BUILDING A REGIONAL INFRASTRUCTURE FOR THE FUTURE OF INTERNET IN LATIN AMERICA

A report to the CAF Latin American Development Bank

Telecom Advisory Services, LLC

FUTURECOM
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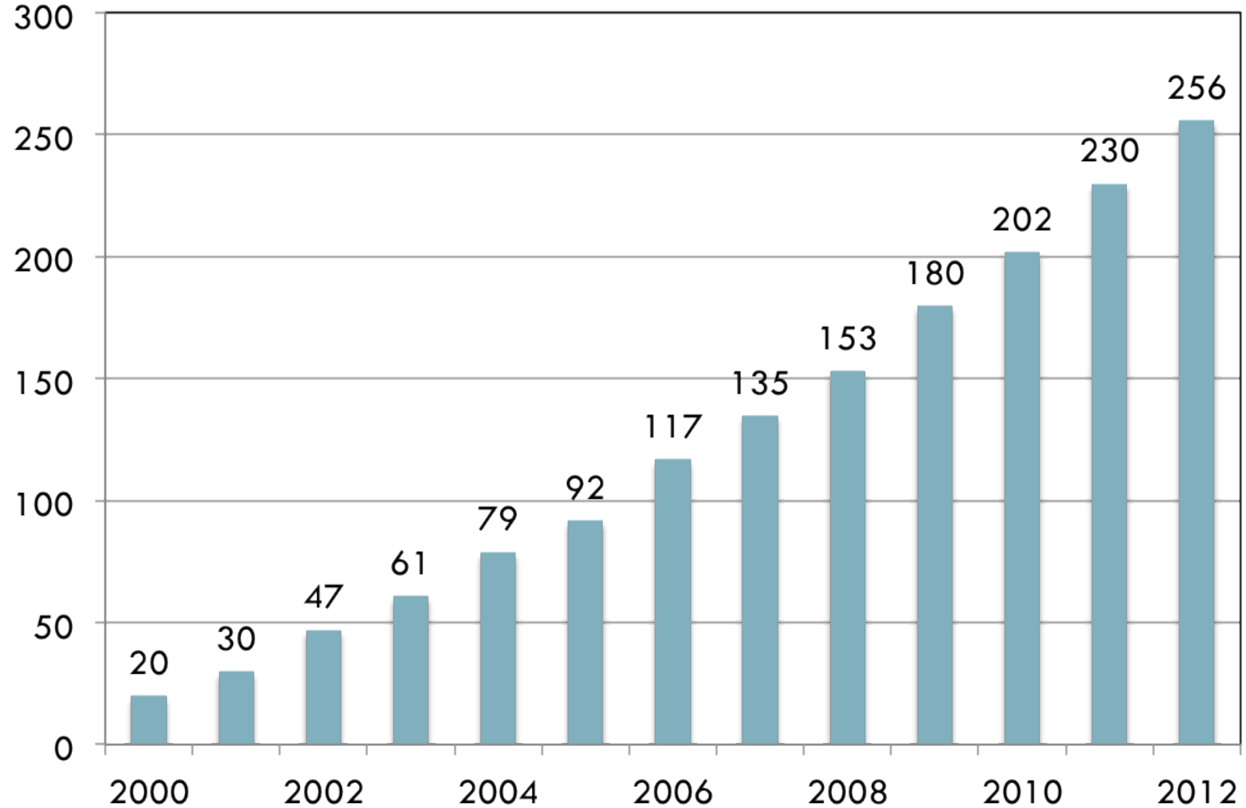
LATIN AMERICA EXHIBITS A MEDIUM LEVEL OF INTERNET ADOPTION, WITH 256 MILLION USERS BY THE END OF 2012, GROWING AT 24% PER YEAR

LATIN AMERICA: USERS OF INTERNET
(‘000’000)

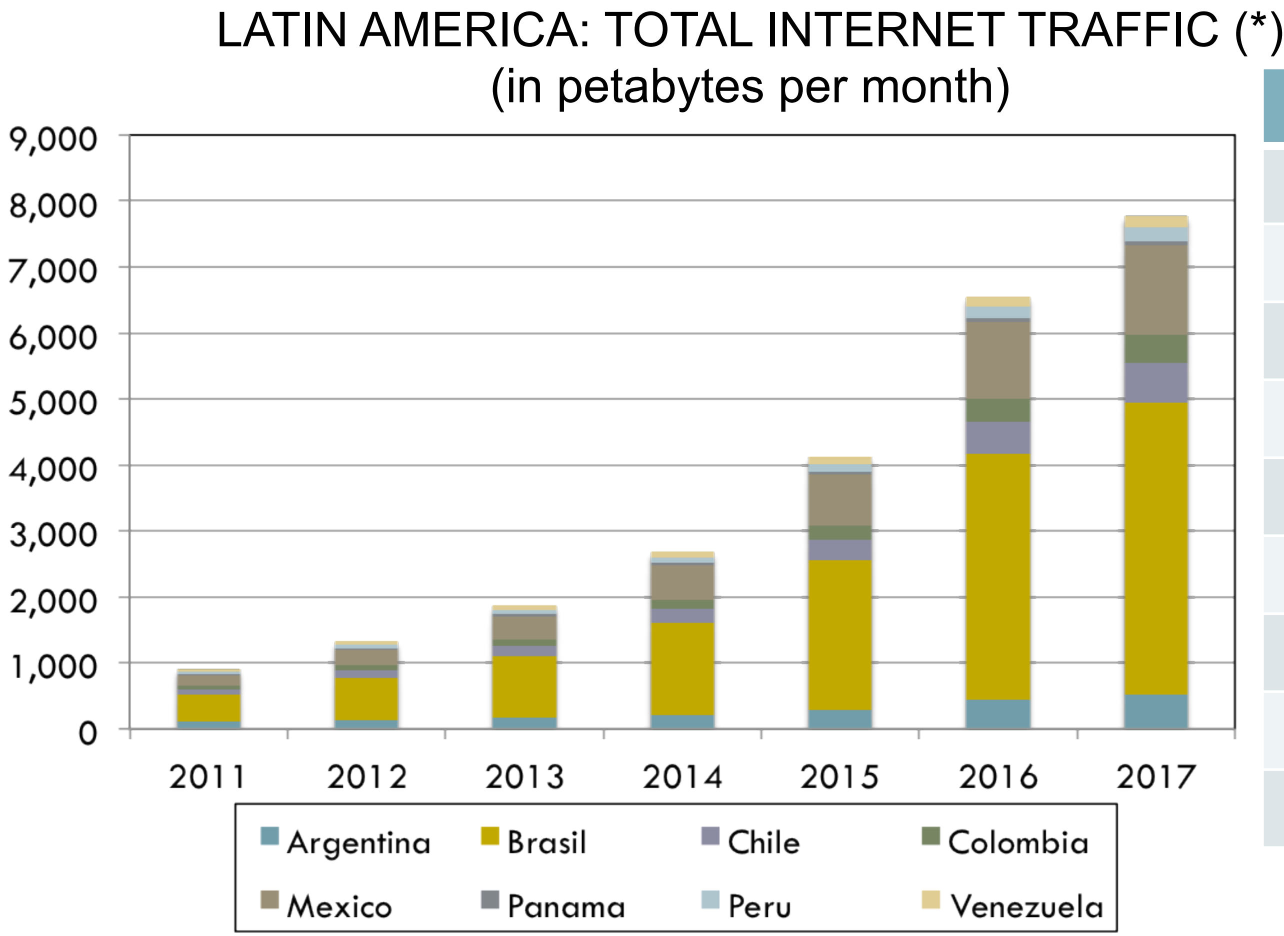


CAGR

Penetration	3,9	5,6	8,9	11,3	14,4	16,6	20,8	23,8	26,5	31,0	34,4	39,4	44,7	24,7 %

Source: ITU (2012)

BY THE END OF 2012, THE TRAFFIC GENERATED BY THE TOP COUNTRIES COMPRISES 1,300 MILLION GIGABYTES PER MONTH, GROWING AT 42% PER YEAR

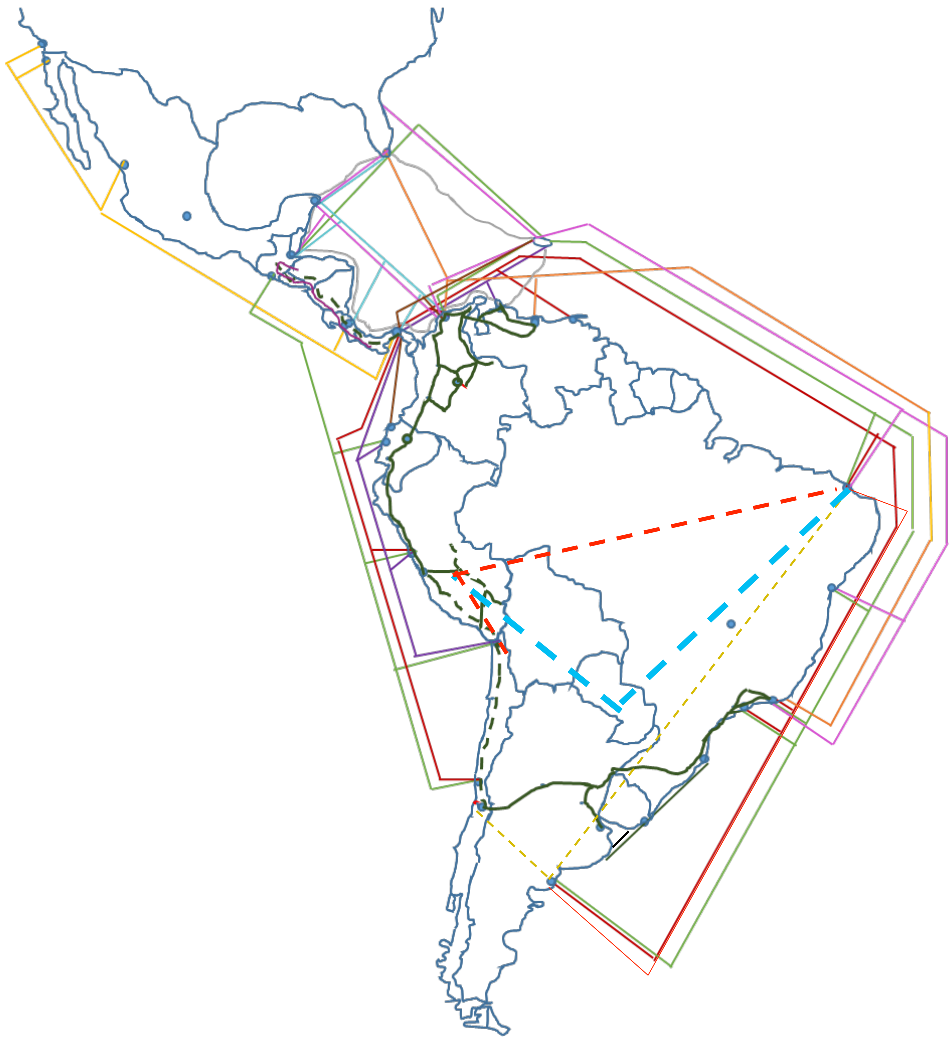


COUNTRY	CAGR
Argentina	32 %
Brazil	47 %
Chile	40 %
Colombia	42 %
Mexico	42 %
Panama	16 %
Peru	37 %
Venezuela	25 %
TOTAL	42 %

Note: 1 PB= 1 Petabyte= 10^15 = 1 million Gigabytes
(*) The countries included represent 85% of total Latin American traffic

Source: Traffic model developed by TAS

FIBER OPTIC DEPLOYMENT HAS ALLOWED TO INCREASE THE INTERNATIONAL TRANSIT CAPACITY WITHIN AND OUT OF THE REGION



		ARG	BRA	CHI	COL	ECU	MEX	PAN	PER	VEN	CA
AMX-1			X		X		X				
PAN-AM				X	X	X		X	X	X	
Sam-1		X	X	X	X	X			X		X
SAC/LAN		X	X	X				X	X	X	
PAC							X	X			X
ARCOS					X		X	X		X	X
MAYA-1					X		X	X			X
PCCS					X	X		X			
Globe Net			X		X					X	
Americas II			X							X	
UNASUR		X	X								
Bicentenario		X									
Atlantis II		X	X								
ARSAT		X	X	X							
COPACO			X						X		
RED DORSAL			X	X					X		
Internexa		X	X	X	X	X		X	X	X	X
Redca								X			X

Source; Telegeography, TAS analysis
Note: only included cables that connect more than one country within Latin America.

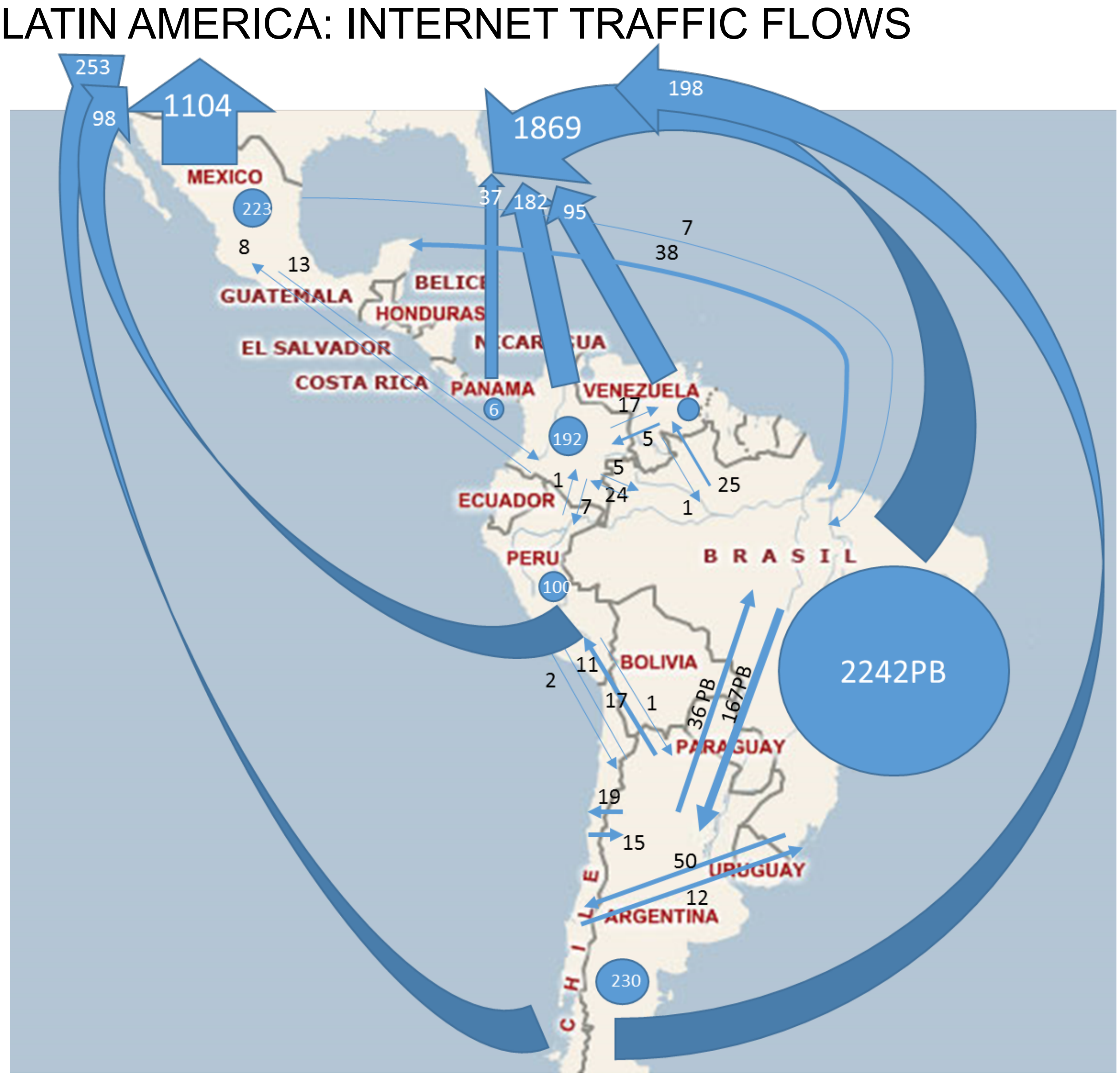
HOWEVER, THE DEVELOPMENT OF THE INTERCONNECTION INFRASTRUCTURE IN LATIN AMERICA HAS BEEN UNEVEN SO FAR

LATIN AMERICA: EXISTING IXPs

COUNTRY	Number of IXPs	Situation
Argentina	11	• Plans to deploy 10 more
Bolivia	0	• 3 planned
Brasil	31	• Plans to deploy 16 more
Chile	8	• Private peering
Colombia	1	• Only local traffic
Ecuador	2	• Only local traffic
El Salvador	1	• Partially operating
Guatemala	0	• No plans as of yet
Honduras	0	• No plans as of yet
México	0	• 1 under construction
Nicaragua	1	• Hosted at a university
Panamá	1	• Informal agreement among ISPs
Paraguay	1	• Incumbent not interconnected
Perú	2	• One operated by consortium
Venezuela	0	• Planned

Source: Compiled by TAS

AS A RESULT, A LARGE PORTION OF LATIN AMERICAN INTERNET TRAFFIC IS STILL INTERCONNECTING IN THE UNITED STATES



Source: Traffic model developed by TAS

APPROXIMATELY 14% OF INTERNET TRAFFIC TOWARD THE UNITED STATES COMPRISES COMMUNICATION FLOWS AMONG LATIN AMERICAN COUNTRIES

LATIN AMERICA: INTERNATIONAL TRAFFIC FLOWS BY MONTH (2012)
(In Petabytes)

		OUTGOING TRAFFIC								
		Argentina	Brasil	Chile	Colombia	Mexico	Panama	Peru	Venezuela	TOTAL
INCOMING TRAFFIC	Argentina		27	3	0.9	1	0	1.4	0	33.3
	Brasil	11		3	1.1	1.2	0.01	0.9	0.6	17.8
	Chile	6	8		1.2	0.6	0.09	2	0.03	17.9
	Colombia	2	4	1		2.3	2.48	0.8	0.6	13.2
	Mexico	1	6	1	1.6		0.35	0.5	0.4	10.8
	Panama	0	0	0	1.6	0.3		0.2	0.4	2.5
	Peru	5	4	2	1.4	0.4	0.02		0.5	13.3
	Venezuela	1	4	0.5	3.4	1.5	0.7	0.6		11.7
	Otros	43	305	54	37.2	193.3	18	24	43	717.5
	TOTAL	83	359	65	48	199	22.3	30	50	856.3
	Latam Average	31 %	15 %	16 %	23 %	4 %	16 %	21 %	15 %	14 %

Source: Traffic model developed by TAS

AN ADDITIONAL 20% OF TRAFFIC IS ORIENTED TOWARD ACCESSING INTERNATIONAL CONTENT ALTHOUGH, IN SOME CASES, THIS IS ALREADY HOSTED IN THE REGION TO REDUCE ACCESS COSTS

LATIN AMERICA: MONTHLY FLOWS OF CONTENT TRAFFIC (2012)
(en Petabytes)

Country	Total Traffic	International Content Traffic	Percentage
Argentina	127	38	30 %
Brasil	652	130	20 %
Chile	109	33	30 %
Colombia	75	22	29 %
México	235	12	5 %
Panamá	25	7	28 %
Perú	47	14	30 %
Venezuela	56	3	5 %
TOTAL	1,326	253.3	20 %

Source: Traffic model developed by TAS

DUE TO THE UNEVEN DEVELOPMENT OF IXPs, LATIN AMERICA IS INCURRING HIGH INTERNATIONAL DATA TRANSPORT COSTS: US$ 1,800 MILLION PER YEAR

LATIN AMERICA: ANNUAL INTERNET TRANSIT COSTS (en US$)

Country	Cost to access international content	Cost to support Latam traffic	Cost for international traffic (ex Latam)	Total
Argentina	US$ 0	US$ 37.10	US$ 87.65	US$ 124.75
Bolivia	US$ 41.16	US$ 20.58	US$ 27.48	US$ 89.22
Brasil	US$ 0	US$ 89.53	US$ 509.43	US$ 598. 96
Colombia	US$ 89.48	US$ 45.89	US$ 147.98	US$ 283. 35
Costa Rica	US$ 18.66	US$ 3.65	US$ 38.52	US$ 60.83
El Salvador	US$ 18.66	US$ 3.65	US$ 38.52	US$ 60.83
Guatemala	US$ 8.11	US$ 1.59	US$ 16.75	US$ 26.45
Honduras	US$ 10.61	US$ 2.07	US$ 21.88	US$ 34.56
Mexico	US$ 7.47	US$ 2.05	US$ 138.76	US$ 148.28
Nicaragua	US$ 6.03	US$ 1.18	US$ 12.44	US$ 19.65
Panama	US$ 5.57	US$ 11.4	US$ 50.1	US$ 67.07
Paraguay	US$ 44.45	US$ 22.23	US$ 29.63	US$ 96.31
Peru	US$ 100.74	US$ 29.83	US$ 55.68	US$ 186.25
TOTAL	US$ 350.94	US$ 270.75	US$ 1,174.82	**US$ 1,796.51**

Source:TAS analysis

THESE COSTS ARE TRANSFERRED TO BROADBAND RETAIL PRICES, WHICH IMPOSES LIMITS TO THE AFFORDABILITY IN LARGE PORTIONS OF THE POPULATION

LATIN AMERICA: EXAMPLES OF LIMITED AFFORDABILITY

	Argentina	Brazil	Colombia	Ecuador	Mexico
Monthly Tariff of Basic Fixed Broadband Plan (in US$)	US$ 23.99	US$ 14.75	US$ 20.77	US$ 20.16	US$ 14.58 (*)
Monthly Raiff of Medium Offer of fixed broadband plan (in US$)	US$ 25.94	US$ 29.65	US$ 22.61	US$ 27.89	US$ 29.16
Income decils that can acquire broadband service	6 to 10	4 to 10	7 to 10	9 and 10	3 to 10
Number of households that cannot acquire broadband	6,555,000	15,300,000	5,940,000	3,040,000	6,320,000

(*) Tariff of cable TV operators with limited geographic coverage

Source: Katz y Callorda. "Mobile broadband affordability in the bottom of the pyramid in Latin America". GSMA, 2013

THIS SITUATION REQUIRES THE URGENT DEPLOYMENT OF IXPs TO REDUCE THE INTERNATIONAL TRANSIT COSTS

INTERNET VALUE CHAIN

Access Devices → Last Mile connectivit y → Internet Service Provider → Regional / International Transport → Interconnection Point → Regional / International Transport → Internet Service Provider

Cost to Accessing Interntaional Content	Cost for intra Latam traffic	Cost for international traffic ex Latam	Total
US$ 350.94 million	US$ 270.75 million	US$ 1,174.82 million	US$ 1,796.51 million

Accelerate the localization of international content in Latin America to reduce access costs

Increase the percentage of traffic interconnected in the region to reduce transit costs

DEPLOY MORE IXPs IN LATIN AMERICA

TRAFFIC ANALYSIS IDENTIFIES TWO COMMUNITIES OF INTEREST (“CLUSTERS”): NORTH AMERICA/ANDEAN/CENTRAL AMERICA AND SOURTHERN CONE INTERCONNECTED BY PERU

LATIN AMERICA: PERCENTAGE OF OUTGOING INTERNET TRAFFIC

		OUTGOING TRAFFIC							
		Mexico	Panamá	Colombia	Venezuela	Peru	Chile	Argentina	Brazil
INCOMING TRAFFIC	México		1.6%	3.4%	0.8%	1.5%	2.0%	1.2%	1.7%
	Panamá	0.1%		3.4%	0.8%	0.5%	0.1%	0.0%	0.0%
	Colombia	1.1%	11.1%		11.0%	2.8%	1.7%	2.0%	1.1%
	Venezuela	0.2%	3.1%	7.0%		2.1%	0.8%	1.6%	1.1%
	Peru	0.2%	0.1%	2.8%	1.0%		3.6%	6.0%	1.0%
	Chile	0.3%	0.4%	2.5%	0.1%	6.6%		6.8%	2.3%
	Argentina	0.5%	0.0%	1.9%	0.0%	4.7%	4.8%		7.6%
	Brazil	0.6%	0.1%	2.2%	1.3%	3.0%	4.1%	12.7%	
	Otros países	97%	84%	77%	85%	79%	83%	70%	85%

Noth America / Andean / Central America (*)

Interconnection Point

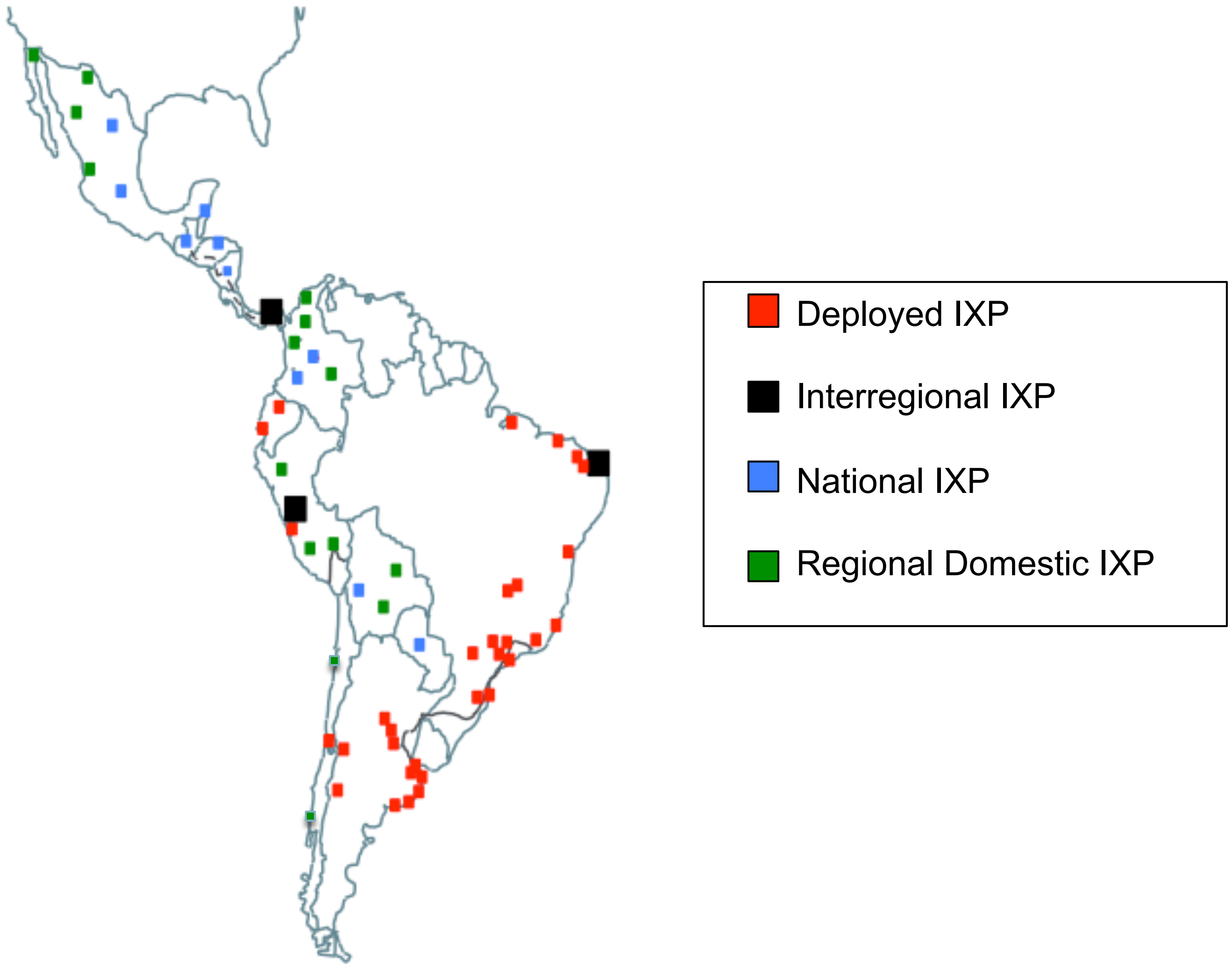
Southern Cone

(*) includes countries with logical pairing such as Guatemala, El Salvador, Honduras, Nicaragua y Ecuador

Source: TAS analysis

WE RECOMMEND DEPLOYING THREE INTERREGIONAL POINTS AND A NETWORK OF DOMESTIC POINTS IN SEVERAL COUNTRIES TO COMPLEMENT THE EXISTING INFRASTRUCTURE

IXP REGIONAL INFRASTRUCTURE

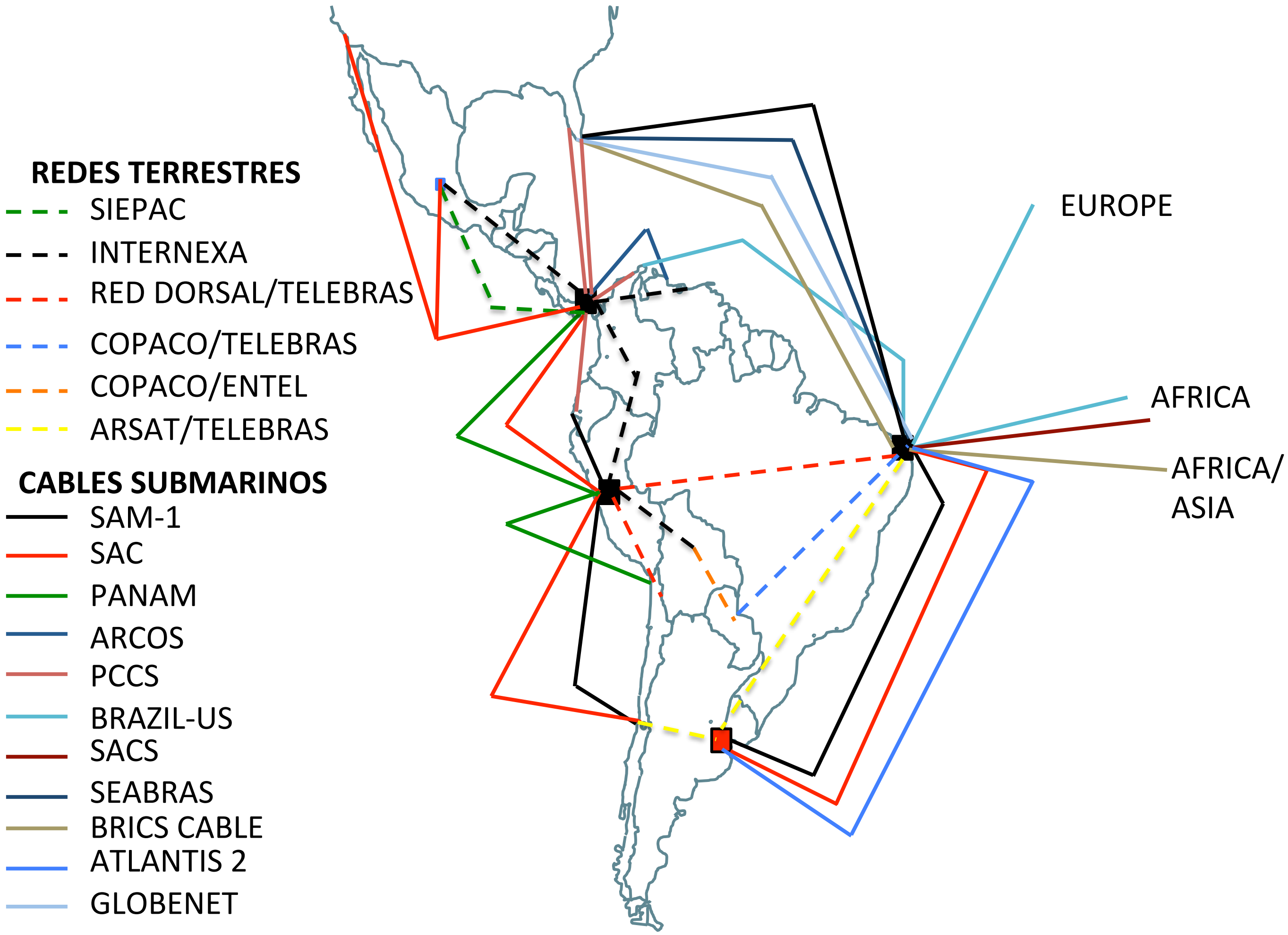


While the recommendations do not include an interregional IXP in the southern cone, the Buenos Aires NAP (deployed within CABASE) represents a *de facto* interregional IXP given that it provides interconnection to ANTEL and is currently undergoing tests with Brazil and Chile.

Fuente: Análisis TAS

THE CONNECTIVITY AMONG THE INTERREGIONAL NODES OF PANAMA, PERU AND BRAZIL WOULD BE FULFILLED BY MULTIPLE TERRESTRIAL NETWORKS AND SUBMARINE CABLES

REGIONAL TRANSPORT INFRASTRUCTURE



Source: Compiled by TAS from Submarine Cable Almanac; ISA Internexa; Siepac; Interviews

THE INITIAL CAPITAL INVESTMENT FOR THE DEPLOYMENT OF IXP IS ESTIMATED BETWEEN US$ 47.4 Y US$ 61.0 MILLION

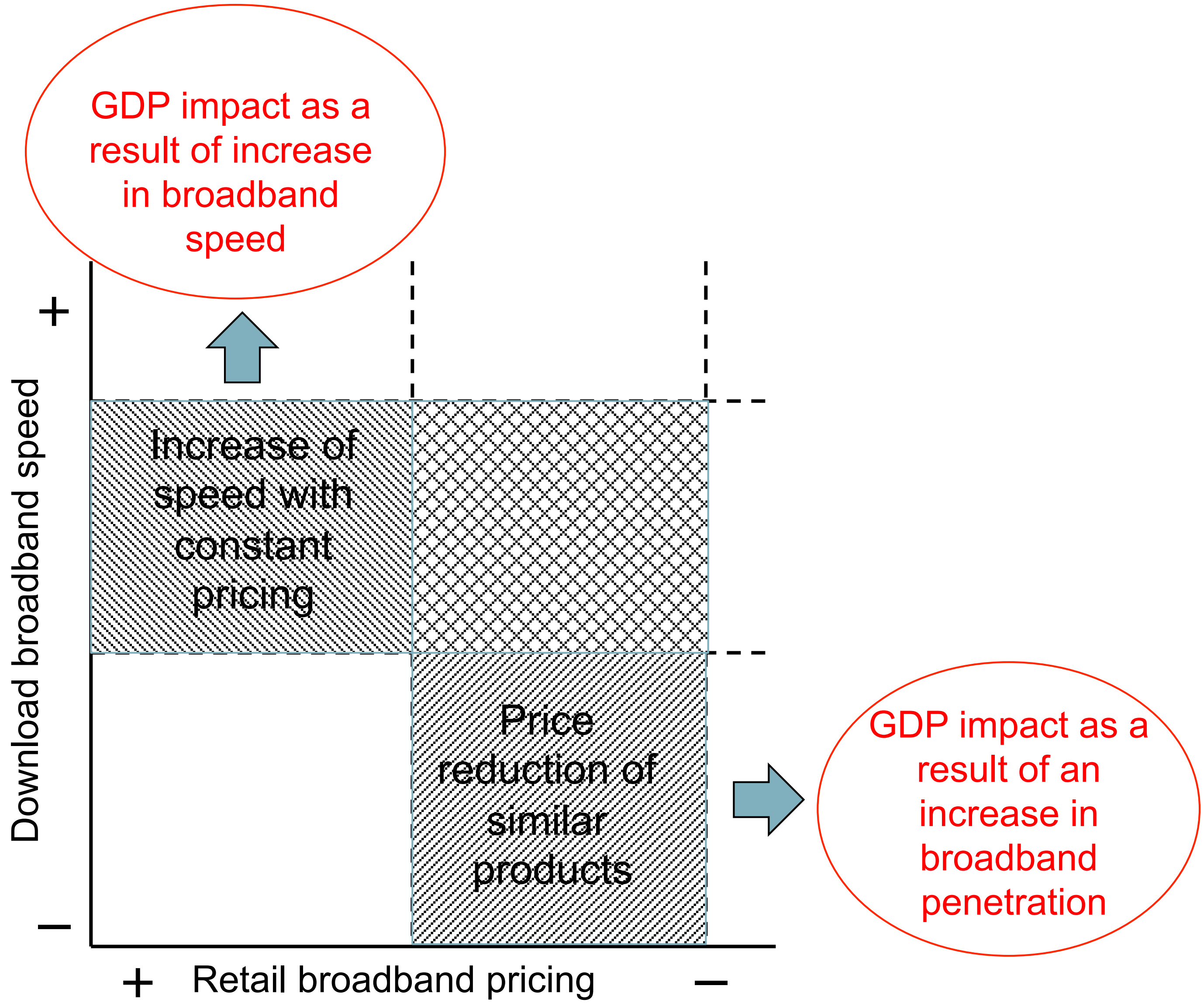
LATIN AMERICA: INITIAL IXP INVESTMENT (CAPEX)

Level	Business Model	Ecample	CAPEX(1) (in US$ '000'000)	Applicable to other locations	Total CAPEX (en US$ '000'000)
Interregio-nal	Interconnection and co-location	Panama	US$ 9.607	Brazil (Fortaleza), Peru (Chilca)	US$ 28.8 – 32.0
National 1	2national centers (interconnection and co-location) Regional centers (interconnection)	Colombia	US$ 3.463	Mexico	US$ 6.9 – 11.0
National 2	1 national center (Interconnection and co-location) Regional centers (interconnection)	Bolivia	US$ 1.384	Peru (nacional)	US$ 2.8 – 6.0
National 3	1 national center (Interconnection and co-location)	Costa Rica	US$ 1.487	Guatemala, Honduras, El Salvador, Paraguay, Asunción	US$ 8.9 – 12.0
Total			US$15.941		US$ 47.4 – 61.0

Source: TAS analysis
Note (1): CAPEX does not include land costs, but it includes civil engineering costs

THE ECONOMIC IMPACT OF THE RECOMMENDED INFRASTRUCTURE IS DERIVED FROM THE REDUCTION IN TRANSIT COSTS AND LATENCY

ECONOMIC IMPACT OF IXP DEPLOYMENT



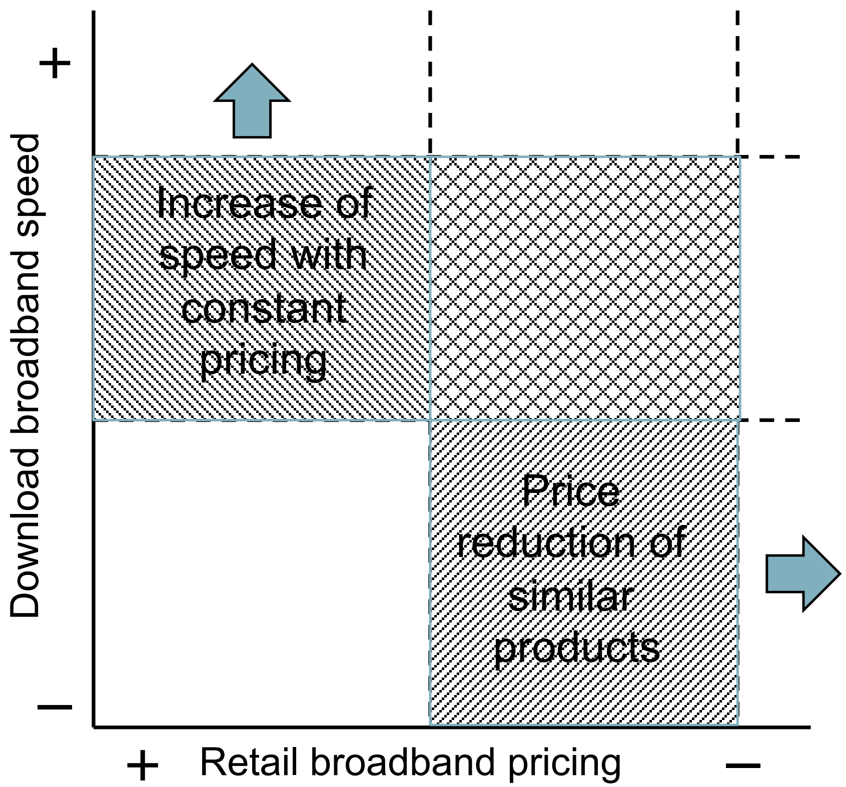
THE AGGREGATED ECONOMIC BENEFIT OF DEPLOYING THE RECOMMENDED IXP WILL RANGE BETWEEN US$ 3.5 Y US$4.4 BILLION

GDP impact as a result of increase in broadband speed

US$ 915 million

AGGREGATE IMPACT
US$ 3.557-4.472 million

- The smaller impact is based on the fact that a single population benefits from both affordability and speed of access
- On the other hand, the highest impact scenario takes place if the benefits accrue to different populations



GDP impact as a result of an increase in broadband penetration

US$ 3.557 million

Source: TAS analysis

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