



Smart Cities: Perspective from the frontlines

Dr. Prashant Pradhan
IBM



Key messages



- **Local context and priorities** are key
 - Each city presents specific opportunities, as well as challenges

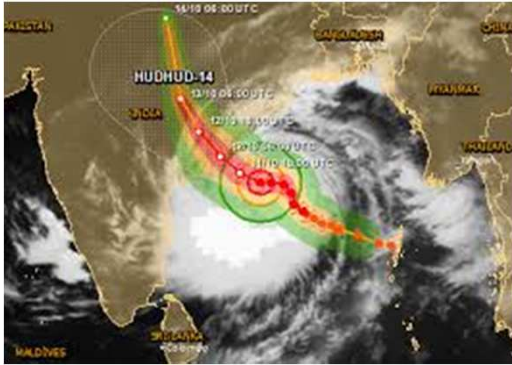
- **Subject matter depth** is critical

- Execution has to be **pragmatic** – leveraging what's available, apply 80-20 rule on investments, keep in mind institutional capability

- **Lead by example** – on-ground perspective from 4 brownfield cities...
 - Vishakhapatnam
 - Allahabad
 - Ajmer
 - Surat

Vizag – Assessment summary

Cyclone 'Hudhud' path



'Stripping' of structures in high wind



Small & medium industries impact



Shipyards impact



Secondary impacts –
water supply canals



Agricultural impact



Shoreline erosion

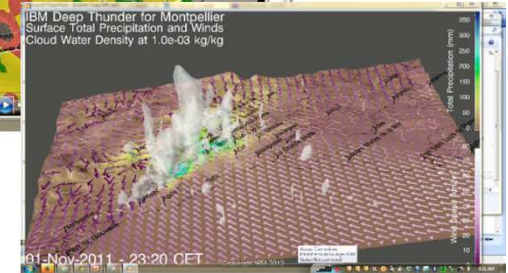
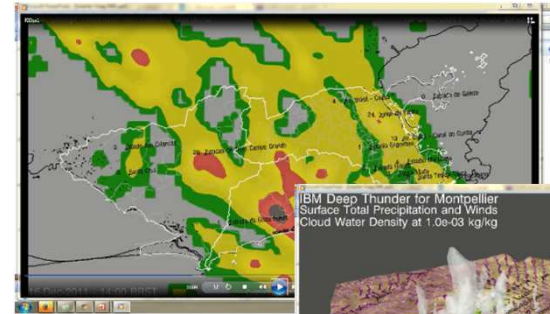


- Port & shipyard – downstream impact on supply chains of large national industries
- Civic infrastructure and MSME (Micro, Small and Medium Enterprises) – high impact from building design
- High secondary risks – e.g. water supply canal breach, potential damage to fuel and chemical storage
- Major livelihood impact – 60,000+ hectares of horticultural and agricultural damage
- Resiliency and Emergency Management is the crucial entry point for Vizag as a Smart City - This will establish multi-agency coordination and information integration, and become a hub to integrate other domains over time, such as transportation, tourism, water, etc.

Approach to make Vizag a Resilient Smart city



Integrated operations for multi-agency coordination

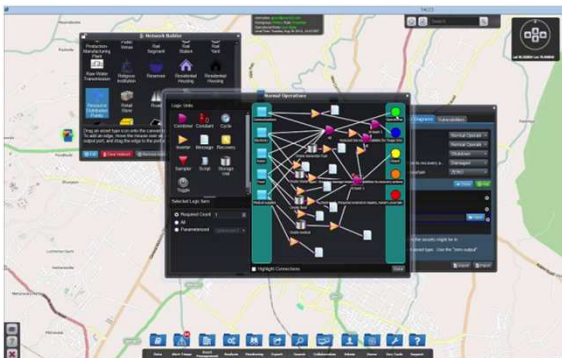


Deep analytics for multi-hazard risk assessment & mitigation



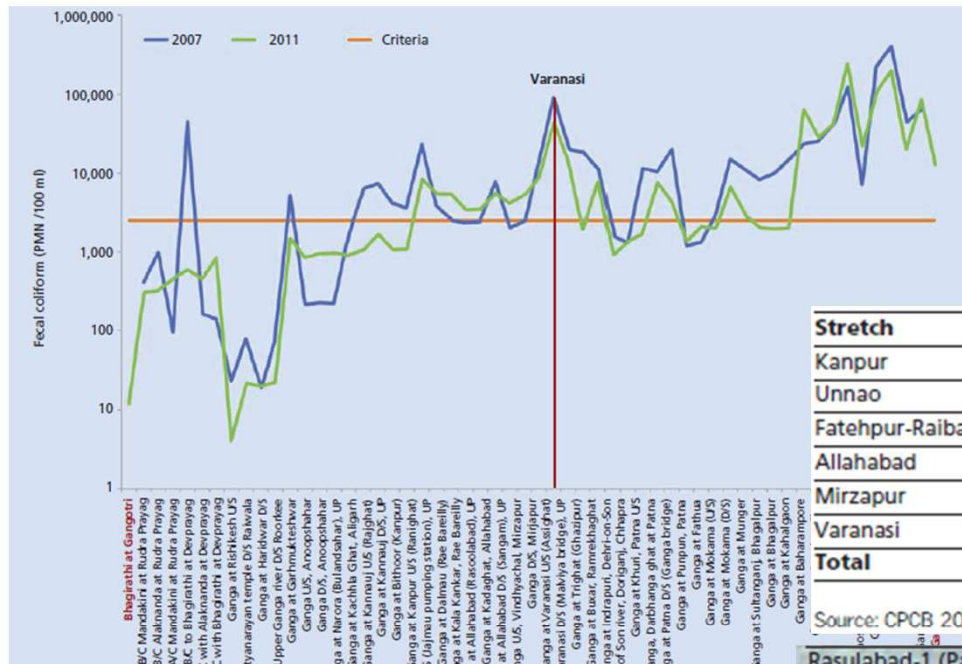
Recovery planning under constraints

Data-driven decision support for emergency response



Allahabad – Assessment summary

- Solid waste management is one of the most crucial areas to initiate Allahabad's smart city journey
- 2 key elements –
 - Map and manage end-to-end waste management cycle
 - Decision support / OR systems to plan for cost-optimal sewage conveyance to STPs (or *in-situ* treatment)



City	Area of city (ha)	Area with sewerage (ha)	Un-sewered area (ha)	Un-sewered area (%)	Drains
Kanpur	25,810	7,558	18,252	71	37
Allahabad	9,510	2,013	7,397	78	57
Varanasi	10,058	1,635	8,432	84	23

Source: UP government 2010, Presentation made at the meeting of the Executive Committee of the State Ganga River Conservation Authority, Lucknow, mimeo

Stretch	Discharge (MLD)	BOD load (kg/day)
Kanpur	600	634,915
Unnao	78	12,068
Fatehpur-Raibareilly	1,491	36,148
Allahabad	294	35,943
Mirzapur	149	9,471
Varanasi	411	9,607
Total	3,023	738,152

Source: CPCB 2013, Pollution Assessment: River Ganga, Central Pollution Control Board, MoEF, July

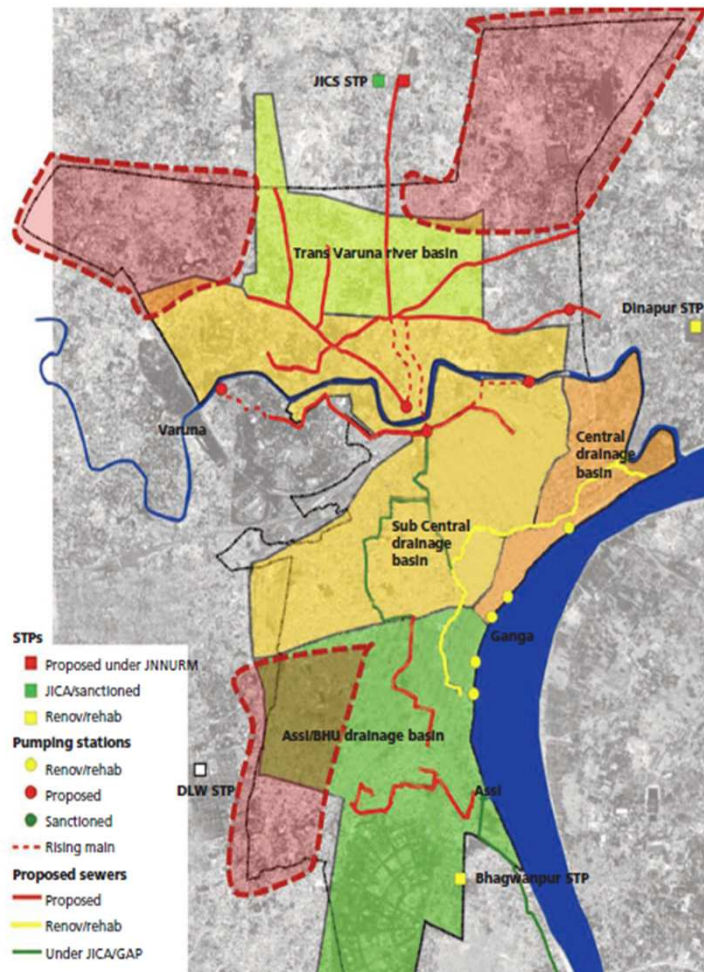
Rasulabad-1 (Pakka nala)	29.80	20,264	Allahabad
Rasulabad-2 (Pakka nala)	20.20	5,656	Allahabad
Rasulabad-3 (Kachha nala)	14.20	1,320	Allahabad
Rasulabad-4 (Kachha nala)	48.50	2,376	Allahabad
Kodar drain	20.00	1,040	Allahabad
Ponghat drain	8.00	161	Allahabad
Solari drain	34.80	1,087	Allahabad
Maviya drain	65.00	3,380	Allahabad
Mualaha drain	46.00	598	Allahabad

Approach (note: data is for Varanasi)

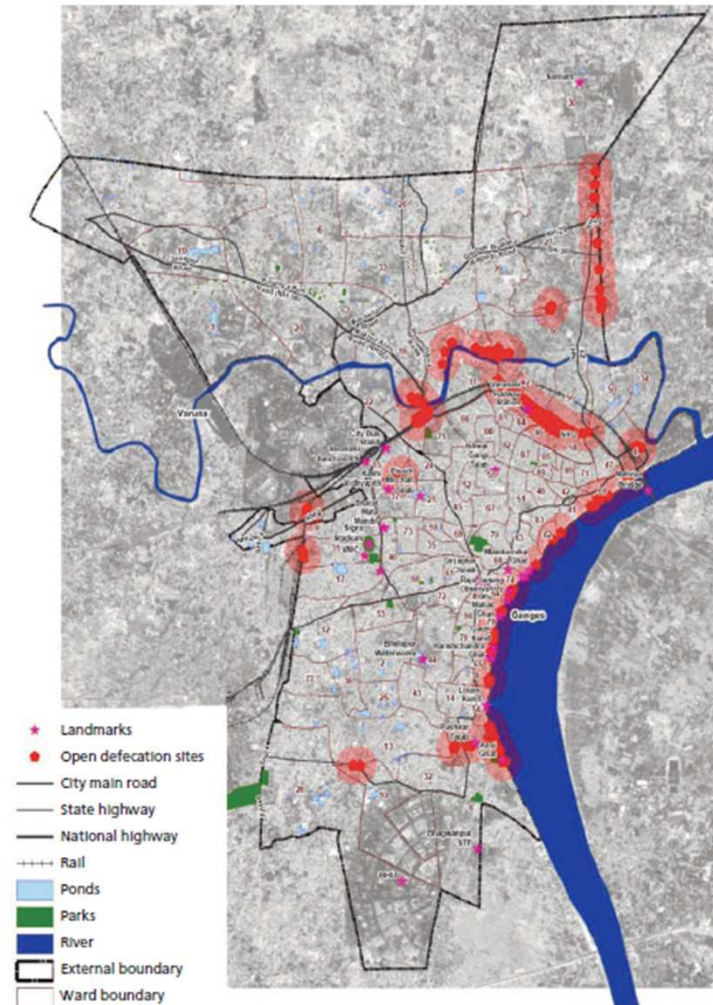
Key design point : What is the optimal design of the end-to-end waste management system – taking into account physical and commercial constraints ?

Note : Varanasi data shown

Coverage of sewage system in Varanasi



Open defecation hotspots in Varanasi

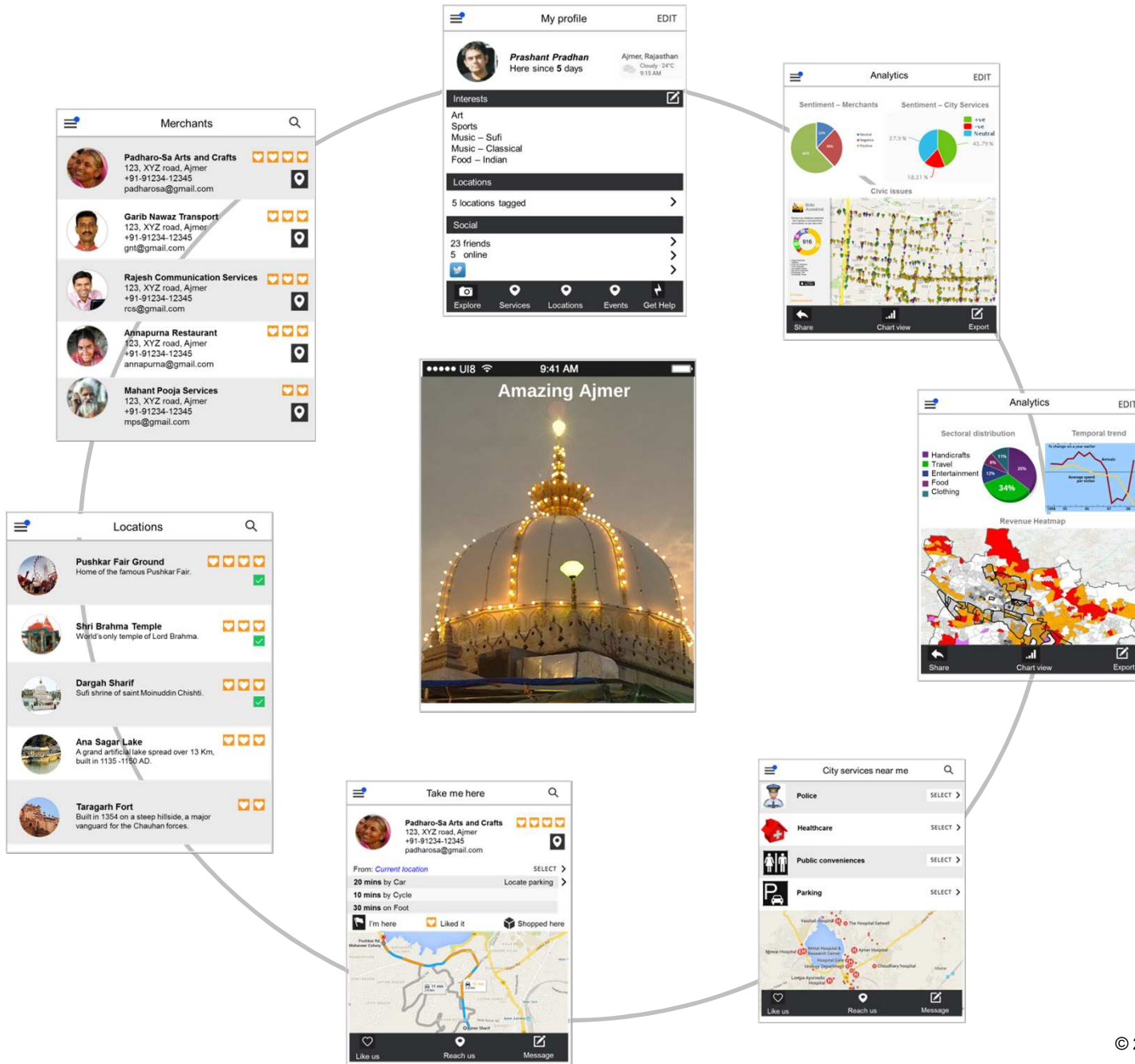


Case of 2013 Kumbh Mela

- City hosts 100 million people in 2 months !
- Released 2,500 cubic feet per second (cusec) from Jan 1 until Feb 28
- Two days before and one day after each of the six shahi snan days, released 11.3 cumec, over and above the minimum stipulated flow
- Intercepted sewage from open drains to convey to treatment plants, without underground drainage.
- Bio-remediation techniques for in-situ treatment (~40% reduction in BOD)
- Shut down about one-fifth of the tanneries in the upstream city of Kanpur, failing to meet the discharge norms. Complete closure during the Kumbh



Ajmer : Economic opportunity – Tourism





Domain assessment summary

- Water management is the crucial area to address in Ajmer’s Smart City roadmap
- Ajmer city’s own SWOT analysis identifies:
 - Poor availability of water is major threat
 - Improper channelization of rainwater and backflow into major drain from Annasagar lake over HFL
- Identifies water leakage prevention, rainwater harvesting incentives and recycling of waste water as some key initiatives

		Target	Achieved
Water Supply	Connections	100%	83%
	Per capita supply	135 lpcd	100 lpcd
	metering	100%	40%
	ContinADAy of supply	24 Hrs	1 Hr
	Quality	100%	80%
	Cost Recovery	100%	38%

Approach – Water Management Center

- Establish Water Management Center (WMC) pilot using available data – for end-to-end water resource management

GIS mapping of all water assets and their associated metrics across stakeholders

Data model for standardised representation of assets

Operations drill down into values and trends of each sensor

**System models of asset connectivity and state
Hydraulic models for leak / pressure management**

Historical asset information and trends for investigation

Tag Name	Unit	Current Reading	Time Stamp
Tank 4 Level	%	17.4	Thu Mar 05 23:46:13 CST 2011
Tank 4 High Flow Meter	GPM	167.0	Mon Feb 23 22:13:16 CST 2011
Tank 4 High Flow	%	400.0	Mon Feb 23 22:13:16 CST 2011
Tank 4 Volume of Tanks	Gal	17.4	Thu Mar 05 23:46:13 CST 2011
Tank 4 In Percentage	%	95.77582	Thu Mar 05 23:46:13 CST 2011

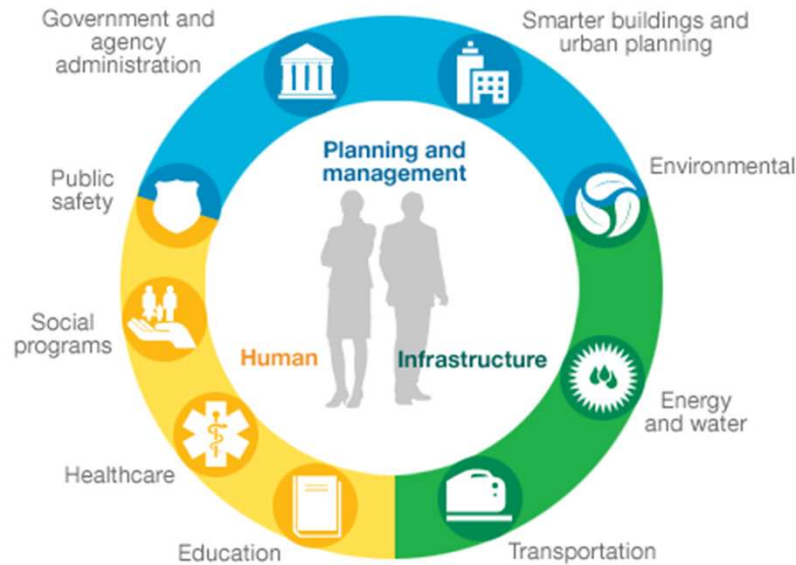
IBM WebSphere Portal - Sonoma - Mozilla Firefox: IBM Edition

SONOMA COUNTY WATER AGENCY

corporation

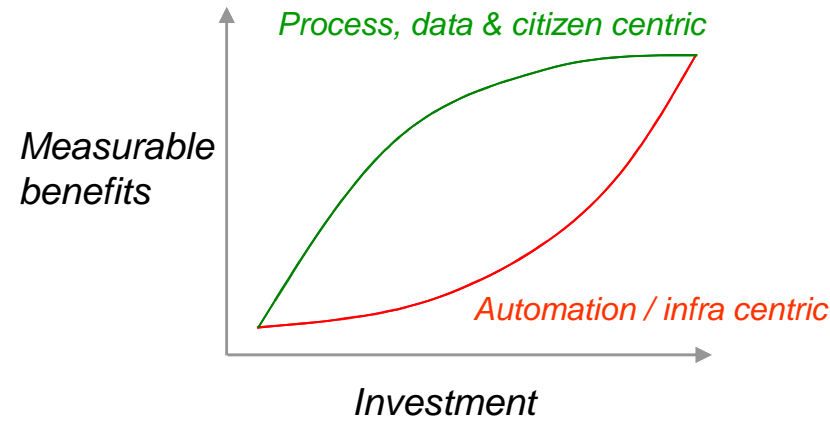
Surat – Vision for Integrated Operations

End state vision

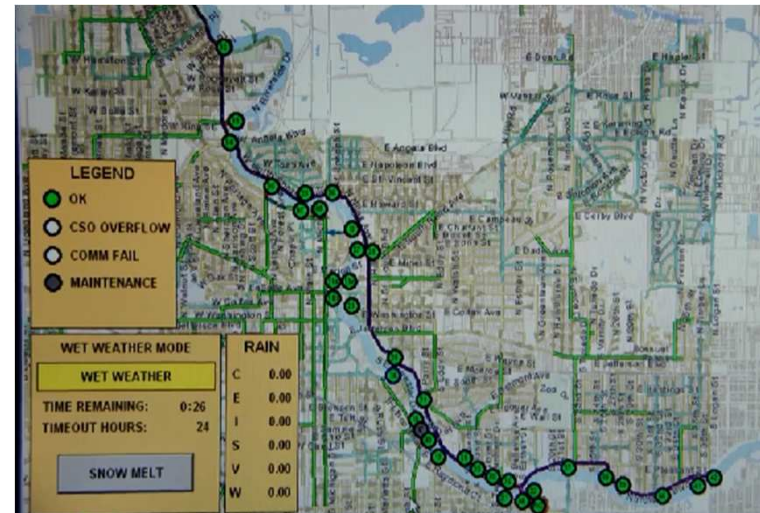


Oct 2015	June 2016	Dec 2016	June 2017	Dec 2017
<ul style="list-style-type: none"> SMAC integrated with: <ul style="list-style-type: none"> GIS layer WTP SCADA STP SCADA Property tax system VBD Health survey system Citizen complaint management 	<ul style="list-style-type: none"> Fleet Management system & BRTS on SMAC Emergency services integrated on SMAC Cognos platform Performance KPIs for BRTS, Property tax system, citizen management 	<ul style="list-style-type: none"> Citizen interaction through social media Asset Management implementation Water distribution SCADA, street light monitoring on SMAC All socio-economic services on analytics platform 	<ul style="list-style-type: none"> All municipality domains on SMAC monitoring 	<ul style="list-style-type: none"> All municipality domains on analytics platform Platform for single view of citizens All city assets on Asset Management system

Perspective on economic viability



City of South Bend actually **saved \$100M** by using analytics to unlock 10MLG of capacity in its sewerage system





- Brownfield is hard, but most critical
- Problem selection, depth, pragmatic execution are Critical Success factors
- Immerse, execute, and replicate with the cities and ULBs – best way to build institutional capacity as we go ...