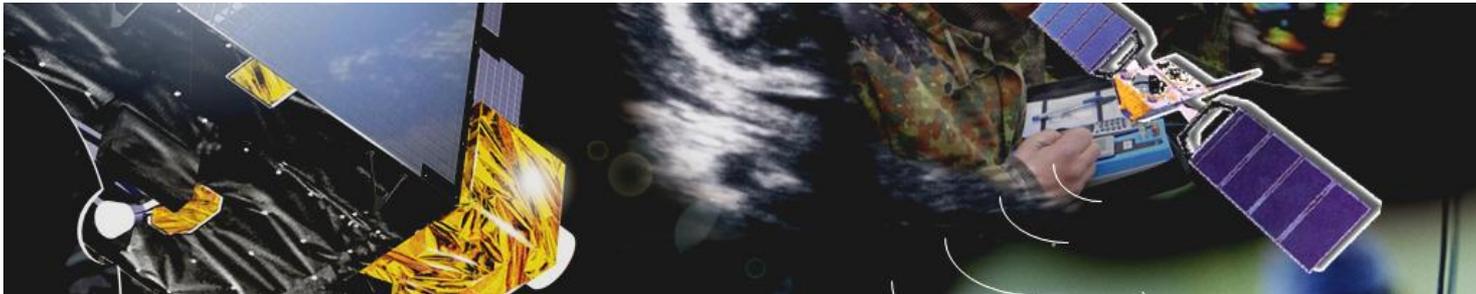


Space Technology Application Areas for Health in an Inclusive Global Information Society



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United Nations / Malaysia Expert Meeting on Human Space Technology
Putrajaya, Malaysia, 2011-11-16

Personal background



- **Doctoral degrees in computer science and medical informatics**
- **Professor for medical informatics and telemedicine at universities in Munich (TUM), Germany, and Tromsø (UiT), Norway**
- **25 years experience with eHealth R&D projects in hospital and region, and in operative IT service (medical computing center)**
- **Research fields: eLearning, telemedicine, computer-aided diagnosis, biosensors, cancer, chronic diseases, healthy ageing, global health**

Supporting actions of WHO, ESA, EC, UN as eHealth expert:

- **WHO Interoperability & eHealth Observatory**
- **ESA Telemed Working Group 2004**
- **TTF (ESA, EC, WHO, AUC, AfDB, RECs) Telemed Task Force, since 2006**
- **Satellite-Enhanced Telemedicine and eHealth for Sub-Saharan Africa Programme (eHSA) (currently)**
- **UNOOSA Space for Human Security 2011**



global situation
enhancing healthcare systems
implementing eHealth
the way forward

World health expenditure is around \$ 2.5 x 10¹²!
That is around 7-8% of the global GDP.
Health is one of the main sectors
in the modern global economy.

**But such expenditure is far from being
homogeneously distributed!**

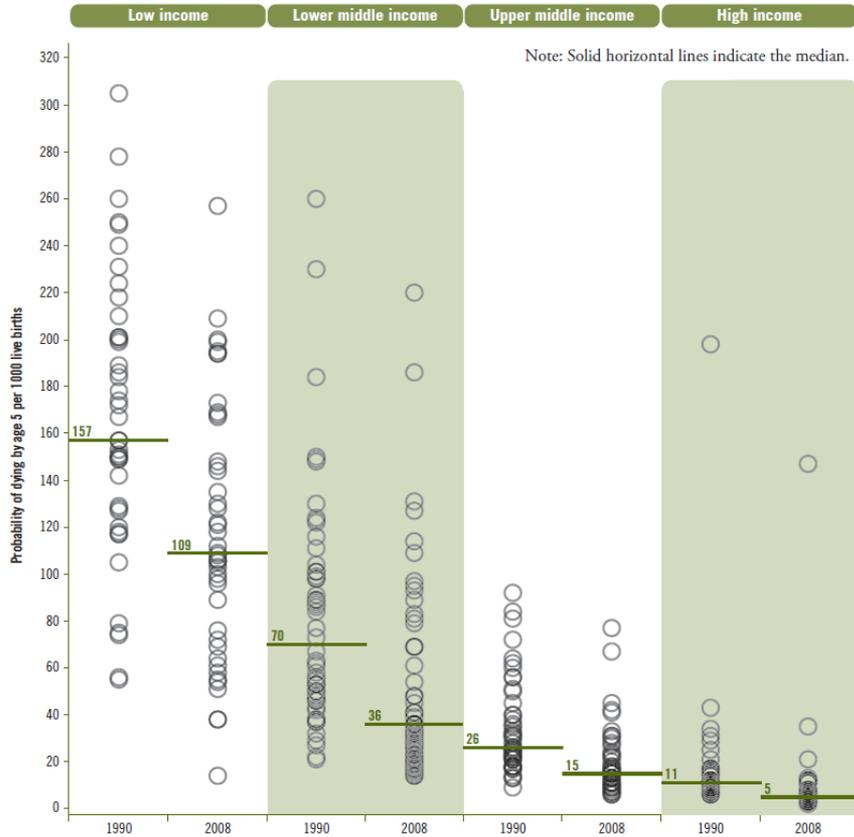
	population	burden of disease	% world income	% total health care expenses
medium and low income countries	84%	93%	18%	10%
high income countries	16%	7%	82%	90%

Source: World Bank 2001, World Development Indicators

(Menabde, WHO, Frascati, 2004, modified)

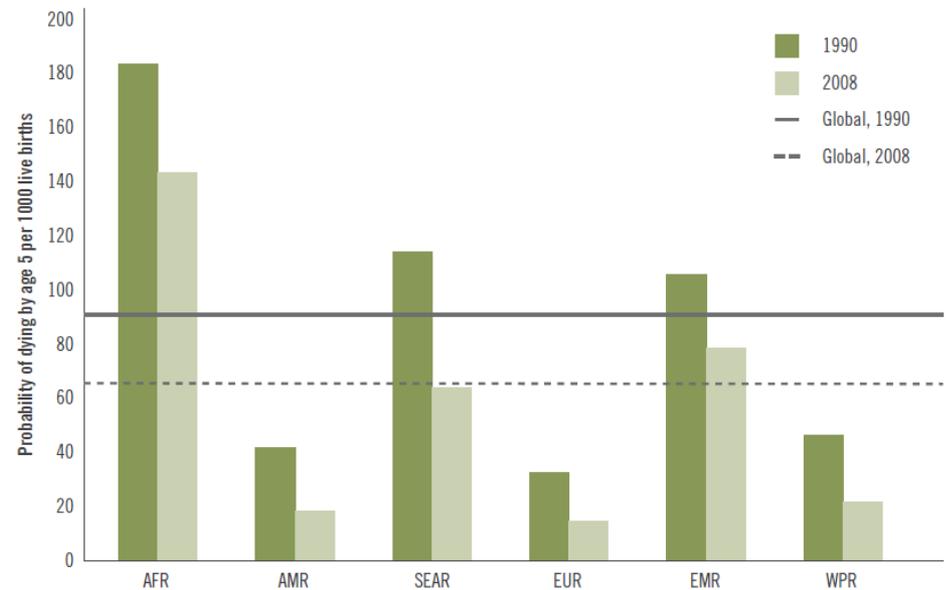
Child mortality under 5

Figure 8: Mortality rate in children under 5 years old by country-income group – 1990 and 2008



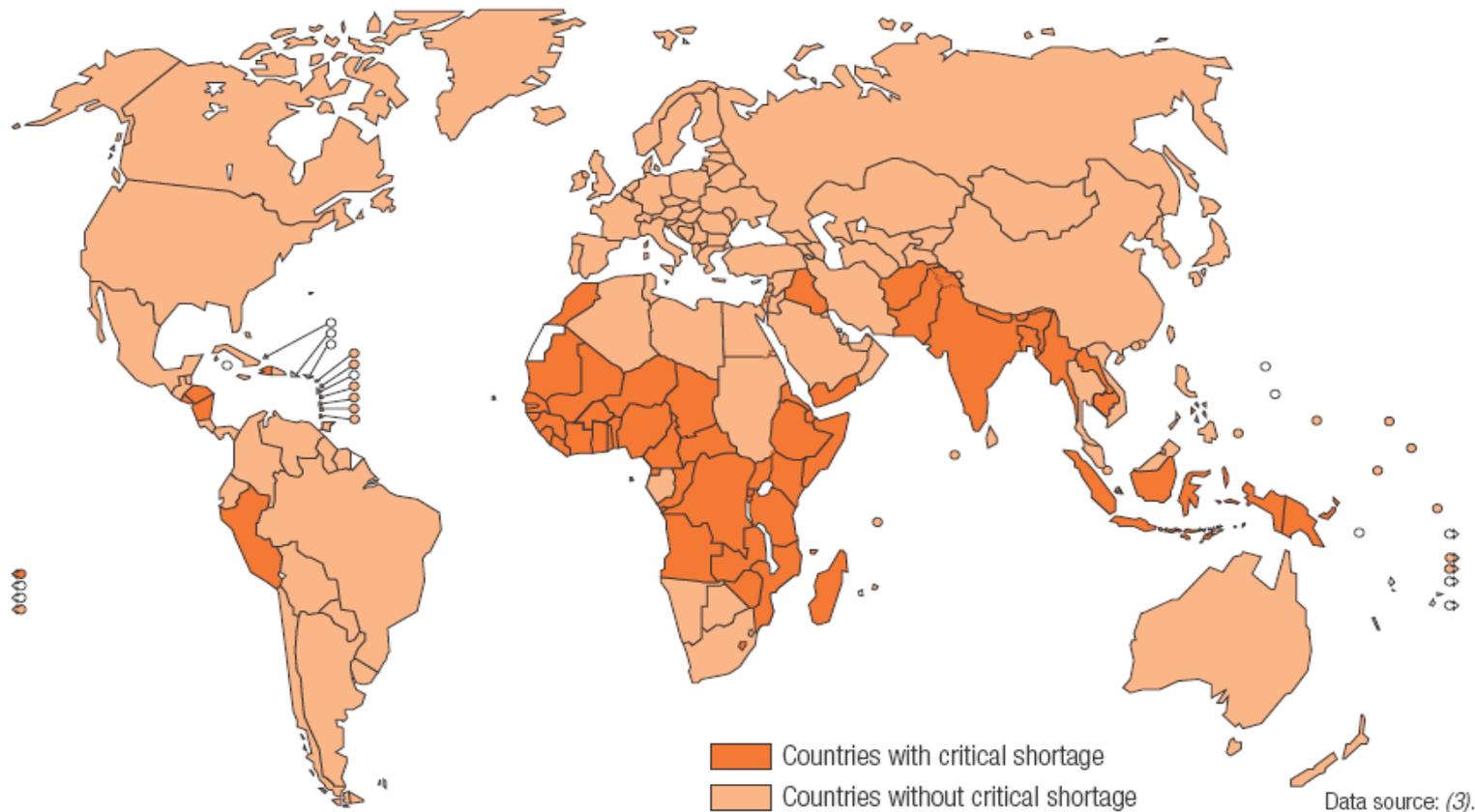
World Health Statistics 2010

Figure 1: Mortality rate in children under 5 years old by WHO region



Health Workforce Crisis

Countries with a critical shortage of health workers
(doctors, nurses and midwives)



(World Health Report 2006)

Digital opportunity



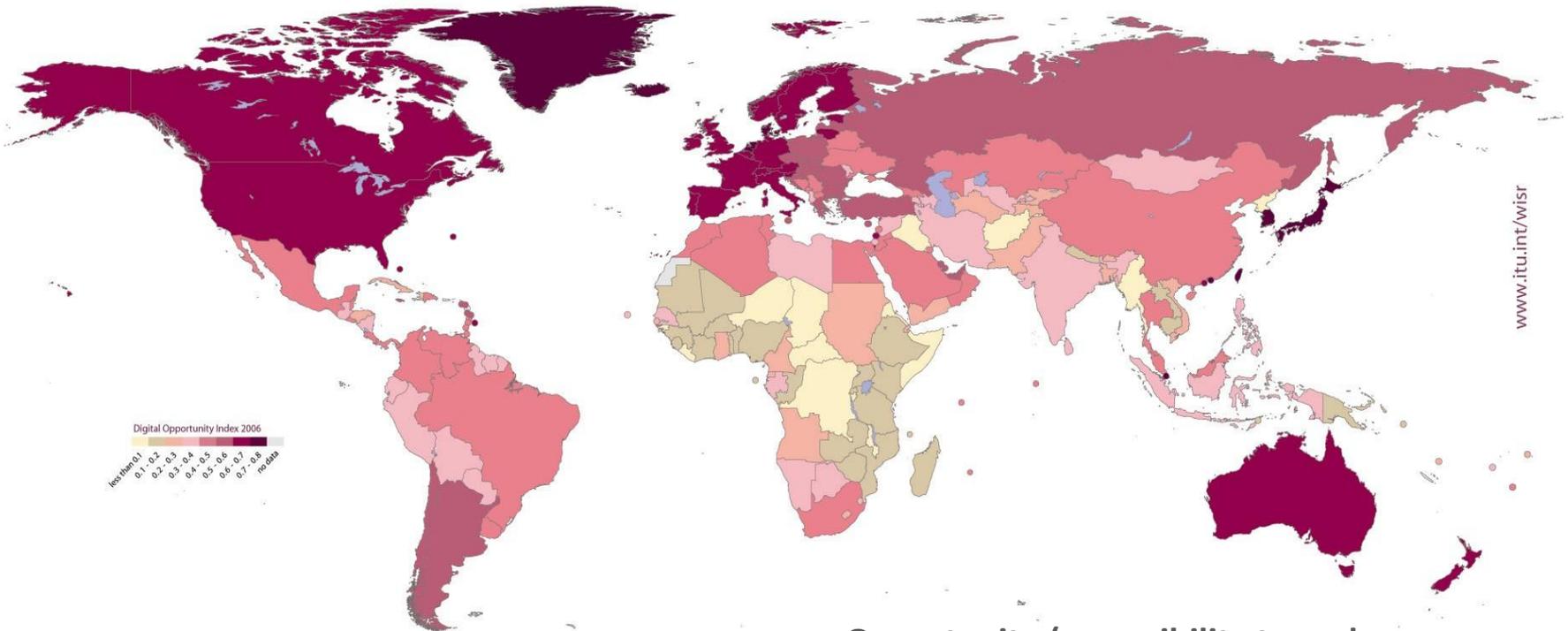
Digital opportunity 2005/2006



International
Telecommunication
Union



UNITED NATIONS

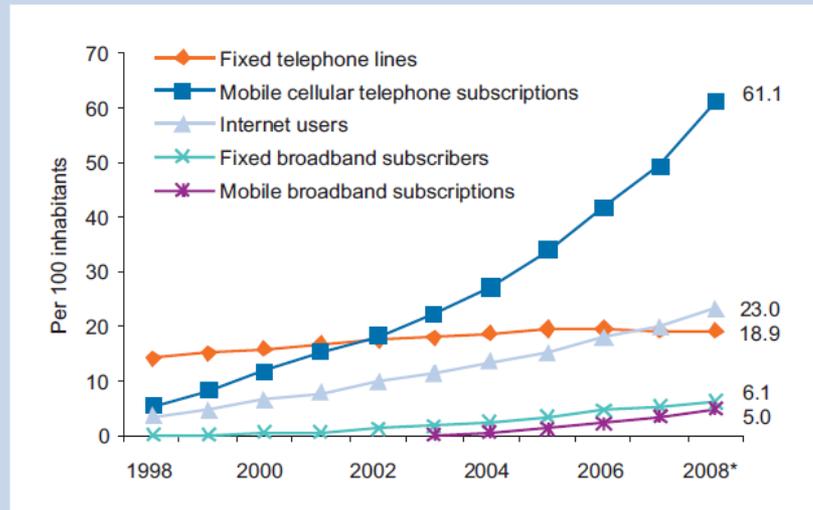


Digital Opportunity Index (DOI) with
11 indicators measuring:

- Opportunity (accessibility to and affordability of ICT services)
- Infrastructure
- Utilization

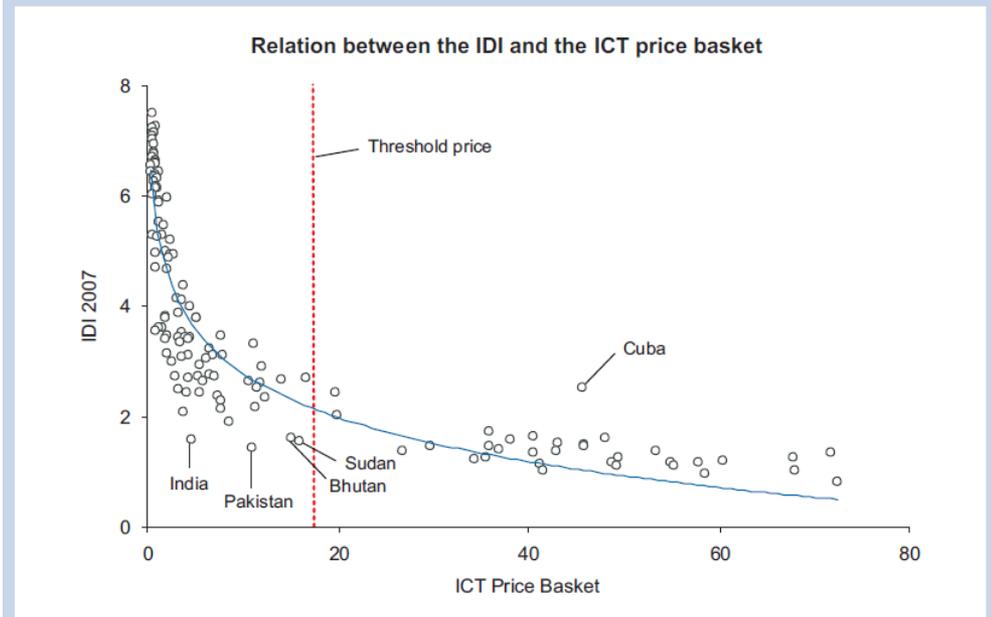
The digital divide

Chart 2.1: Global ICT developments, 1998-2008



Note: * Estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Chart 6.2: IDI and ICT Price Basket comparison



Source: ITU.

(ITU 2009, Measuring the Information Society – The ICT Development Index)



global situation
enhancing healthcare systems
implementing eHealth
the way forward

OPPORTUNITIES AND CHALLENGES OF EHEALTH AND TELEMEDICINE VIA SATELLITE

C. Dario¹, A. Dunbar², F. Feliciani³, M. Garcia-Barbero², S. Giovannetti¹, G. Grasczew⁴,
A. Güell⁵, A. Horsch⁶, M. Jenssen⁷, L. Kleinebreil⁸, R. Latifi⁹, M. M. Lleo¹⁰,
P. Mancini¹¹, M. T. J. Mohr¹², P. Ortiz García¹³, S. Pedersen⁷, J. M. Pérez-Sastre¹³, A. Rey¹⁴

¹Healthcare Unit No. 9 of Treviso, Italy, ²WHO Regional Office for Europe, Division of Country Support, Barcelona, Spain, ³ESTEC, Noordwijk, The Netherlands, ⁴Charité Hospital, University Medicine Berlin, Germany, ⁵Centre National d'Etudes Spatiales, Paris, France, ⁶Department of Medical Statistics and Epidemiology, Munich University of Technology, Germany, ⁷Norwegian Center for Telemedicine, Tromsø, Norway, ⁸L'Assistance Publique Hôpitaux de Paris, France, ⁹Surgical Department, University of Arizona, Tucson, USA, ¹⁰Department of Pathology, Section of Microbiology, University of Verona, Italy, ¹¹European Space Agency, Paris, France, ¹²International Center of Telemedicine, Regensburg, Germany, ¹³Iberia Medical Service, Spain, ¹⁴Geneva University Hospital, Switzerland

eHealth for Africa

Opportunities for Enhancing the Contribution of ICT to Improve Health Services

E. Asamoah-Odei¹, H. de Backer², N. Dologuele³, I. Embola⁴,
S. Groth⁵, A. Horsch⁶, T. B. Ilunga⁷, P. Mancini⁸, M. Molefi⁹, W. Muchenje⁷,
G. Parentela⁸, S. Sonoiya¹⁰, N. Squires², M. Youssouf⁷, K. Yunkap⁵

¹World Health Organization, African Regional Office

²European Commission, Directorate General Development

³Organisation de Coordination pour la lutte contre les Endémies en Afrique Centrale

⁴Communauté Economique et Monétaire de l'Afrique Centrale

⁵World Health Organization, Head Office

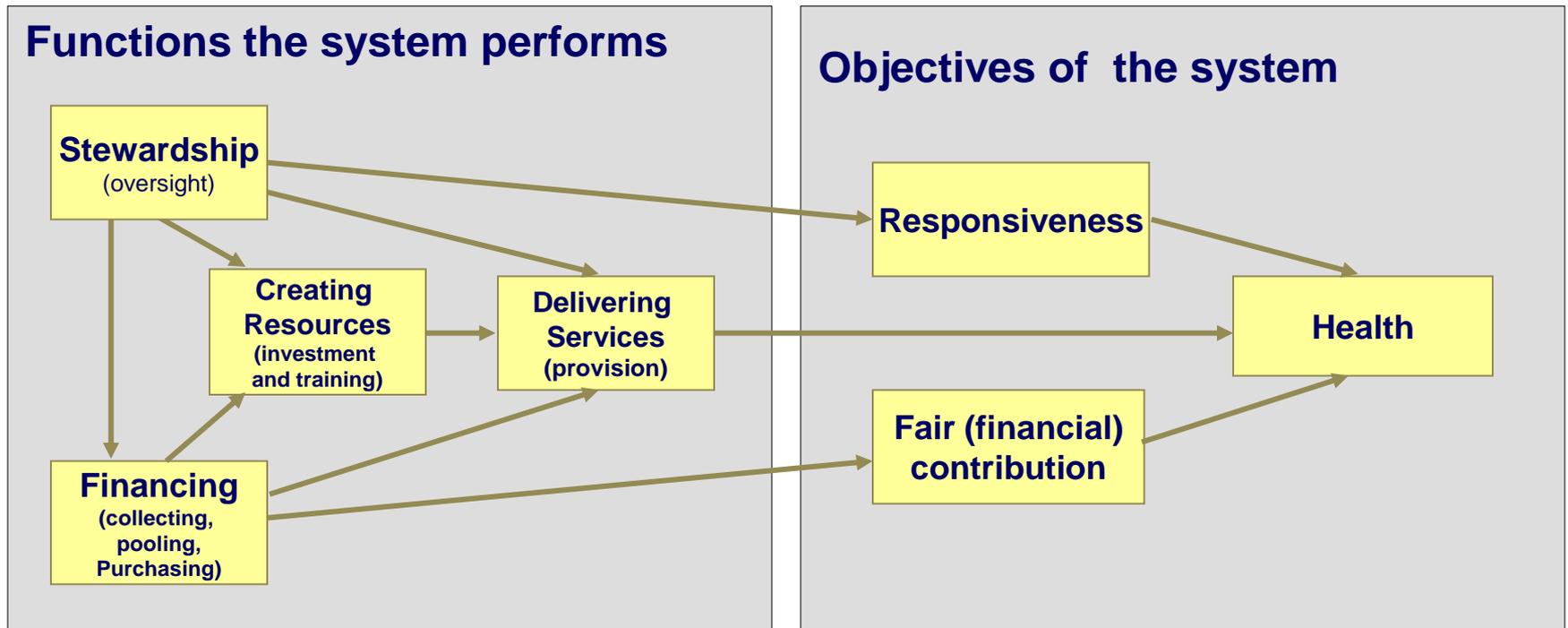
⁶Munich University of Technology, Germany & University of Tromsø, Norway

⁷African Development Bank, ⁸European Space Agency

⁹Medical Research Centre, South Africa & New Partnership for Africa's Development

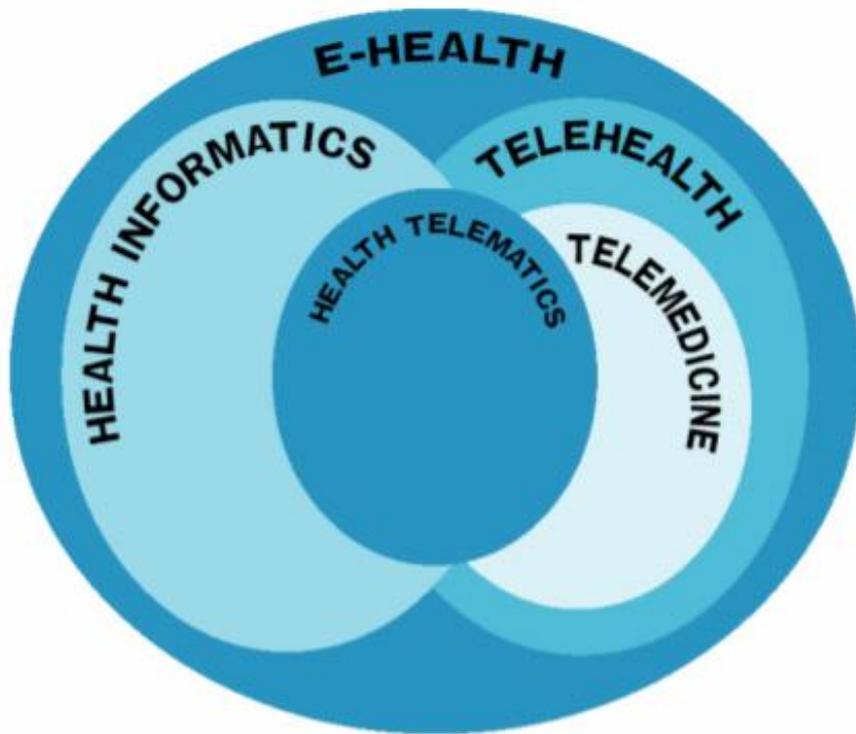
¹⁰East African Community

Relations between functions and objectives of a health system



(Menabde, WHO, Frascati, 2004)

A definition of eHealth



eHealth is the use of ICT for health at the local site and at a distance (WHO 2004).



Citizens, Professionals,
Providers, Policy makers

Telemedicine mainly is the use of ICT for delivery of healthcare services, where distance is a critical factor (WHO 1997).



Professionals, Patients

Service provision - eCare

eHealth potential through eCare

- Improving access, equity, quality and accountability
- Connecting healthcare facilities and healthcare professionals
- Diminishing geographical / physical barriers
- Less traveling for patients / professionals
- Less medical errors
- High-quality healthcare independent of location
- For citizen / patient new ways to practice self-determination and self-responsibility for own health
- For professional better access to patient data

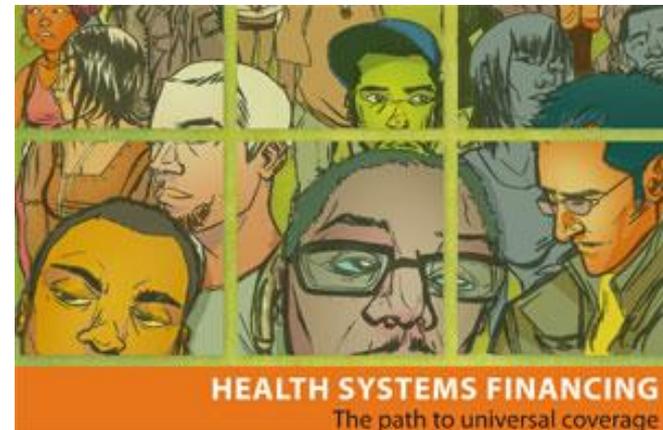
Financing – eAdministration/eGov

Financing
(collecting,
pooling,
Purchasing)

- eHealth potential through eAdministration
 - Improving information systems
 - For more effective resource allocation and purchasing
- Example eGovernance
 - Electronic pooling and purchasing where conventional infrastructures do not exist or are inefficient and time-consuming
 - Can support transparency and efficiency



World Health Report 2010



Resource generation - eLearning

eHealth potential

– eLearning

- Internet-based
- Virtual universities, courses
- Information & interaction
- Collaboration & link to other knowledge resources

– Connection of / to existing resources

- Patient-oriented services
- Knowledge-oriented services
- Countries without or with unstable infrastructure

Stewardship – eSurveillance/eGov

Stewardship
(oversight)

- eHealth potential through eSurveillance / eGovernment
 - improving information systems for decision making
 - early response in emergency situations
- Public sector
 - active role in pushing deployment of eBusiness for the health and social services sector

Space for health and human safety



Satcom
eCare, eLearning
eAdmin/eGov

ISS
medical research*
biosensors /BME

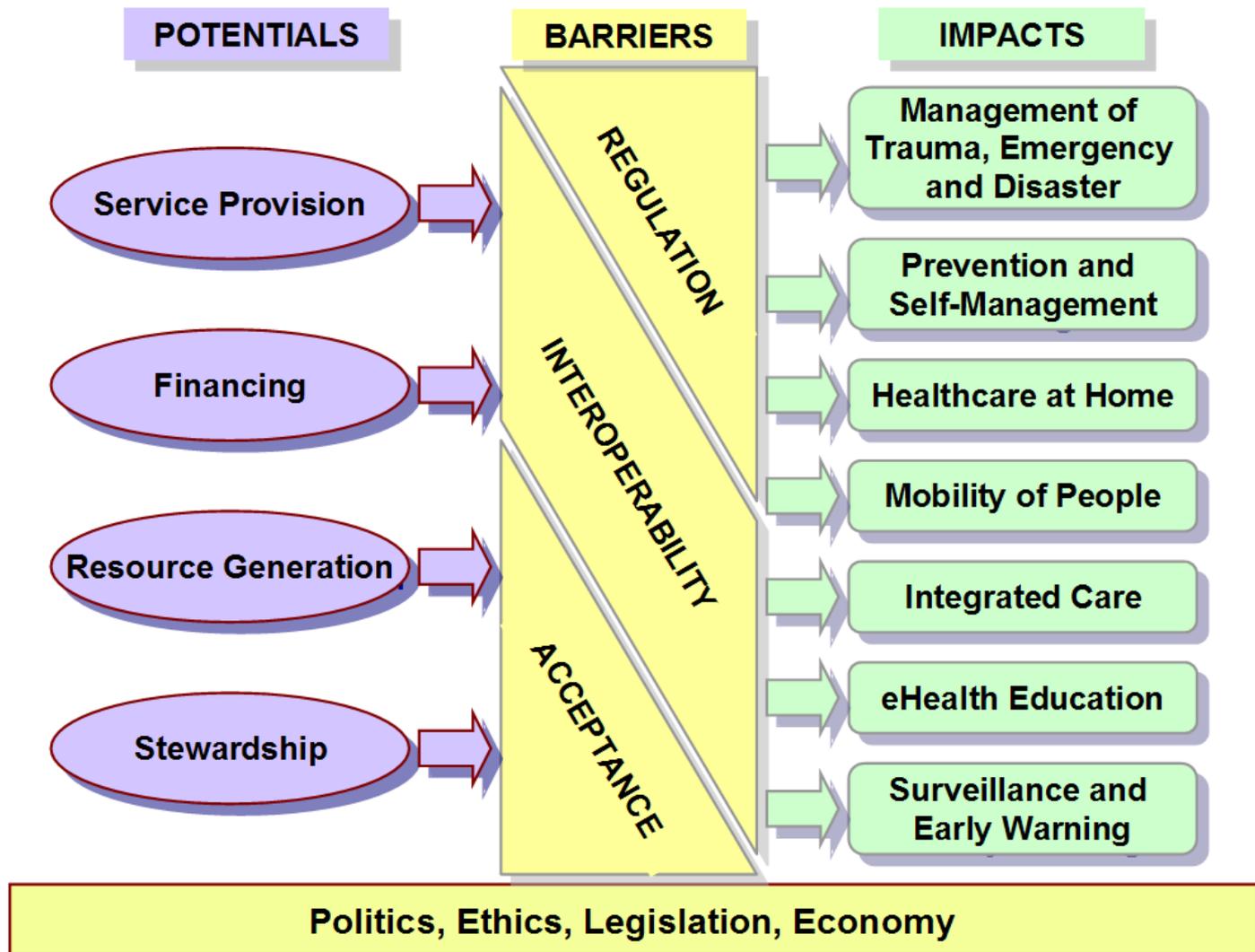
Earth Observation
Meteosat
eSurveillance

* vaccines (e.g. malaria, HIV/AIDS)
aging / physiology

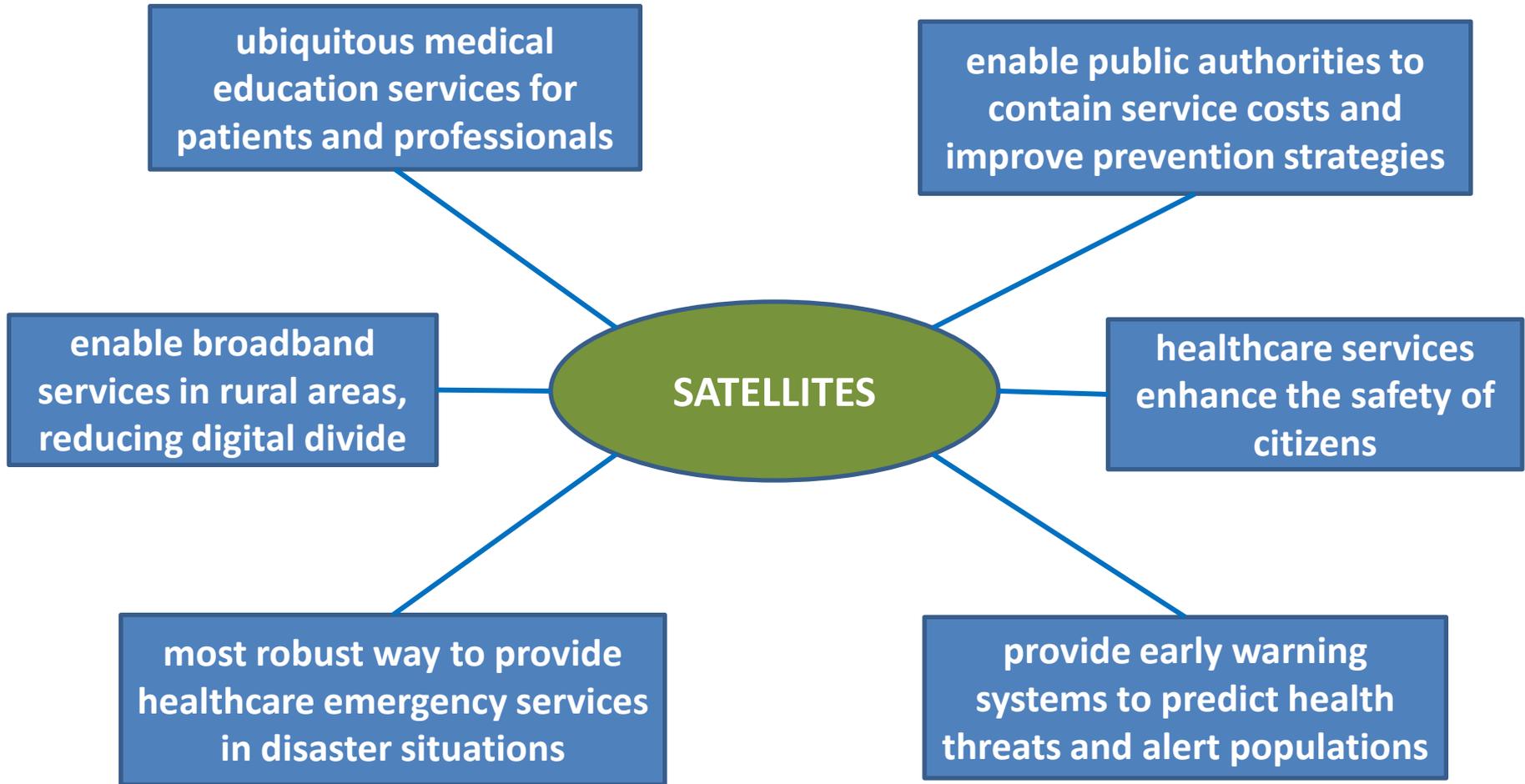


global situation
enhancing healthcare systems
implementing eHealth
the way forward

The eHealth challenge



Specific satellite potentials



Trauma, Emergency, Disaster

- Increase chance to save lives
- Save costs in the long term
- Reduce administrative overhead
- Ensure proper care at the site of trauma or disaster
- **Improve the care during the “Golden Hour”**
- Create evidence based medicine at the site
- Share acquired experience



Ramstein 1988



Düsseldorf 1996



Eschede, 1998



Storm Lothar 1999



Flood Elbe 2002

Mobility of People

Example air travels



- Less diversions
- Better care on board

- Flight attendant 1st aid
- Airline medical kits
- Telemedical support



"Please pay attention, as the stewardess shows you our procedure for drunken passengers."

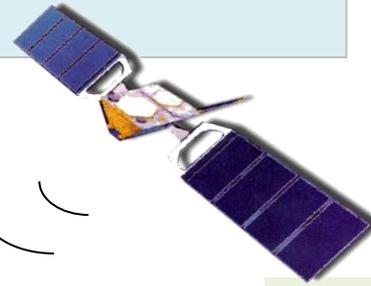
(ESA Telemed Working Group, 2004)

Surveillance and Early Warning

EARTH OBSERVING SAT
Ocean conditions
earthquake activity
volcanic activity

METEOSAT
Meteorological
conditions

ENVIRONMENT MONITORING SAT
Moisture, rainfall, greenness,
temperature, etc.



**EWS revealing any
alarming data or
trend change**

**Integration and archiving of data
to create models for:**

- communicable diseases
- evaluation of volcanic risk
- evaluation of earthquake risk
- dangerous meteorological events

**Rapid communication
of the alarm to
appropriate centres,
institutions, persons**

- Saving lives, reducing post-traumatic consequences
- Prediction / prevention instead of care afterwards
- Decreasing costs for severe diseases / injuries

(ESA Telemed Working Group, 2004)

Cost Benefit Analysis of Satellite-Enhanced Telemedicine and eHealth Services in Sub-Saharan Africa

November 2008

(PricewaterhouseCoopers)

eCare in the Clinic: IKON in Mali

eCare in the Village: Uganda Health Information Network

eLearning: Kenyan Nurses; and Réseau Afrique Francophone de Télémédecine (RAFT)

eSurveillance: Nigeria Malaria Surveillance

eAdministration/eGovernance: Rwanda TRACnet; and Pharmaceuticals Tracking

Cost Benefit Analysis of Satellite-Enhanced Telemedicine and eHealth Services in Sub-Saharan Africa

November 2008

(PricewaterhouseCoopers)

Sub-Saharan Africa health impact	Lives Saved p.a.	One Year Value	Lifetime Value¹
eCare in the Clinic	16,800	\$680 million	\$746 million
eCare in the Village	151,800	\$259 million	\$2,576 million
eLearning	85,100	\$145 million	\$1,444 million
eSurveillance	644,100	\$1,248 million	\$55,902 million
eAdministration/ eGovernance	477,900	\$934 million	
TOTAL	1,375,700	\$3,266 million	\$60,668 million

Differences in Lifetime value are attributed to the differences in target populations the programmes are designed to address.

eHSA programme


esa
telecommunications & integrated applications
European Space Agency

ESA [Home](#) [User Support Office](#) [Special Interest Groups](#) [Knowledge Share](#) [Integrated Applications](#)

15 Nov 2011

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- Current and Future
- Tenders
- Open Call for Proposals ▶
- ARTES 1 Workplan 2011 ▶
- ARTES 5.1 Workplan 2011 ▶



Telemedicine initiative for sub-Saharan Africa: pilot projects proposed

20 Mar 2007

Satellite solutions delivering information and communication technologies can help improve health in sub-Saharan Africa; this was the main conclusion of a dedicated telemedicine task force which met recently in Botswana. To make these solutions a reality, some short-term, concrete actions have been suggested in a pilot projects proposal. Three activities are proposed: one focussing on the health workforce (scaling-up numbers, improving performance, increasing quality); a second on clinical services (increasing health service coverage, reaching isolated areas) and a third aimed at strengthening the intelligence gathering capacity of health systems and their ability to use information for decision making.

These demonstration projects will be used to inform and to help develop a framework for extending eHealth, which should be considered as part of the European Union Strategy for Africa commitment to utilise Information and Communication Technologies (ICT) to enhance interconnectivity in Africa. The potential of this greater interconnectivity, which will be supported under the tenth European Development Fund (EDF), to extend the reach of health and health services will be tested and demonstrated through these proposed projects.

Held in Gaborone, Botswana on 1 March 2007, it was the third meeting of the Telemedicine Task Force, which is composed of the main relevant African organisations, the World Health Organization, the European Commission and the European Space Agency. It was set up after a workshop held in Brussels in January 2006 that highlighted the potential of satellite telecommunication technology to support health systems in Africa. One of the key tasks of its mandate was to develop a complete picture of telemedicine opportunities in the sub-Saharan region and to formulate recommendations for future action.

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eHSA programme

THEMATIC
AREAS

eCare

eLearning

eSurveillance

eGovernance/
eAdministration

Governance

HORIZONTAL
STUDIES

Regulatory Aspects

Interoperability: System of Systems

Sustainability, Liability, Business



global situation
enhancing healthcare systems
implementing eHealth
the way forward

Vision or goal?

MDGs and beyond:
Health for ALL

space bridges national
and regional borders

health services accessible
and affordable for everyone

satcom includes all
remote populations

global surveillance
and response

sufficient number of
health professionals



Questions?

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