, Chhor, Dadu

Flood Preparedness - 2011

- Pakistan experienced devastating floods in 2010. During the initial days of these floods satellite imagery was the only reliable means of information pertaining to the flood extent and damage to the infrastructure and agriculture
- In view of the experience of 2010 floods it was decided by the Government of Pakistan to establish a task force prior to monsoon season of 2011 to plan for disaster management support using satellite derived data in case of flooding in any part of the country
- The task force ensured the availability of updated base line data such as population, infrastructure etc. It also developed standing operating procedures and made appropriate arrangements for provision of satellite derived maps and situational update reports to the concerned federal and provincial government departments and international agencies

Flood Preparedness - 2011

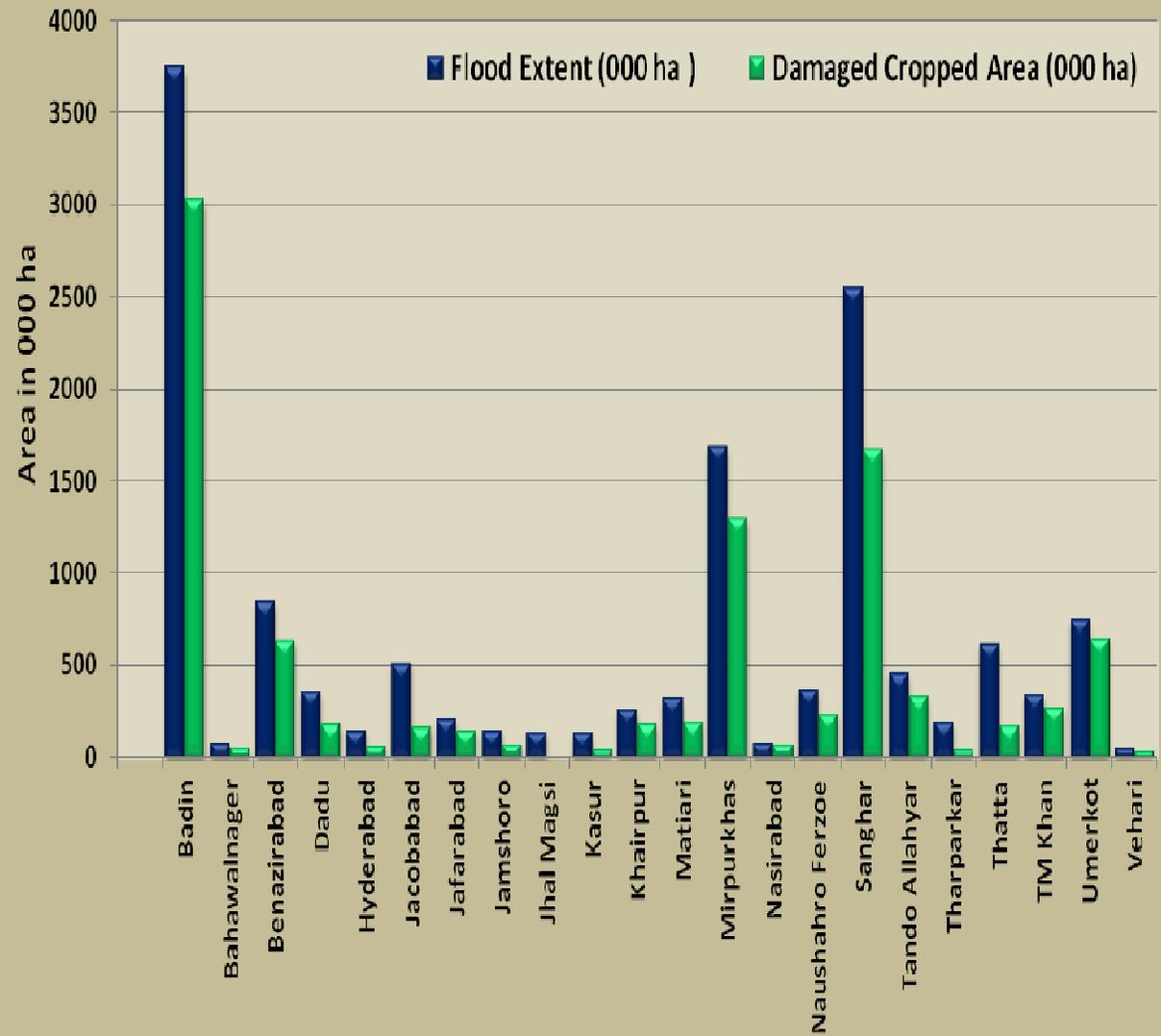
A Letter of Agreement was also signed between SUPARCO and FAO, UN in July, 2011 to implement a joint project on flood preparedness that capitalized on satellite based information and locally available expertise and experiences to effectively address the flood response programme. The ToRs were :

- Provision to the FAO of the areas at risk of flooding in 2011 based upon data from 2010 event, current embankment status, historical data and any additional data deemed of relevance to the assessment of flood risk in 2011
- Ongoing flood, flash flood and land-slide information and its impacts when available during any flood event that may occur in 2011
- Vulnerability assessment based on population density and propensity to flood over time including any available data on where populations are post-2010 flood event

Monitoring of Floods

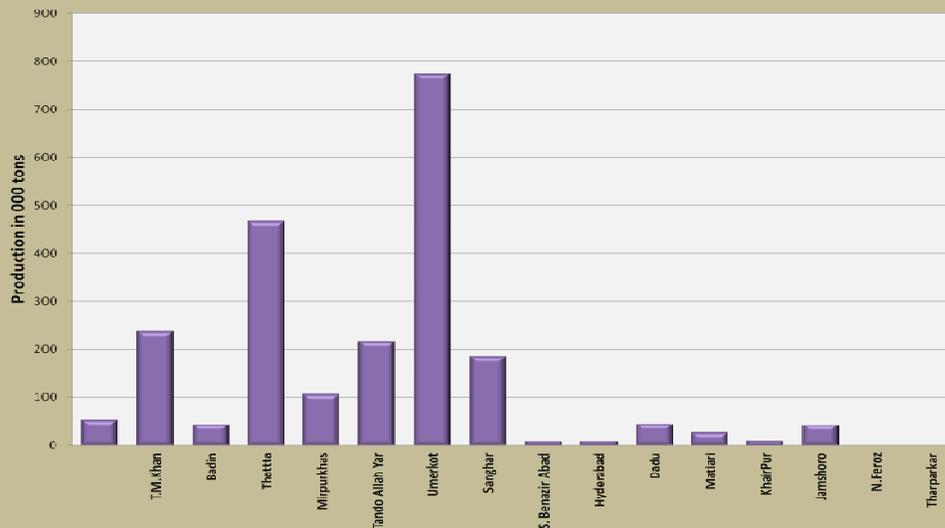
- Rapid mapping of the flood affected areas using MODIS data
- SPOT 4 and SPOT 5 data used for detailed damage assessment of infrastructure and agriculture
- Provision of timely actionable reports to disaster management agencies involved in relief, early recovery and rehabilitation of the affected population

Damage to Agriculture



Damage to Agriculture-Cotton

SINDH FLOODS 2011: Damage to Cotton

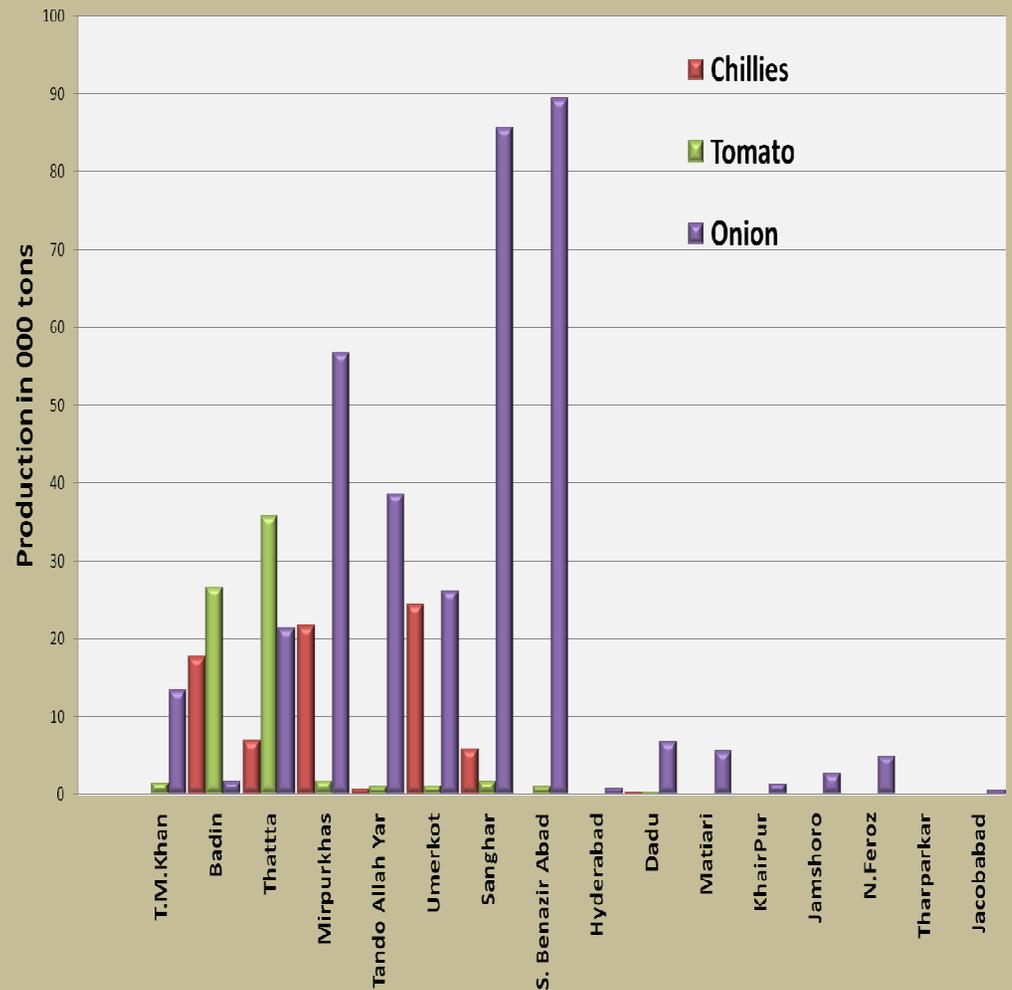


District			Sindh	
	000 ha	Kg/ha	Damage factor	000 bales
Sindh				
Tando Muhammad Khan	8.1	1430	0.8	54.51
Badin	33.4	1508	0.8	237.02
Thatta	7.2	1288	0.8	43.64
Mirpurkhas	86.4	1152	0.8	468.39
Tando Allah Yar	16.6	1376	0.8	107.49
Umerkot	45.4	1015	0.8	216.85
Sanghar	124.7	1319	0.8	774.02
Shaheed Benazir Abad	37.1	1060	0.8	185.06
Hyderabad	1.43	1409	0.8	9.49
Dadu	2.13	893	0.8	8.97
Matiari	6.85	1393	0.8	44.90
KhairPur	5.92	965	0.8	26.88
Jamshoro	2.34	965	0.8	10.61
Naushahro Feroze	8.47	1093	0.8	43.57
Tharparkar	0.03	1045	0.8	0.16
Jacobabad	0.00	0	0.8	0.00
Total	369.3	1284.0	0.8	2231.6
Punjab				
Kasur	0	0	0	0.00
Bahawalnagar	2.5	740	0.4	4.34
Vehari	1.8	645	0.4	2.77
Total	4.3	700	0.4	7.11
Balochistan				
Nasirabad	0	0	0	0
Jaffarabad	0	0	0	0
Jhal Magsi	0	0	0	0
Total	0	0	0	0
Grand Total	373.6	1273	0.8	2238.7

Damage to Agriculture-Minor Crops



SINDH FLOODS 2011: Damage to Chillies, Tomato and Onion



Damage to Infrastructure



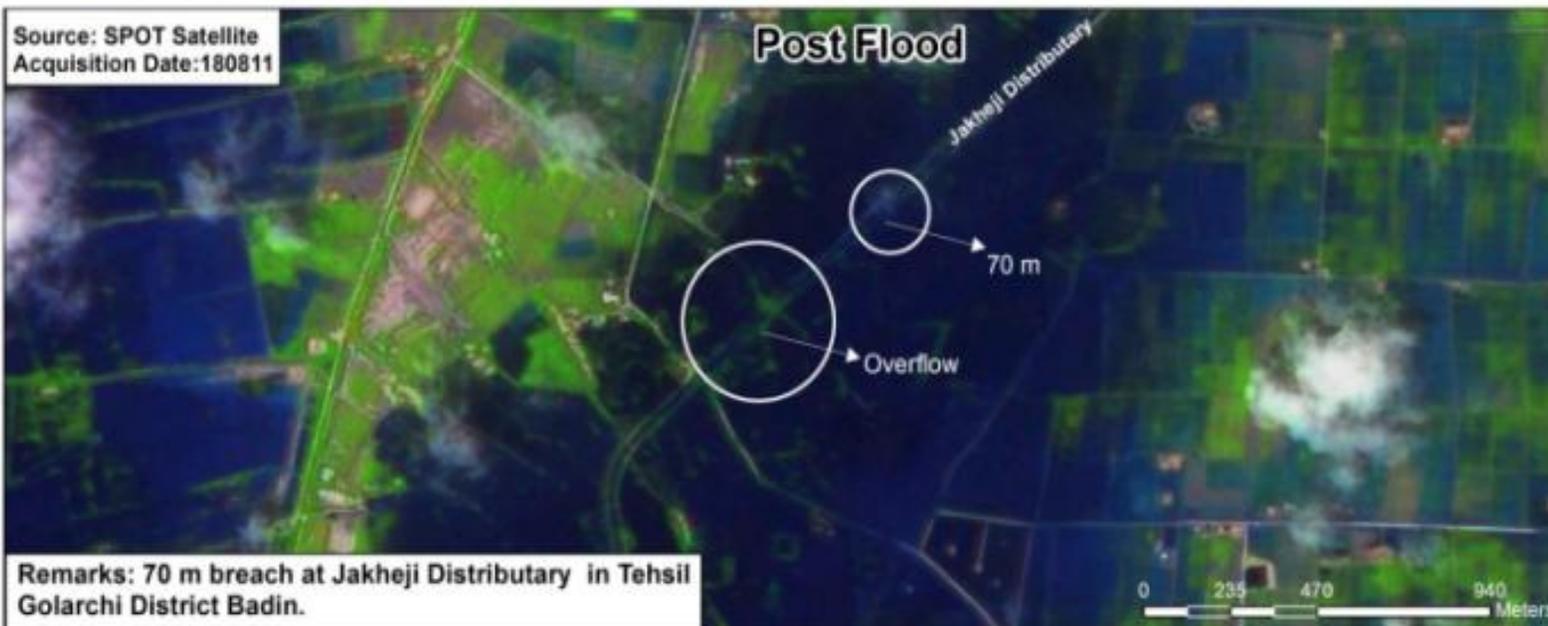
District	Inundated Area (Sq km)	Damaged Roads (Km)			Railway (Km)	Bridge	No. of Settlements	Agriculture (Sq km)	No. of Houses
		National	Provincial	Kacha Pakka					
Badin	3751	23	1708	2412	13.3	5	1277	3031	163908
Bahawalnagar	81	0	0	154	0		197	54	6530
Benazirabad	850	25	434.6	527.6	38.9		465	640	81551
Dadu	360	0	136	388	3.1	1	232	186	36578
Hyderabad	151	0	14.9	169	10.7		138	66	16581
Jacobabad	517	0	17	817	17		345	169	24827
Jafferabad	211	0	76	258	0		56	152	4970
Jamshoro	154	0	55	101	0		85	69	11019
Jhal Magsi	146	0	31	171	0		118	14	5426
Kasur	138	0	0	154.5	0		99	40.7	7139
Khairpur	268	0	37	545	0		372	187	37471
Matlari	325	0	58	147	10.3		227	193.2	33527
Mirpurkhas	1694	33	1559	1764	45		987	1303	200861
Nasirabad	79	0	7	64	0		51	71	4945
Naushahro Ferzoe	376	8	188	223	23		649	237	50225
Sanghar	2554	28	773	1493	9	7	1052	1674	57823
Tando Allahyar	462	0	106	290	0		286	334	53143
Tharparkar	197	0	39	234	0		233	47.9	14179
Thatta	621	0	133	373	0		627	176	22621
TM Khan	346	3	243	578	1.8		708	271	32636
Umerkot	754	2.5	127	634	19.5		1543	651	55379
Vehari	56	0	0	86	0		77	36.7	2415
Total	14091	122.5	5742.5	11583.1	191.6	12	9824	9603.5	923754

Canal Breach & Overflow - District Badin

Source: SPOT Satellite
Acquisition Date: 050611



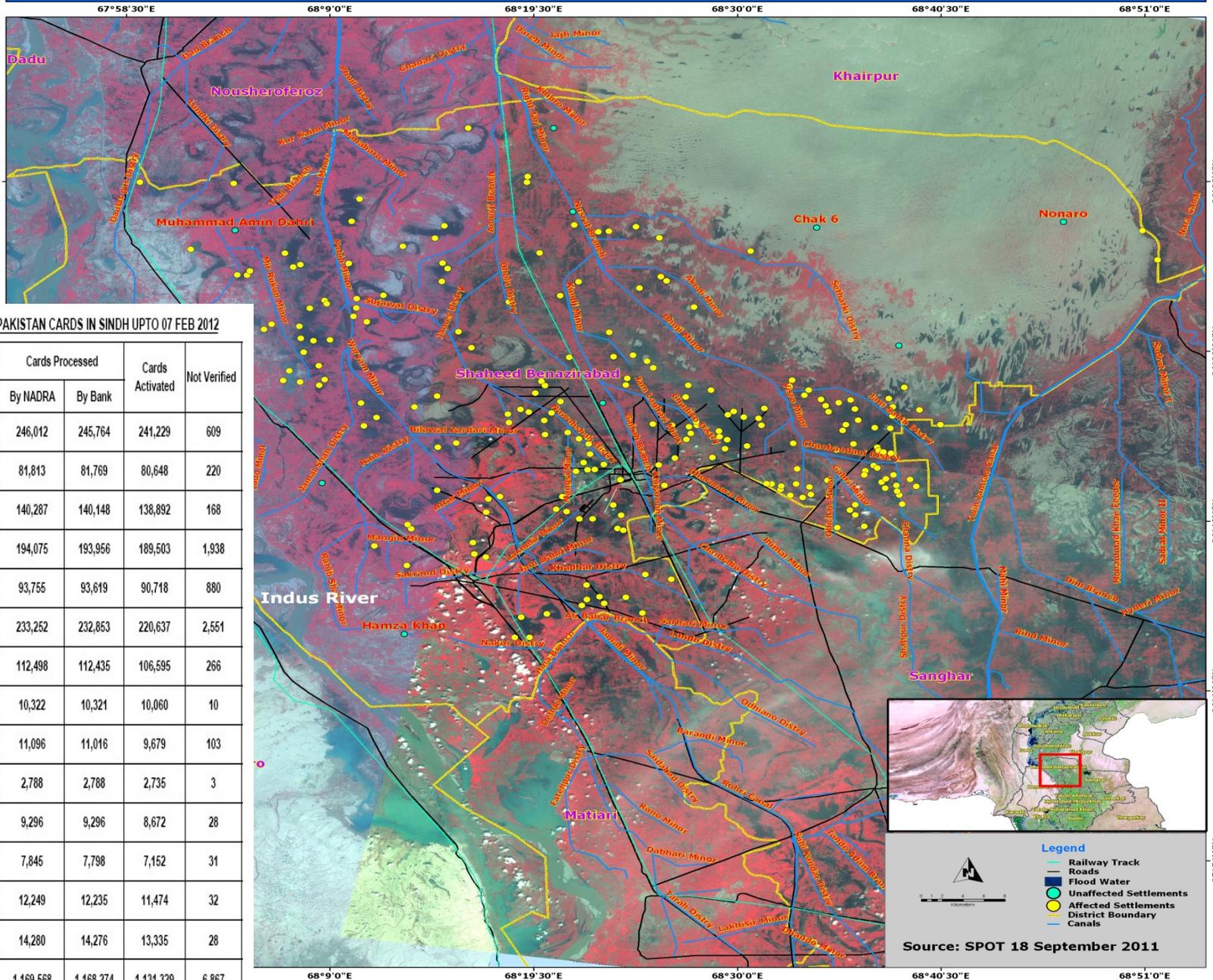
Source: SPOT Satellite
Acquisition Date: 180811



Remarks: 70 m breach at Jakheji Distributary in Tehsil Golarchi District Badin.



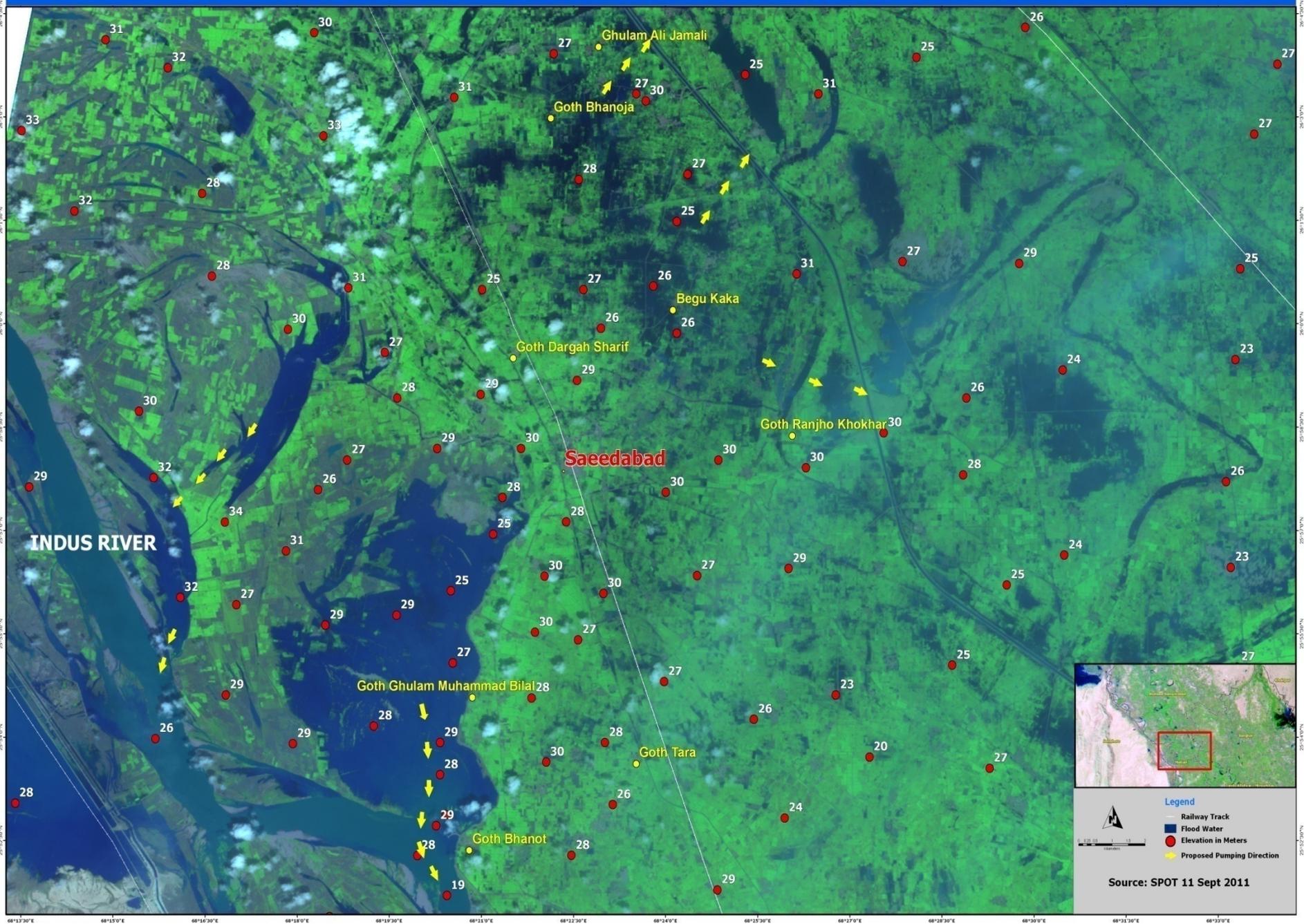
SINDH FLOOD 2011: RAIN WATER IN DISTT SHAHEED BENAZIRABAD



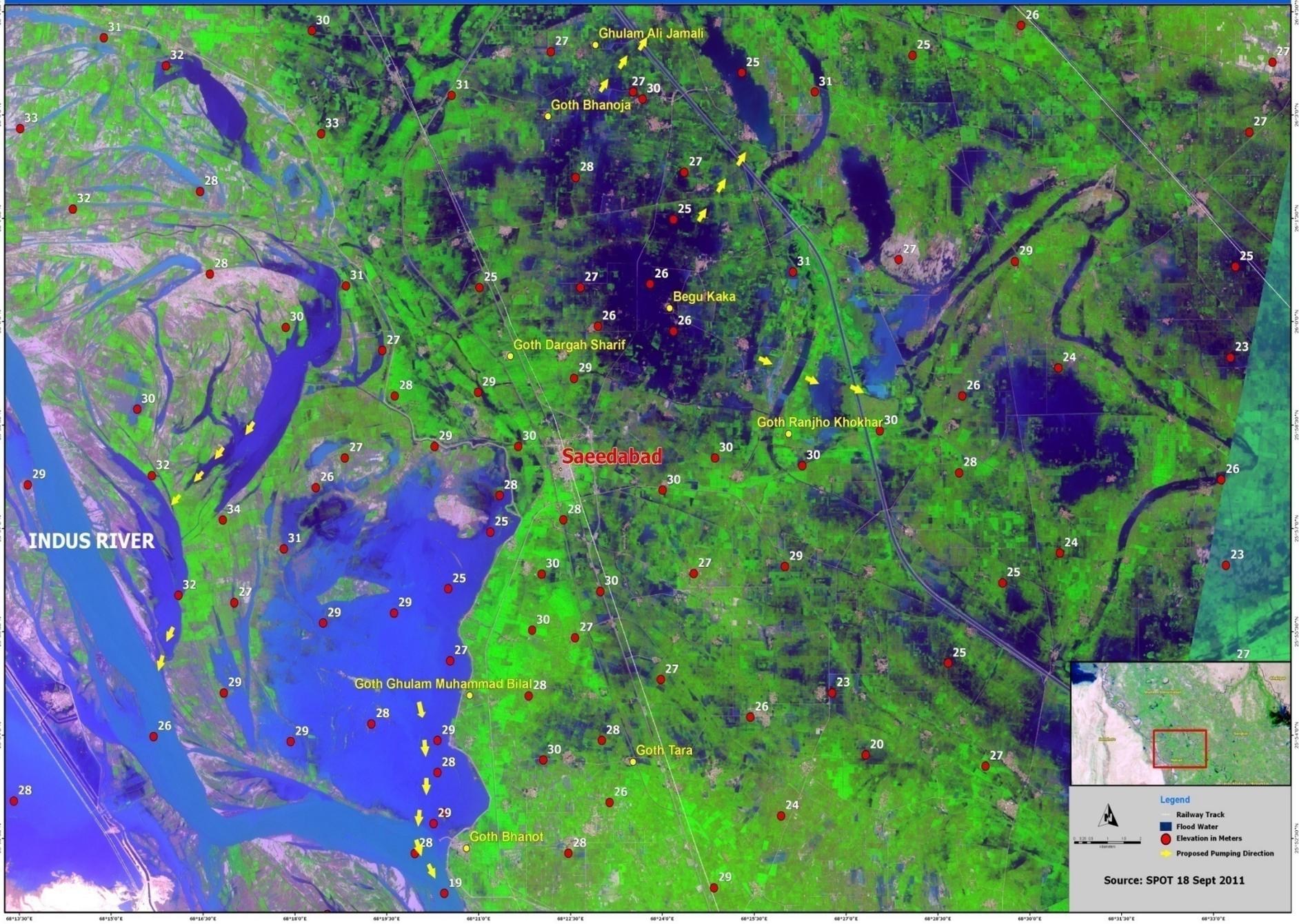
PROGRESS ON DISTRIBUTION OF PAKISTAN CARDS IN SINDH UPTO 07 FEB 2012

S#	District	Caseload	Cards Processed		Cards Activated	Not Verified
			By NADRA	By Bank		
1.	Badin	278,680	246,012	245,764	241,229	609
2.	Tando Muhammad Khan	84,285	81,813	81,769	80,648	220
3.	Mirpur Khas	138,618	140,287	140,148	138,892	168
4.	Shaheed Benazirabad	217,624	194,075	193,956	189,503	1,938
5.	Tando Allahyar	108,984	93,755	93,619	90,718	880
6.	Sanghar	309,373	233,252	232,853	220,637	2,551
7.	Umer Kot	123,273	112,498	112,435	106,595	266
8.	Jamshoro	11,862	10,322	10,321	10,060	10
9.	Hyderabad	9,701	11,096	11,016	9,679	103
10.	Thatta	3,001	2,788	2,788	2,735	3
11.	Ghotki	11,338	9,296	9,296	8,672	28
12.	Tharparker	9,669	7,845	7,798	7,152	31
13.	Mitiani	14,301	12,249	12,235	11,474	32
14.	Dadu	18,594	14,280	14,276	13,335	28
		1,339,303	1,169,568	1,168,274	1,131,329	6,867

SINDH FLOOD 2011: RAIN WATER FLOW NEAR SAEEDABAD



SINDH FLOOD 2011: RAIN WATER FLOW NEAR SAEEDABAD

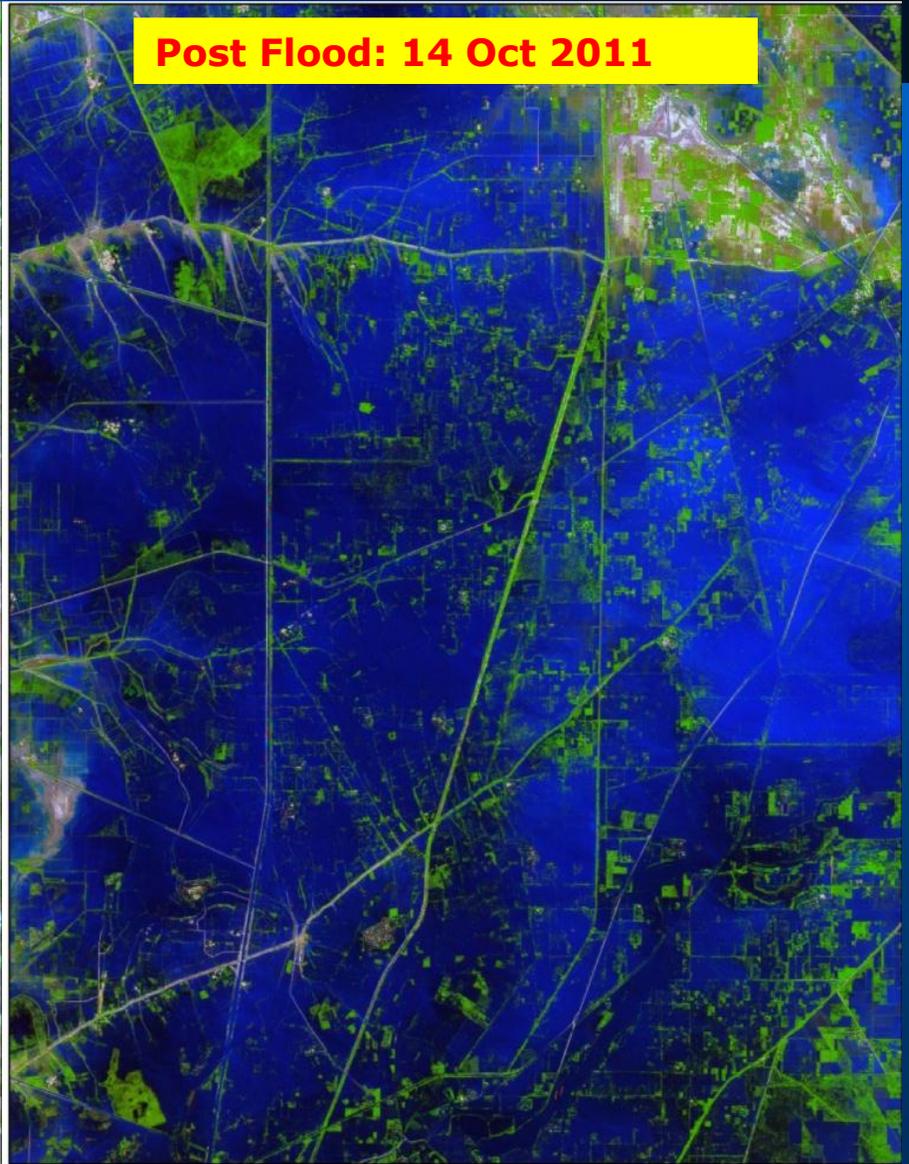


Badin District

Pre Flood: 05 June 2011



Post Flood: 14 Oct 2011

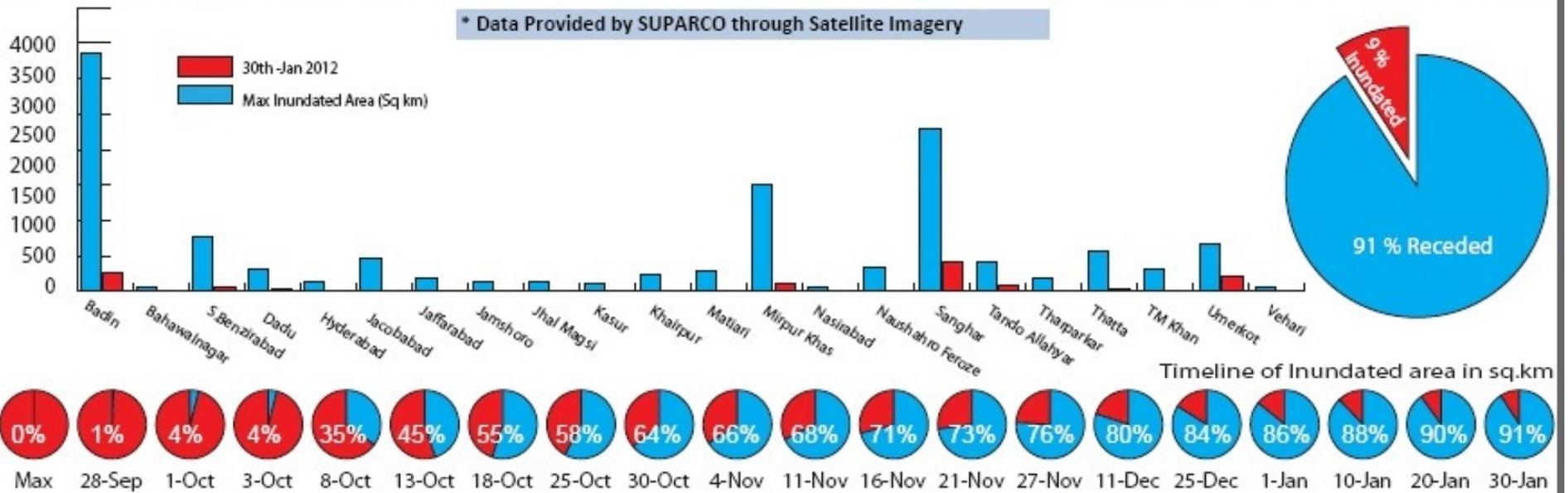


Recession of Flood

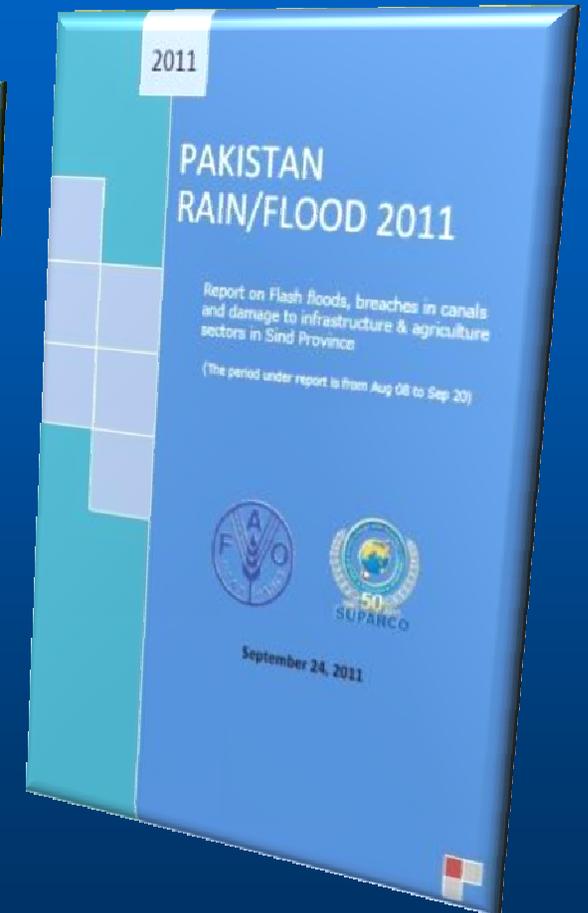
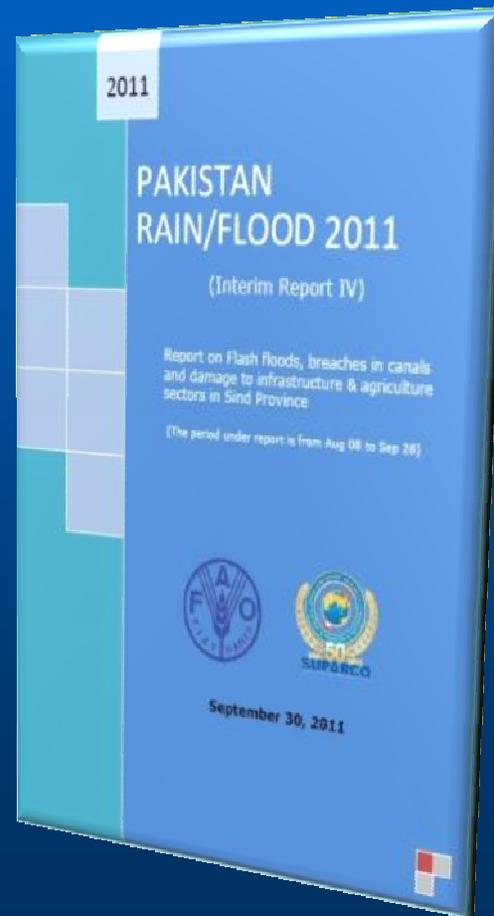
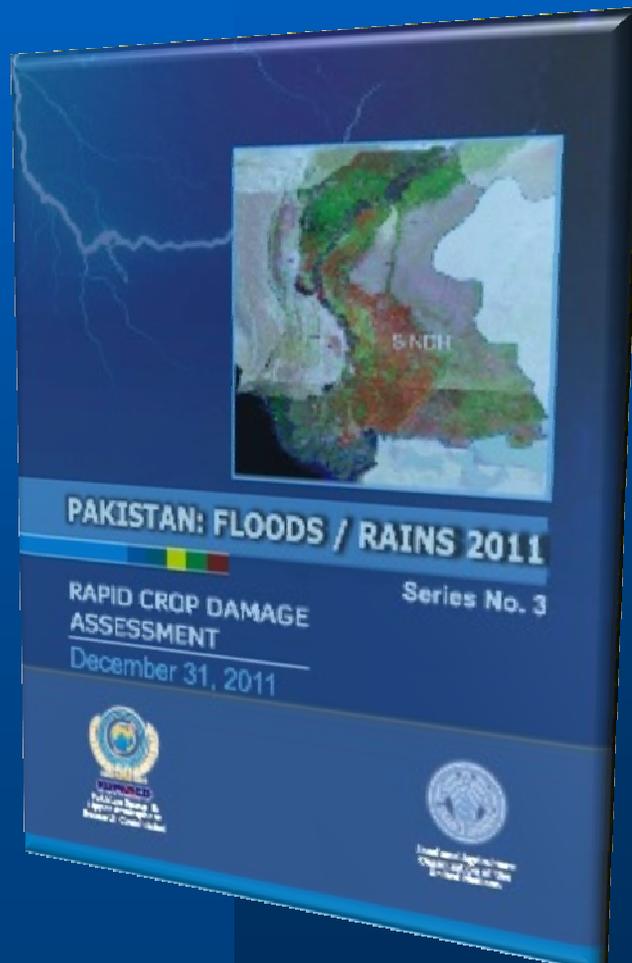
Inundate Area (Sq Km)

District	Max Inundated	28-Sep-11	1-Oct-11	3-Oct-11	8-Oct-11	13-Oct-11	18-Oct-11	25-Oct-11	30-Oct-11	4-Nov-11	11-Nov-11	16-Nov-11	21-Nov-11	27-Nov-11	11-Dec-11	25-Dec-11	1-Jan-12	10-Jan-12	20-Jan-12	30-Jan-12
Badin	3751	3687	3644	3632	2645	2359	1930	1767	1592	1425	1401	1208	1145	968	783	573	483	393	332	302
Bahawalnager	81	81	70	62	38	23	14	11	5	1	1	1	1	1	0	0	0	0	0	0
Benazirabad	850	827	806	797	417	288	256	232	163	150	142	128	123	118	97	82	81	73	67	62
Dadu	360	360	289	279	186	175	140	107	98	87	86	75	71	65	60	55	53	31	28	26
Hyderabad	151	151	137	137	34	22	22	22	20	19	18	14	13	13	12	8	7	7	6	5
Jacobabad	517	517	492	490	235	169	114	103	95	77	74	63	59	55	39	30	28	23	21	18
Jafarabad	211	211	190	185	124	80	64	41	19	13	11	8	6	5	1	0	0	0	0	0
Jamshoro	154	154	110	101	68	54	33	29	21	20	20	18	17	16	15	10	8	5	4	3
Jhal Magsi	146	146	135	130	88	59	47	31	13	9	7	4	3	3	2	0	0	0	0	0
Kasur	138	138	133	122	55	42	29	17	6	4	3	1	1	1	0	0	0	0	0	0
Khairpur	268	268	260	258	29	18	17	16	14	13	12	9	8	7	6	4	3	0	0	0
Matiari	325	325	315	314	116	79	75	71	57	45	44	40	35	32	30	22	20	17	14	12
Mirpurkhas	1694	1685	1674	1668	1288	1079	867	785	670	641	602	520	460	397	278	209	200	172	139	123
Nasirabad	79	79	75	68	41	28	21	15	8	5	4	2	1	1	0	0	0	0	0	0
Naushahro Ferzoe	376	376	365	362	110	69	50	47	37	31	30	27	26	25	24	20	19	16	15	13
Sanghar	2554	2550	2450	2442	2081	1726	1543	1458	1254	1223	1170	1076	987	925	771	672	648	534	465	456
Tando Allahyar	462	450	448	446	264	234	223	219	201	198	196	178	167	165	141	112	108	96	85	82
Tharparkar	197	197	202	201	126	178	157	145	120	109	105	97	85	79	60	103	23	19	14	10
Thatta	621	650	606	606	393	275	214	206	136	120	115	102	84	78	65	45	43	38	35	32
TM Khan	346	340	336	333	179	131	96	84	81	75	68	61	58	57	55	34	27	23	20	16
Umerkot	754	760	784	784	674	637	566	561	491	468	455	430	421	415	347	297	294	274	245	233
Vehari	56	56	49	44	23	14	8	4	3	1	1	0	0	0	0	0	0	0	0	0
Total	14091	14008	13570	13461	9214	7739	6486	5971	5106	4734	4565	4062	3771	3426	2786	2196	2041	1716	1486	1390

* Data Provided by SUPARCO through Satellite Imagery



Publications



Recommendation

Prior planning and availability of updated baseline data needs to be ensured for coordinated and timely response

Conclusion

Space based technologies are essential for disaster risk reduction and emergency response



Thank you