

ICT IMPACT ON DEVELOPING COUNTRIES



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FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C.**

2005

TOPICS FOR DISCUSSION

- **ICT PROBLEMS, SOLUTIONS, FACTORS AND POLICIES – WHY?**
- **ECONOMICAL ICT TECHNOLOGY**
- **INTERNET AND MOBILE TAKE UP**
- **INTERNET – WHAT IS IT AND WHAT DOES IT MEAN?**
- **INTERNET CONCERNS**
- **VOICE OVER INTERNET PROTOCOL (VoIP)**
- **VoIP FOR DISABILITIES**
- **VoIP AND THE PUBLIC SWITCHED TELECOMMUNICATIONS NETWORK (PSTN)**
- **MOBILES AND THE PSTN**
- **WORLD TRADE ORGANIZATION SIGNIFICANCE**
- **VSAT PRICING**

ICT PROBLEM AND SOLUTIONS

PROBLEM:

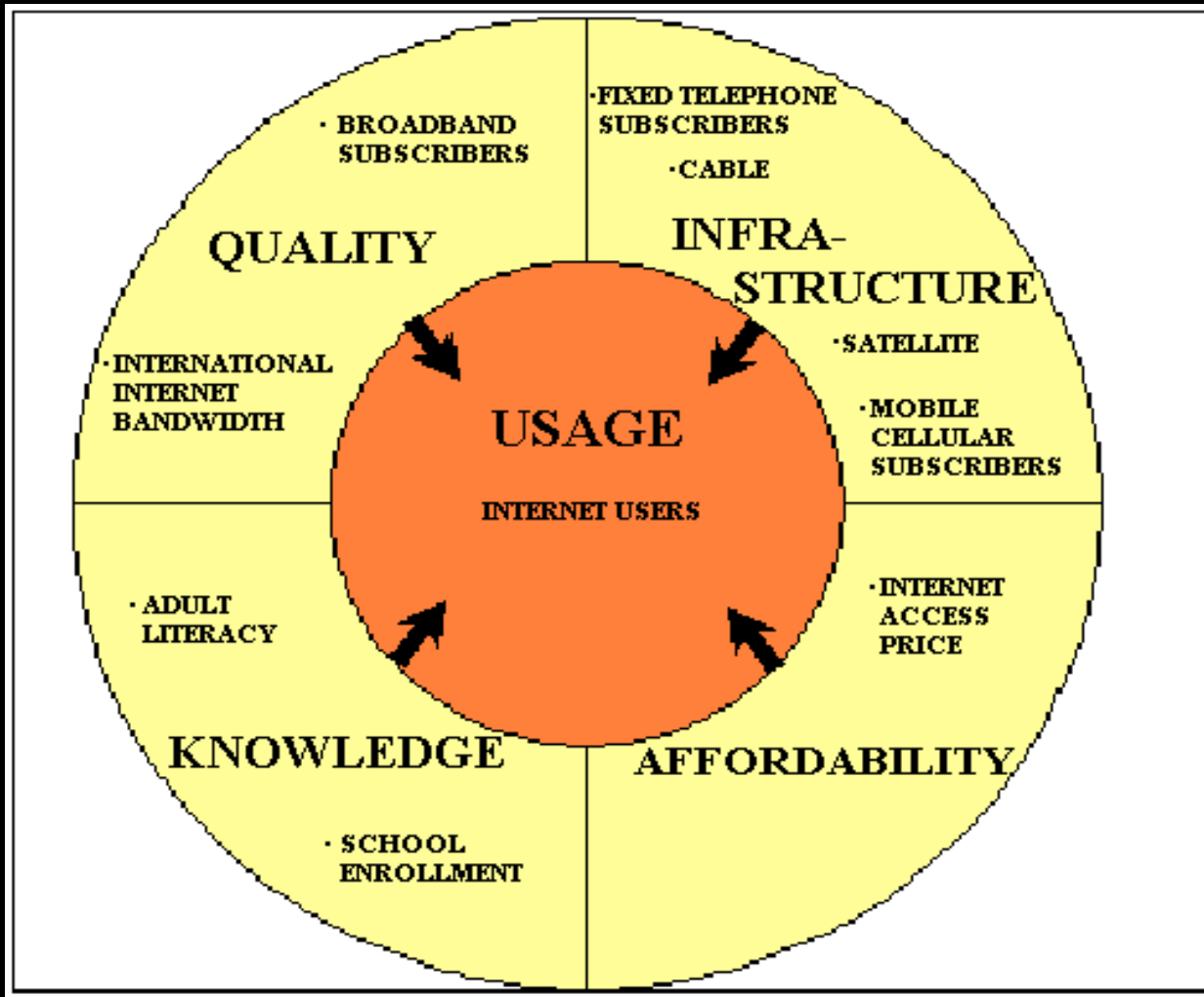
TECHNOLOGY HAS WIDENED THE
DIGITAL DIVIDE BETWEEN
DEVELOPED AND DEVELOPING
COUNTRIES.

SOLUTION: *

1. IMPROVE EDUCATIONAL SYSTEMS, AND
2. EXPAND TELECOMMUNICATION NETWORKS

*ILO at the World Economic Forum, Davos, 2001

INFORMATION AND COMMUNICATIONS TECHNOLOGY FACTORS FOR ACCESS



SOURCE: ITU.

UNIVERSAL SERVICE AND UNIVERSAL ACCESS POLICIES

- **IT IS UNDERSTOOD THAT MARKET SOLUTIONS WILL NOT ENSURE THE EXPANSION OF NETWORKS TO ECONOMICALLY LESS VIABLE (RURAL) AREAS OR TO DISABLED INDIVIDUALS**
- **UNIVERSAL SERVICE OR UNIVERSAL ACCESS OBLIGATIONS, AND FUNDING ARE A NATIONAL POLICY ISSUE**

ICT POLICY OBJECTIVES

- **FOSTER COMPETITIVE AND INNOVATIVE INTERNET CONNECTION, AND MULTIMEDIA INDUSTRIES**
- **MINIMIZE REGULATION AND ENACT FLEXIBLE REGULATORY POLICIES**
- **PROMOTE MARKET ACCESS AND ADOPTION OF OPEN, NON-DISCRIMINATORY, TRANSPARENT POLICIES**

WHY?

ICT POLICY *ROUGHLY* CORRELATES TO ECONOMY*

- **19% OF QATAR'S POPULATION USES THE INTERNET; PER CAPITA INCOME - - \$20,700**
- **17% OF CAYMAN ISLANDS' POPULATION USES INTERNET; PER CAPITA INCOME - - \$35,000**
- **1% OF SYRIA'S POPULATION USES THE INTERNET; PER CAPITA INCOME - - \$1,160**
- **< 1% OF GHANA'S POPULATION USES THE INTERNET; PER CAPITA INCOME - - \$270**

CONCRETE PROPOSALS TO FUND *DIGITAL DIVIDE*

**PROJECTS: AGENDA FOR THE FEBRUARY 17 – 25, 2005,
PREPARATORY MEETING - - THE WORLD SUMMIT OF
THE INFORMATION SOCIETY, GENEVA**

- **FEBRUARY 2005 REPORT TO EU COMMISSION**

LOW-COST COMPUTERS AND MOBILE HANDSETS*

MIT MEDIA LABORATORY HAS DEVELOPED AN EXPERIMENTAL LAPTOP USING LINUX, A 1 GBYTE SOLID-STATE MEMORY (NO HARD DISC), LOW-COST BATTERIES WITH HAND-CRANK CHARGER, AND LOW-COST MINIATURE REAR PROJECTION SCREEN (HALF THE COST OF A LAPTOP TODAY IS THE SCREEN).

COST \approx \$100

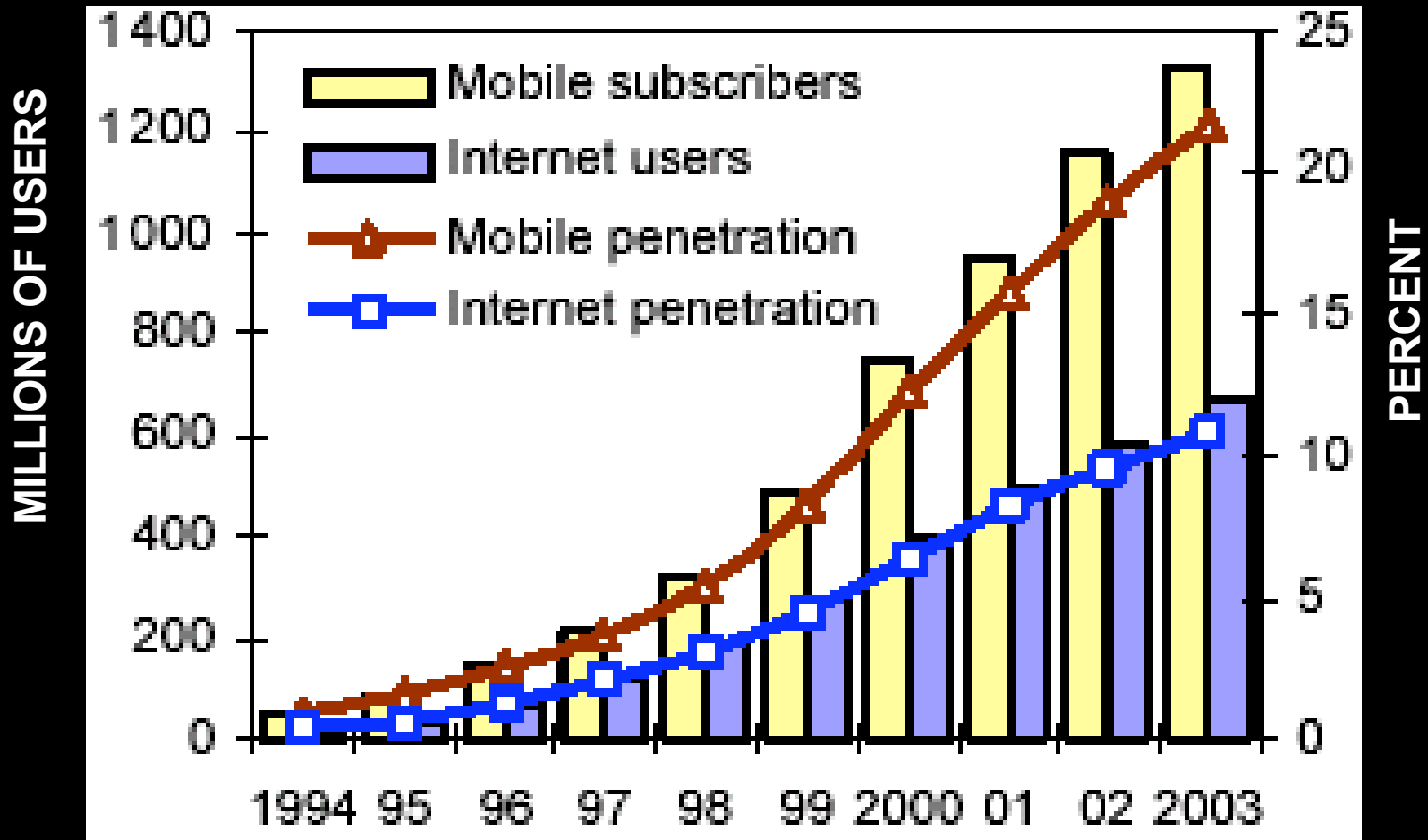
GSM ASSOCIATION HAS DEVELOPED ITS FIRST LOWCOST HANDSET IN RESPONSE TO DEMAND FROM DEVELOPING COUNTRIES. STATED GOAL IS "TO HELP CONNECT THE UNCONNECTED PEOPLE OF THE WORLD". NINE EMERGING MARKET OPERATORS (AIS, BHARTI, GLOBE, MAXIS, ORASCOM, SINGTEL, SMART, TELENOR AND TURKCELL) ARE PARTICIPATING IN THIS INITIATIVE.

COST $<$ \$40

(SEEKING A UNIT THAT COSTS $<$ \$30)

***FEBRUARY 2005**

WORLDWIDE INTERNET AND MOBILE PENETRATION PER 100 POPULATION



SOURCE: ITU WORLD TELECOMMUNICATION INDICATORS DATABASE, 2004⁹

ITU, DEC. 2004: ICT WORLDWIDE VALUE = \$1.1 TRILLION

INTERNET?

**THE INTERNET HAS ENABLED THE
CREATION OF BUSINESSES
WITHOUT MUCH CAPITAL. IT HAS
ENLARGED THE COMPETITION --
NOT ONLY THE SHOP DOWN THE
STREET BUT THE SHOP HALFWAY
AROUND THE WORLD.
GEOGRAPHICAL BOUNDARIES ARE
DISAPPEARING.**

INTERNET USERS

(JUNE 2004)

ASIA-PACIFIC	223 MILLION
NORTH AMERICA	175 MILLION
EUROPE	173 MILLION
OTHER	129 MILLION
GLOBALLY	700 MILLION (OUT OF 6.4 BILLION - - 11%)

DAILY E-MAIL GROWTH

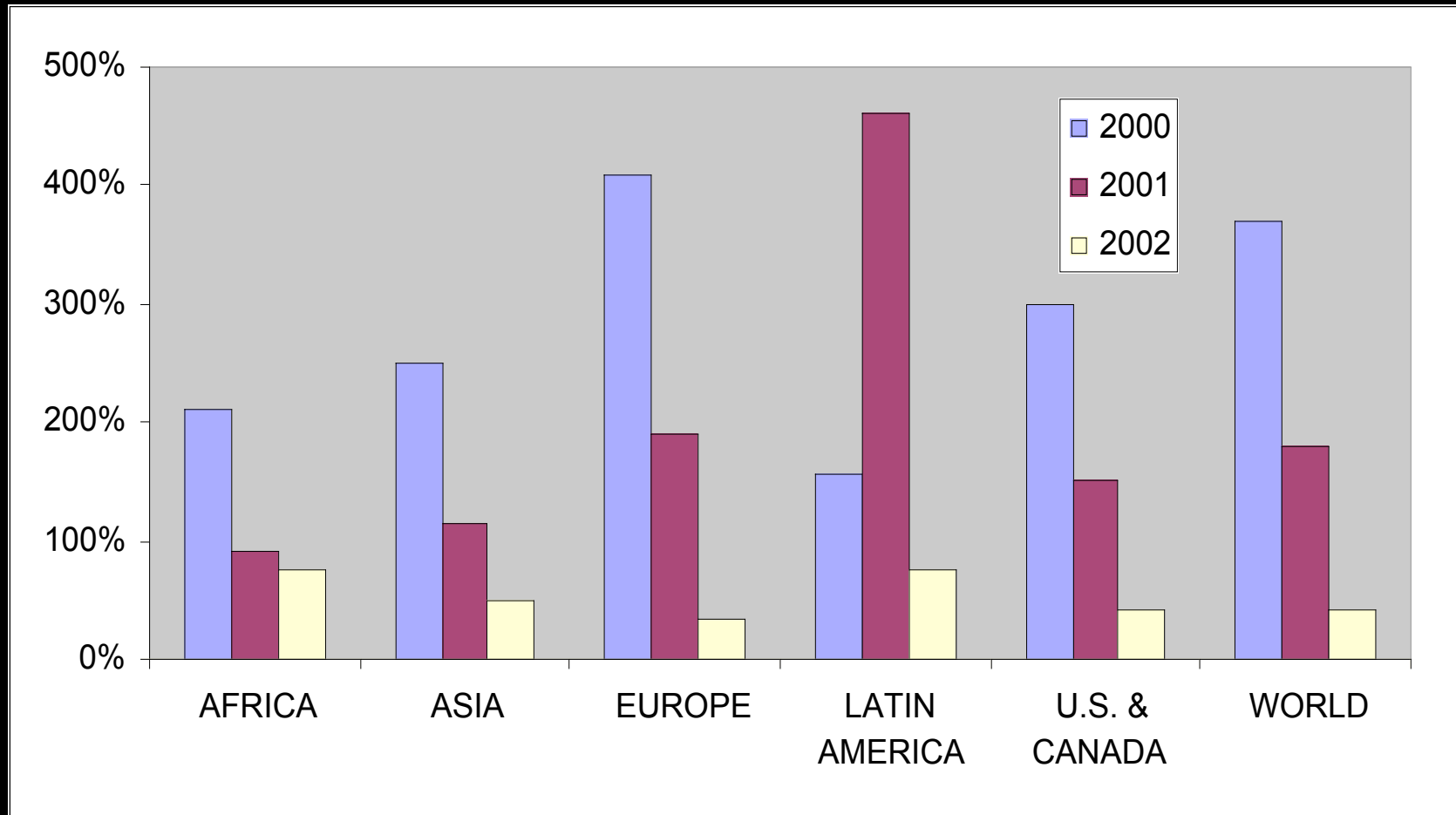
1999 - 3.5 BILLION

2003 - 11 BILLION

CONVERGENCE TO INTERNET

- **TREND IS TOWARDS THE CONSOLIDATION OF VOICE, VIDEO AND DATA SERVICES IN THE INTERNET**
- **PROGRESS TOWARD THIS CONSOLIDATION WILL BE VIA DEVELOPMENTS SUCH AS UBIQUITOUS BANDWIDTH, INCREASED EASE OF USE, GREATER CONNECTIVITY AND IMPROVED SECURITY**

INTERNET BANDWIDTH GROWTH



DOMAINS*

.ASIA

.AERO

.ARPA

.BIZ

.COM - 45%

.COOP

**.COUNTRY CODES: (.de - 12%
and .uk - 8%)**

.EDU

.EU

.GOV

.MOBI**

.INFO

.INT

.JOBS

.MAIL

.MIL

.MUSEUM

.NAME

.NET - 5%

.ORG - 4%

.PRO

.TEL

.JOBS**

***BOTH JAPANESE AND CHINESE CHARACTERS ARE NOW IN USE**

****PENDING (FROM MOBILE PHONES AND FOR HUMAN RESOURCES)**

INTERNET CONCERNS

**FRAUD - AUTHENTICITY
CYBERSTALKING OR VOYERISM
GAMBLING
MONEY LAUNDERING
DRUG TRAFFICKING
PORNOGRAPHY
TAXES
SPAM
QUALITY
INTELLECTUAL PROPERTY RIGHTS
VIRUSES
CULTURE
SECURITY (PRIVACY)
WIRELESS NUMBER DIRECTORY**

WHAT IS VoIP / INTERNET VOICE?

VOICE OVER INTERNET PROTOCOL (VoIP) ALLOWS TELEPHONE CALLS USING A COMPUTER NETWORK -- A DATA NETWORK, LIKE THE INTERNET:

- VoIP CONVERTS THE VOICE SIGNAL FROM YOUR TELEPHONE INTO A DIGITAL SIGNAL THAT TRAVELS OVER THE INTERNET THEN CONVERTS IT BACK AT THE OTHER END SO YOU CAN SPEAK TO ANYONE WITH A REGULAR PHONE NUMBER.**
- WHEN PLACING A VoIP CALL USING A PHONE WITH AN ADAPTER, YOU'LL HEAR A DIAL TONE AND DIAL JUST AS YOU ALWAYS HAVE.**
- VoIP ALSO ALLOWS YOU TO MAKE A CALL DIRECTLY FROM A COMPUTER USING A CONVENTIONAL TELEPHONE OR A MICROPHONE.**

VOICE OVER INTERNET PROTOCOL

VoIP IS NOT JUST ANOTHER WAY OF PROVIDING TRADITIONAL TELEPHONE SERVICE. IT IS A NEW APPLICATION ON A NEW KIND OF NETWORK THAT WILL CREATE NEW OPPORTUNITIES FOR BUSINESSES AND CONSUMERS. VoIP WILL RAISE STANDARDS ISSUES THAT NEED SOLUTIONS SUCH AS:

- ARRANGEMENTS FOR FINANCE / PSTN CONNECTION**
- SUPPORTING EMERGENCY RESPONSE NEEDS OF PUBLIC SAFETY AUTHORITIES, ESPECIALLY AS RELATED TO THE RESPONSE LOCATION**
- VoIP TECHNOLOGIES HELPING ACCESSIBILITY AND USABILITY OF COMMUNICATIONS NETWORKS BY PERSONS WITH DISABILITIES**
- SECURITY AND LEGAL ISSUES NEED RESOLUTION IN RESPONSE TO APPROPRIATE LEGAL REQUIREMENTS**
- OTHER STANDARDS ISSUES RAISED BY VOIP**

IP FOR PERSONS WHO ARE DEAF

- **IP BROADBAND (DSL OR CABLE MODEM) CAN SUPPORT VIDEO CALLING, AND BECAUSE A PC CAN BE USED FOR VIDEO, IN MANY CASES THE ONLY COST TO THE CONSUMER IS A USB VIDEO CAMERA**
 - **IP VIDEO CALLING WILL LIKELY BECOME WIDELY USED IN THE NEAR FUTURE, BOTH FOR BUSINESS AND HOME CALLERS**
 - **THIS WILL BENEFIT THE DEAF AND HARD-OF-HEARING COMMUNITIES, AS THEY WILL BE ABLE TO USE SIGN LANGUAGE AND LIP READING ON VIDEO CALLS, AND AFFORD THE INEXPENSIVE HARDWARE**
- **GALLAUDET UNIVERSITY IS ALREADY EXPERIMENTING WITH VIDEO CALLING, AND EVEN HAS INSTALLED MANY "VIDEO TELEPHONE BOOTHS" ON ITS CAMPUS, FOR STUDENTS TO MAKE IP VIDEO CALLS TO EACH OTHER.**

VoIP FOR PERSONS WHO ARE BLIND

- **TECHNOLOGY AND COST LIMITATIONS OF PTSN PHONES CREATE BARRIERS FOR ACCESS BY BLIND USERS (FOR EXAMPLE, A BLIND USER CANNOT SEE A DISPLAY WITH CALLER ID ON IT)**
- **VoIP "PHONES" CAN ACTUALLY BE CREATED BY INSTALLING A SOFTWARE-BASED TELEPHONE ONTO A STANDARD PC WITH AUDIO CARD AND SPEAKERS, AND THEN CAN BE EASILY AND CHEAPLY CUSTOMIZED FOR ACCESSIBILITY FEATURES**
 - **PCs (WINDOWS AND APPLE) ALREADY HAVE QUITE A BIT OF EXISTING "ACCESSIBILITY FEATURES" THAT THE VoIP SOFTPHONE CAN TAKE ADVANTAGE OF, SUCH AS TEXT-TO-SPEECH FOR AUDIBLE CALLER ID AND MESSAGE WAITING INDICATION.**
 - **IT IS MUCH CHEAPER TO MAKE A BLIND-ACCESSIBLE TELEPHONE BASED ON A PC, THAN TO CREATE SPECIAL HARDWARE FOR A STANDALONE PHONE, AND THIS MAKES BLIND-FRIENDLY TELEPHONES AFFORDABLE FOR MORE USERS.**

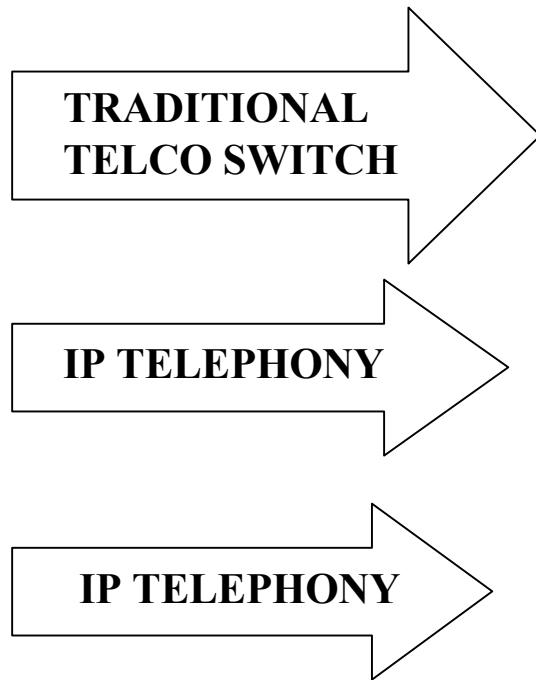
PSTN AND IP TELEPHONY

- **PSTN IS BASED ON CIRCUIT-SWITCHED TECHNOLOGY, EVOLVED AS A VOICE NETWORK (HIGHLY REGULATED)**
- **INTERNET BASED ON PACKET-SWITCHED TECHNOLOGY, EVOLVED AS A DATA NETWORK (LARGELY UNREGULATED)**
- **INTERNET IS HEADED TO REPLACE THE PSTN BY A “NEXT GENERATION NETWORK” (NGN) – ITU-T STUDY GROUP**

V_oIP AND PSTN RELATIVE COSTS

- **IP TELEPHONY (V_oIP) CAN BE OFFERED AT PRICES SIGNIFICANTLY BELOW THOSE FOR PSTN TELEPHONY**
- **PSTN PRICING IS DISTANCE-SENSITIVE WHILE PRICING OF IP TELEPHONY IS LARGELY INDEPENDENT OF DISTANCE (LIKE SATELLITE COMMUNICATIONS)**
- **V_oIP TODAY MEANS A TRADE-OFF BETWEEN QUALITY AND COST**

VoIP vs SWITCHED CIRCUIT NETWORK COST



SOLUTION	INVESTMENT	CAPACITY	ADVANTAGES
CLASS 5 SWITCH	US \$20 MILLION	20,000 LINES	? QUALITY ? RELIABLE ? PROVEN TECHNOLOGY
INTERNET POP	US \$0.1 MILLION	400,000 MINUTES PER MONTH	? EFFICIENCY ? NEW SERVICES POTENTIAL ? SCALABILITY
IP FULL OPERATION	US \$3 TO 5 MILLION	35 MILLION MINUTES PER MONTH	

VoIP PERMITTED

**ANGOLA
ANTIGUA AND BARBUDA
ARGENTINA
AUSTRALIA
AUSTRIA
BELGIUM
BHUTAN
CANADA
CHINA
CONGO
COSTA RICA
CYPRUS
CZECH REPUBLIC
DENMARK
DOMINICAN REPUBLIC
ESTONIA
ETHIOPIA
FINLAND
FRANCE
GAMBIA
GERMANY**

**GREECE
GUATEMALA
GUYANA
HONG KONG SAR
HUNGARY
ICELAND
INDIA
IRELAND
ITALY
JAPAN
KENYA
KOREA (REP)
KYRGYZSTAN
LUXEMBOURG
MADAGASCAR
MALAYSIA
MALTA
MEXICO
MOLDOVA
MONGOLIA
NEPAL**

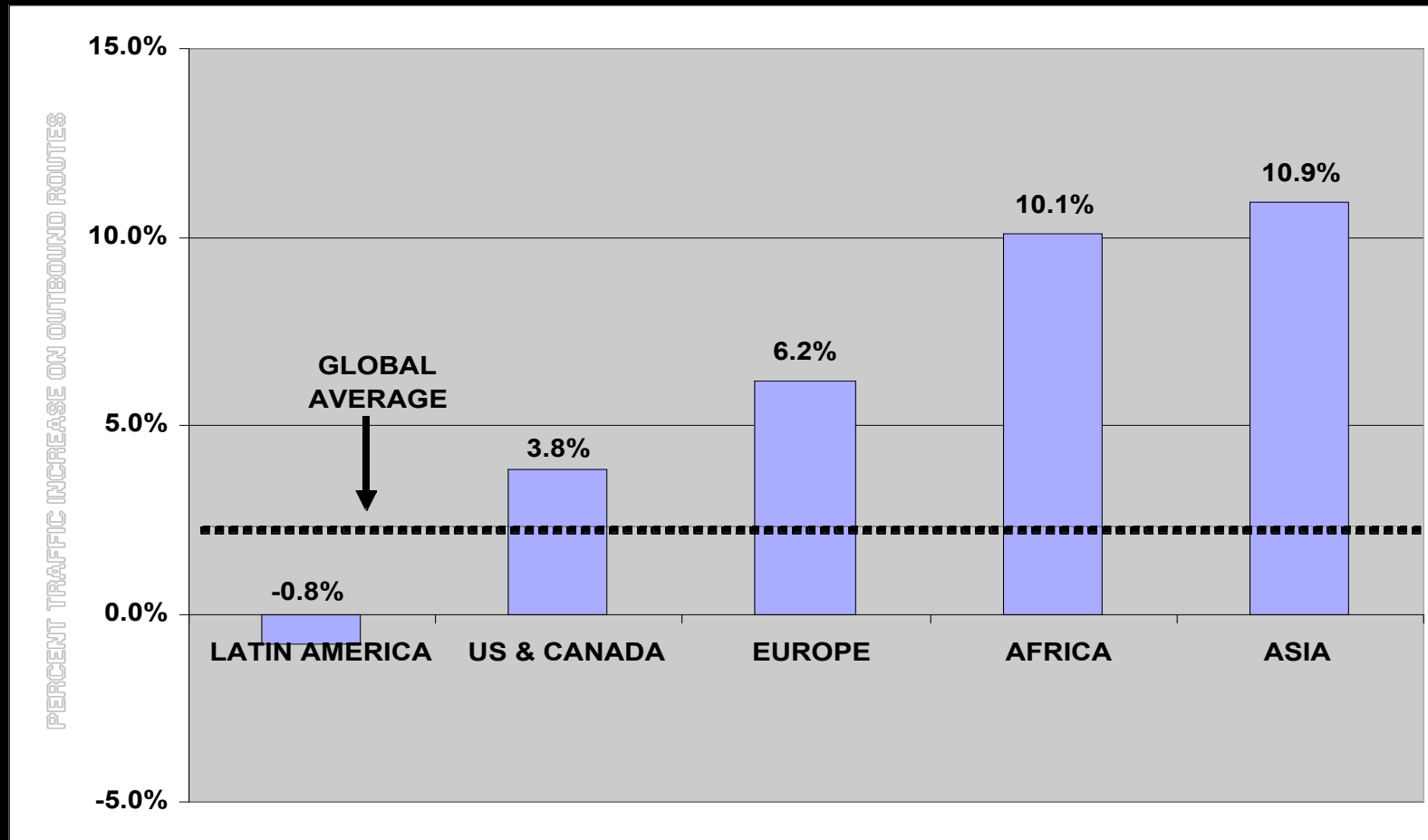
**NETHERLANDS
NEW ZEALAND
PERU
PHILIPPINES
POLAND
PORTUGAL
SINGAPORE
SLOVAK REPUBLIC
SPAIN
SRI LANKA
ST. LUCIA
ST. VINCENT
SWEDEN
SWITZERLAND
TONGA
UGANDA
UNITED KINGDOM
UNITED STATES
VIET NAM**

61/189

GLOBAL INTERNATIONAL TRAFFIC

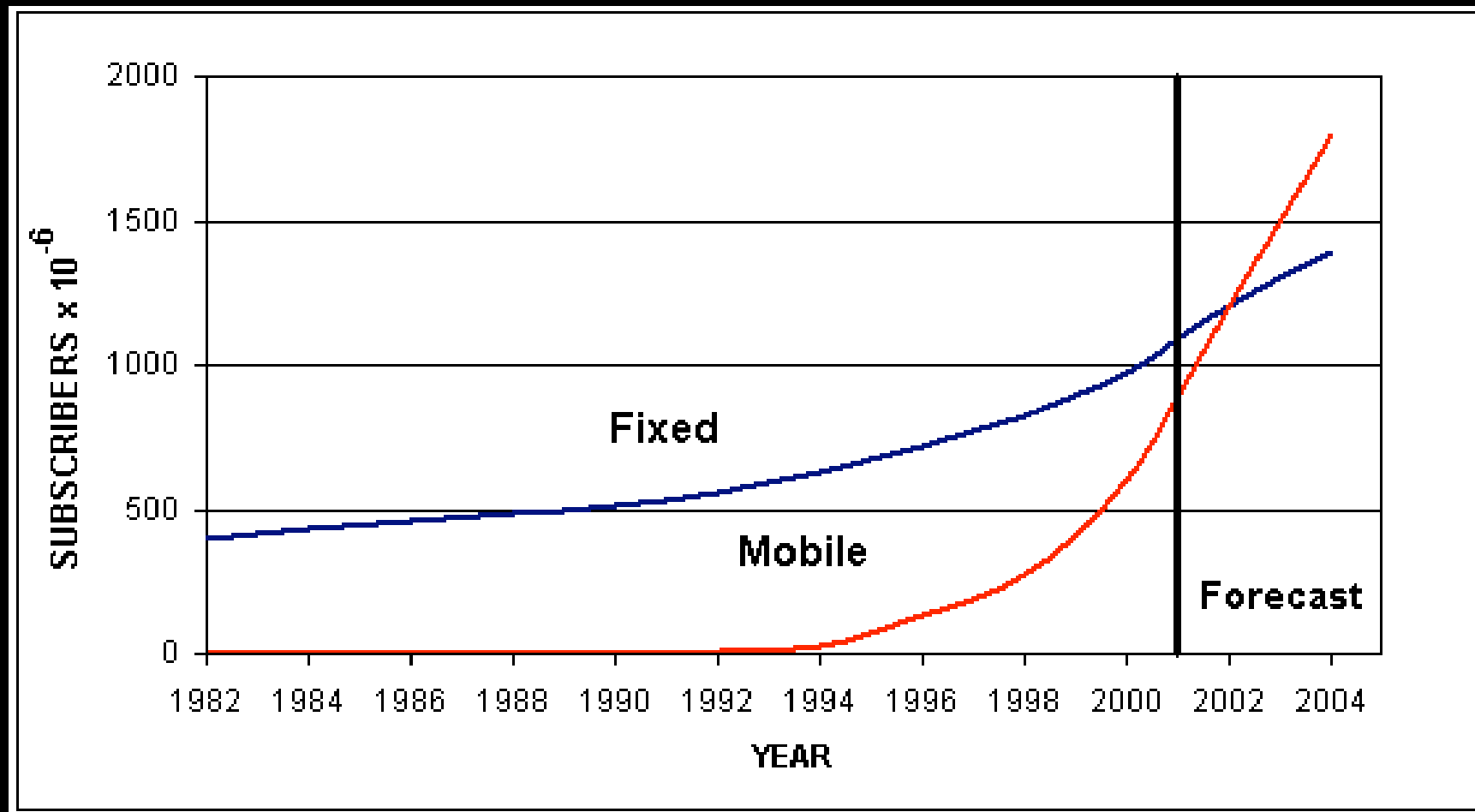
- **INTERNATIONAL SWITCHED TRAFFIC INCREASED JUST OVER SIX PERCENT IN 2002 TO 155.2 BILLION MINUTES; IN 2003 TO 170 BILLION MINUTES (9.5% INCREASE)**
- **VoIP TRAFFIC SURGED 80 PERCENT IN 2002 TO 18.7 BILLION MINUTES, ACCOUNTING FOR ALMOST 11 PERCENT OF INTERNATIONAL TRAFFIC; IN 2003 TO 22 BILLION MINUTES (17.6% INCREASE)**
- **VoIP APPEARS TO HAVE A NOTABLE IMPACT IN LATIN AMERICA, WHERE SWITCHED TRAFFIC VOLUMES DECREASED IN 2002.**
- **VoIP TRAFFIC TO INDIA, PAKISTAN, AND BANGLADESH MORE THAN DOUBLED IN 2003 OVER 2002**
- **VoIP IS STILL PRIMARILY USED TO BYPASS HIGH SETTLEMENT RATES IN DEVELOPING COUNTRIES**

FIXED LINE TRAFFIC GROWTH 2001 TO 2002



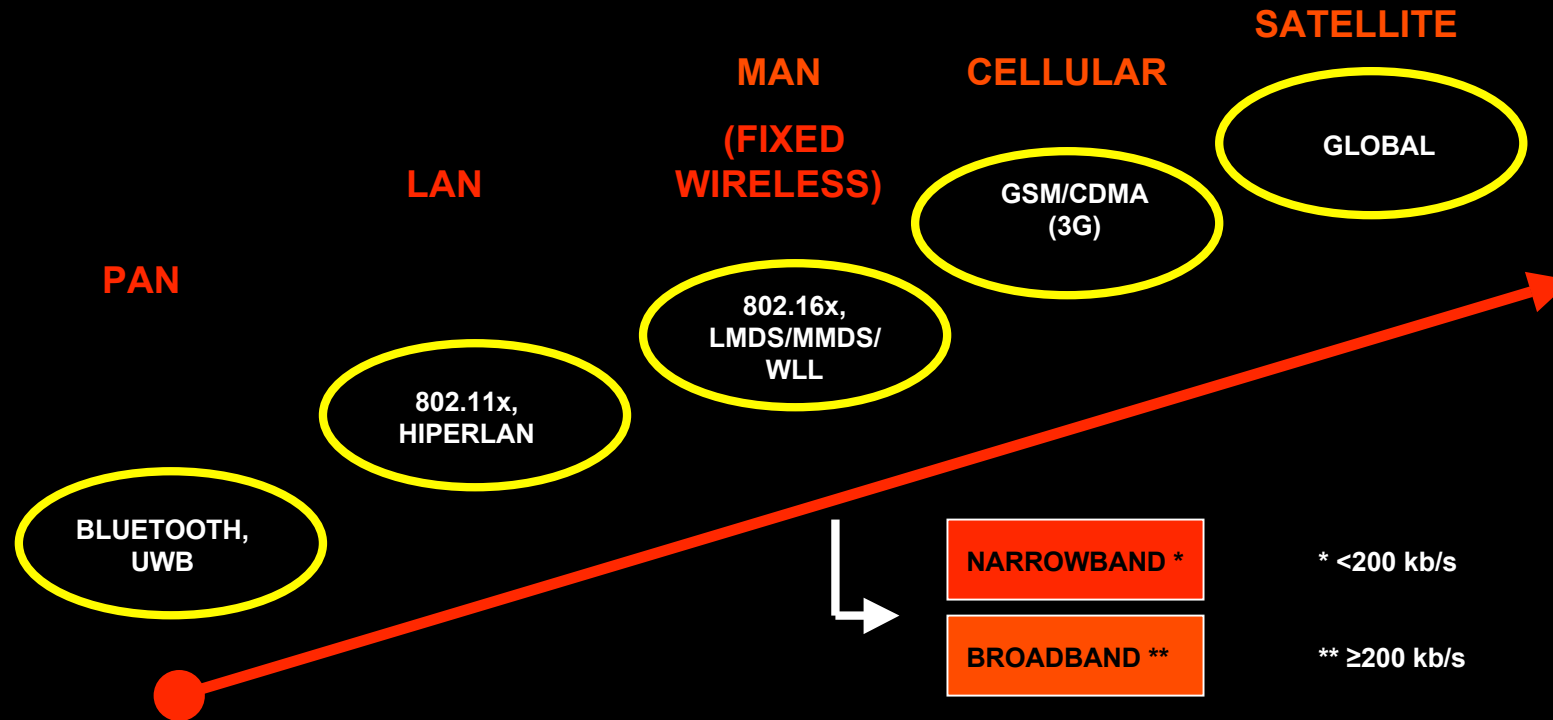
NOTES: GLOBAL TRAFFIC WAS 155.2 BILLION MINUTES IN 2002. DATA DO NOT INCLUDE VoIP TRAFFIC.

MOBILE AND FIXED TELEPHONE SUBSCRIBERS (WORLDWIDE) AS A FUNCTION OF YEARS



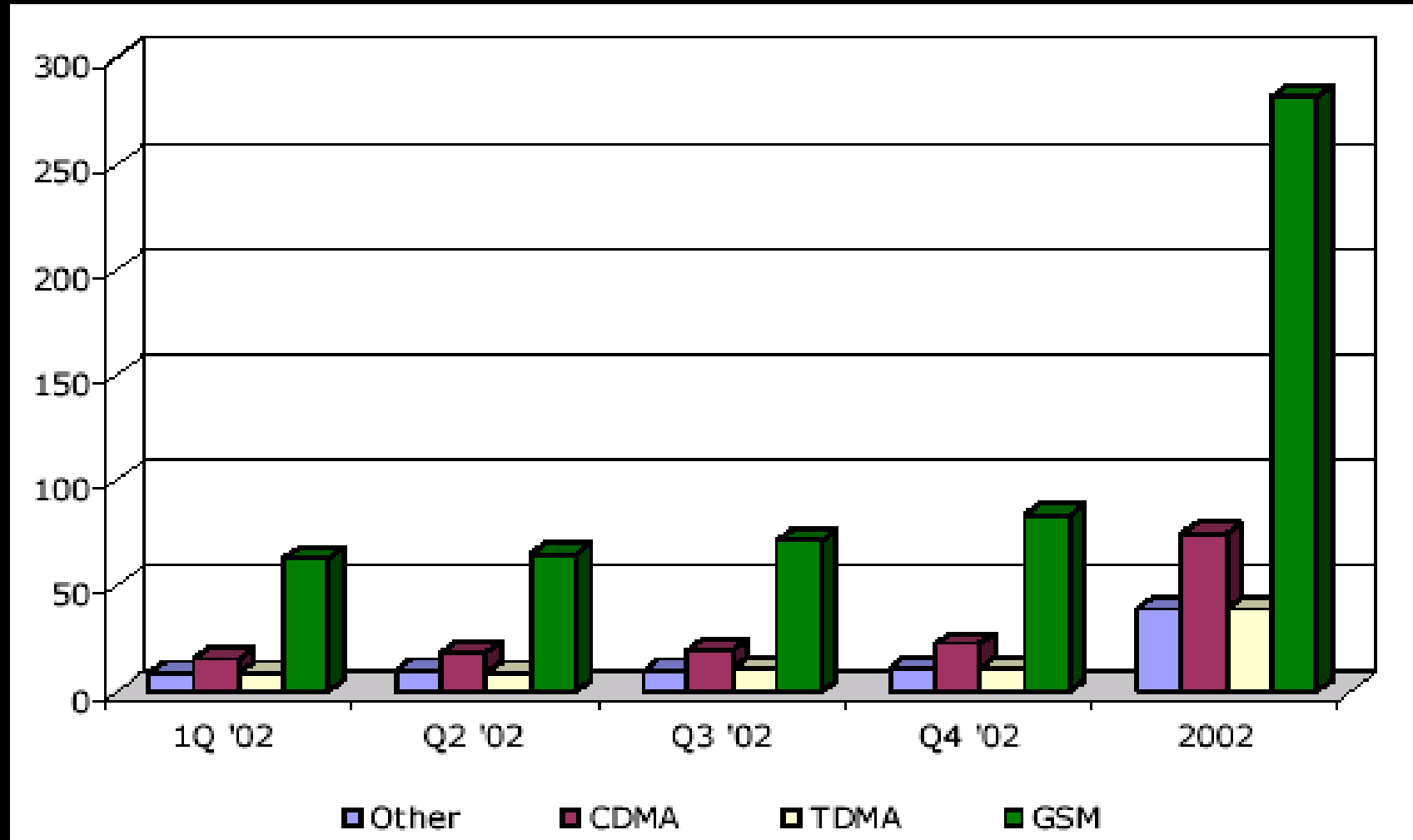
Source: ITU World Telecommunication Indicators Database and ITU projections.

WIRELESS MARKET

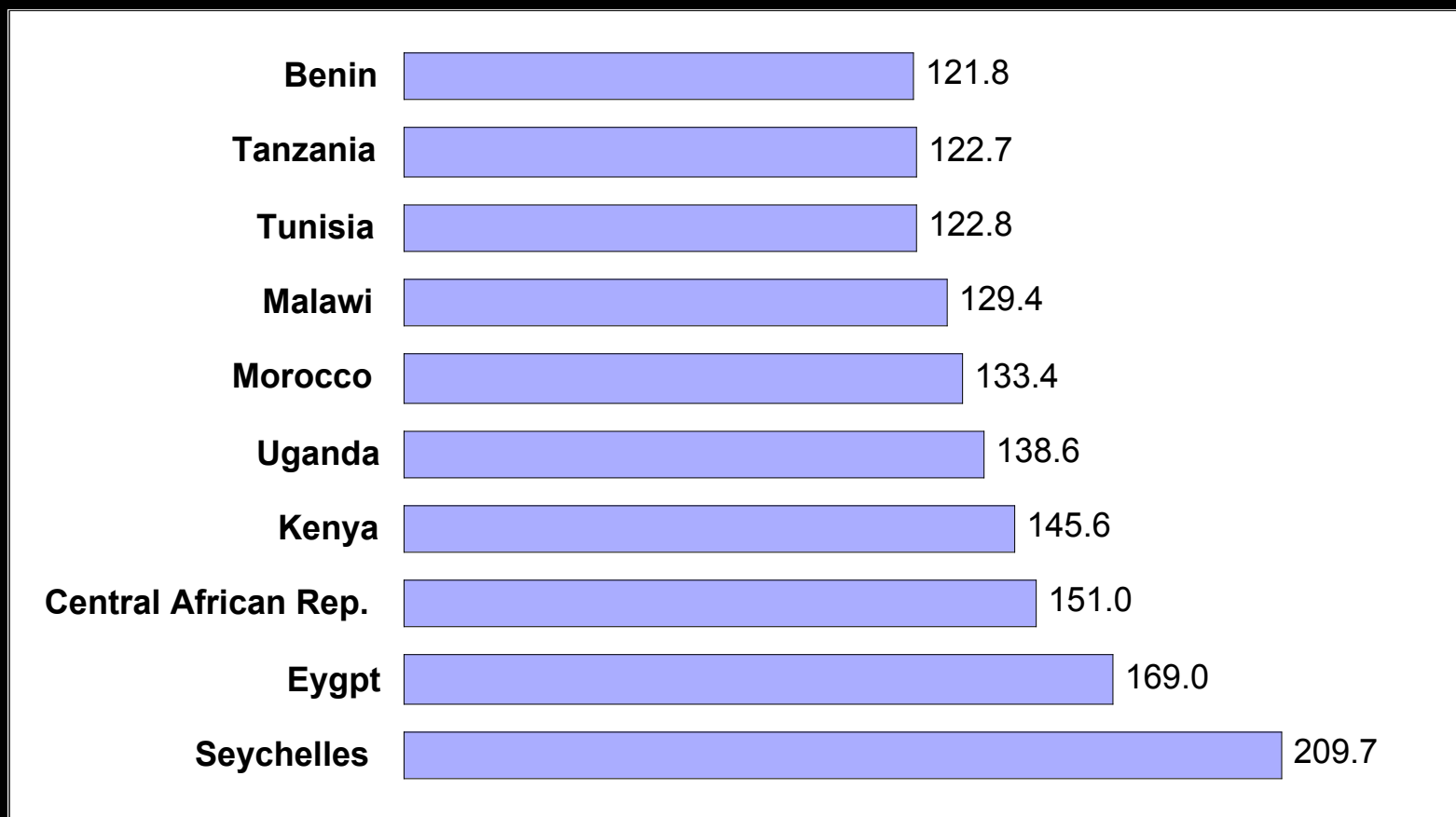


<u>PAN</u>	<u>LAN</u>	<u>MAN</u>	<u>3G CELLULAR</u>	<u>SATELLITE</u>
CORDLESS PHONES	WLANS:	RESIDENTIAL TOWERS	MULTIMEDIA (VOICE, VIDEO, DATA)	GLOBAL CELLULAR PHONES
PCs	HOTELS	BUSINESSES	CELLULAR PHONES	RNSS
PDAs	RETAIL	MUNICIPALITIES		
HOME GATEWAYS	CONFERENCES			
	BUSINESS			

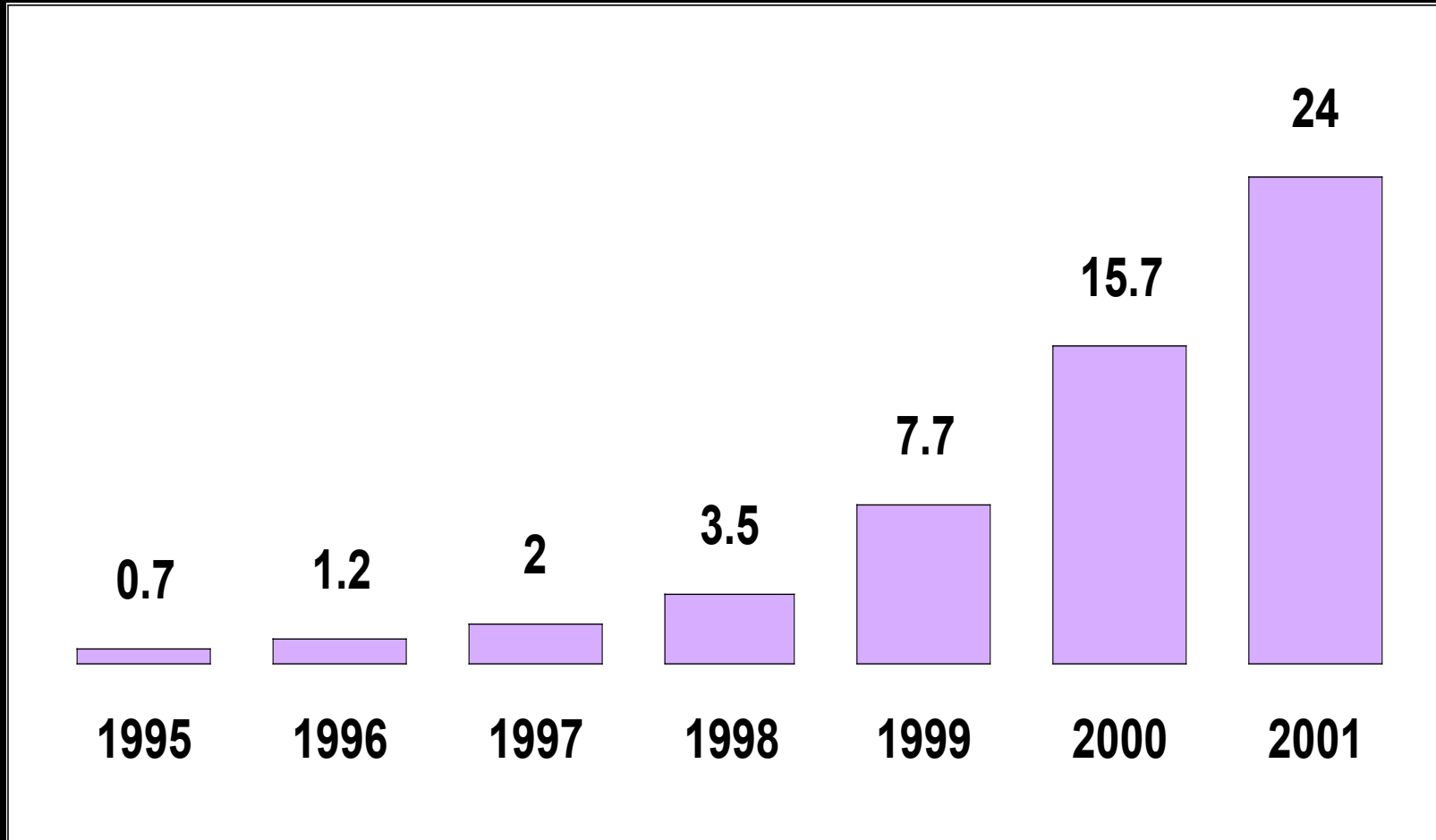
2002 GLOBAL MOBILE TERMINAL SHIPMENTS (1000's) BY TECHNOLOGY



MOBILE GROWTH IN AFRICA (1995-2001) TOP 10 ECONOMIES, COMPOUND ANNUAL GROWTH RATE (%)

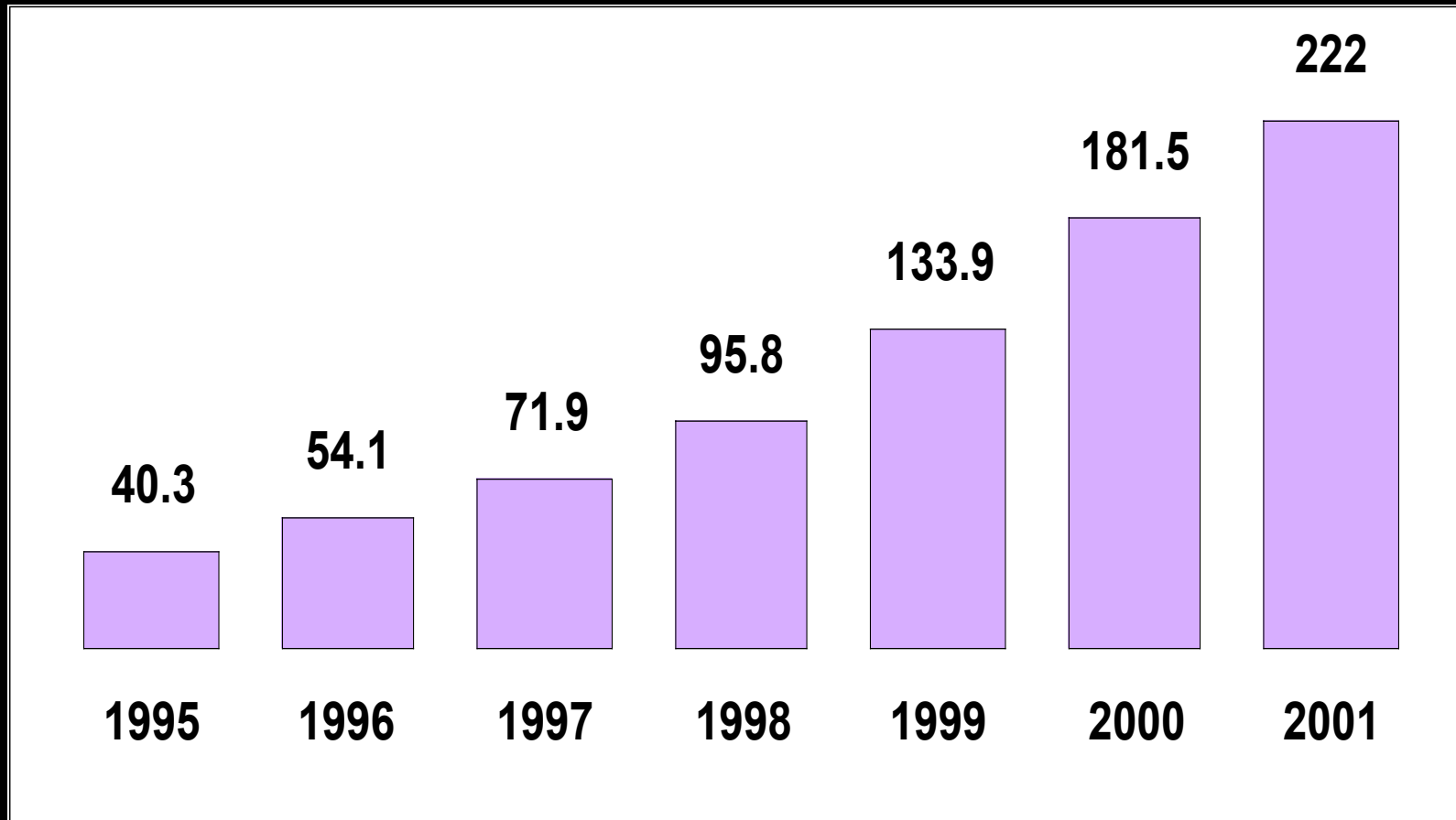


MOBILE SUBSCRIBERS IN AFRICA (MILLIONS)



Source: ITU Internet Reports 2002: Internet for a Mobile Generation.

MOBILE SUBSCRIBERS IN THE AMERICAS (MILLIONS)



WORLD TRADE ORGANIZATION (WTO) AND TELECOMMUNICATION TRADE LIBERALIZATION

- **WTO MEMBERSHIP ALLOWS MEMBERS TO MAKE BINDING TREATY COMMITMENTS IN SPECIFIC SECTORS, INCLUDING TELECOMMUNICATIONS SERVICES**
- **GENERAL AGREEMENT ON TRADE IN SERVICES (GATS) AS OF OCTOBER 2003:**
 - **105 WTO MEMBERS HAVE MADE SPECIFIC GATS COMMITMENTS IN SOME OR ALL ASPECTS OF TRADE IN TELECOMMUNICATIONS SERVICES**
 - **98 IN BASIC TELECOMMUNICATIONS; ORIGINAL COMMITMENTS IN 1997 KNOWN AS BASIC TELECOM AGREEMENT**

WTO AND TELECOMMUNICATIONS SERVICES

- **WTO REFERENCE PAPER, ADOPTED BY MAJORITY OF MEMBERS MAKING COMMITMENTS IN BASIC TELECOMMUNICATIONS, IMPOSES OBLIGATIONS REGARDING:**
 - **COMPETITIVE SAFEGUARDS**
 - **INTERCONNECTION**
 - **UNIVERSAL SERVICE**
 - **LICENSING**
 - **REGULATOR INDEPENDENCE**
 - **SCARCE RESOURCE ALLOCATION (E.G., NUMBERS, SPECTRUM)**

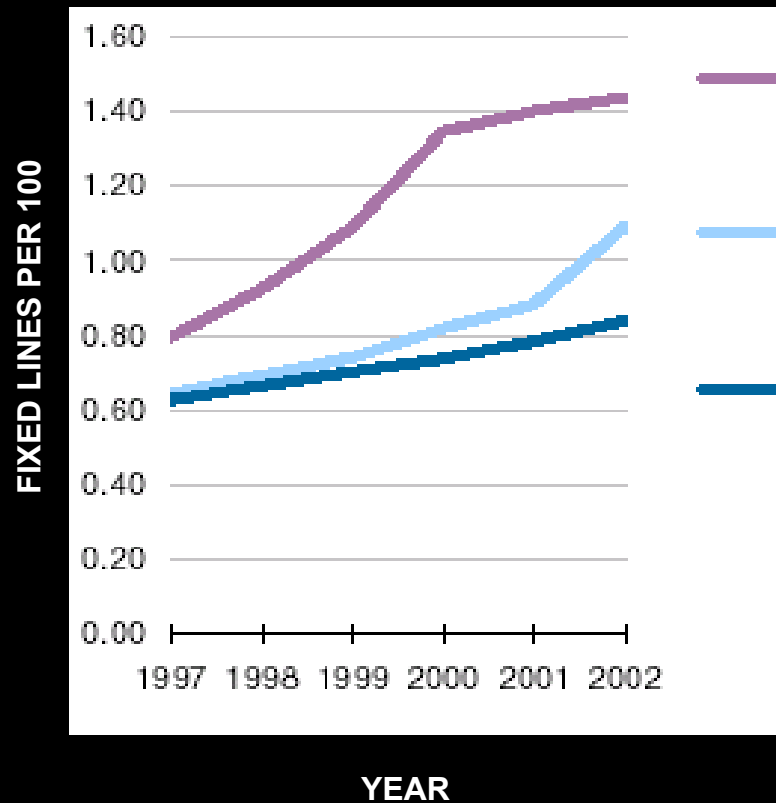
WHY GATS COMMITMENTS IN TELECOMMUNICATIONS SERVICES ARE UNIQUE

- **GATS COMMITMENTS IN TELECOMMUNICATIONS ENTAIL COMPLEX DOMESTIC SECTORAL REFORMS, INCLUDING THE INTRODUCTION OF COMPETITION AND THE ESTABLISHMENT OF AN EFFECTIVE REGULATOR AND REGULATIONS**
- **FUNCTIONS AS A MULTILATERAL INVESTMENT AGREEMENT, GRANTING RIGHTS TO THE SERVICE SUPPLIERS OF OTHER WTO MEMBERS, ALLOWING SOME FOREIGN OWNERSHIP AND CONTROL IN TELECOMMUNICATIONS**
- **WTO REFERENCE PAPER FUNCTIONS AS A MULTILATERAL AGREEMENT REGARDING COMPETITION REGULATION, IMPOSING A COMMON SET OF PRO-COMPETITIVE REGULATORY PRINCIPLES**

WHY GATS COMMITMENTS IN TELECOMMUNICATIONS MATTER TO DEVELOPING COUNTRIES

- **COMMITMENTS FUNCTION AS A WELL-KNOWN SIGNALING DEVICE TO INVESTORS AND FOREIGN SERVICE SUPPLIERS**
- **COMMITMENTS CAN CREATE MOMENTUM FOR FURTHER DOMESTIC SECTOR REFORM, AND IT CAN ALSO ANCHOR THOSE REFORMS WITHIN AN INTERNATIONAL LEGAL FRAMEWORK TO GUARD AGAINST POLICY REVERSAL**
- **DEPENDING ON SPECIFICS, COMMITMENTS COULD PROMOTE CONSUMER WELFARE AND TELEDENSITY, COMPETITION, AND PRIVATIZATION INITIATIVES**

EFFECT OF WTO ON GROWTH OF FIXED LINES IN SUB-SAHARAN AFRICA



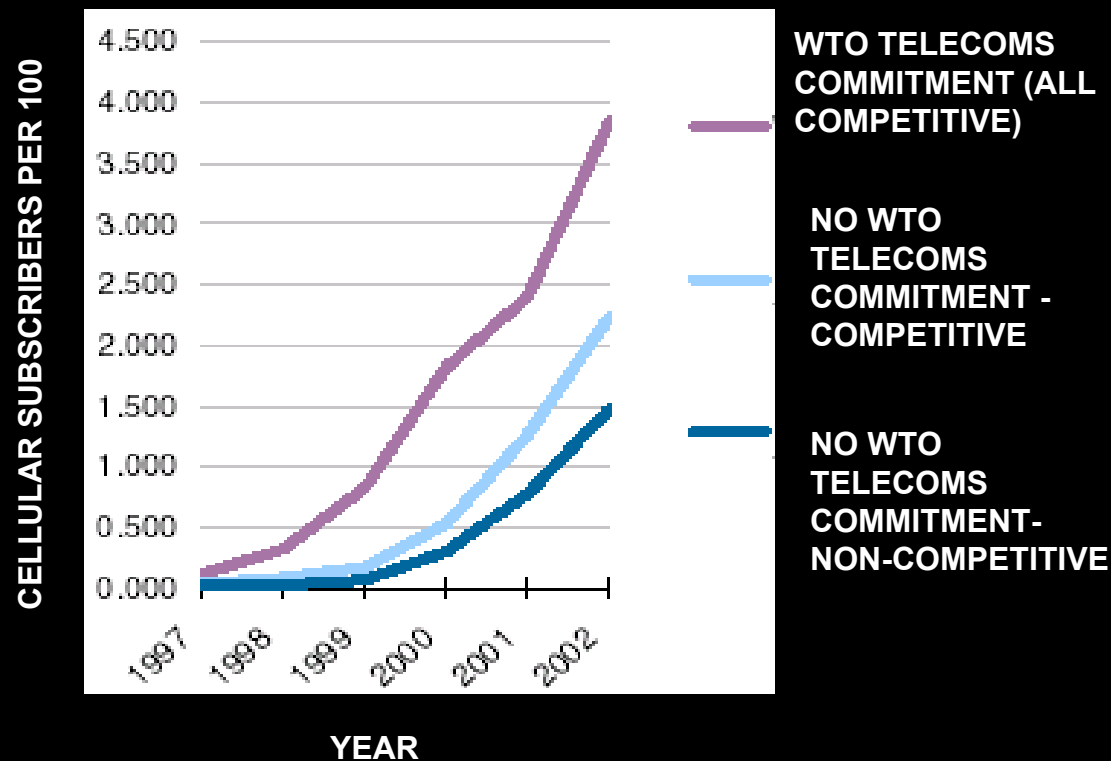
WTO TELECOMS
COMMITMENT
(ALL PRIVATIZED)

NO WTO
TELECOMS
COMMITMENT -
PRIVATIZED

NO WTO
TELECOMS
COMMITMENT-
NOT PRIVATIZED

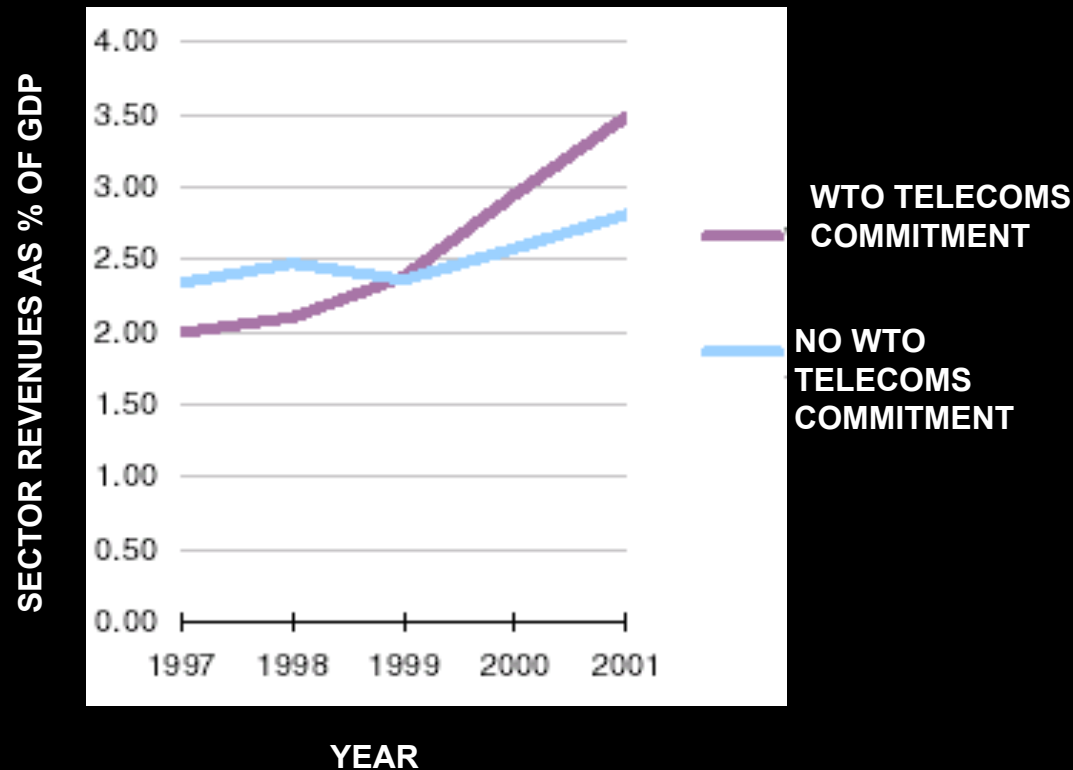
- **COUNTRIES WITH WTO TELECOMS COMMITMENTS PERFORM BETTER**
 - **GREATER FIXED LINE PENETRATION**
 - **FASTER GROWTH**
- **COUNTRIES WITHOUT BASIC TELECOM COMMITMENTS HAVE GREATER FIXED LINE PENETRATION IF THE INCUMBENT IS PRIVATIZED**

EFFECT OF WTO ON GROWTH OF MOBILE LINES IN SUB-SAHARAN AFRICA



- COUNTRIES WITH BASIC TELECOM COMMITMENTS HAVE GREATER MOBILE SUBSCRIPTION
- COUNTRIES WITHOUT BASIC TELECOM COMMITMENTS HAVE GREATER PENETRATION IF THERE IS COMPETITION IN MOBILE

EFFECT OF WTO ON REVENUES IN SUB-SAHARAN AFRICA

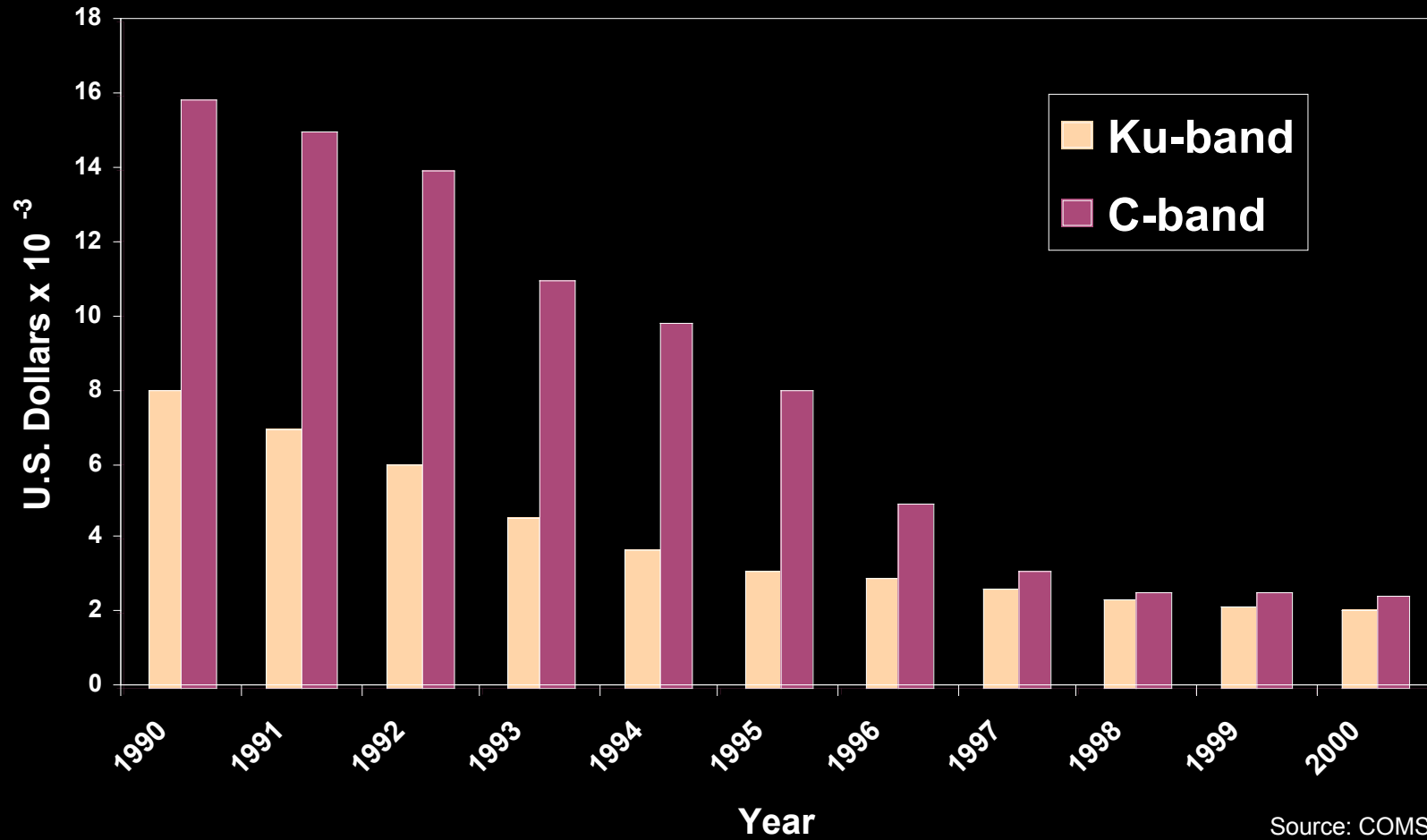


- **COUNTRIES WITH BASIC TELECOM COMMITMENTS PERFORMED BETTER**
 - **GREATER SECTOR REVENUES THAN COUNTRIES WITHOUT BASIC TELECOM COMMITMENTS**
 - **FASTER GROWTH RATES**

WTO CONCLUSIONS

- **GATS COMMITMENTS ACT AS A MECHANISM FOR A COUNTRY TO ATTRACT MORE PRIVATE SECTOR INVESTMENT**
- **GATS COMMITMENTS CORRELATE WITH BETTER PERFORMANCE IN THE TELECOMMUNICATIONS SECTOR – MORE RAPID GROWTH IN FIXED-LINE PENETRATION, MOBILE SUBSCRIBERSHIP, AND TELECOMMUNICATIONS-SECTOR REVENUES**
- **AS EXISTING COMMITMENTS ARE FURTHER IMPLEMENTED AND NEW COMMITMENTS MADE, MORE REFINED METRICS WILL BE AVAILABLE TO FURTHER SUBSTANTIATE THESE FINDINGS**

VSAT TERMINAL PRICING TRENDS



Source: COMSYS

<http://www.fcc.gov>

William.luther@fcc.gov

COMPROMISE

**“ALL GOVERNMENT, INDEED
EVERY HUMAN BENEFIT
AND ENJOYMENT, EVERY
VIRTUE, AND EVERY
PRUDENT ACT, IS FOUNDED
ON *COMPROMISE* ...”**

- Edmund Burke -

Irish philosopher, 1775