PRESENTATION AT NAFIS 2023 SUMMIT

DIGITIZATION AND DATA MANAGEMENT

IMPERATIVES FOR DELIVERING AFFORDABLE HOUSING

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PRESENTATION OUTLINE

- GLOBAL AND AFRICA CONTEXT FOR REAL ESTATE
- TECHNONOGY – DATA MANAGEMENT – HOUSING
- DATA AGENDA FOR AFRICA – DRAWN FROM WORK DONE BY CAHF
- DATA QUALITY ASSESSMENT – FOCUS ON NIGERIA
- APPLICATION OF DATA QUALITY TO LAND – CASE STUDIES
- DIGITIZATION AND APPLICATION OF BLOCKCHAIN TECHNOLOGY TO HOUSING
- DIGITIZATION OF THE LAND REGISTRY
- BLOCKCHAIN TOKENIZATION – TOKENIZATION OF REAL ESTATE
- MULTIPLIER EFFECT OF DIGITIZATION ON AFFORDABLE HOUSING
- AFFORDABLE HOUSING POLICY – THE NEED FOR IMPACTFUL INVESTMENT
- CONCLUSION

Background

Global and Africa Context

Backdrop For Digitized Data

The Imperative of Good Data for Digitization of Real Estate

Global Housing – Multi Trillion $ Opportunity

Developing Affordable Housing: **Investment Opportunity**—and **Challenge**

The prospect of trying to fill a **gap of 440 million housing units** may seem daunting to policy makers, but it could represent a **massive opportunity for the private sector**.

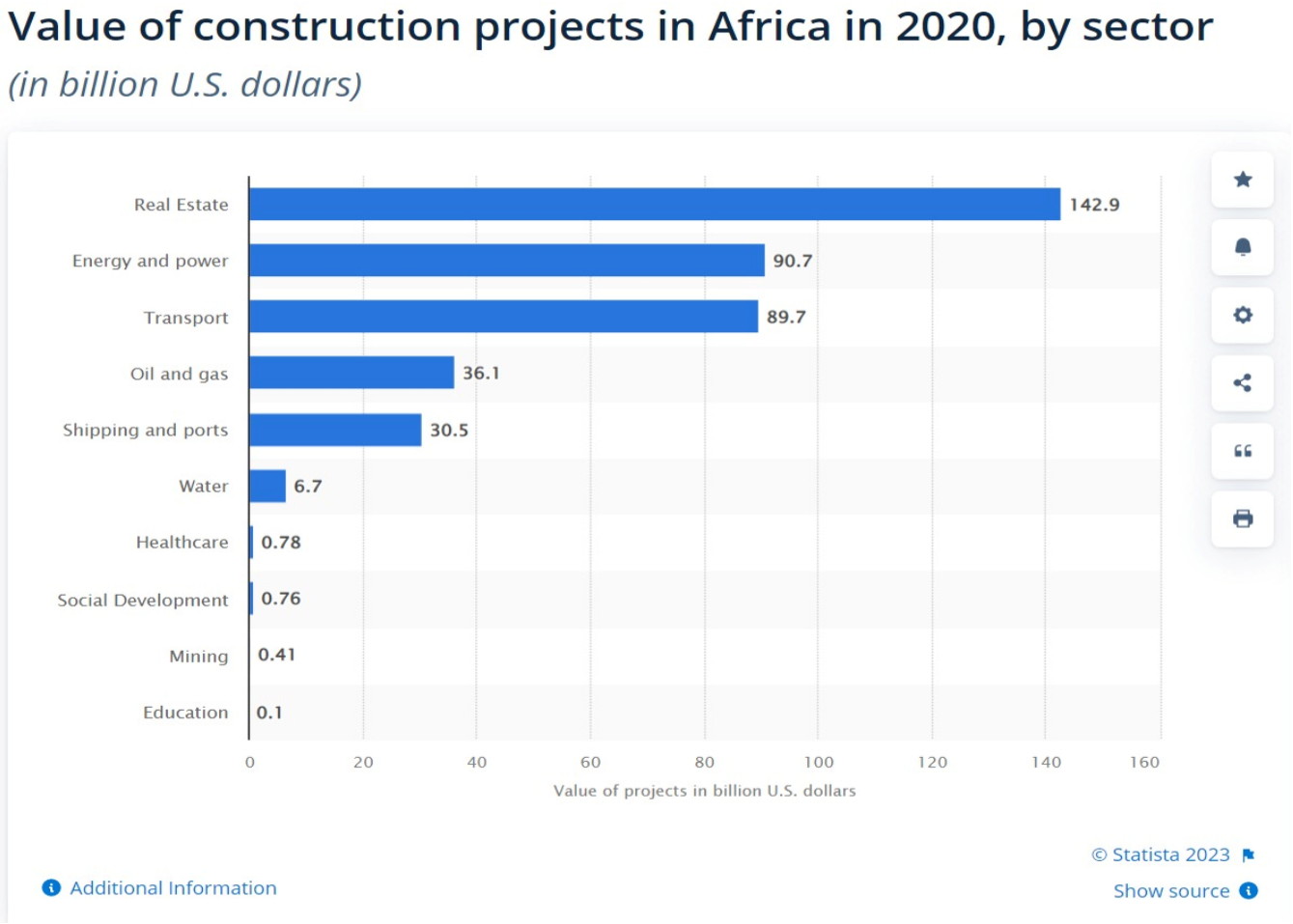
The **investment associated with building the housing needed to close this gap** would be **$9 trillion to $11 trillion for construction** alone.

With the **cost of land**, we estimate the **total could be as much as $16 trillion**.

- McKinsey Global Institute

frica – Value of Construction Projects by Sector

- **Real estate projects in Africa were valued at nearly 143 billion U.S. dollars in 2020.**
- **Commercial construction had projects exceeding a total value of 118 billion U.S. dollars.**
- **Projects in industrial construction were valued at some 21.6 billion U.S. dollars.**
- **Cultural real estate had projects worth around 300 million U.S. dollars.**



Selected African Countries
Property Price to Income Ratio

Select Region: Eastern Africa | Middle Africa | Northern Africa | Southern Africa | Western Africa

More information about these indices

Search:

Rank	Country	Price To Income Ratio	Gross Rental Yield City Centre	Gross Rental Yield Outside of Centre	Price To Rent Ratio City Centre	Price To Rent Ratio Outside Of City Centre	Mortgage As A Percentage Of Income	Affordability Index
1	Ghana	78.6	17.0	0.4	5.9	255.1	1937.5	0.1
2	Nigeria	28.2	29.4	15.7	3.4	6.4	507.8	0.2
3	Ethiopia	26.4	10.9	6.8	9.1	14.8	445.7	0.2
4	Kenya	16.0	3.5	4.6	28.5	21.7	216.9	0.5
5	Algeria	16.0	3.4	3.7	29.6	27.1	143.2	0.7
6	Morocco	14.2	4.6	5.0	21.7	19.8	111.2	0.9
7	Egypt	12.0	6.8	7.0	14.7	14.3	162.0	0.6
8	Tunisia	11.9	4.9	4.9	20.5	20.3	144.8	0.7
9	South Africa	3.4	9.9	11.2	10.1	8.9	36.0	2.8

Showing 1 to 9 of 9 entries

Source: Numbeo.com 2023

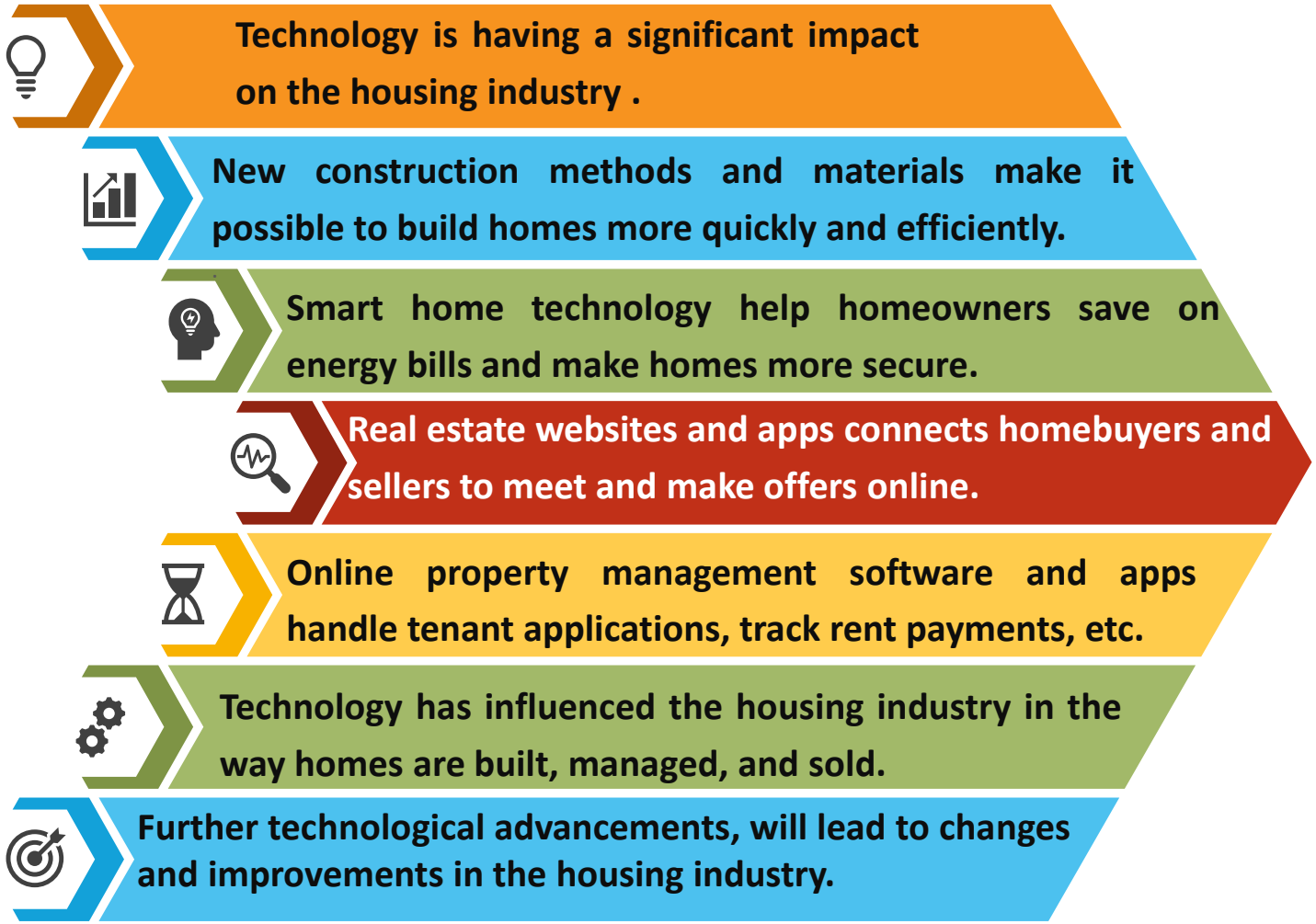
The Figure Shows Relative Affordability of Residential Units in Africa's Leading Cities Based on Square Meters Purchased with US$ 100,000. 2022

Section one

Technology and Housing

Imperative for Digitization

TECHNOLOGY AND HOUSING



TYPES OF DATA MANAGEMENT

Master Data Management (MDM):

- MDM focuses on creating a single, reliable source of data by aggregating information from various data sources.
- It involves tools and processes for maintaining consistent and accurate master data to support informed business decisions.

Data Stewardship:

- Data stewards are responsible for enforcing data management policies across an organization.
- They oversee data collection and movement, ensuring that best practices are implemented

Data Quality Management:

- Data quality managers work to identify and rectify issues in collected data, such as duplicate records, inconsistent data versions, and other quality problems.
- They support the data management system by ensuring data is accurate and reliable.

Data Governance:

- Data governance establishes policies for data intake, flow, and protection within an organization.
- It acts as a framework that outlines rules and guidelines for data management.

Data Security

- Data security specialists are crucial in safeguarding data.
- They manage encryption, protect against unauthorized access, and prevent accidental data breaches or deletions.

Big Data Management:

It focuses on data intake, data integrity, and storage of vast amounts of raw data that other teams use for operations improvement, security, and business intelligence.

Data Warehousing:

- Involves the infrastructure and systems used to aggregate and store data for in-depth analysis.
- Provides the foundation for extracting valuable business insights from data, often stored in physical or cloud-based warehouses

DATA MANAGEMENT IN AFFORDABLE HOUSING

TENANT SCREENING AND SELECTION:

- Data management systems can store and analyze applicant information, including credit histories and rental references.
- Algorithms can help in objective tenant selection, reducing the risk of discrimination and ensuring a fair process.

.

PROPERTY MANAGEMENT:

- Data systems can track maintenance schedules, repair requests, and maintenance costs.
- Predictive maintenance using historical data can reduce unexpected repair expenses.

PROPERTY ALLOCATION:

- Data-driven allocation systems can prioritize individuals and families in need, ensuring that those with the greatest need receive affordable housing.

RENT COLLECTION AND PAYMENT TRACKING:

- **Smart meters** and **data analysis** can help **monitor** and **manage energy consumption** in affordable housing units.
- Data-driven insights can lead to **energy-saving initiatives and reduced utility costs** for both tenants and property owners.

AFFORDABILITY ASSESSMENTS:

- Data can be used to **determine** the **affordability of housing options** based on income levels, household size, and location.
- This helps policymakers and organizations in developing targeted housing programs.

GLOBAL DATA MANAGEMENT COMPANIES SPECIALIZING IN AFFORDABLE HOUSING

YARDI SYSTEMS

The Affordable Housing platform offers features for compliance, reporting, financial management, and tenant services.

MRI SOFTWARE:

Helps organizations streamline operations and ensure regulatory compliance. Their solutions include budgeting, reporting, and tenant management tools

PROPERTYGURU

Access to thousands of properties for sale and rent with detailed information about each property, including maps and photos

LANDTECH

Provides the property industry with the tools they need to facilitate their daily operations.

SQUAREYARDS

Grant users access to an inventory of residential and commercial properties, harnessing data-driven methodologies and market.

LANDCHECKER

An all-in-one source, of property information and data analysis tools, to help professionals and homeowners make informed decisions, faster.

AFRICAN DATA MANAGEMENT COMPANIES SPECIALIZING IN AFFORDABLE HOUSING

CONDIGITAL

provides cloud project and enterprise management for construction companies in Africa

INSTANT PROPERTY

offers Software as a service to the Real Estate Industry empowering sector players with both technology and data to help them with their digital transformation.

CROWD PROP

platform that enables individuals to invest in real estate through the form of crowdfunding.

HouseME

Provides an online auction mechanism where landlords receive bids on their rental properties from prospective tenants.

NAWY

Offer Various Services Including Brokerage and Property Financing Services

JUMBA

A Kenyan construction technology platform founded in April 2022 that simplifies B2B purchase and financing of construction materials

NIGERIA DATA MANAGEMENT COMPANIES SPECIALIZING IN AFFORDABLE HOUSING

CUTSTRUCT TECHNOLOGY LTD

A digital marketplace that servers as a one-stop-shop for all construction needs and also shields construction stakeholders against the risk they will ordinarily experience in the industry

ESTATE INTEL

A data platform that helps organisations interacting with the real estate and construction industry make faster and smarter decisions.

PISON HOUSING COMPANY

Map, segment, analyse, and classify the Nigerian residential and commercial real estate markets.

REAL ESTATE INFORMATION CENTRE

Provide access hard to get real estate data and information in a timely and cost effective basis by providing intelligent and user-friendly information solutions.

VENCO

Offers a suite of solutions designed to streamline property management such as; Collections management, Utility vending, Charge administration

SPLEET

Offer products that find apartments and pays monthly, carry out due diligence and verify tenants, request facility management for property and apply for rental loans.

Section Two

DATA AGENDA FOR AFRICA

THE IMPERATIVES FOR DIGITIZATION

CENTRE FOR AFFORDABLE HOUSING FINANCE IN AFRICA; DATA AGENDA FOR HOUSING IN AFRICA OVERVIEW

Market intelligence & data is **fundamental market infrastructure** for the housing finance sector

01

The objective of the Data Agenda is to catalyse the provision and dissemination of this data

02

The unavailability of data and market intelligence undermines the private sector participation and good policy engagement in affordable housing finance

03

The vision is the **development of a housing and housing finance data universe in Africa** that provides regulators, policymakers, developers and housing financiers with **accurate, relevant and current data**.

04

CAHF: THE DATA AGENDA FOR HOUSING IN AFRICA IN PARTNERSHIP WITH 71POINT4 AND REALL

1. Data Landscape reports for all countries
2. Databases of the 115 Market Shaping Indicators in 2020, for all countries. To be collected annually and extended to new countries over time.
3. Country profiles; Kenya, Uganda, Tanzania, Mozambique, Nigeria and Ghana
4. A Market Shaping Indicators Metadata Document for the 115 Market Shaping Indicators
5. A special B40 dashboard using USAID's Demographic and Health Survey (DHS) database.
6. An online dashboard which displays the data collected against the Market Shaping Indicators for each country in Africa.

THE DATA AGENDA FOR AFRICA INVOLVES FIVE BROAD COMPONENTS

DATA COLLECTION AND ASSESSMENT

Collect, assess and **curate** available data (public, private and deal-specific) **relevant to increased investment in affordable housing** across Africa

01

02

- Encourage **data owners to make existing data available & improve quality /coverage of data**.
- Commissioning partners to gather additional data (primary data)

IDENTIFY DATA GAPS & AND CLOSE KEY DATA GAPS

INTEGRATION & EXPANSION OF DATA TOOLS, PRODUCTS

Integrate, optimise and **expand** our set of **knowledge products & data tools** to produce a set of **key data outputs** that are **widely used**

03

04

Build the capacity of partner institutions to **analyse data and engage** with **data-driven outputs**

CAPACITY BUILDING

CREDIBLE DATA PROMOTION

Promote the importance of **accessible, credible data** as a catalyst in the affordable housing market

05

A DATA AGENDA FOR HOUSING IN AFRICA: 115 HEADLINE MARKET SHAPING INDICATORS HAVE BEEN IDENTIFIED ACROSS THE VALUE CHAIN AND CRITICAL CONTEXTUAL AREAS

Land & Infrastructure
- ❑ Land Assembly
- ❑ Land Title
- ❑ Infrastructure

Construction & Investment
- ❑ Stock
- ❑ Flow
- ❑ Industry
- ❑ Building Materials
- ❑ Process

Sales & Rental
- ❑ Ownership
- ❑ Rental
- ❑ Transactions
- ❑ Finance
- ❑ Affordability

Maintenance & Management
- ❑ Home Improvements
- ❑ Municipal Management
- ❑ Finance

Value chain

Enabling Environment
- ❑ Operating Environment

Economic Environment
- ❑ Macroeconomic Indicators

Economic Environment
- ❑ Macroeconomic Indicators

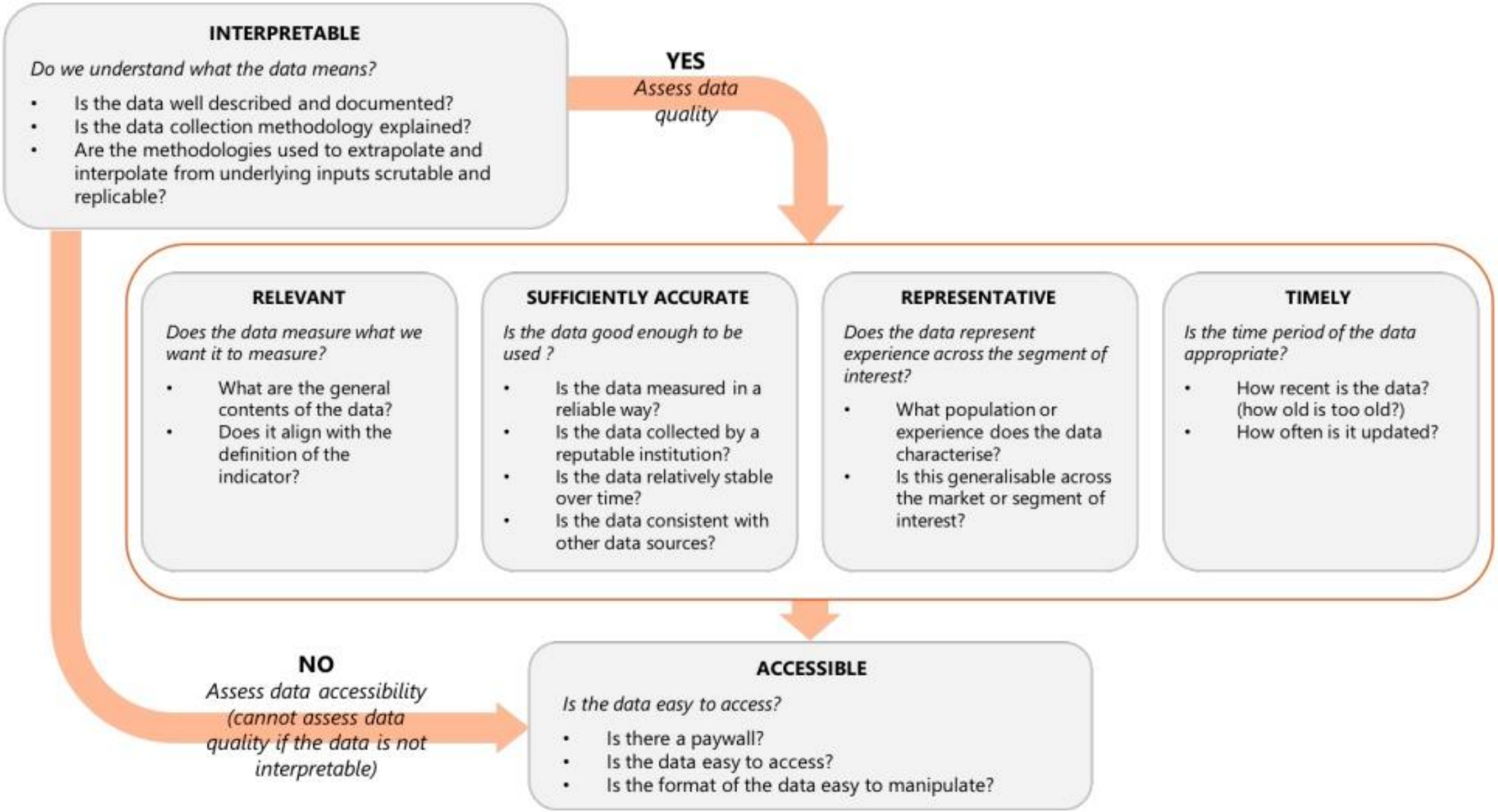
Context

Section Three

DATA QUALITY ASSESSMENT

DIGITIZATION THE ESSENCE OF DATA QUALITY

DATA QUALITY ASSESSMENT FRAMEWORK



AN ASSESSMENT OF DATA AVAILABILITY

Some Government Agencies as Data Sources:

NBS

NIGERIA NATIONAL BUREAU OF STATISTICS

NBS publishes demographic, socio-economic, and economic statistics on its website through downloadable reports and open data platforms.

NPC

NATIONAL POPULATION COMMISSION

The National Population Commission is responsible for producing data on the Nigerian people and economy.

CBN

CENTRAL BANK OF NIGERIA

Data on Nigeria's housing finance sector is primarily collected by the Central Bank of Nigeria (CBN) and shared on various platforms.

NMRC

NIGERIA MORTGAGE REFINANCE COMPANY

NMRC hosts the Housing Market Information Portal (HMIP), a decision-making tool supporting affordable housing and housing finance growth in Nigeria.

FMBN

FEDERAL MORTGAGE BANK OF NIGERIA

Provide long-term credit facilities to mortgage institutions in Nigeria.

Data sources for **climate issues** related to **housing** are the **National Environmental Standards and Regulations Enforcement Agency (NESREA)** *monitors environmental compliance and enforcement*, the **Nigerian Meteorological Agency (NiMet)** *provides weather and climate information*, the **Nigerian Hydrological Services Agency (NIHSA)** *provides hydrological information* and the **National Emergency Management Agency (NEMA)** *provides disaster management information.*

World Bank data and the **Demographic and Health Survey (DHS) program by USAID** are widely used as data sources.

Commercial banks provide data through their annual reports and financial statements, accessible on their websites.

The delivery of affordable housing and the development of the mortgage sector often require collaborative efforts between various government agencies.

These agencies includes:

FHA	FHFL			
FEDERAL HOUSING AUTHORITY	FAMILY HOMES FUNDS			
FHA delivers national housing programmes, planning approvals & permits its website through downloadable application forms, reports and open data platforms.	FHF is responsible for the delivery of social housing - also responsible for producing data on social housing			

The data sources for **climate issues** related to **housing** are the **National Environmental Standards and Regulations Enforcement Agency (NESREA)** *monitors environmental compliance and enforcement*, the **Nigerian Meteorological Agency (NiMet)** *provides weather and climate information*, the **Nigerian Hydrological Services Agency (NIHSA)** *provides hydrological information* and the **National Emergency Management Agency (NEMA)** *provides disaster management information.*

KEY DATA PRODUCERS AND CUSTODIANS IN NIGERIA

REGULATOR / GOVERNMENT DEPARTMENT

- National Bureau of Statistics
- Central Bank of Nigeria
- National Population Commission
- Federal Ministry of Finance, Budget and National Planning
- Federal Ministry of Works and Housing
- Federal Mortgage Bank of Nigeria
- Family Homes Funds
- Lagos State Real Estate Transaction Department
- Nigerian Investment Promotion Commission

PRIVATE INSTITUTION / INDUSTRY BODY

- Nigeria Mortgage Refinance Company
- NRE-DCMP
- Mortgage Banking Association of Nigeria
- Real Estate Developers Association of Nigeria
- Nigerian Institute of Town Planners
- Nigerian Institute of Estate Surveyors and Valuers

NGO

- Reall
- EFiNA
- CAHF

DFI

- World Bank / IFC
- AfDB
- DHS Program

OVERVIEW OF DATA AVAILABILITY AND QUALITY

- Data published by these institutions has allowed CAHF and 71Point4 to populate available data according to the Headline Indicator Market Shaping Framework

- The Figure illustrates this data collection activity per component by including a high-level characterization of data quality for indicators that were populated.

Quality Assessment: Scoring

Data Quality	Score
	Excellent
	Good
	Moderate
	Poor

INDICATORS POPULATED WITH DATA FROM THE NBS

	Transport as a % of total household expenditure – National: 6.4 %
	GAP: Gross fixed capital formation of dwellings as % of GDP GAP: Residential construction sector as a % of GDP- National GAP: Residential rental sector as a % of GDP- National GAP: Number of people employed in the residential construction sector GAP: Average residential building cost inflation for dwellings over 5 years
	% of households that own their dwelling – National: 62 % GAP: % of dwellings with female or joint ownership % of households that rent their dwelling – National: 22 % GAP: % of population living in households that rent their dwelling – B40
	Improvements to dwellings as a % of household expenditure – National: 5 % % of households without access to basic waste collection services – National: 60 % GAP: % households without access to basic waste collection services – B40
	No Indicators
	No Indicators

THE TABLE BELOW SUMMARISES SOME OF THE KEY CONSIDERATIONS THAT MAY FRAME NEXT STEPS FOR DATA PRODUCERS AND CUSTODIANS GOING FORWARD, WITH HIGH VALUE INTERVENTIONS IN RED. MUCH OF THE DATA THAT CAN PROVIDE RICH INSIGHTS INTO NIGERIA'S HOUSING MARKET

	Nigeria National Bureau of Statistics	Central Bank of Nigeria	Federal Ministry of Works and Housing/ Federal Mortgage Bank of Nigeria	State Governments/FHF	Private Sector	DFIs / NGOs
Unlock	NBS and NRE-DCMP can extract and analyse household data to close data gaps	Republish on NMRC's HMIP succinct housing and housing finance related statistics published by the CBN			Extract and analyse data collected by industry bodies (REDAN and NIESV) with emphasis on the affordable sector.	Analyse new DHS data when it becomes available
Disseminate	More frequent iterations of surveys (e.g Social Accounting Matrix) and sector summary reports (Real Estate and Construction Report	Opportunity to disseminate data on residential lending activity and mortgage loan performance.	Publish indicators & reports on residential transfers (including raw land sales, registration and sale of new units and residential resale transactions).	Disseminate indicators and reports on turnaround times from application to decision for planning submissions, as well as cost of compliance related to applications and permitting	Dissemination of priority indicators on NMRC's Housing Market and Information Portal	
Disaggregate	Make raw data available for household level analysis of income, housing circumstances, etc.	Transactions data generated by lenders & credit bureaus could significantly improve public understanding of credit access and performance	Especially make available underlying transactions data so that third parties can augment and add value to the data	Make available detailed data on units completed to enable analysis of activity in the affordable segment of the market	Encourage donors to create more comprehensive and standardised data gathering protocols and templates for projects they fund	
Gather	Through the synergy created by the NRE-DCMP, there maybe opportunities for the NBS to gather and publish building and construction data.	There is an opportunity for to create more comprehensive and standardized data gathering protocols and templates for government funded housing initiatives			Where DFIs fund affordable housing developments, they should request that developers submit comprehensive and standardised data in line with clear protocols and templates (as with NGOs) – participation in the Open Access initiative	

LATEST GLOBAL ESTIMATES FOR GROSS DOMESTIC PRODUCT IN PPP INT$ ADJUSTED FOR BASE YEAR AND INFORMAL ECONOMY

GDP PPP Estimates: All Countries	2022 Estimate Billions, Int$	2023 Estimate Billions, Int$	World Economics Data Quality Rating (A-E)
China	$31,558.79	$33,136.73	B
United States	$23,149.01	$23,635.14	A
India	$15,875.07	$16,875.20	D
Japan	$5,675.45	$5,788.96	A
Russia	$5,509.97	$5,631.19	C
Germany	$5,010.54	$4,985.49	A
Indonesia	$4,810.51	$5,051.04	C
Brazil	$4,287.58	$4,420.50	B
Türkiye	$3,696.18	$3,807.07	B
France	$3,532.91	$3,568.24	A
United Kingdom	$3,478.51	$3,495.90	A
Mexico	$3,375.11	$3,483.11	C
Italy	$3,179.64	$3,201.90	A
Korea, Rep.	$2,881.11	$2,921.44	A
Spain	$2,301.29	$2,358.82	A
Saudi Arabia	$2,287.59	$2,305.89	B
Canada	$2,105.77	$2,133.14	A
Nigeria	$2,023.83	$2,082.52	E
Egypt	$2,011.95	$2,086.39	D
Thailand	$1,834.57	$1,896.94	D
Poland	$1,695.15	$1,715.49	B

Data quality rating definitions:

A: As good as it gets
B: Good
C: Use with caution
D: Poor
E: Extremely poor quality

Data source: World Economics Research, London

LATEST AFRICA'S ESTIMATES FOR GROSS DOMESTIC PRODUCT IN PPP INT$ ADJUSTED FOR BASE YEAR AND INFORMAL ECONOMY

GDP PPP Estimates: All Countries	2022 Estimate Billions, Int$	2023 Estimate Billions, Int$	World Economics Data Quality Rating (A-E)
Mauritius	$34.60	$36.20	B
Algeria	$589.42	$604.75	B
Rwanda	$46.10	$48.96	C
Morocco	$417.53	$427.56	C
South Africa	$1,174.47	$1,175.65	C

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GDP PPP Estimates: All Countries	2022 Estimate Billions, Int$	2023 Estimate Billions, Int$	World Economics Data Quality Rating (A-E)
Botswana	$57.71	$59.84	C
Benin	$68.13	$72.21	C
Malawi	$42.62	$43.64	C
Namibia	$33.97	$34.92	C
Burkina Faso	$74.08	$77.72	C
Togo	$27.86	$29.39	C
Ghana	$289.62	$294.25	C
Uganda	$160.79	$169.95	C
Senegal	$96.89	$104.94	C
Cote d'Ivoire	$245.43	$260.65	D
Comoros	$3.71	$3.82	D
Kenya	$389.56	$410.20	D
Niger	$51.04	$54.16	D
Lesotho	$8.28	$8.46	D
Tanzania	$264.66	$278.42	D
Tunisia	$170.51	$172.73	D
Mauritania	$38.69	$40.39	D
Cameroon	$150.13	$156.59	D
Mozambique	$62.92	$66.06	D
Gambia	$9.50	$10.03	D
Eswatini	$17.75	$18.25	D

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LATEST AFRICA'S ESTIMATES FOR GROSS DOMESTIC PRODUCT IN PPP INT$ ADJUSTED FOR BASE YEAR AND INFORMAL ECONOMY

GDP PPP Estimates: All Countries	2022 Estimate Billions, Int$	2023 Estimate Billions, Int$	World Economics Data Quality Rating (A-E)
Egypt	$2,011.95	$2,086.39	D
Zambia	$109.21	$113.58	D
Sierra Leone	$24.55	$25.31	E
Ethiopia	$445.82	$473.02	E
Liberia	$12.17	$12.69	E
Zimbabwe	$65.55	$67.19	E
Guinea-Bissau	$5.95	$6.21	E
Nigeria	$2,023.83	$2,082.52	E
Guinea	$62.44	$65.93	E
Madagascar	$75.97	$79.16	E
Libya	$202.41	$237.84	E
Chad	$44.04	$45.58	E
Burundi	$15.96	$16.49	E
Mali	$90.74	$95.28	E
Angola	$393.39	$407.16	E
Congo, Rep.	$35.10	$36.54	E
Central African Republic	$8.48	$8.69	E
Congo, Dem. Rep	$207.63	$220.71	E
Gabon	$67.19	$69.20	E
Sudan	$326.05	$329.96	E

Data quality rating definitions:

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B: Good
C: Use with caution
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E: Extremely poor quality

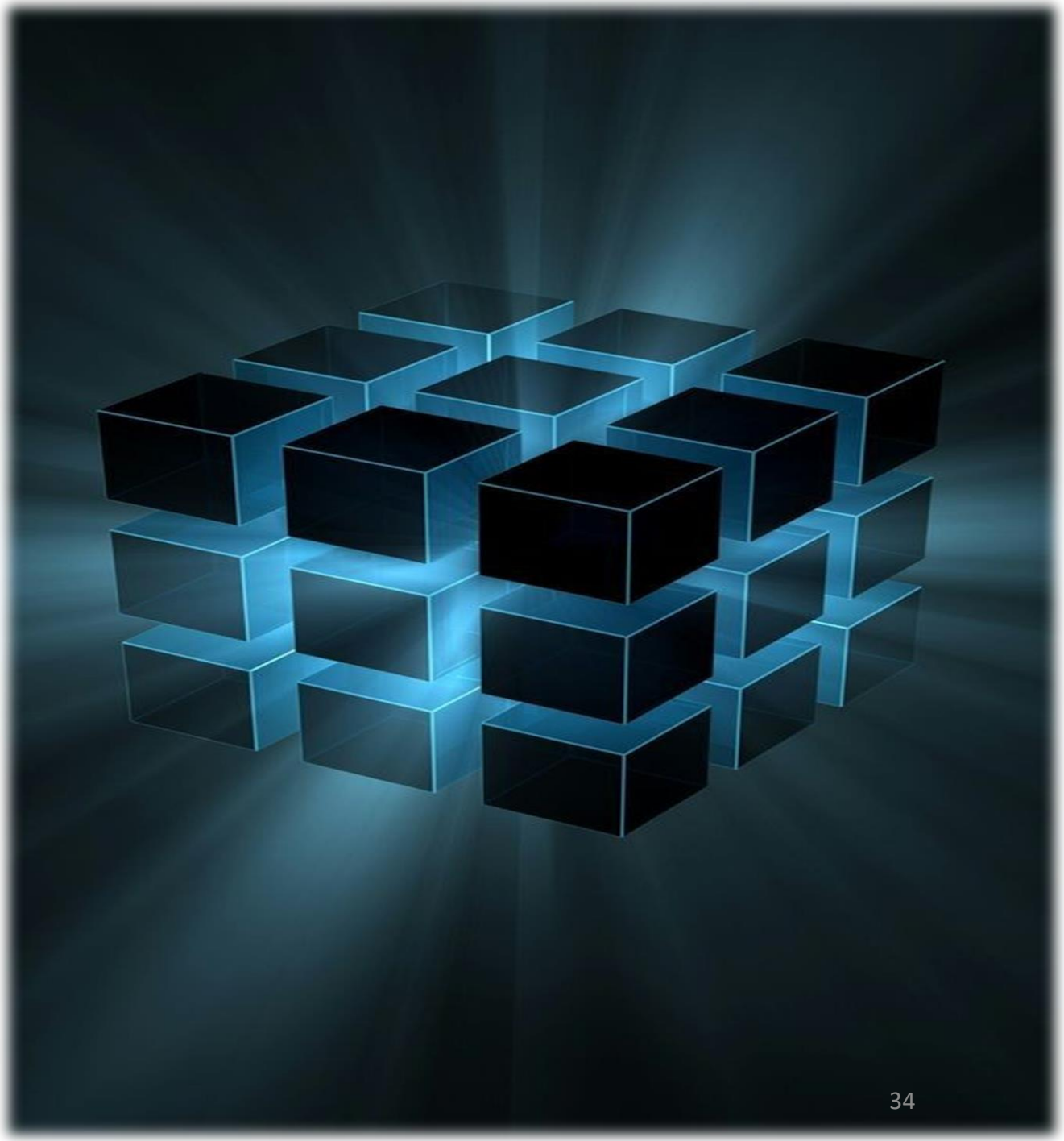
Data source: World Economics Research, London

Section Four

DIGITIZATION AND APPLICATION OF BLOCK CHAIN

IMPERATIVES FOR AFFORDABLE HOUSING

Blockchain



Blockchain Decentralization and Society

- We acknowledge a need to set **this presentation within the context of a broader relationship** between blockchain and society.
- The **current centralization** of the internet allows a few private companies to effectively control the commons/marketplace of ideas. There are reported cases of dominant big technology companies not acting in the best interest of society.
- Some see blockchain as a revival of **open-protocol ethos**, enabling self-sovereign ID, Peer to Peer (P2P) value exchange, etc.
- The **drive for open and democratic values** online should consider the political powers of technology giants, and social attitudes towards decentralized governance structures.

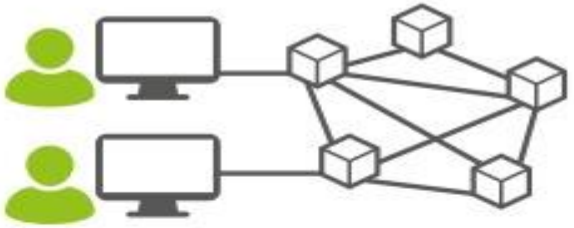
Why Blockchain Makes Sense for Real Estate in Nigeria

- The technology is **decentralized**, **fault-tolerant**, and **tamper-resistant**; offering **security and resiliency**.
- **Blockchain is disruptive for land governance**, it can **promote property rights formalization, registry modernization**, and the collection/analysis of data.
- Blockchain can generate **increased efficiency and lower transaction costs** in the **global real estate sector**.
- The technology allows for **improved liquidity** of property, **financial inclusion**, and **increased foreign investment**.

Types of Blockchain:
Public - Private: Consortium-Permissioned and Permissionless

			Read (who can access the ledger and see transactions)	Write (who can generate transactions and send them back to network)	Commit (who can update the state of the ledger)	Example
Blockchain types	Public	Permissionless	Open to everyone	Anyone	Anyone (*)	Bitcoin, Ethereum
		Permissioned	Open to everyone	Authorised participants	All or subset of authorised participants	Ripple
	Private	Consortium	Restricted to na authorised set of participants	Authorised participants	All or subset of authorised	Multiple banks operating a shared ledger
		Permissioned	Fully private or restricted to a limited set of authorised nodes	Network operator only	Network operator only	Internal bank ledger shared between parent company and subsidiaries

Public and Private Blockchain Types



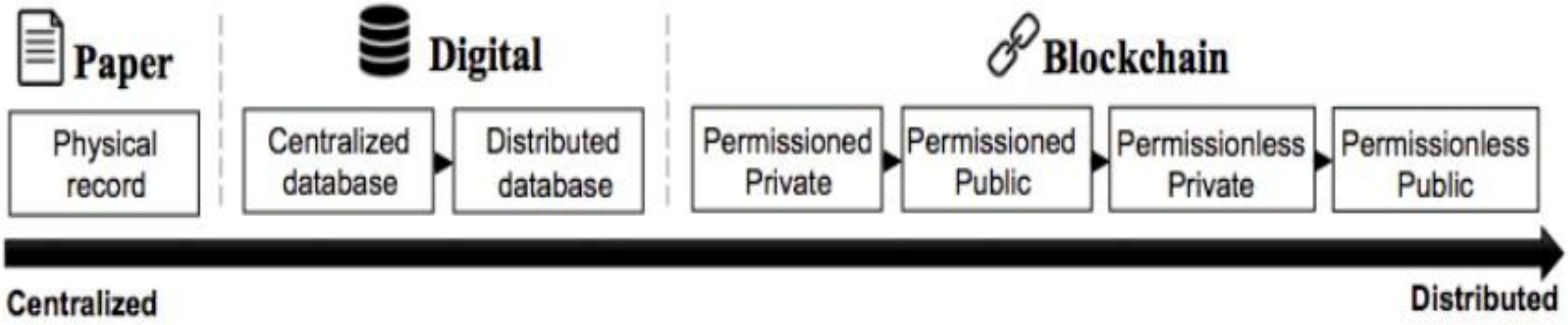
Public

- Anyone can join and transact
- All transactions are public and anonymous
- There is transaction fee
- Relatively slow network
- Difficult scalability
- Very resilient to hacking
- Hard to implement system changes
- Consensus is incentive driven

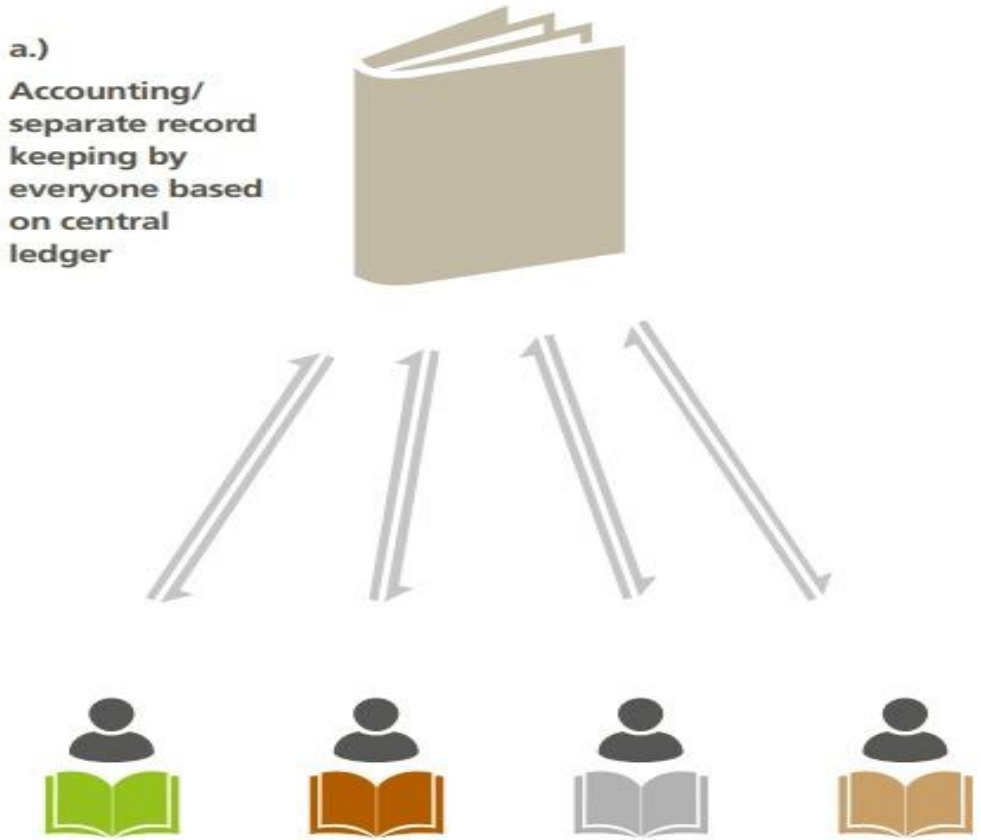
Private

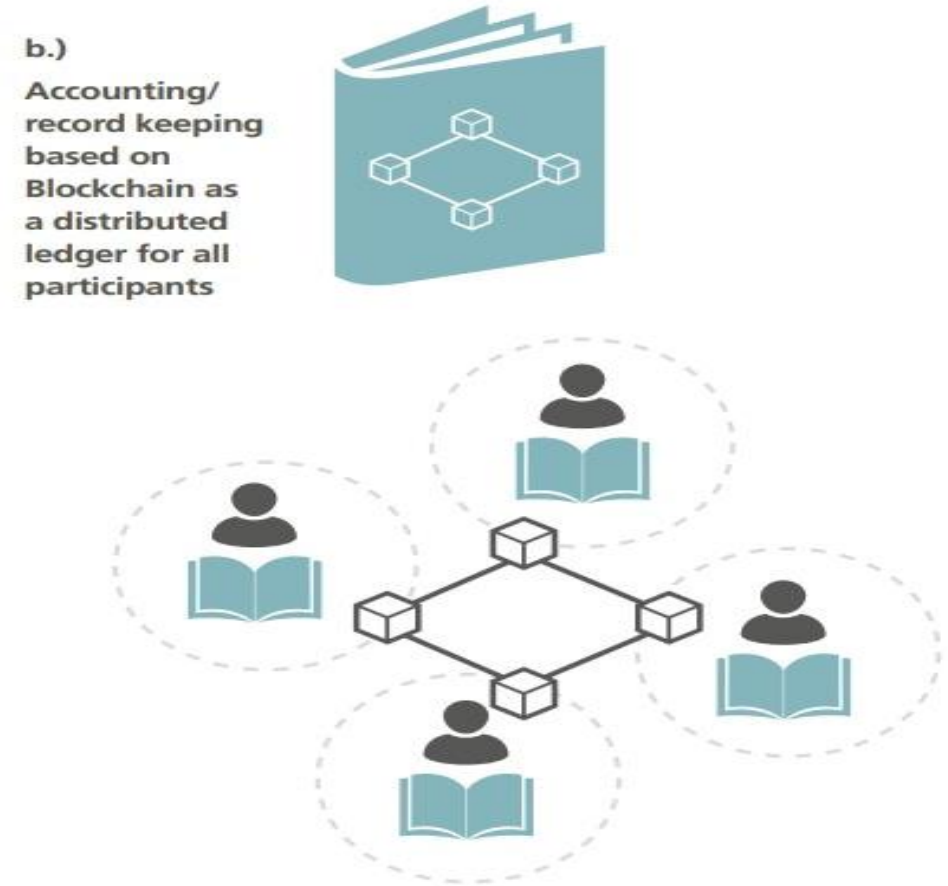
- Only defined members can join and transact
- Transactions are public and confidential
- Transaction fee can be eliminated
- Fast network
- Highly scalable
- Resilient to hacking
- Easy to implement system changes
- Consensus is based on permissions

Centralized vs Distributed Systems Record

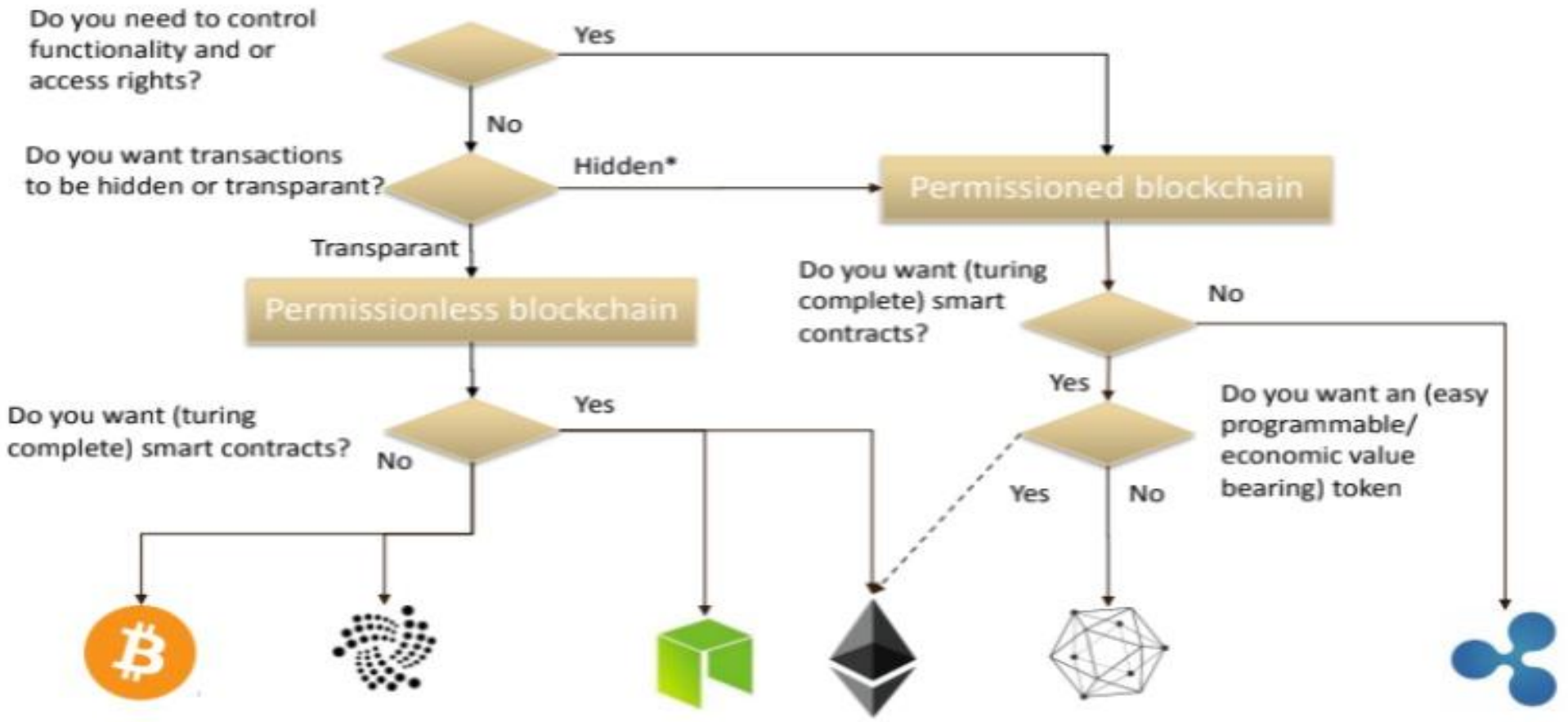


Centralised (a.) and Distributed (Blockchain) Record Keeping (b.)



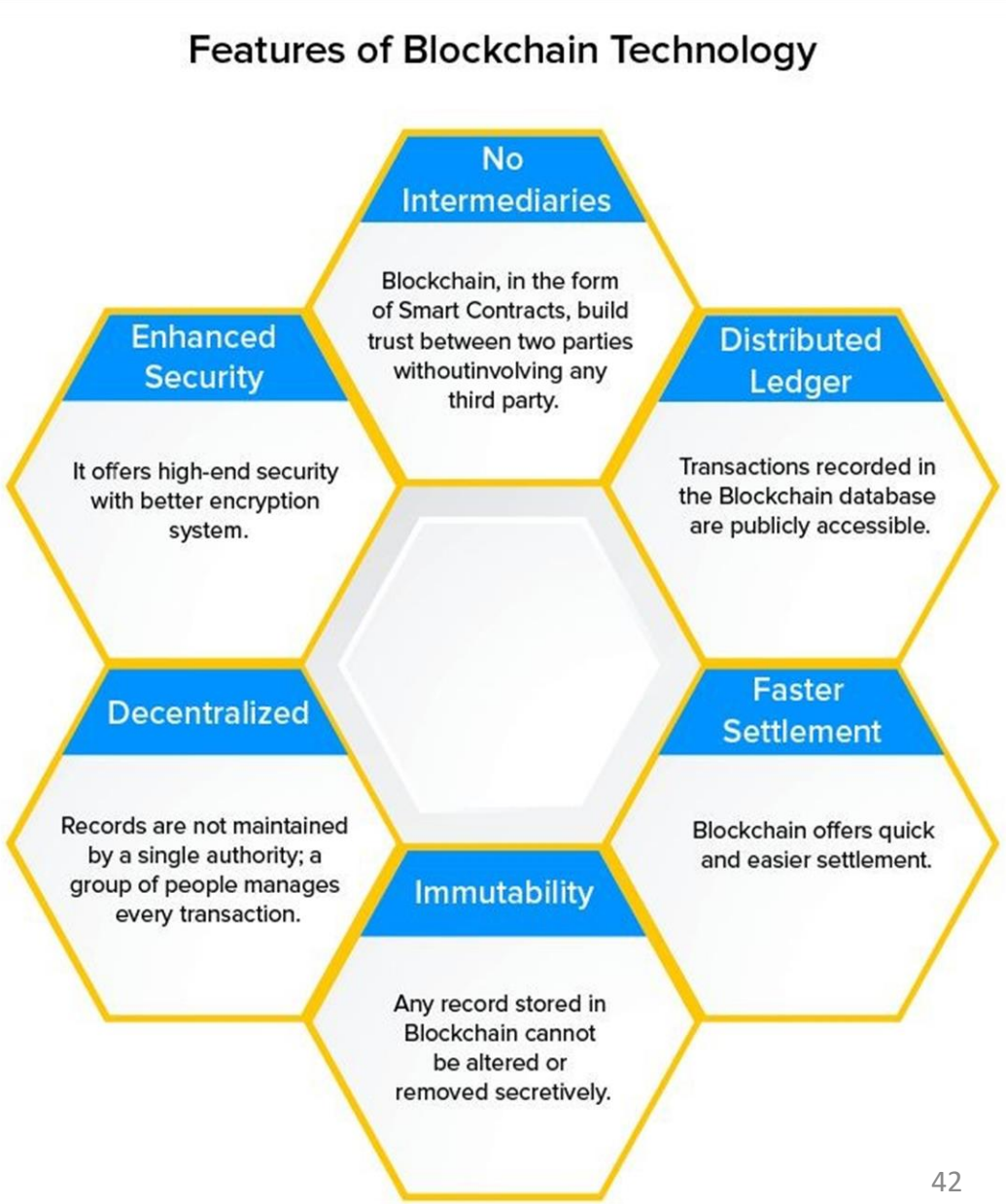


Decision Tree - Which Blockchain?



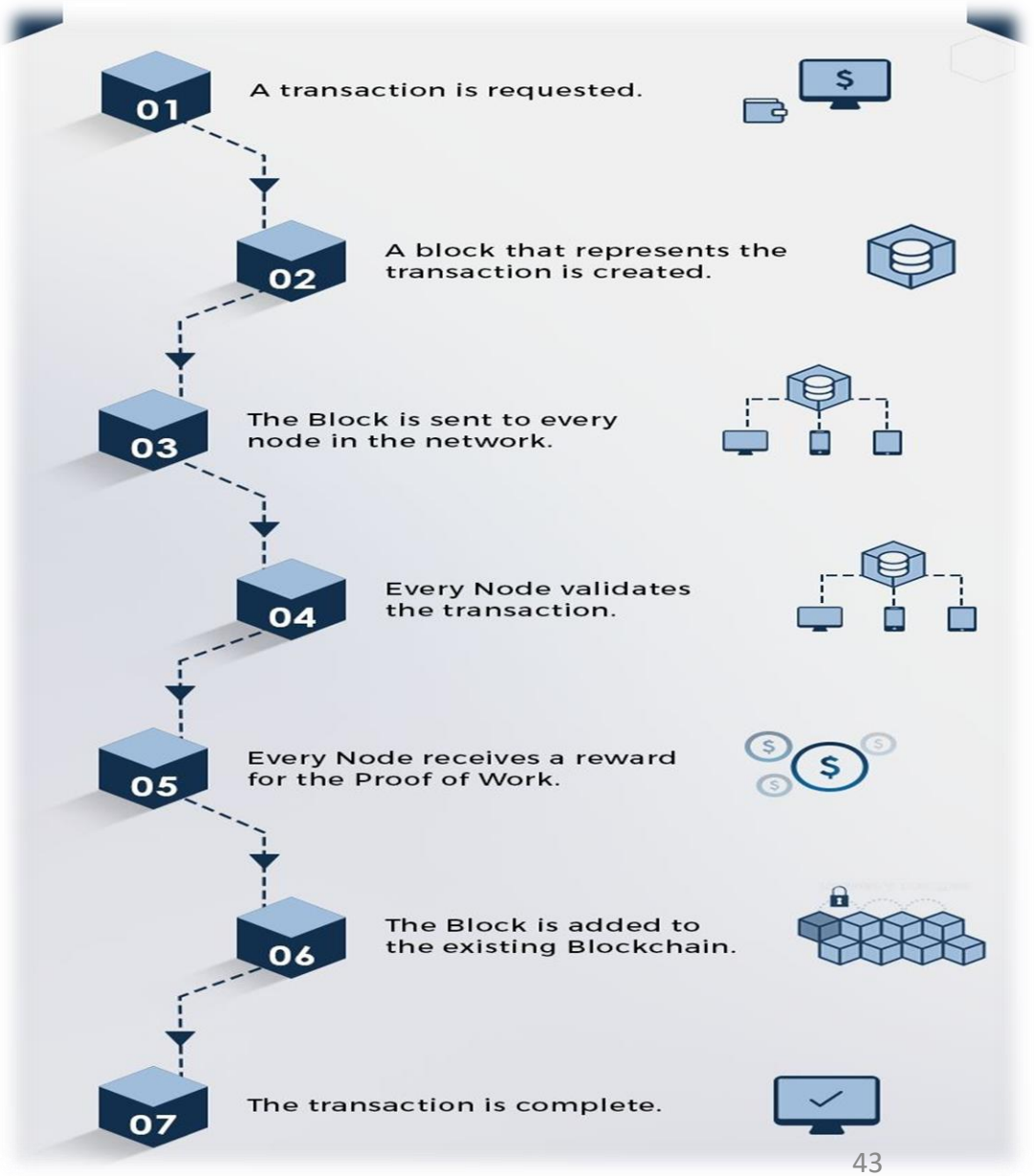
Blockchain Overview

- Blockchain is a **digital ledger that maintains information in a secure and transparent manner**.
- It consists of a **chain of blocks that contain validated and confirmed transactions.**
- **Decentralized and distributed among a network of users**.
- **No single user has complete control over the information, making it more secure and resistant to tampering or fraud.**
- **Blockchain uses cryptography to secure and verify transactions.**
- Each **transaction is encrypted and linked to the previous transaction, creating a chain of verified transactions that cannot be altered or deleted**.
- Blockchain technology has potential applications in finance, real estate, Land registry, supply chain management, and more.
- It can **improve transparency, security, and efficiency in various industrie**s

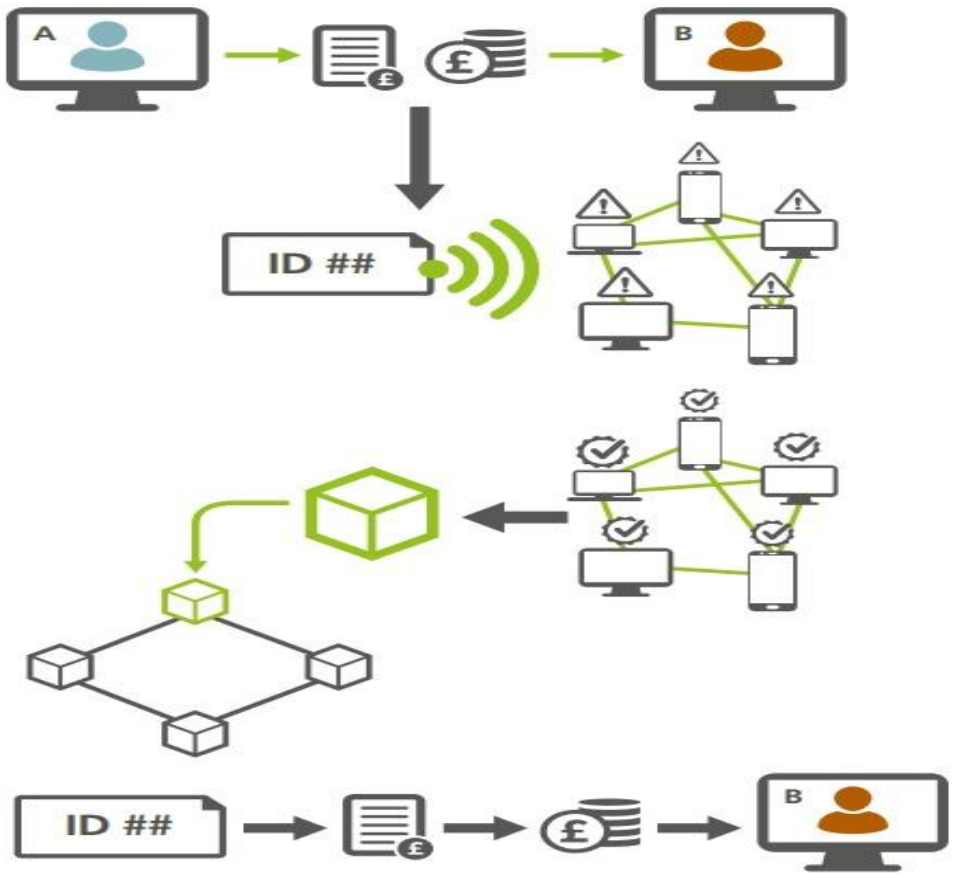


How Does Blockchain Work

- **Creation of Transaction**: A user creates a new transaction and signs it with their private key.
- **Propagation of Transaction**: The transaction is broadcasted to the network of nodes for verification and validation.
- **Verification**: The nodes on the network verify that the transaction meets the blockchain protocol's requirements.
- **Inclusion in a Block**: The transaction is grouped together with other verified transactions and added to a block.
- **Consensus**: The block is verified and approved by the network of nodes using a consensus algorithm.
- **Confirmation**: Once the block is added to the blockchain, the transaction is considered confirmed, and the recipient's digital assets or information are transferred to their account.
- **Tamper-Proof**: The transaction is tamper-proof due to the use of cryptography, consensus, and immutability.



Transaction on the Blockchain



1 Transaction proposed between A and B

2 Network validation of the proposed, identified transaction

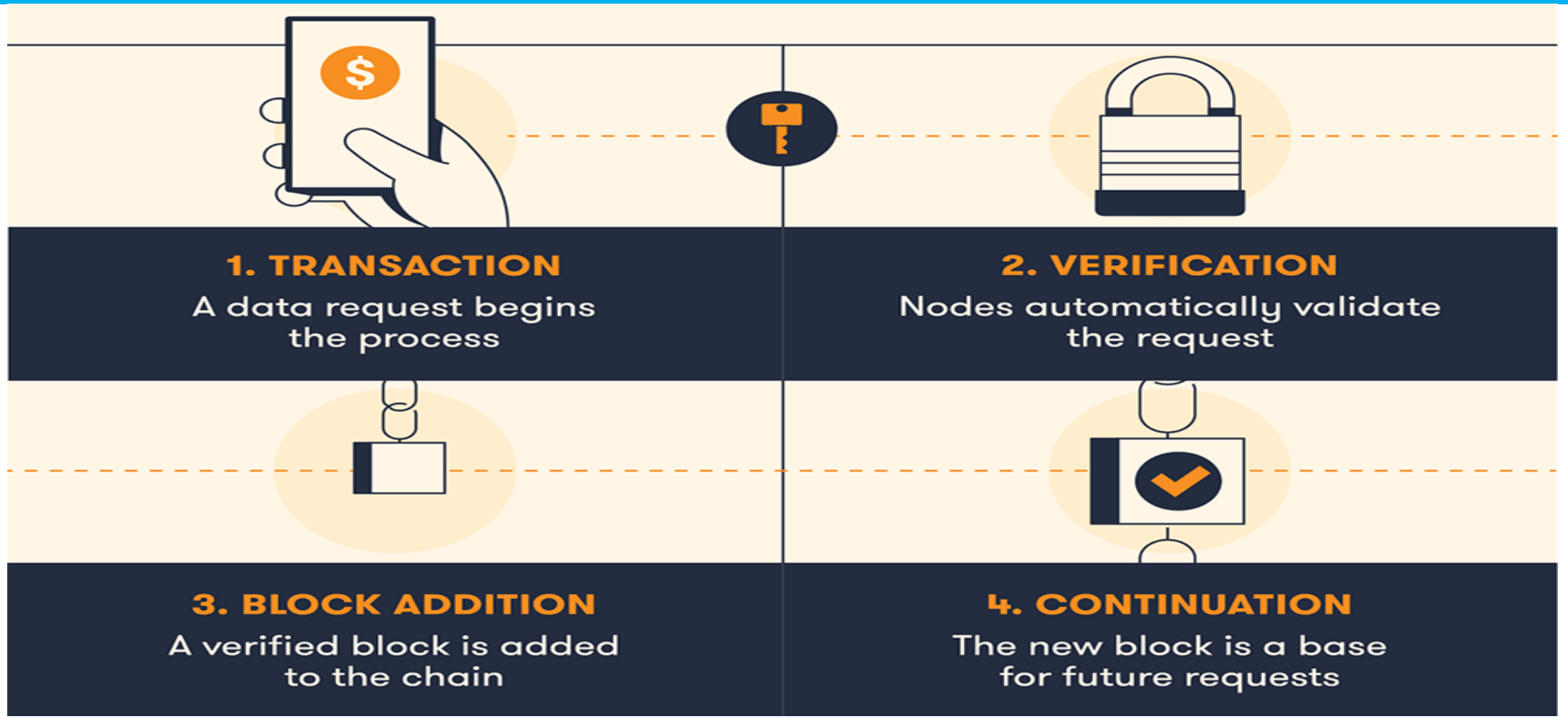
3 Validated transaction is included on the blockchain as a new block

4 Blockchain is updated, transaction details are secured

5 Transaction is executed

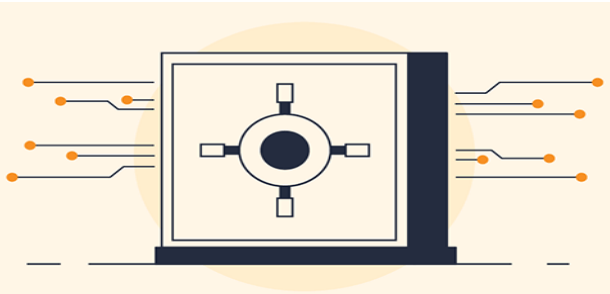
Collaborative Project Ecosystem

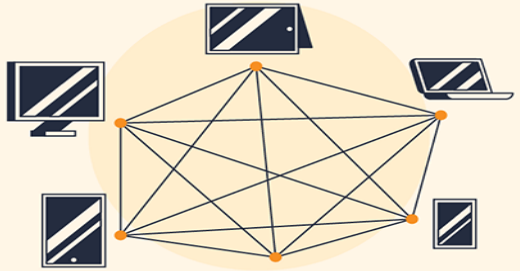
Recap on Blockchain



Recap Benefits of Blockchain

SECURE
Multilayer encryption protects data from unauthorized changes





DECENTRALIZED
Lack of a central server lessens the possibility of a system failure

SCALABLE
Interconnected architecture adapts to small and large projects

Benefits of Blockchain to the Construction Industry

PREDICTIVE MAINTENANCE

A detailed ledger of a building's assets **simplifies long-term repair and upkeep**

Benefits of Blockchain to the Construction Industry contd…

SMARTER CONTRACTS

Triggering contract milestones **enforces a project's scope** while structuring its flow

Benefits of Blockchain to the Construction Industry contd…

PROACTIVE OVERSIGHT

Adhering to regulations is simple for third parties responsible for oversight

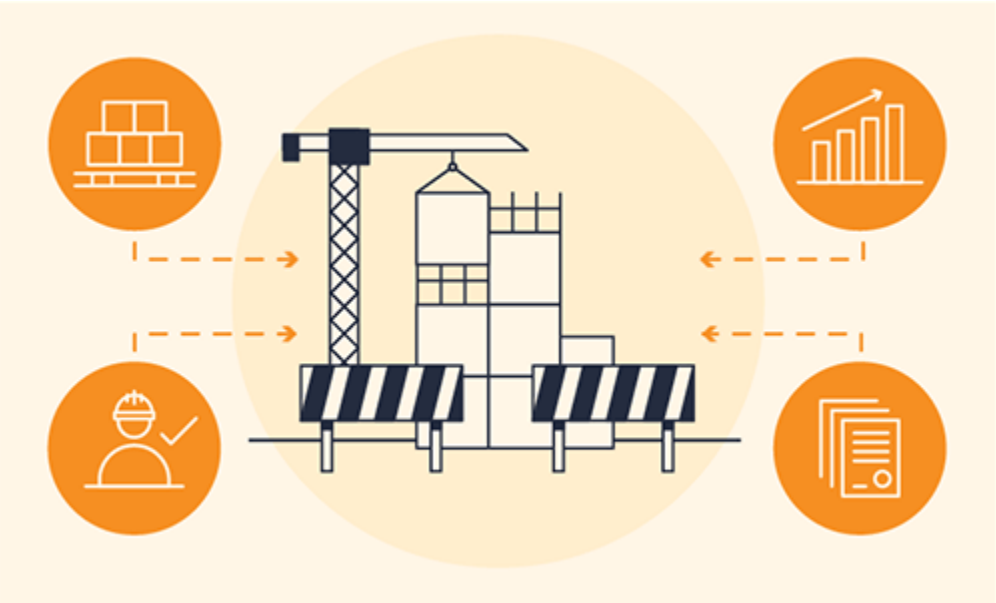
Benefits of Blockchain to the Construction Industry contd…

Benefits of Blockchain to the Construction Industry contd…

24/7 COLLABORATION

With instant access to project files, **any party can give input for all to see**

Benefits of Blockchain to the Construction Industry contd…



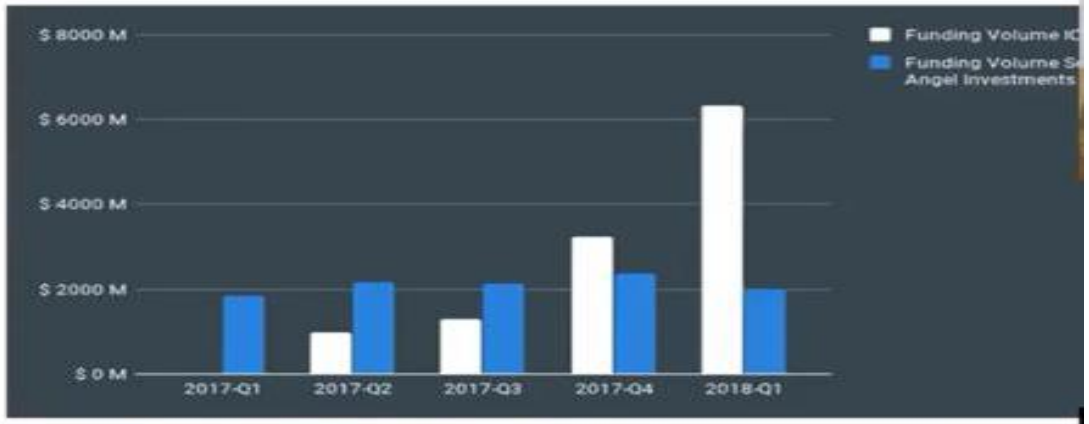
STREAMLINED SUPPLY CHAINS

Vet suppliers and contractors faster with an **immutable ledger of projects and receipts**

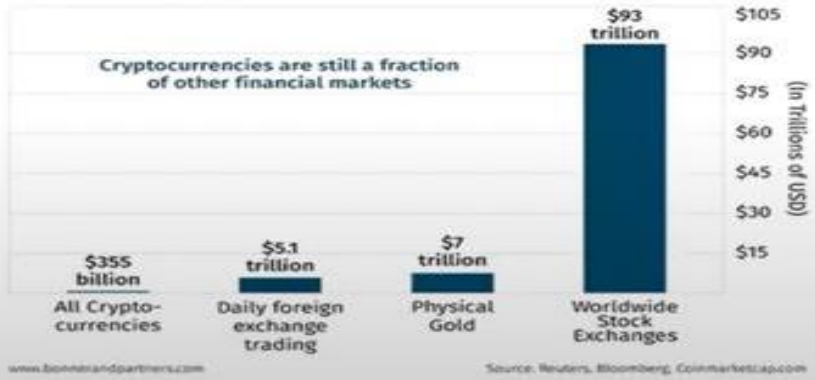
Leading Applications of Blockchain

Top blockchain applications:

1) Cryptocurrencies ($288B on June 20)
2) ICOs (2019: "just" $338M so far)
3) Payments & money transfers
4) Tokenization of securities
5) Supply chain optimization



Cryptocurrency Market vs. Other Asset Classes



Important Issues to Consider

Some questions to ask...

- Is the technology mature enough?
- Are your citizens digitally enabled?
  - Identities, connectivity, etc.
- What about data confidentiality?
- Legal framework changes?
- *Is it worth doing in comparison to traditional methods?*

Value Creating Opportunities

...but new opportunities for value are created

- Increase trust with high visibility and third party validation of transactions
- Smooth the information flow across government and business entities
- Increase market liquidity
- Support high-trust foreign investment

Overview: Case for Blockchain in Real Estate

1. Future of Property Rights (RFP's) **seven prerequisites** for **blockchain introduction** into a **land registry**.

2. Conceptual framework: **Eight levels of integration** from the simple to more radical.

3. **Five aspects on the future** interaction of blockchain and land, from title insurance to regulation.

4. **Some examples** of countries and companies active in blockchain.

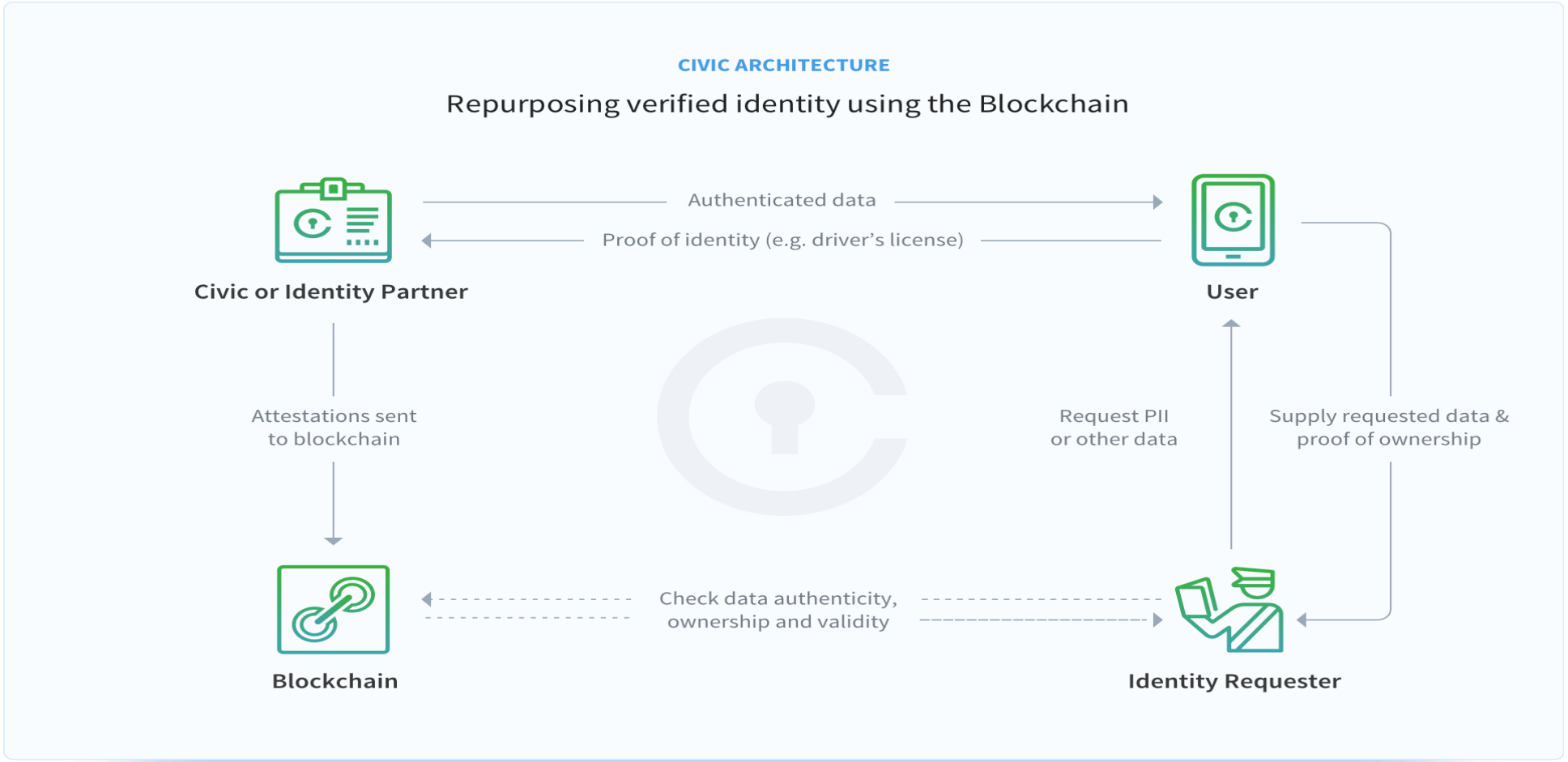
Prerequisites for Blockchain Integration

1. An identity solution
2. Digitized records
3. Multi-sig Wallets
4. A private or hybrid blockchain
5. Accurate data
6. Connectivity and a technology aware population
7. A trained professional community

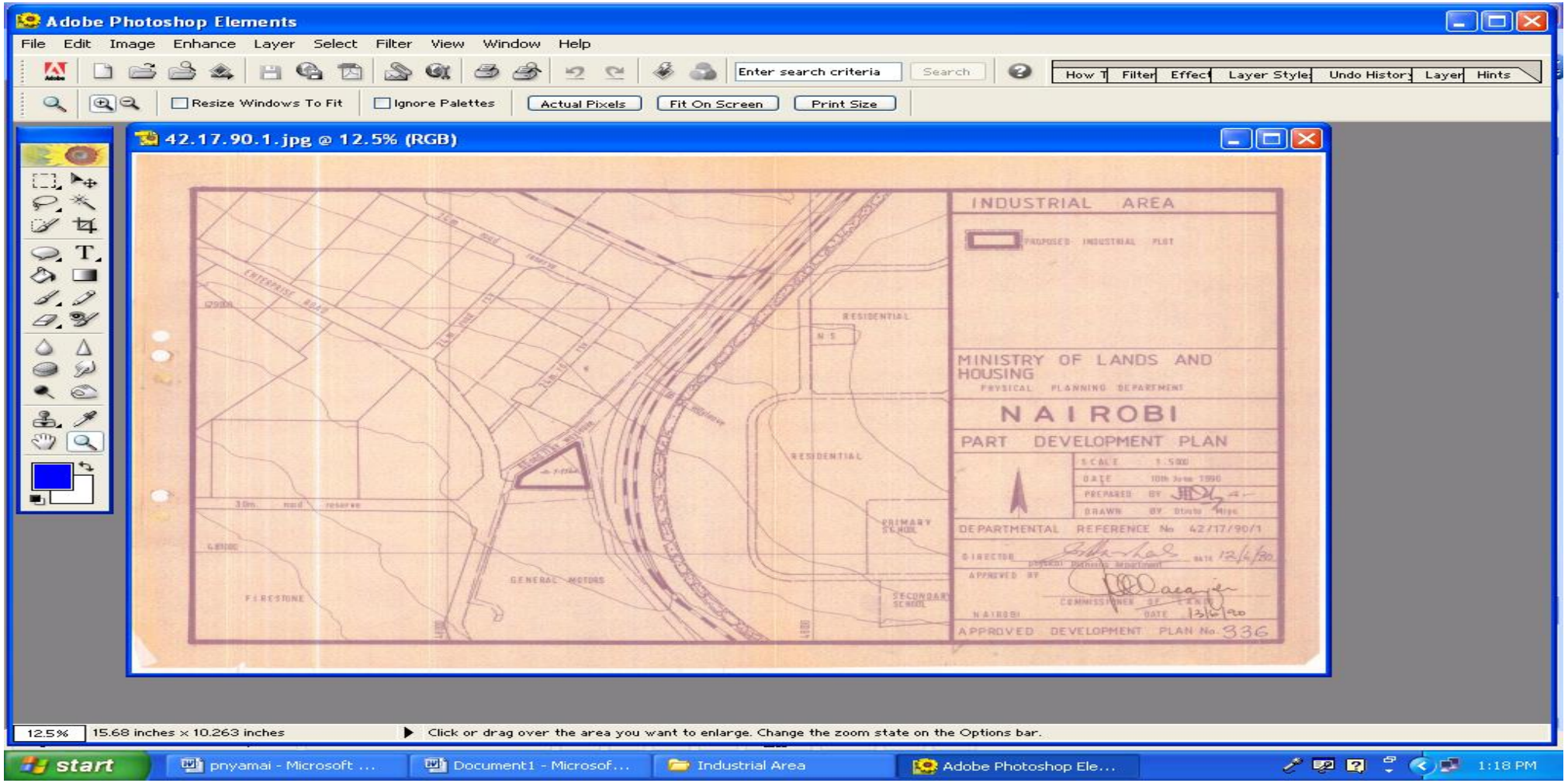
Source: Mike Graglia, Christopher Mellon, and Evan Akin, "Prerequisites for Incorporating Blockchain into a Registry," *FPR Blog (Blog)*, July 31, 2017, https://www.newamerica.org/international-security/future-property-rights/blog/prerequisites-incorporating-blockchain-registry/.

Prerequisites 1: Identity Must Come First

Example of Distributed Identity Workflow:



Prerequisites 2: Digitized Records

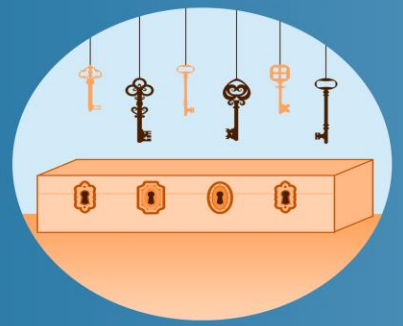


Prerequisites 3: Multi-sig Wallets

WHAT IS MULTISIG
and why does it matter?

MultiSig transactions, short for multi-signature, give several users access to a single wallet. Cryptocurrency wallets have a public key, which is shared, and a private key, which is kept secret. Transactions must be signed with a users private key in order to verify ownership, and validate a transaction.

MULTIPLE KEYS



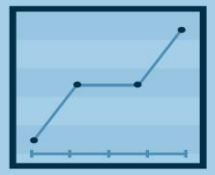
Multi-sig wallets have a public key with more than one private key.

M of N TRANSACTIONS

Requires multiple parties to be in agreement to complete a transaction.

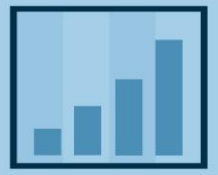
ADVANCED SECURITY

Provides extra security, making coins safer from theft.



Multisig was first introduced in 2012, but did not become wide-spread until 2014.

A multisig wallet may only require a certain number of its multiple users to validate a transaction.

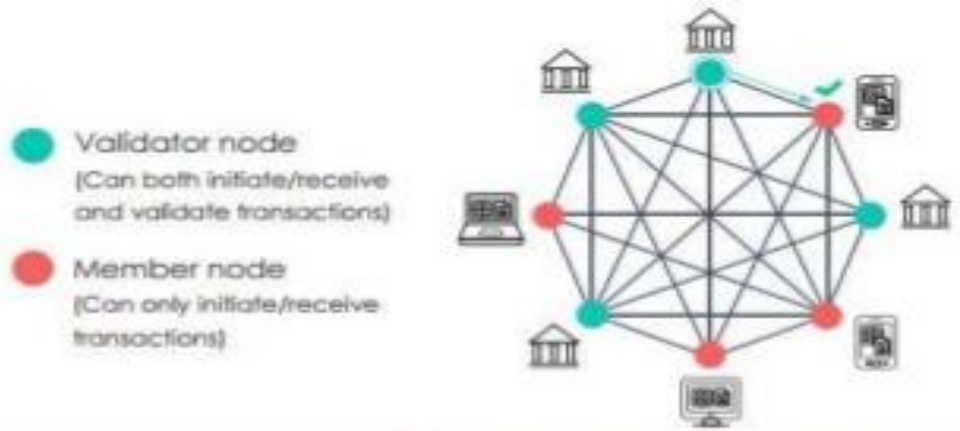


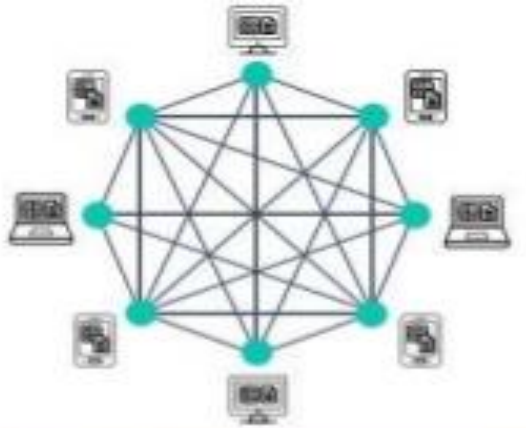
In 2014, less than 0.02% of BTC transactions were secured by multisig. That number is now 10%.

Public addresses begin with the number 1, Multisig addresses begin with the number 3.

HolyTransaction

Prerequisites 4: Private Chains are Key





	Permissioned Blockchain (Private)	Permissionless Blockchain (public)
How do you get access to the network?	Authorized access	Open access
How are their approach to laws and regulations?	Aims to follow financial regulations such as AML/ KYC	Aims to create censorship resistant, anonymous transactions, outside current legal framework
Who are the validators?	Pre-selected, trusted validators	Anonymous, fully decentralized validators
What can it be used for?	Enterprise-level systems	Permissionless innovation, open-access applications

Source: www.slideshare.net/Nitishsharma77/blockchain-73134967

Section Five

BLOCKCHAIN APPLICATION

LAND REGISTRATION SYSTEM

STATE OF LAND INFORMATION SOUTH AFRICA

Source: landportal.org

STATE OF LAND INFORMATION TANZANIA

Key Category	Data available?	Representation of Sources					Data up-to-date?
		Government	Research Institutions	National CSOs	Int. Organizations	Other	
Land Tenure Data	✗	✓	!	!	!	✗	!
Land Cover, Use & Management	✓	!	✓	✗	✓	✗	!
Land Disputes	✗	!	✓	✗	!	✗	!
Human Settlements	✓	!	✓	✗	✓	✗	!
Land Markets & Financing	✓	✓	✓	✗	✓	✗	!
Land, Climate Change & Environment	✗	✓	✓	✗	!	✗	!

✓ = good practice ! = room for improvement ✗ = poor practice

Source: landportal.org

OVERALL RESULTS OF THE OPEN DATA ASSESSMENT FOR MADAGASCAR'S LAND DATA

	Online	Accessible	Free	Timely	Metadata	Standards	Downloadable	Open licence	Machine readable	Linked Data (URIs)	TOTAL
Legal	Partially Online	Fully Accessible	Fully Free	Very Timely	No Metadata	No Standards	Partially Downloadable	No Open License	Not Machine Readable	No URI	Partially Open
Land Tenure	Not Online	Not Accessible	Not Free	Not Timely	No Metadata	No Standards	Not Downloadable	No Open License	Not Machine Readable	No URI	Not Open
Land Use	Partially Online	Fully Accessible	Slightly Free	Slightly Timely	No Metadata	No Standards	Slightly Downloadable	No Open License	Not Machine Readable	No URI	Slightly Open
Land Devpt	Slightly Online	Not Accessible	Fully Free	Not Timely	No Metadata	No Standards	Slightly Downloadable	No Open License	Not Machine Readable	No URI	Not Open
Land Value	Not Online	Not Accessible	Slightly Free	Not Timely	No Metadata	No Standards	Not Downloadable	No Open License	Not Machine Readable	No URI	Not Open
Other Land Data	Partially Online	Not Accessible	Partially Free	Not Timely	Partial Use of Metadata	No Standards	Slightly Downloadable	Slight Use of Open License	Not Machine Readable	No URI	Slightly Open
OVERALL	Slightly Online	Slightly Accessible	Slightly Free	Not Timely	Slight Use of Metadata	No Use of Standards	Slightly Downloadable.	No Use of Open Licenses	Not Machine Readable	No Uniform Resource Identifiers	Slightly Open

Source: landportal.org

Blockchain-Based Land Registration System:

A Conceptual Framework

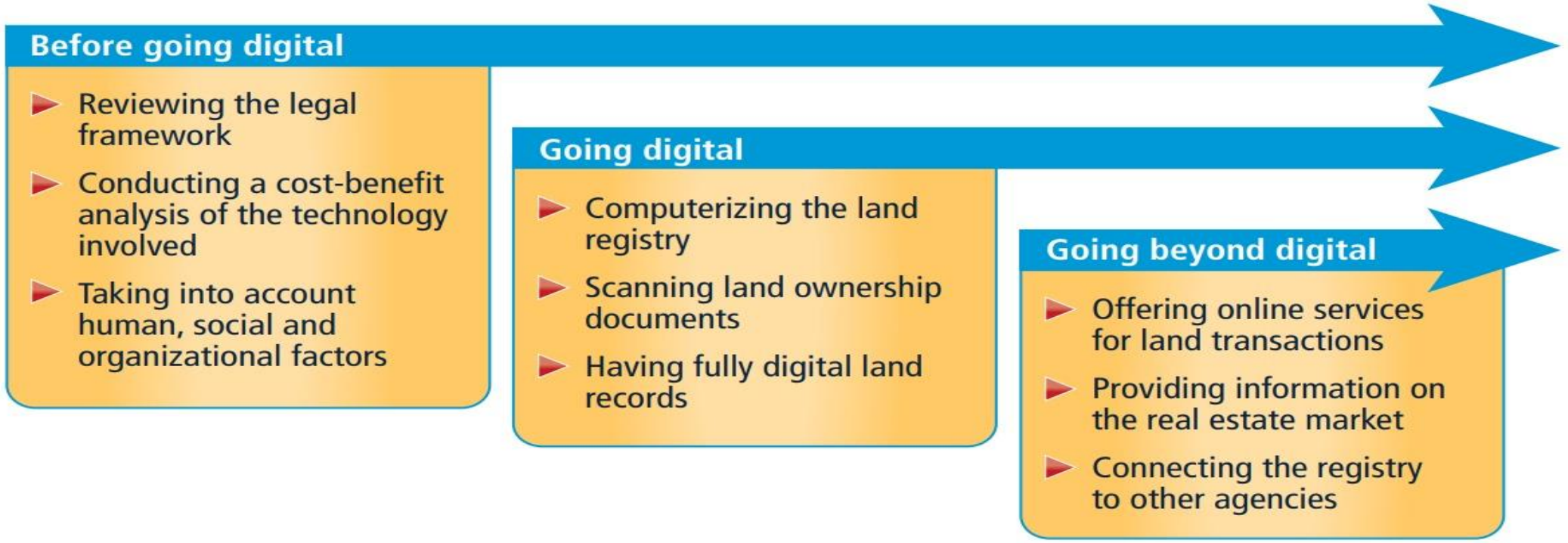
Blockchain Registry Integration Framework

Level	Name	Description	Example
0	No Integration	No use of blockchain	Most of the world
1	Blockchain Recording	Public blockchain used to record documents related to land transactions	Brazil, Georgia, Dubai
2	Smart Workflow	Blockchain used to record progress of a transaction	Sweden, Dubai Properties (Landstream)
3	Smart Escrow	**Smart contracts used for escrowing payment Five Steps Block Chain based property acquisition**	**PROPY**
4	Blockchain Registry	Central database replaced with a permissioned blockchain	Dubai
5	Disaggregated Rights	Various rights to a single parcel are disaggregated and managed via blockchain	No known example
6	Blockchain Fractional Rights	Rights for a given parcel are fragmented and managed via blockchain	Pangea (potentially)
7	Peer-to-Peer Transactions	Rights are transacted without intermediaries on Level 4 system	No known example
8	Interoperability	Different blockchain registries merge	No known example

Blockchain for Land Registry

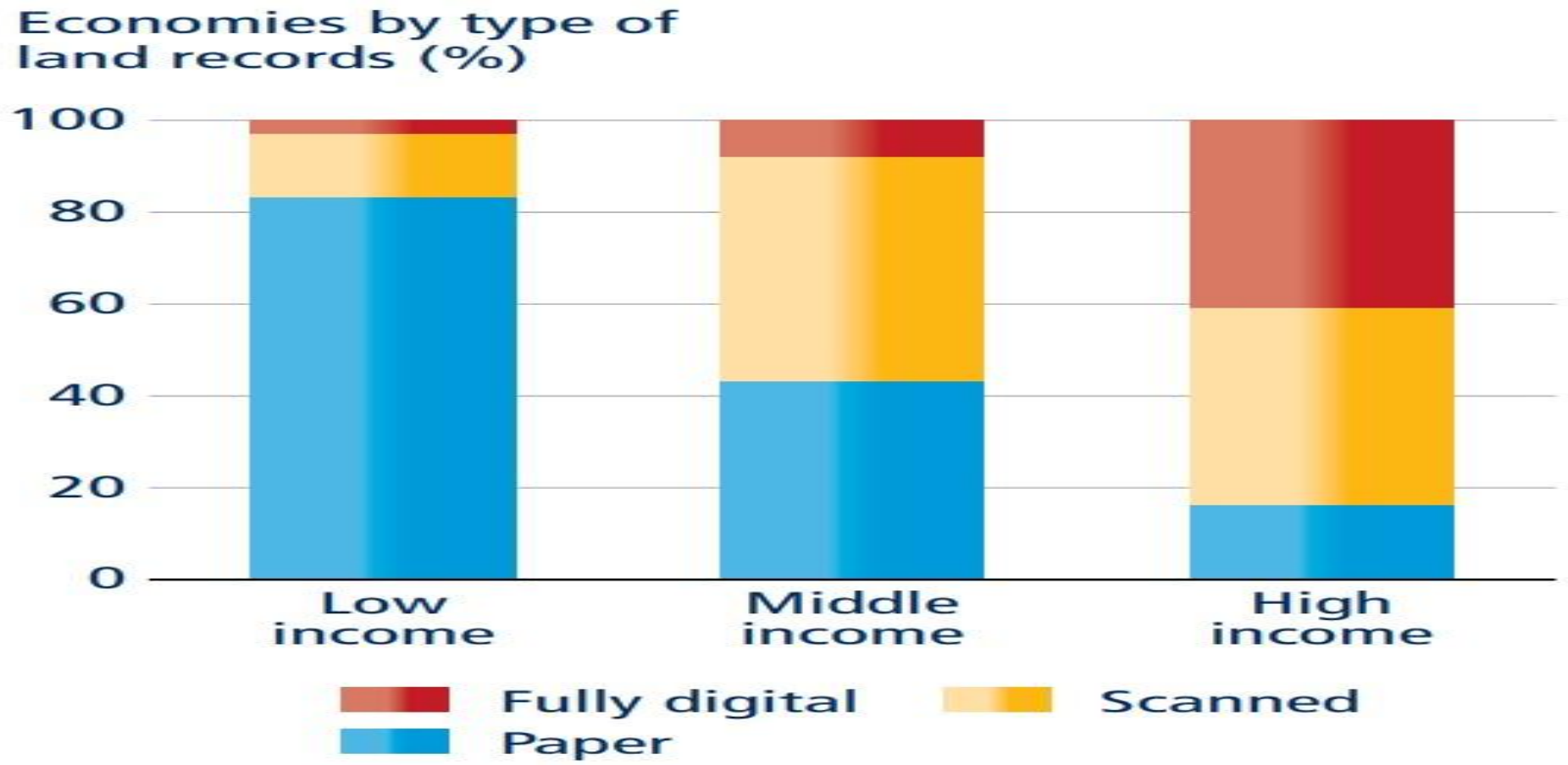
- **Blockchain for Land Registry** - Administration of land and property involves a **vast array of documents and supporting data**.
- Existing land information systems are typically **centralized ledgers (databases)** that provide a **system of record of a nation's land transactions**.
- A **digital repository affords greater capabilities** than the paper-based counterpart but, by itself, **digitalization provides no intrinsic transformation to the land registration process**.
- **Digitalization of paper-based land records** adds **redundancy, concurrency,** and **consistency, characteristics of database systems**.
- Ultimately this can lead to **automation** and introduce **efficiencies** to the process at the application layer (e.g., **availability of information, protection against catastrophic loss** or man-made disasters).
- Many governments have leveraged on information and communication technologies (ICTs) to increase openness and transparency (e.g., e-Government, open data initiatives).
- **Distributed databases** can help **protect these central repositories** through **replication** and **duplication**.
- Nevertheless, the **integrity of the records is still vulnerable to tamper and fraud** by **entities in the network that are not trustworthy** (e.g., a **rogue individual modifying** or **deleting land records**).

The Stages in Projects for Digitizing Land Records



Source: World Bank 2016

The Types of Land Records Varies Widely Across Income Groups



Source: World Bank 2016

Future of Blockchain for Real Estate

- Blockchain can ensure more reliable **title insurance** records, increasing efficiency and lowering costs.
- The simplicity of the **Torrens title system may provide the optimal legal framework** for a blockchain registry (at higher levels) - since it mirrors the architecture of Blockchain.
- Blockchain-based **real estate markets** can help drive **financial inclusion** within developing countries.
- Blockchain registries and other stores of data can create an unprecedented tool for **studying the impact of land governance policies**, **bringing land into big data**.
- **Nations and States will retain the power** to regulate and tax land transactions.

Some Examples of Registries and Blockchain

Company	Product	Geographic Location of Pilot
BitFury	Exonum	Republic of Georgia, Ukraine
ChromaWay	Postchain	Sweden, India, Australia
CONSENSYS	Landstream, Pangea	Dubai
epigraph	Unnamed SaaS, OpenTitle	Honduras
PROPY	Propy Registry	Ukraine, Vermont
UBITQUITY	Parallel Registry Utilizing Colu Colored Coin Protocol	Brazil

Design of Land Administration and Title Registration Based on Blockchain Technology

Land Assembly / Acquisition

Blockchain technology can be applied to the process of land assembly and acquisition in the context of the Community Advancement through Affordable Housing (CAHF) program in several ways:

SMART CONTRACTS: Replace paper contracts with digital contracts. Data is kept in the blockchain network and may be retrieved when needed. Binding all participants to the terms established in the smart contract. Can be used to automate the transfer of ownership and payment (execute automatically) once all the conditions of the sale have been met. Reduces the time and cost associated with the traditional legal process of land transfer.

TRANSPARENCY AND IMMUTABILITY: provides a tamper-proof record of all transactions on the Blockchain to prevent fraud and disputes over ownership or payment. Once a transaction has been recorded, it cannot be altered.

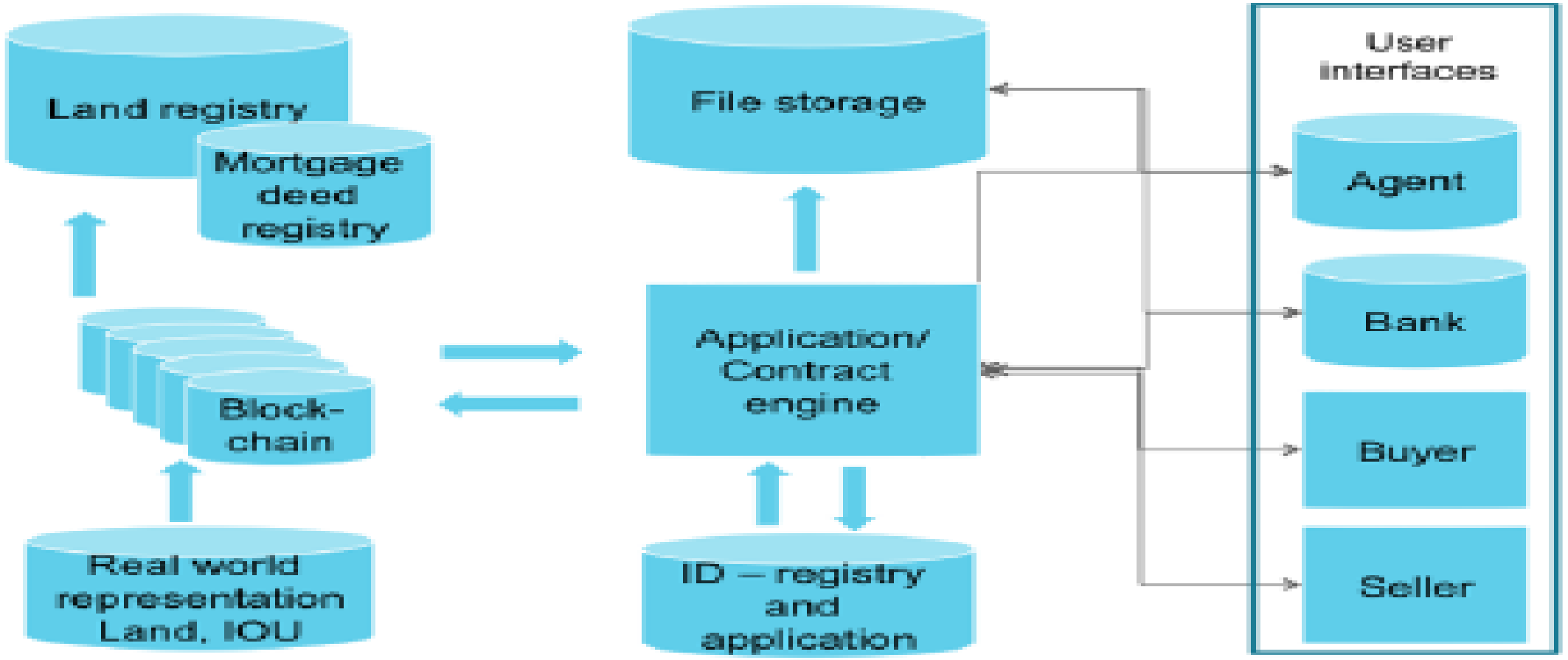
DECENTRALIZATION: Allows for decentralized ownership and management of assets, this could mean that ownership of land is distributed across a network of stakeholders, rather than being concentrated in the hands of a few powerful actors.

TRACEABILITY: By tracking the provenance of land on the Blockchain, it is possible to ensure that it has not been obtained through illegal means such as corruption, deforestation, or human rights abuses. This can help to promote ethical land acquisition practices

TITLE/ TENURE: Digital Title Deeds

- Blockchain Technology can be used to **create a secure digital registry of property ownership and transfers**.
- This would **replace the vulnerable paper-based systems** used in many countries, **reducing the risk of fraud and corruption.**
- By using Blockchain, **ownership records would be stored in a decentralized, immutable ledger** that is **transparent** and **accessible to authorized parties**.
- **Transactions would become faster and more efficient**, and there would be **greater transparency and accountability in the property market**.
- The **risk of fraudulent transactions** would be **reduced**, as each **transfer of ownership** would **require consensus among a network of nodes**, making it **difficult to manipulate the system**.
- Blockchain technology could make it easier to **verify the authenticity of property titles** and **resolve disputes over ownership or title transfers**.
- Implementing Blockchain technology could **improve the efficiency and transparency of property markets.**

Technical Overview
Components of Blockchain Solutions

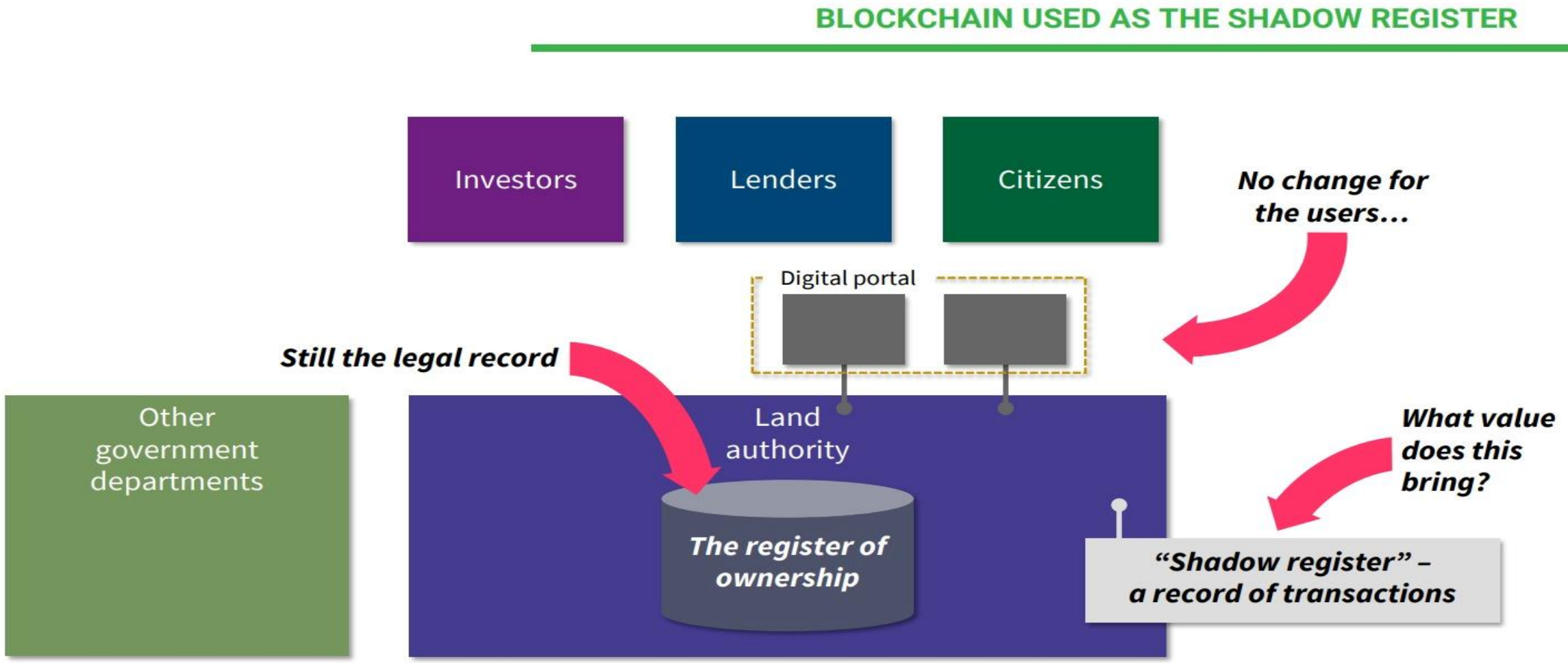


TOWARDS A SMART LAND REGISTRY

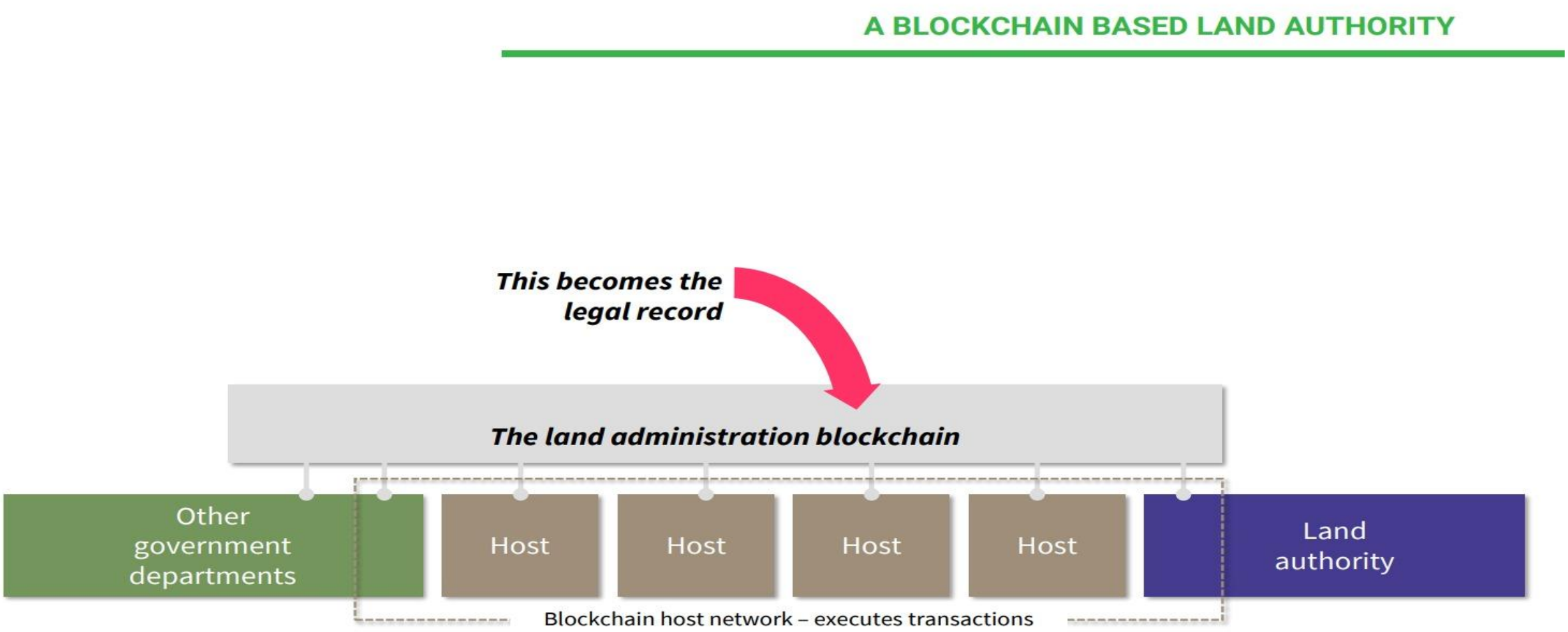
MOVING TO THE "SMART LAND REGISTRY"

- Codification of rights and accurate spatial representation of parcels and RRRs
- Formal management of change to the register
- Well defined identity for citizens and legal entities
- Citizen facing digital services
- Enabling software-driven land transactions
- Ease registration process increasing take-up – esp. from informal tenures

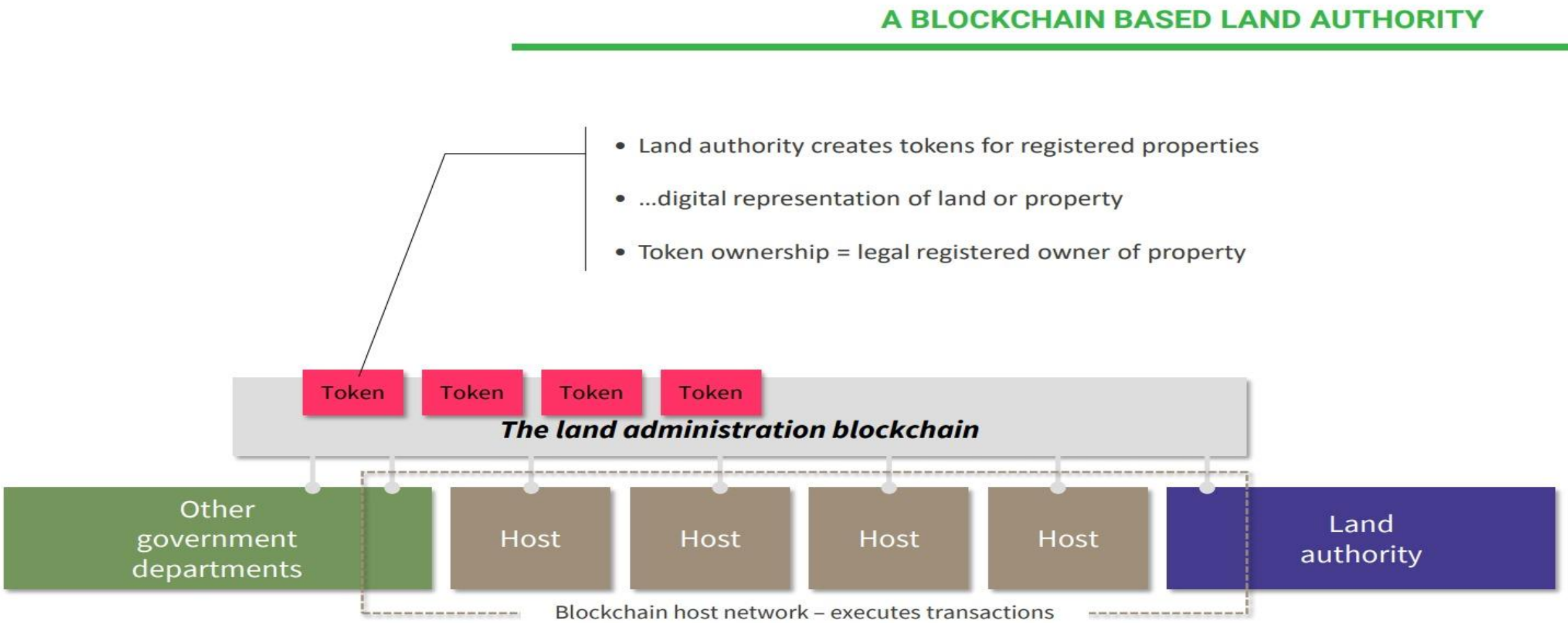
BLOCKCHAIN-BASED LAND REGISTRY



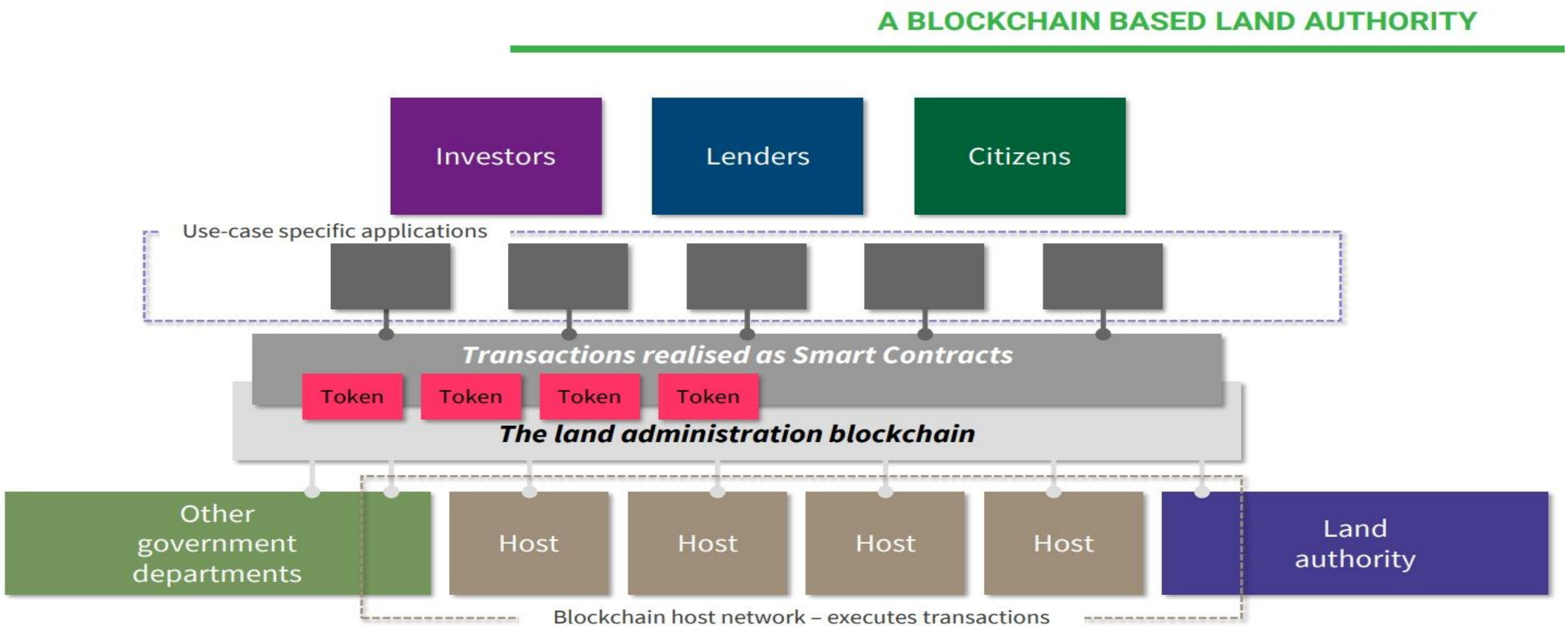
BLOCKCHAIN-BASED LAND AUTHORITY



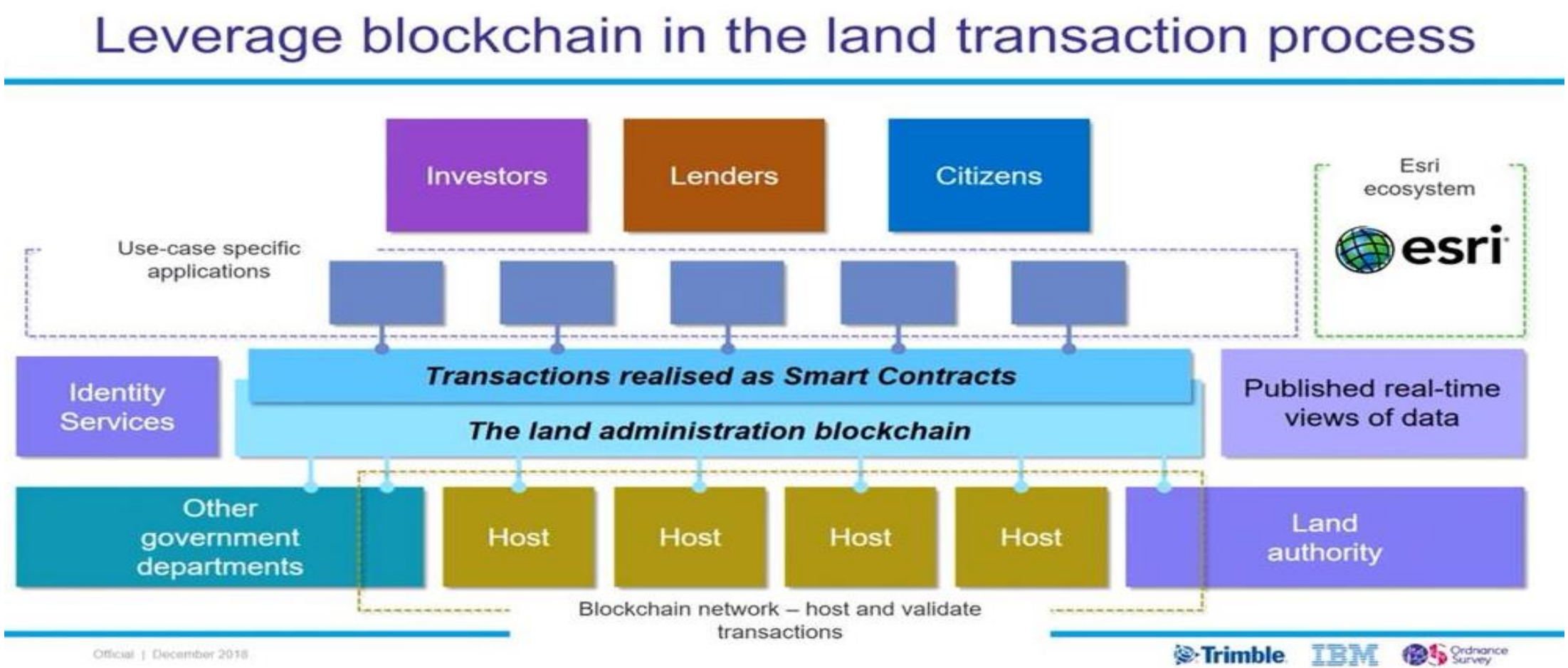
BLOCKCHAIN-BASED LAND AUTHORITY…



BLOCKCHAIN-BASED LAND AUTHORITY…



Blockchain Use in the Land Transaction Process



BLOCKCHAIN-BASED LAND AUTHORITY
Challenges and Benefits

- What are the legal implications.
- Benefits of increased market liquidity.
- Who hosts the chain?
- Technical challenges to using the technology

- Increase trust with high visibility and third-party validation of transactions
- Smooth the information flow across government and business entities.
- Increase market liquidity.
- Supports high-trust foreign investment

DUBAI REAL ESTATE
BLOCKCHAIN SOLUTION TO ENABLE LAND REGISTRATION – NETWORK PERMISSION

Network

DLD	DEWA	DM	RTA	DEVLPR	BROKERS	SURVEYER	BUYER	TENANT	OWNER	AUDITR	MC	FIN INST	DNRD	TOURISM	POLICE	DISPUTE
Manage Brokers			R	R	W		UI	UI	UI		R	W	R	R	W	R
RE Project Mgmt	R	R		W	R	W	UI					W				R
EJARI	W	W					UI	UI	UI		W	W	R			W
Developer Mgmt	R	R	R	W	R	W	UI		UI		R	W	R		R	W
Mollak				W				UI	UI		W	W				R
Survey				W		W	UI		UI	W	R	W				R
Land Partition	R	W		W	R	W			UI	R	R	W				R
RE Company Reg	R	W		R	R	R	UI		UI	R	R	W	R		R	R
Sale Deed Execution	W	R		W	R	W	UI	UI	UI	R	R	W	W		R	R
Tender Registration																
Ownership Transfer	W	R		R	R							W	W			R
Property Disputes	W	R		R	R	R	UI	UI	UI	R	R	W	W		W	W
Rental Disputes	W	R						UI	UI		W	W	W		W	W
MC Management				R	R		UI	UI	UI		W	W			R	R
Facility mgmt.	W	R		W	R	W	UI	UI	UI	R	W	R		R		R
Audit	R	R		R	R	R	UI	UI	UI	W	R	R				R
Power of Attorney	R			R	R	R	UI	UI	UI	R	R	R				R
Advertising			R	W	W	R	UI	UI	UI	W	R	W		R	R	R
Mortgage				W	R		UI	UI	UI	R	R	W	R			R

Read Permission
Write Permission

PRACTICAL APPLICATION OF BLOCKCHAIN: LAND ASSEMBLY/ACQUISITION

Country / Institution	Application of Blockchain to Land Assembly / Acquisition
Sweden's Land Registry	Tested a Blockchain-based system for **registering land titles** in 2016 to **prevent fraud and errors** in the land registration process.
Georgia's - National Agency of Public Registry	Use of Blockchain technology to **register land titles** in 2017 through the "**Blockchain Land Titling Project**" to reduce corruption and disputes over land ownership.
Ghana - Bitland	Blockchain-based platform - allows individuals and communities to **register and verify land titles** using GPS to prevent disputes over land ownership.
Global - PROPY	Blockchain-based platform for buying and selling properties using **smart contracts** to **reduce transaction costs** and **ensure secure & efficient transactions.**
Ubiquity	Blockchain-based platform that allows individuals and organizations to **record and verify real estate transactions** using **smart contracts** to **reduce fraud** and **errors** in the transaction process.

PRACTICAL APPLICATION OF BLOCKCHAIN TO TITLE/ TENURE - AFRICA

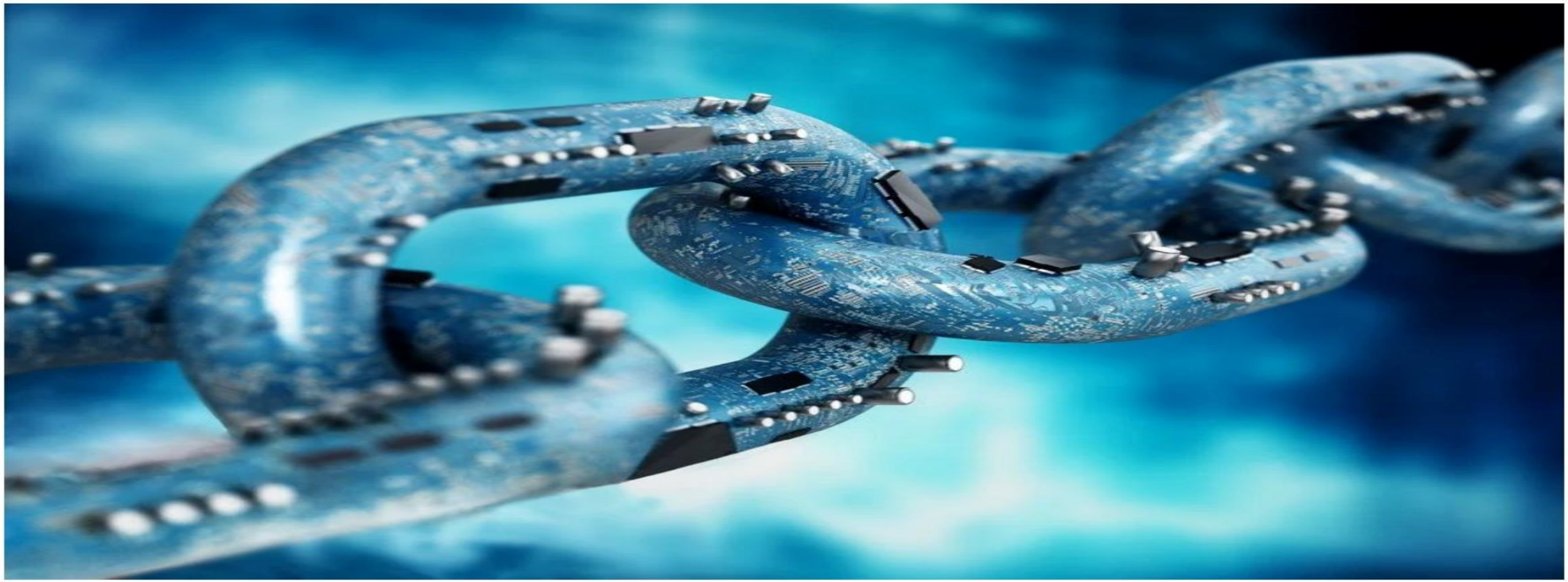
Country / Institution	Application of Blockchain to Title / Tenure in Africa
Kenya - Land Layby	Startup using Blockchain technology for recording land buying and selling transactions. The platform uses **smart contracts to automate** the **transfer of ownership**, which **reduces the time and cost of the transfer process.**
Ghana - BenBen	Proptech startup that uses Blockchain technology to provide a secure and transparent way for individuals and businesses to record and verify property transactions. Uses a private Blockchain network to **create a tamper-proof ledger of ownership records**, which **reduces the risk of fraud and corruption in the property market**.
Nigeria - LandChain	Blockchain-based platform developed by the Nigerian government to help individuals and businesses to **register and verify land titles**. The platform uses a private Blockchain network to **create a secure and transparent ledger of ownership records.**
Nigeria - HouseAfrica	Proptech startup that uses Blockchain technology to create a secure and transparent way for individuals and businesses to **register and verify property titles**.

Section Six

BLOCKCHAIN TOKENIZATION

REAL ESTATE TOKENIZATION

BLOCKCHAIN TOKENIZATION



Source: Getty Images

What are Digital Securities?

What are Digital Securities?

- Digital securities take the form of tokens on a secure distributed ledger (known as blockchain).
- Digital securities offer key benefits over more traditional forms of securities, including instant settlement and cost-free custody.
- Digital securities primarily fall under securities regulation of any jurisdiction but may also extend to the Central bank.
- **Digital Tokens in Nigeria** will fall under the supervision of the Securities and Exchange Commission (SEC) with respect to the tokenized asset and the Central Bank of Nigeria with respect to the use of digital currency in transaction settlement.

BLOCKCHAIN TOKENIZATION IN REAL ESTATE

Recap Problems of Real Estate Investment

- **Inefficient transfer** and **record keeping processes**: Administrative work = 50% to 75% of an issuers total operating cost.
- **Illiquidity** – About 1% of global real estate assets are traded on national stock exchanges.
- **Inaccessibility** – Most people are excluded from trading in real estate.
- **Lack of Transparency** – A lot of real estate market suffer from a critical lack of transparency

Tokenization Solves the Problems

- **Automation of middlemen processes**: Tokenization saves $1.7 billion in the US alone.
- **Improved Liquidity**: Cost effective secondary market fractionalization.
- **Lowered Barrier to Investment**: Tokenization enables fractionalization + significantly reduced transaction administration costs.
- **Increased Transparency**: Tokenizing real estate will make the market more transparent

BLOCKCHAIN TOKENIZATION IN REAL ESTATE

- Tokenization refers to the process of **converting an asset into a digital token.**
- In the context of real estate, **tokenization involves dividing a property into smaller fractional ownership units**, which can then be **represented by digital tokens** on a Blockchain that can be stored and traded on a Blockchain.
- These tokens can be bought and sold, providing investors with a way to invest in real estate without the need for large sums of capital.

BLOCKCHAIN TOKENIZATION IN REAL ESTATE

TOKENIZATION

Definition: the process of issuing a blockchain token (security token) that digitally and legally represents a real asset

Efficiency – time & cost (x10 reduction):

- Digitization and automation of processes
- Automated compliance and governance
- Removal of human errors

New capabilities:

- Increased liquidity (from 0 to 1)
- Fractional ownership / democratization

Other values:

- Global standards and interoperability
- Logging of transactions
- Factor x10 increased design space

Comparison of Traditional and Digital Assets

Traditional VS digital securities in private markets

Attributes	Traditional	Digital
Accessibility	Only for UHNW and Institutional Investors	**All Accredited and Institutional Investors** (MAS definition)
Fees	Opaque due to multiple intermediaries	Transparent
Fractionalisation of Assets	Limited availability	**Any asset can be fractionalised**
Distributions and Payments	Manual transfer / transfer agents	**Auto / Smart contracts**
Settlement Time	Typically T+2	**Instant**
Lockups	≥1 year	No lockup
Operational Costs of Issuance, Trading and Custody	High	**Low**

TOKENIZATION IN AFFORDABLE HOUSING

01

Tokenization:

Conversion of an asset into a digital token.

02

Real Estate Tokenization:

Process of dividing a property into smaller fractional ownership units

03

Representation on Blockchain:

Digital tokens on a blockchain represent ownership units.

04

Investment Accessibility:

Enables investment in real estate with smaller capital.

04

Buy and Sell Opportunities:

Tokens can be bought and sold by investors.

MULTIPLIER EFFECT OF TOKENIZING ON AFFORDABLE HOUSING MARKET

Fractional Ownership:

- Enables a broader range of individuals to participate in real estate investments
- This increased participation can lead to more diverse sources of funding for affordable housing projects.

Lower Transaction Costs:

- Reduced transaction costs mean that more funds can be directed toward actual property development and improvement rather than being spent on intermediary fees

Efficient Capital Deployment:

- With a more efficient and accessible investment environment, capital can be deployed more quickly and effectively.
- This agility in capital deployment can contribute to a multiplier effect by accelerating the development and completion of affordable housing projects.

Increased Liquidity:

- Liquidity allows for more frequent transactions in the real estate market.
- The increased transaction volume can stimulate economic activities

Access to Global Investors:

- The inflow of international capital through tokenization can have a multiplier effect on the funding available for affordable housing, fostering economic growth and development.

Community Participation:

- Increased transparency and fractional ownership can encourage community participation and engagement.
- When communities are actively involved in the development process, the multiplier effect extends to social and economic benefits within the community.

Illustration of Digital Securities Platform

Digital Securities Platforms

Frictionless, fair, and safe digital securities and digital assets investments for all

Example of ADDX issuer services:
- Tokenisation
- Custody of issued digital securities
- Post-trade services

(e.g. income distribution)

Regulated by

MAS
Monetary Authority of Singapore

since Feb 2020

- Recognised Market Operator
- Capital Markets Service Licensee:
  - Dealing in capital markets products
  - Providing custodial services for securities

Example of ADDX investor services:
- Execution and settlement
- Custody of investment portfolio
- Reporting

Illustration of Fractional Ownership and Liquidity

Changing the Role of Private Market Assets in a Portfolio

Current

- **High risk, high return**
- **Long-term return enhancement**
- **Risky due to**
  - **Long tenors**
  - **Non existent secondary market**
  - **High entry ticket size ($1m and above)**
  - **Potentially volatile underlying asset**

Digital Securities Platform eg ADDX

- **Fractional ownership** solves high entry ticket sizes – allows use of private market assets as diversification tool for portfolio of all sizes.
- **Secondary market** solves risk associated with long tenor.
- Shelf of product range from higher risk/ return to safer yield type product (e.g. Astree, CGS – CIMB Securities)

POTENTIAL APPLICATION OF BLOCKCHAIN TOKENIZATION IN REAL ESTATE:

- **Fractional Ownership:** Tokenization allows for fractional ownership, meaning that investors can own a portion of a property instead of having to purchase the entire property. This allows for smaller investors to participate in real estate investments that were previously inaccessible.
- **Increased Liquidity:** By **digitizing real estate assets, tokenization can increase liquidity** in the market, as investors can easily buy and sell their fractional ownership units on a Blockchain platform.
- **Lower Transaction Costs:** Blockchain technology eliminates the need for intermediaries, such as brokers and lawyers, reducing transaction costs for both buyers and sellers.
- **Improved Transparency:** Blockchain technology **provides a secure, transparent, and immutable record of all transactions**, making it easier to **track ownership, verify property ownership, and prevent fraud**.
- **Access to Global Investors:** Tokenization allows for **global access to real estate investments**, as investors from all over the world can participate in the market without the need for geographic proximity.

PRACTICAL APPLICATION OF BLOCKCHAIN TOKENIZATION IN REAL ESTATE

Institution	Application of Blockchain to
PROPY	Enables the **purchase and sale of real estate properties using digital tokens**. Propy's platform allows for tokenization of properties, making it easier for investors to invest in real estate with lower transaction fees and increased transparency.
RealT	Tokenization platform that **allows investors to purchase fractional ownership of properties** using digital tokens. Tokenizes properties and makes them available for investment on its platform. Manages the properties and distributes the rental income to investors.
Harbor	Platform allows the **creation and sale of security tokens**, **including real estate** investments. **Provides regulatory compliance and facilitates the trading of security tokens on a Blockchain**.
SwissRealCoin	Enables **fractional ownership of Swiss real estate properties**. Tokenizes real estate assets and allows investors to purchase fractional ownership units, which can be traded on a Blockchain.
Slice	Allows investors to purchase fractional ownership of high-end residential properties in New York City. Tokenizes properties and makes them available for investment using digital tokens. **Investors can trade their tokens on a Blockchain-based platform.**

TOKENIZATION PLATFORM IN REAL ESTATE

DIGISHARES PLATFORM

ISSUANCE

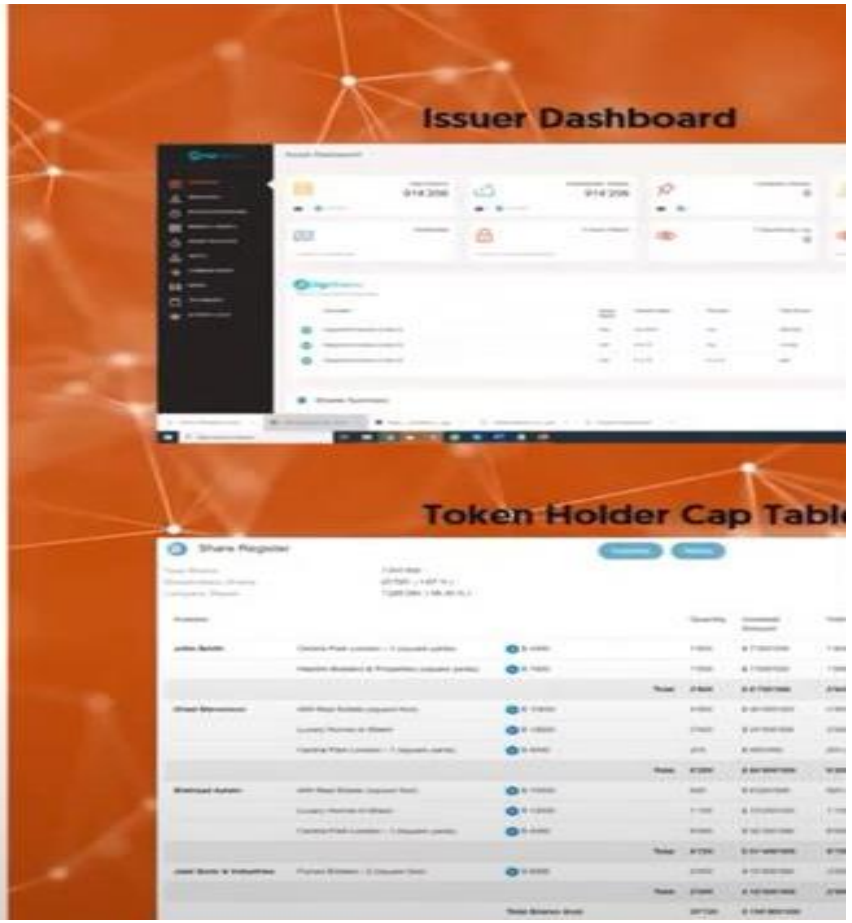
- ✓ Investor registration and verification (KYC / AML)
- ✓ Token purchase
- ✓ Electronic document workflow and signatures

CORPORATE MANAGEMENT

- ✓ Share cap table over multiple share classes
- ✓ Shareholder meetings and votes
- ✓ Dividends and interest payout in crypto and fiat
- ✓ Reissuance of lost tokens

TRADING

- ✓ Internal bulletin board marketplace with atomic swap
- ✓ Circle USDC integration for full automation and non-crypto use



Challenges and Opportunities

Legal / Structure

- Amendments to existing issuance documentation
- Novel structures

Regulatory

- Clarity in tax treatment
- Operational support from institutions (e.g. stamp duty)

Transparency

Acceptance of DLT technology / Confusion with crypto

Section Seven

MULTIPLIER EFFECT OF DIGITIZATION ON AFFORDABLE HOUSING

MULTIPLIER EFFECT

- **The multiplier effect in finance refers to the amplification of an initial economic stimulus or change in spending that leads to a larger impact on overall economic activity.**
- **This concept is often associated with fiscal policy, where an initial injection of money into the economy, such as government spending or tax cuts, sets off a chain reaction of increased spending and income.**

HOW IT WORKS

Initial Spending:

Let's say the government increases spending on infrastructure projects. This is the initial injection of money into the economy.

Increased Income

The workers and businesses involved in these projects receive payments, increasing their income.

Secondary Spending:

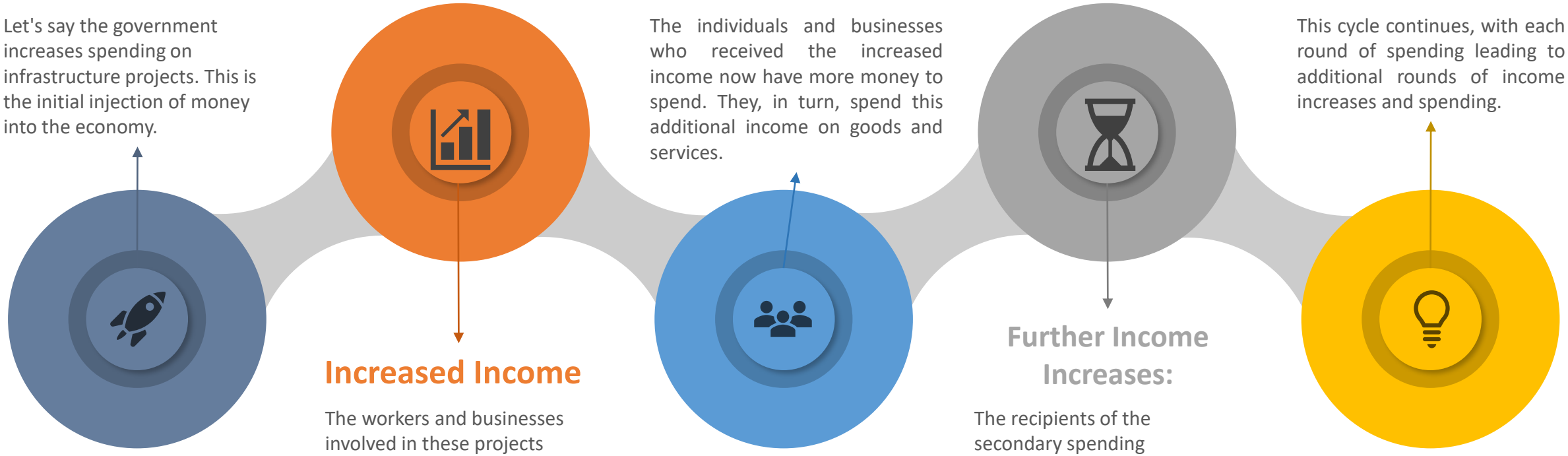
The individuals and businesses who received the increased income now have more money to spend. They, in turn, spend this additional income on goods and services.

Further Income Increases:

The recipients of the secondary spending experience an increase in income, leading to more spending.

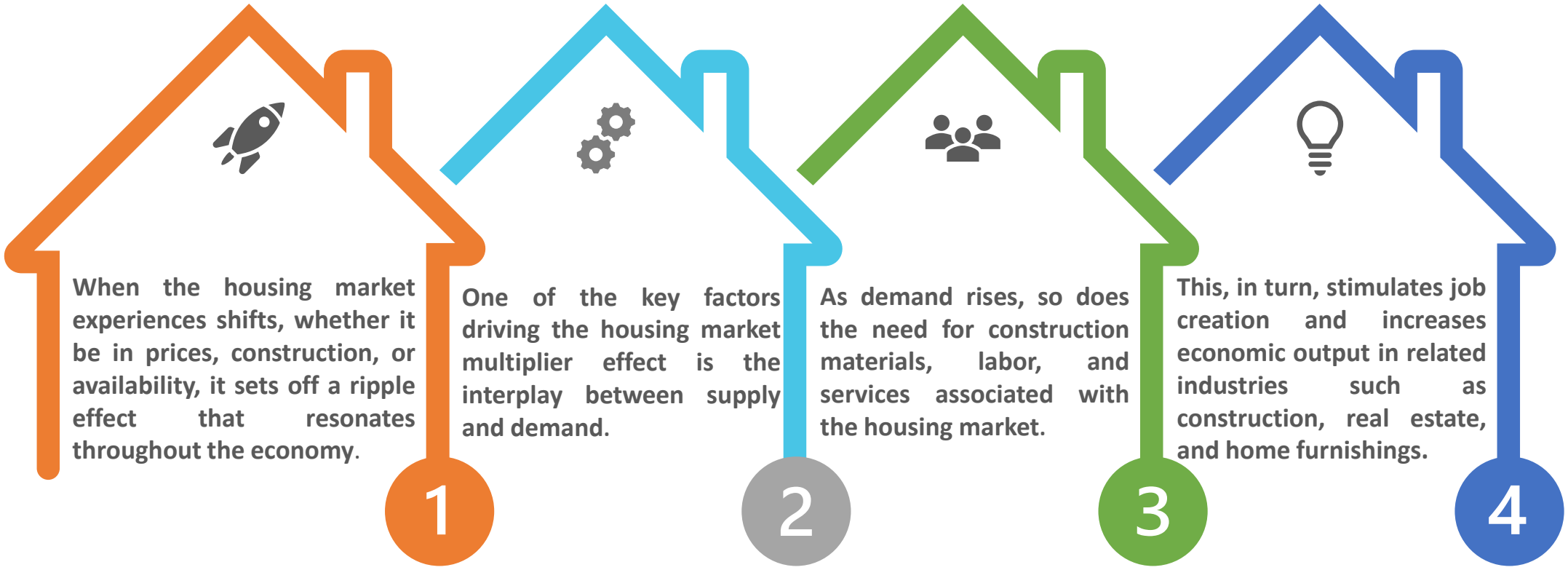
Repeat Process:

This cycle continues, with each round of spending leading to additional rounds of income increases and spending.



MULTIPLIER EFFECT OF AFFORDABLE HOUSING

Housing market multiplier effect refers to the amplification of economic activity triggered by changes in the housing market



DIGITIZING THE MORTGAGE MARKET CAN HAVE A RIPPLE EFFECT ON VARIOUS ECONOMIC ACTIVITIES, CONTRIBUTING TO INCREASED DEMAND IN SEVERAL SECTORS

Faster Processing and Approval:

- **Impact: Digitization streamlines the mortgage application and approval process, reducing the time it takes to secure a mortgage.**
- **Effect: This can lead to increased demand for real estate transactions as potential buyers can move more quickly in making purchasing decisions.**

Data-Driven Decision-Making:

- **Impact:** Digital technologies enable better analysis of borrower data.
- **Effect:** Lenders can make more informed lending decisions, expanding the pool of eligible borrowers and increasing demand for housing.

Efficient Financial Transactions:

- **Impact: Digital mortgages involve electronic financial transactions and documentation.**
- **Effect: Increased efficiency in financial transactions can contribute to a faster turnover of funds, potentially leading to increased investment in real estate and related sectors.**

Job Creation in Technology and Finance:

- **Impact: The development and maintenance of digital mortgage platforms require skilled professionals.**
- **Effect: Job creation in the technology and finance sectors can lead to increased consumer spending, contributing to economic growth**

Access to a Broader Market:

- **Impact: Digital platforms can provide broader access to mortgage products and services.**
- **Effect: This can stimulate demand from a wider pool of potential homebuyers.**

Stimulating Home Improvement and Furnishing Industries:

- **Impact: Increased home sales may stimulate demand for home improvement and furnishing services.**
- **Effect: Increased new home owners, could lead to an increase in spending on renovations, furniture, and other related products.**

Job Creation Multiplier Effect - Illustration

- 2018 Family Homes Funds (FHF) indicate plans to support development of 500,000 homes
- Projected Job creation 1.5 million grassroots / low income jobs by 2023.
- Over 4000homes under construction in five states: Ogun, Nasarawa, Kano, Delta and Kaduna.
- Construction of 400 homes complete in Grand Luvu, Nasarawa State – jobs created – 8000.
- Average cost per home – N3.5 million

Section Eight

AFFORDABLE HOUSING – NEED FOR POLICY

THE IMPERATIVES OF POLICY FOR THE BIGGEST IMPACT

THE NEED FOR IMPACTFUL HOUSING POLICY

National Housing Policy should focus of delivering **affordable housing** for target groups with the **biggest impact**:

- **Informal (slump) settlements** where the residents to foster inclusion and attain several **SDGs** (SDG 3, 4, 5, 7, 8, 9, 10, 11)
- **First time home owners**
- **The B40 – Social Housing**

Affordable Housing Funding Source

	Asset Size (N) & Euro for UK	Percent of Total	Percent of PenCom & UK Pensions
FMBN	140,100,000,000.00	29%	0.84%
FHFL	93,000,000,000.00	20%	0.55%
NMRC	24,020,000,000.00	5%	0.14%
FHA		0%	0.00%
PENCOM ASSETS	219,276,000,000.00	46%	1.31%
SUB TOTAL	476,396,000,000.00	100%	2.84%
PENCOM	16,760,000,000,000.00		
PENCOM ASETS INVESTMENT @ 5%	838,000,000,000.00		5.00%
UK PENSION FUND *UK Govt plans incentives for Pension Funds to Build Affordable Housing – Jeremy Hunt Chancellor: 14 Nov. 2023.*	1,757,000,000,000.00 *On 22nd Nov 2023 UK Govt. plans bigger pension schemes to invest in start-up companies . Mansion House Compact – voluntarily commit 5%*		5.96%

Conclusion

Digitization is a critical step in the journey of developing affordable Housing to harness the **Investment Opportunity**— and meet **Challenge** of affordable housing in Nigeria and the continent.

The prospect of trying to fill a **gap of 20+ million housing units in Nigeria** may seem daunting to policy makers, but it is a **massive opportunity for the private sector in partnership with the public sector**.

The investment associated with building the housing needed to close this gap is huge but the **avenues for raising funds for the construction of new houses in Nigeria exists**, it requires the **will, desire** and **commitment** to do so.