

THE EVALUATION OF THE IMPACT OF BASIC SANITATION INFRASTRUCTURE AT THE US- MEXICO BORDER

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The US-Mexico Border



- 3000 km, home to more than 11.8 million people.
- 75% of the population was not served with WW treatment infrastructure (before 1990).
- Contaminated drinking water, high rates of gastro intestinal diseases and hepatitis.
- Untreated wastewater in shared water bodies
- BECC have addressed the asymmetries in basic sanitation.

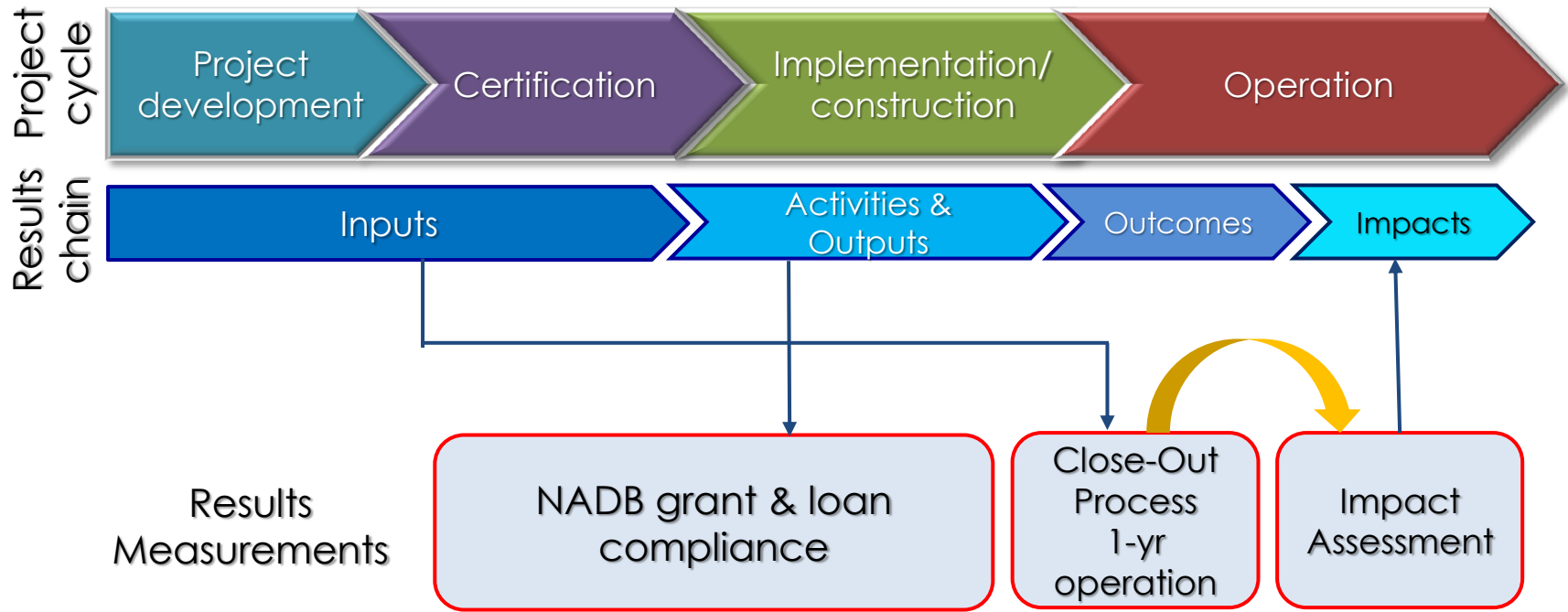
Objective

- Present the results of a methodology to measure the impact of wastewater projects in reference to BECC's mission.
- BECC's mission is to *provide health and environmental benefits to border communities*
- The IA is aimed to communicate to stakeholders, partners and funding agencies the value created by the US and Mexico funding collaboration.

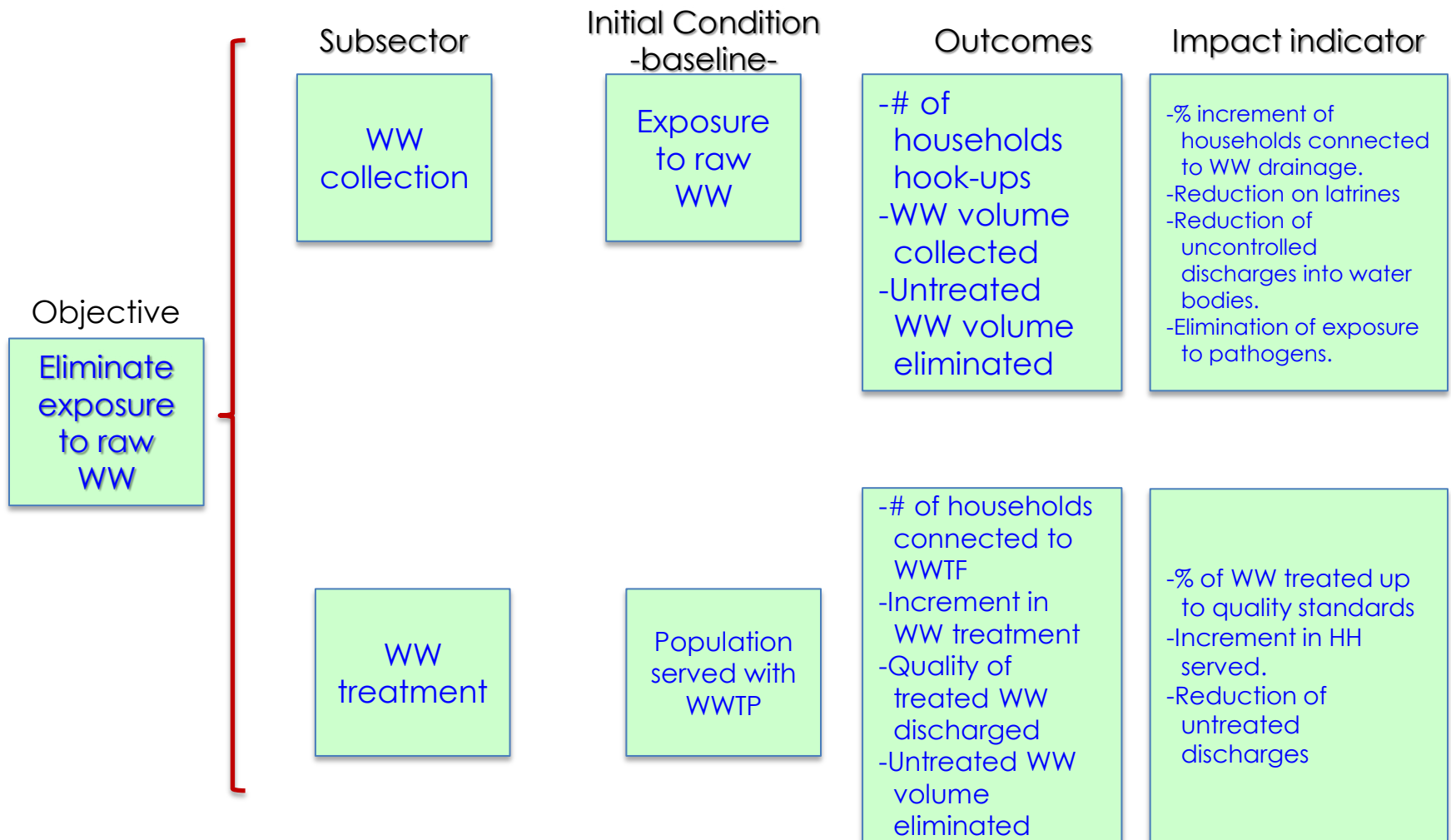


Methodology

- The impact assessment complements the *closeout* process (COP)
- The COP allows measuring results along components of the results chain:
 - *Outputs*, facilities were constructed as certified in terms of their physical characteristics
 - *Outcomes*, infrastructure provides access to residents as anticipated.
- The Impact Assessment (IA) collects data to address performance indicators:
 - (1) increase in wastewater residential connections system;
 - (2) overall reduction in the number of latrines and cesspools;
 - (3) reduction of untreated wastewater flowing into international water bodies;
 - (4) reduction in associated diseases and/or exposure to raw sewage and
 - (5) increased quality of life.



Logical Framework Approach



CASE 1

Valle de Juárez, selected communities: El Porvenir, Praxedis G. Guerrero, Guadalupe & Dr. Porfirio Parra

RESULTS

- Communities have a strong association to agricultural activities.
- Exposure to pathogens.
- Wastewater flowing through the community and into agricultural ditches.
- Certification in 2007, construction completed between July 2009 and June 2010.
- Baseline information in 2008-2009;
- The implementation of the wastewater collection and treatment system (output provided access to 100% of the population (outcome) within the community with wastewater service.
- The study reflects the impacts of the infrastructure implemented including:



Total investment \$146.8 million USD



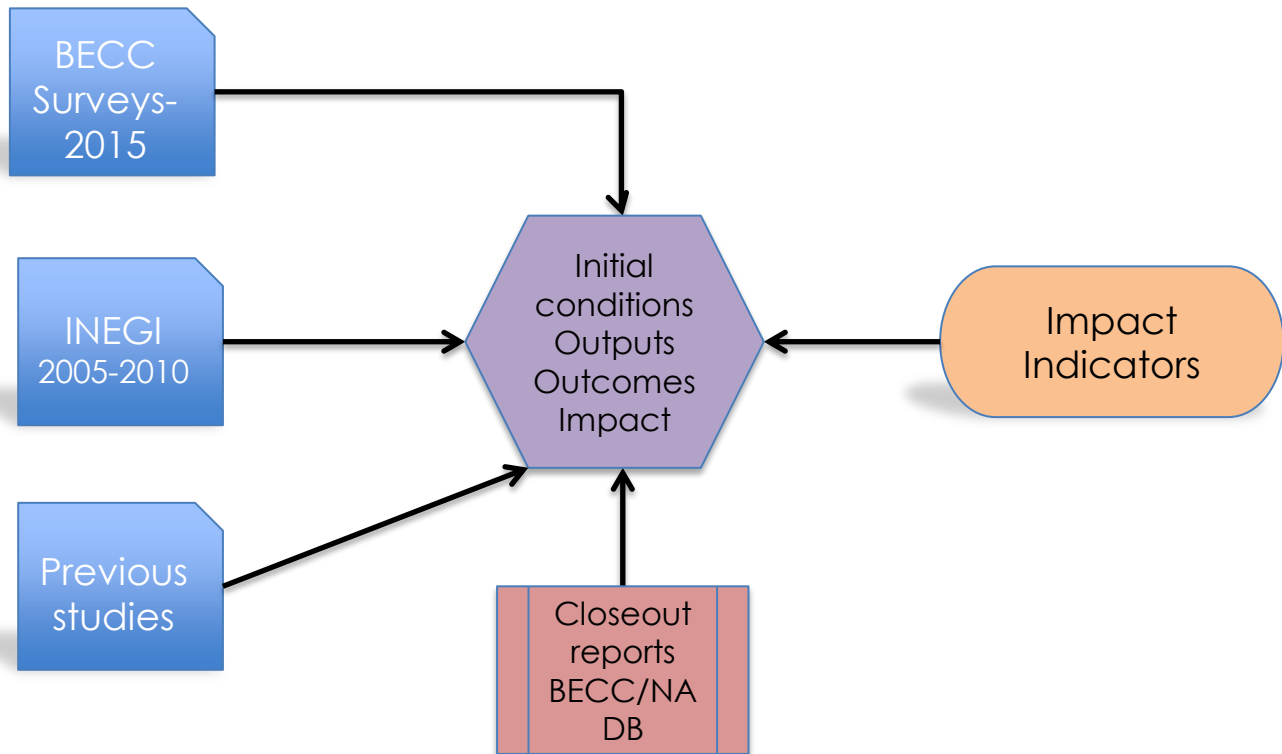
- (1) The percentage of households connected to the municipal wastewater system increased in the four studied communities to over 88%;
- (2) Consequently, the percentage of households with plumbing inside the house increased in the four studied communities;
- (3) The percentage of households with latrines and cesspools decreased in the four studied communities to almost 0%; and
- (4) 100% of the wastewater collected for all of the communities was not properly treated.

Selected Projects for Valle de Juarez

Community	Description	Total cost, MD
Práxedis G. Guerrero (Pop. 2,128)	Certification: Sept-2007 Completed: May-2009 Wastewater collection / treatment (WWTP 15 lps) 22.3 km ww collection	\$4.28
El Porvenir (Pop. 1253)	Certification: Sept-2007 Completed: Feb-2010 Wastewater collection / treatment (WWTP 15 lps) 27.5 km ww collectors	\$2.27
Guadalupe (Pop. 3,022)	Certification: Jul-2007 Completed: Feb-2010 Wastewater collection / treatment (WWTP 18 lps) 37 km ww collectors	\$3.4
Dr. Porfirio Parra (Pop. 956)	Certification: Jul-2007 Completed: Mar-2009 Wastewater collection/treatment (WWTP 12 lps) 11.36 km ww collectors	\$2.0
	TOTALS	\$16.39

Valle de Juárez

Information Management



Results CASE 1

El Porvenir	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population connected to the WW collection system	15%	97%	547%
Latrines	22%	3%	-86%
Cesspools	54%	0%	-100%
Population with WW treatment	0%	100%	100%
Flow of untreated raw WW (L/s)	10	0	—
Discharge points of raw WW adjacent to the community	1	Eliminated	—
Residents subject to exposure to raw WW during rainy season	100%	Eliminated	—

Praxedis G. Guerrero	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population connected to the WW collection system	70%	95%	36%
Latrines	11%	0%	-100%
Cesspools	19%	3%	-84%
Population with WW treatment	0%	100%	100%
Flow of untreated raw WW (L/s)	8	0	—
Discharge points of raw WW adjacent to the community	2	Eliminated	—
Residents subject to exposure to raw WW during rainy season	100%	Eliminated	—

Guadalupe	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population connected to the WW collection system	49%	88%	80%
Latrines	26%	8%	-69%
Cesspools	13%	13%	0%
Population with WW treatment	0%	100%	100%
Flow of untreated raw WW (L/s)	4	0	—
Discharge points of raw WW adjacent to the community	4	Eliminated	—
Homes exposed to raw WW in adjacent agriculture drain	30	0	—

Dr. Porfirio Parra	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population connected to the WW collection system	78%	95%	22%
Latrines	5%	0%	-100%
Cesspools	14%	4%	-71%
Population with WW treatment	0%	100%	100%
Flow of untreated raw WW (L/s)	4	0	—
Discharge points of raw WW adjacent to the community	9	Eliminated	—
Homes exposed to raw WW in adjacent agriculture drain	80	0	—

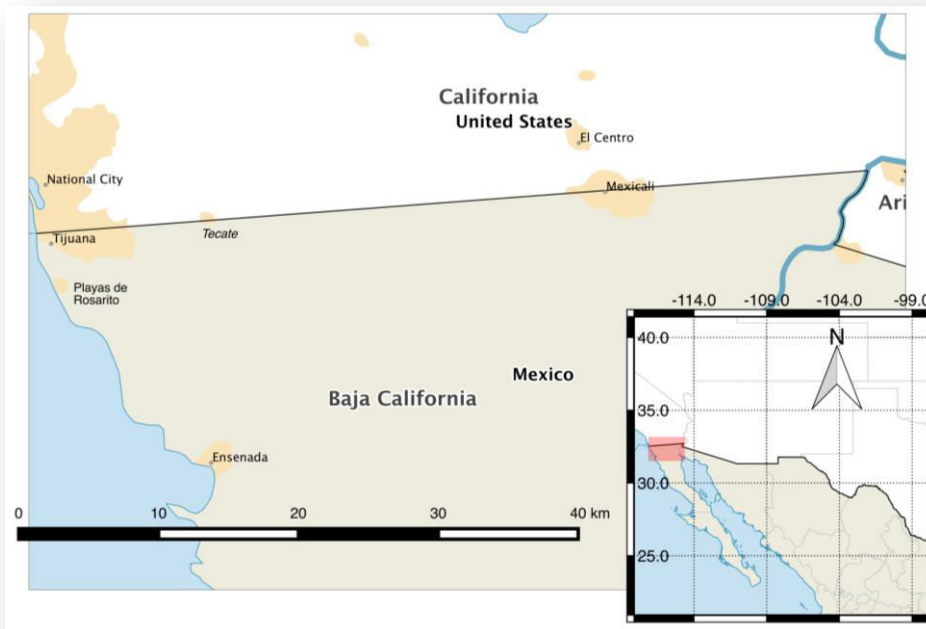
WWTF Selected for CASE 1: Valle de Juarez



CASE 2

Baja California: Tijuana, Playas de Rosarito, Tecate & Mexicali

- Selected communities experience rapid growth due to migration from southern Mexico;
- Baseline information provided by the local utilities, COP and INEGI.
- Surveys of 3,409 households
- Some of the impacts of the infrastructure studied:
 - (1) Sanitation conditions in the cities of Tijuana, Rosarito, Tecate, and Mexicali, measured as coverage of services for the collection and treatment of wastewater, significantly improved between the years 2000 and 2015;
 - (2) infrastructure projects implemented by the BECC and North American Development Bank were an important catalyst for this achievement
 - (3) The percentage of households with latrines and cesspools decreased significantly in the four studied communities;
 - (4) The decrease in the incidence of gastrointestinal diseases was significant in three of four communities studied ranging from 16% to 33%;
 - (5) Opinion surveys showed a high degree of satisfaction with the operation of the utility (87%+) as well as a perception of well-being associated with the implemented project (90%).

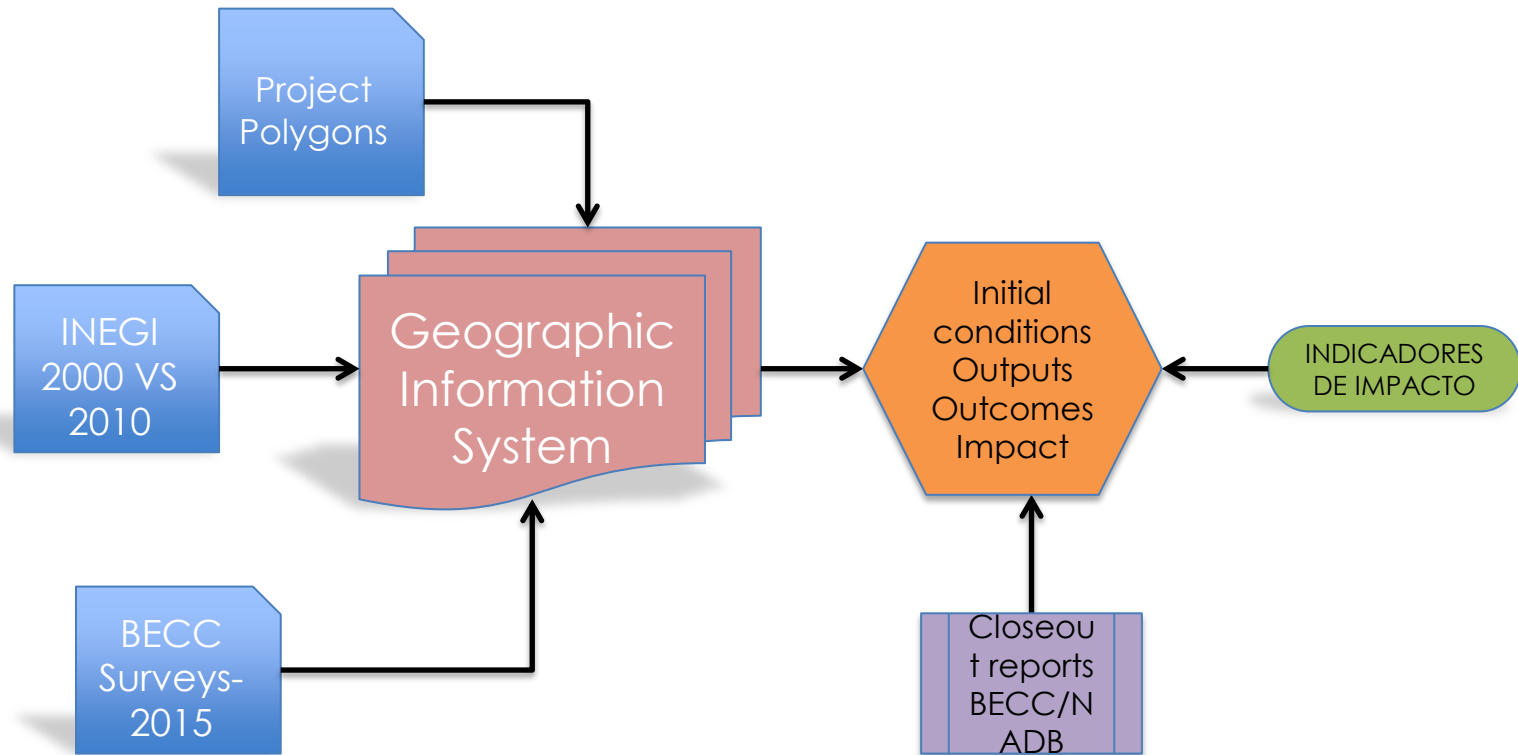


Selected Projects for BC

Community	Description	Total cost, MD
Tijuana (Pop. 1,722,348)	Certification: Sept-2007 Completed: May-2009 2-WWTP, 146 km collectors	\$92.66
Playas de Rosarito (Pop. 105,150)	Certification: Sept-2007 Completed: Feb-2010 1-WWTP, 119.6 km collectors.	\$18.83
Tecate (Pop. 11,098)	Certification: Jul-2007 Completed: Feb-2010 1-WWTP, 43 km collector.	\$11.50
Mexicali (Pop. 1,025,743)	Certification: Jul-2007 Completed: Mar-2009 1-WWTP, 63 km collectors	\$128.56
	TOTALS	\$251.55

Baja California Impact Assessment

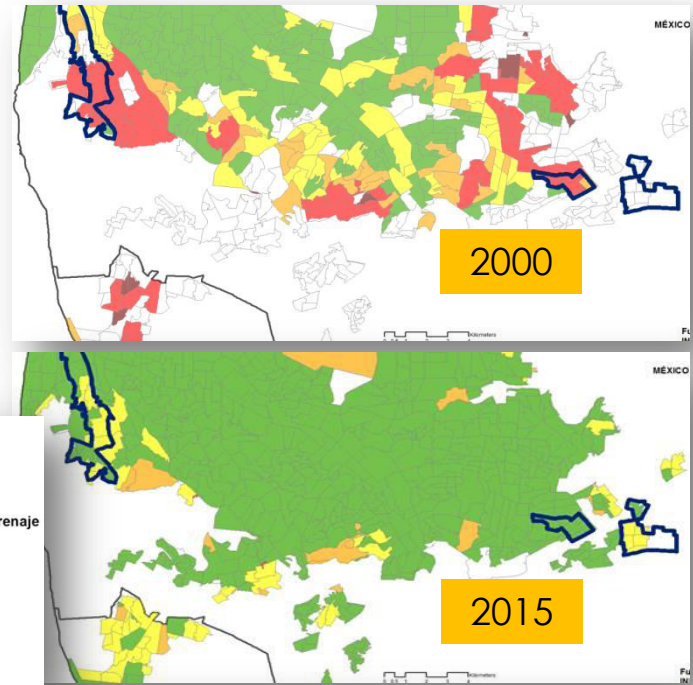
Information Management



Tijuana – WW collection in project polygons

Initial environmental conditions		
○ Residents within the project polygons (2015)		46,581
○ Population connected to the wastewater collection system		0%
▶ Latrines		88.6%
▶ Cesspools		11.4%
○ Population with wastewater treatment		0%
○ Flow of untreated raw wastewater (L/s)		95
○ Discharge points of raw wastewater adjacent to the community		Multiple
○ Residents subject to exposure to raw sewage during rainy season		100%

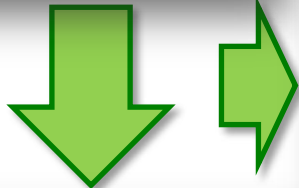
Wastewater collection system coverage



BECC/NADB projects



Outputs		
○ Wastewater collection lines (km)		146

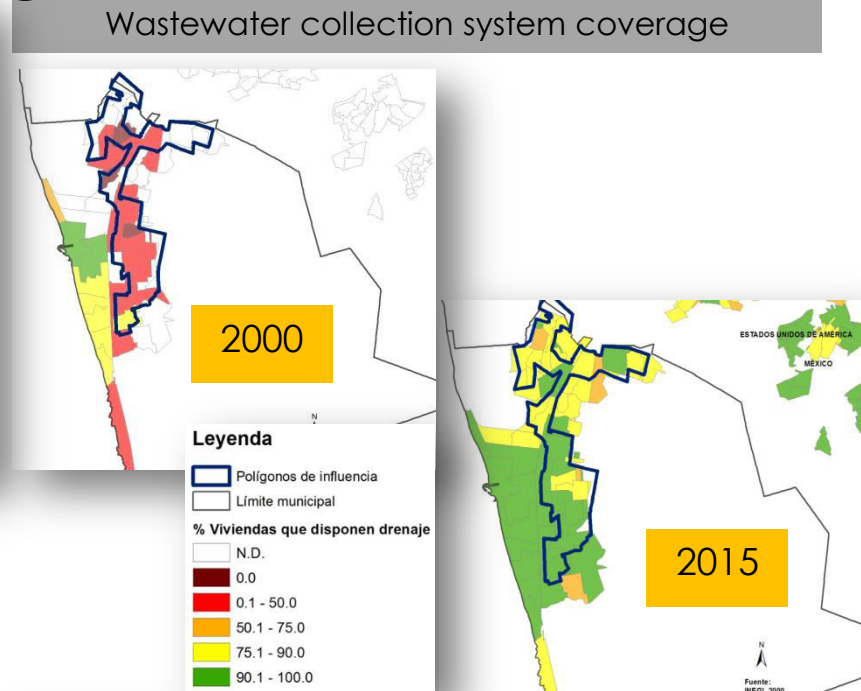


Outcomes		
○ Access to wastewater collection infrastructure		100%
○ Access to wastewater treatment infrastructure		100%

Impacts		
○ New wastewater domestic hookups		2,721
○ Population connected to the wastewater collection system		89.9%
▶ Latrines		10%
▶ Cesspools		1.1%
○ Population with wastewater treatment		100%
○ Flow of treated wastewater (L/s)		85
○ Discharge points of raw wastewater		Eliminated
○ Risk of residents exposure to raw sewage during rainy season		Eliminated

Playas de Rosarito – WW collection in project polygons

Initial environmental conditions		
○ Residents within the project polygons (2015)		20,042
○ Population connected to the wastewater collection system		0%
▶ Latrines		88.6%
▶ Cesspools		11.4%
○ Population with wastewater treatment		0%
○ Flow of untreated raw wastewater (L/s)		41
○ Discharge points of raw wastewater to the Pacific Ocean		Multiple
○ Residents subject to exposure to raw sewage during rainy season		100%



BECC/NADB projects

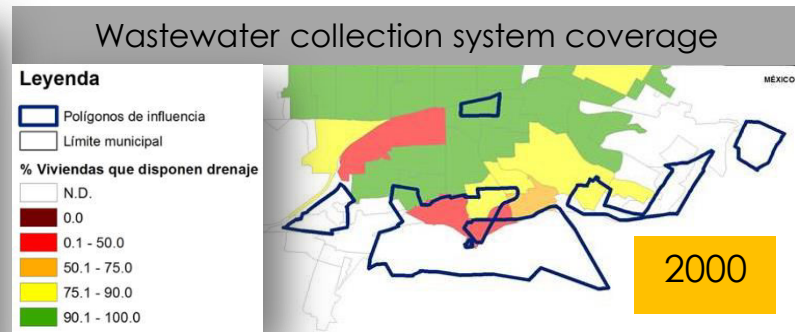
Outputs		
○ Wastewater collection lines (km)		119.6

Outcomes		
○ Access to wastewater collection infrastructure		100%
○ Access to wastewater treatment infrastructure		100%

Impacts		
○ New wastewater domestic hookups		4,555
○ Population connected to the wastewater collection system		79%
▶ Latrines		18%
▶ Cesspools		3%
○ Population with wastewater treatment		100%
○ Flow of treated wastewater (L/s)		38
○ Discharge points of raw wastewater to the Pacific Ocean		Eliminated
○ Risk of residents exposure to raw sewage during rainy season		Eliminated

Tecate – WW collection in project polygons

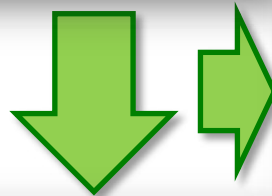
Initial environmental conditions		
● Residents within the project polygons (2015)		18,489
● Population connected to the wastewater collection system		0%
▶ Latrines		68%
▶ Cesspools		32%
● Population with wastewater treatment		0%
● Flow of untreated raw wastewater (L/s)		38
● Discharge points of raw wastewater adjacent to the community and to the Tecate river		Multiple
● Residents subject to exposure to raw sewage during rainy season		100%



BECC/NADB projects



Outputs	
● Wastewater collection lines (km)	43



Outcomes	
● Access to wastewater collection infrastructure	100%
● Access to wastewater treatment infrastructure	100%

Impacts	
● New wastewater domestic hookups	3,408,202
● Population connected to the wastewater collection system	94%
▶ Latrines	6%
▶ Cesspools	0%
● Population with wastewater treatment	100%
● Flow of treated wastewater (L/s)	38
● Discharge points of raw wastewater adjacent to the community and to the Tecate river	Eliminated
● Risk of residents exposure to raw sewage during rainy season	Eliminated

Mexicali – WW collection in project polygons

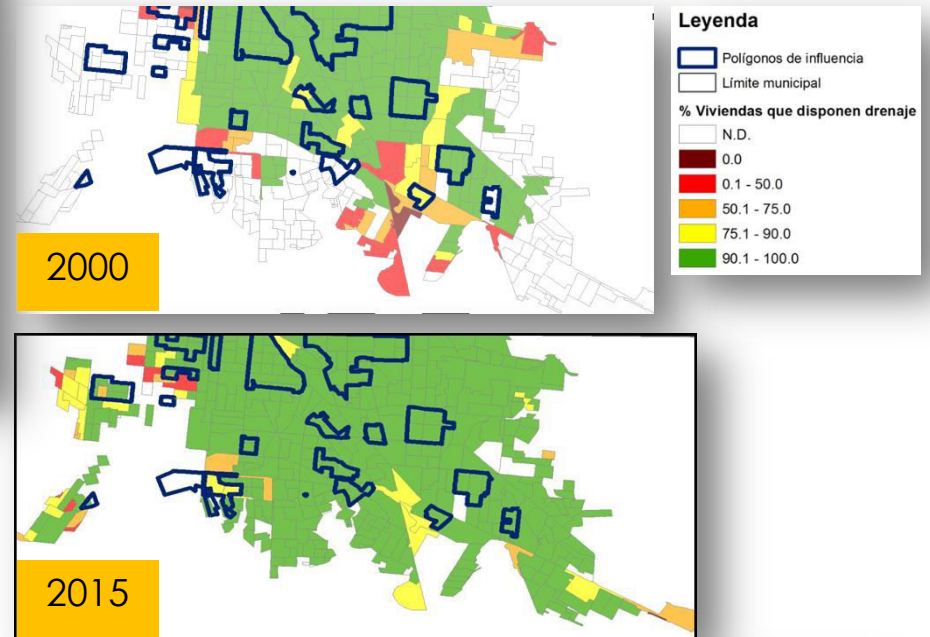
Initial environmental conditions		
○ Residents within the project polygons (2015)		50,596
○ Population connected to the wastewater collection system		0%
▶ Latrines		29%
▶ Cesspools		71%
○ Population with wastewater treatment		0%
○ Flow of untreated raw wastewater (L/s)		103
○ Discharge of raw wastewater to the Río Nuevo		Multiple
○ Residents subject to exposure to raw sewage during rainy season		100%

BECC/NADB projects

Outputs		
○ Wastewater collection lines (km)		78.2

Outcomes		
○ Access to wastewater collection infrastructure		100%
○ Access to wastewater treatment infrastructure		100%

Wastewater collection system coverage

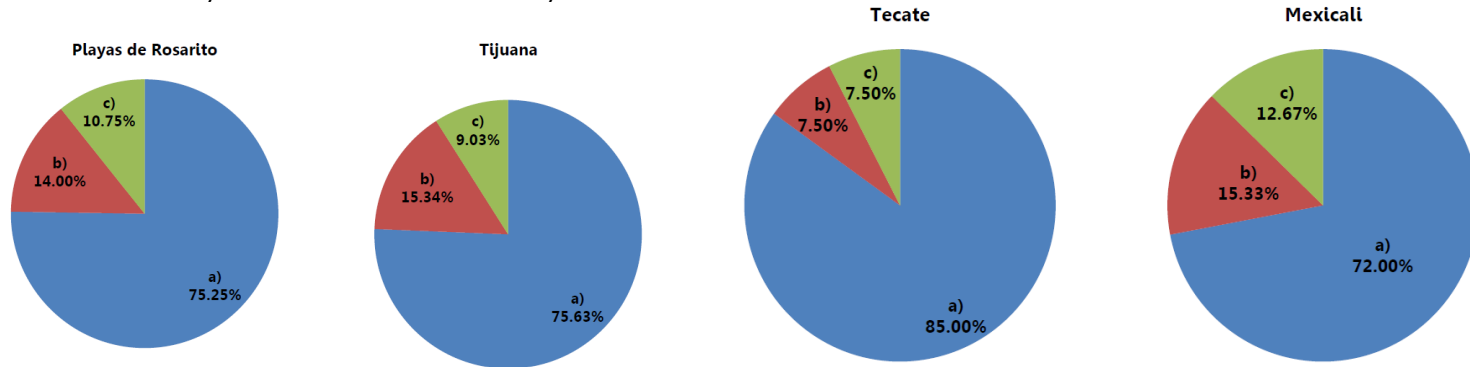


Impacts		
○ New wastewater domestic hookups		11,499
○ Population connected to the wastewater collection system		98.3%
▶ Latrines		1.3%
▶ Cesspools		0.4%
○ Population with wastewater treatment		100%
○ Flow of treated wastewater (L/s)		100
○ Discharge of raw wastewater to the Río Nuevo		Eliminated
○ Risk of residents exposure to raw sewage during rainy season		Eliminated

Survey

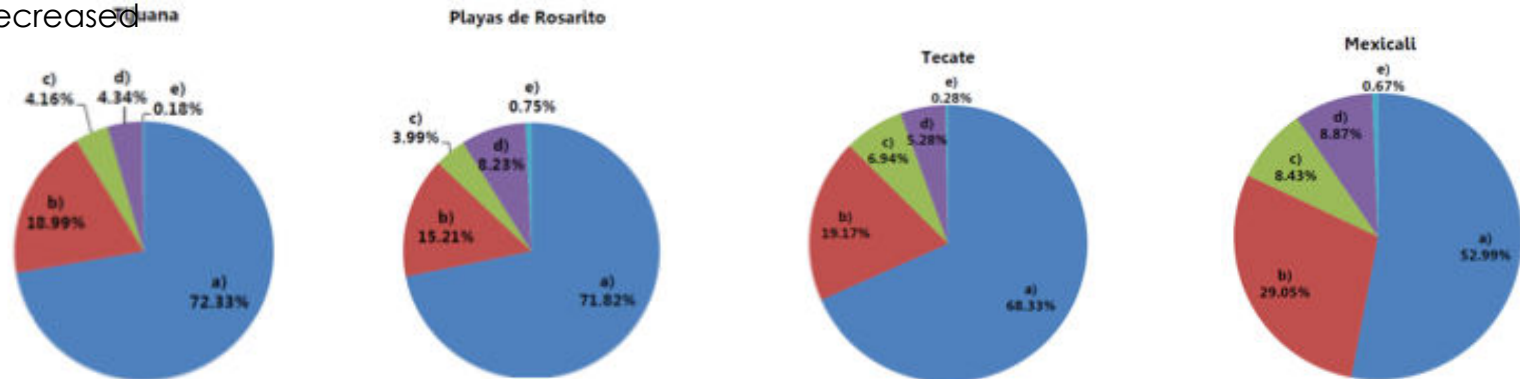
14. Your satisfaction with the WW and WW treatment service

Answers: a= Very satisfied; b= modestly satisfied; c= unsatisfied



21. What change in your quality of life did you perceived after the construction of the sanitary infrastructure?

Answers: a= Very much improvement; b=improved; c= modestly improved; d= the same and e= decreased



Impact Assessment Summary for Baja California -city wide projects-

Tijuana WW System	Initial conditions	Impacts	Change
City-wide (Projects by BECC/NADB & others)	Yr.2000	Yr.2015	%
Population (inhabitants -INEGI)	1,210,520	1,722,348	42%
Population connected to the WW collection system	77%	91%	18%
Existing wastewater domestic hookups	266,762	488,250	83%
Wastewater treatment coverage	73%	97%	33%
Gastrointestinal diseases rate (/10000)	444	320	-28%
Flow of untreated raw wastewater (L/s)	627	0	-

Playas de Rosarito	Initial conditions	Impacts	Change
City-wide (Projects by BECC/NADB & others)	Yr.2000	Yr.2015	%
Population (inhabitants -INEGI)	63,420	105,150	66%
Population connected to the WW collection system	45%	65%	44%
Existing wastewater domestic hookups	8,493	32,191	279%
Wastewater treatment coverage	36%	100%	178%
Gastrointestinal diseases rate (/10000)	392	329	-16%
Flow of untreated raw wastewater (L/s)	36	0	-

Tecate	Initial conditions	Impacts	Change
City-wide (Projects by BECC/NADB & others)	Yr.2000	Yr.2015	%
Population (inhabitants -INEGI)	77,795	111,098	43%
Population connected to the WW collection system	84%	96%	14%
Existing wastewater domestic hookups	16,454	27,710	68%
Wastewater treatment coverage	0%	100%	100%
Gastrointestinal diseases rate (/10000)	526	632	20%
Flow of untreated raw wastewater (L/s)	200	0	-

Mexicali	Initial conditions	Impacts	Change
City-wide (Projects by BECC/NADB & others)	Yr.2000	Yr.2015	%
Population (inhabitants -INEGI)	764,602	1,025,743	34%
Population connected to the WW collection system	83%	95%	14%
Existing wastewater domestic hookups	162,682	488,250	200%
Wastewater treatment coverage	91%	100%	10%
Gastrointestinal diseases rate (/10000)	289	193	-33%
Flow of untreated raw wastewater (L/s)	115	0	-



Conclusions



- BECC mandate of improving human health and the environment had been fulfilled and that communities had been serviced as expected by the promoters.
- Additionally, projects met the fundamental environmental objective of providing access to service, and demonstrate that residents utilized infrastructure and benefitted from improved quality of life and in the overall sanitation of the community.

- The surveys in all cases show a perception of improvement after the interventions (survey data is available from the authors).
- The Results Measurement Framework proved to be a useful tool in determining the actual impact of sanitary infrastructure in support of the objective effect of financial investment beyond the merely cost per capita analysis, which not always reflects the hidden costs of health and quality of life
- The proper planning with local and federal authorities combined with the use of funds for technical assistance (mostly from BECC) appear to be the formula to incentivize the flow of funds to assist socio-economically challenged communities.



THANK YOU

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