



**IPB University**  
— Bogor Indonesia —

# Forest Industry Innovation to Create Sustainable Job in the Future

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*The Sixth General Assembly for Asia-Pacific Forestry Education Coordination Mechanism , 15-17 August 2023, Kunming China*

# Faculty of Forestry and Environment IPB

## Bogor, West Java, Indonesia



- QS World Univ. Ranking 2023 | *by Subject Agriculture & Forestry* | ~ # 51
- 1<sup>st</sup> National University Ranking

Established in 1963, the oldest Faculty of Forestry in Indonesia with “A” (Excellent) National Accredited:

4 Study Program in Departments have international accreditation (AUN-QA, ASIIN and SWST)

1. Dept. of Forest Management
2. Dept. of Forest Product Technology
3. Dept. of Forest Resource Conservation and Ecotourism
4. Dept. of Silviculture

**Number of Lecturer: 114**

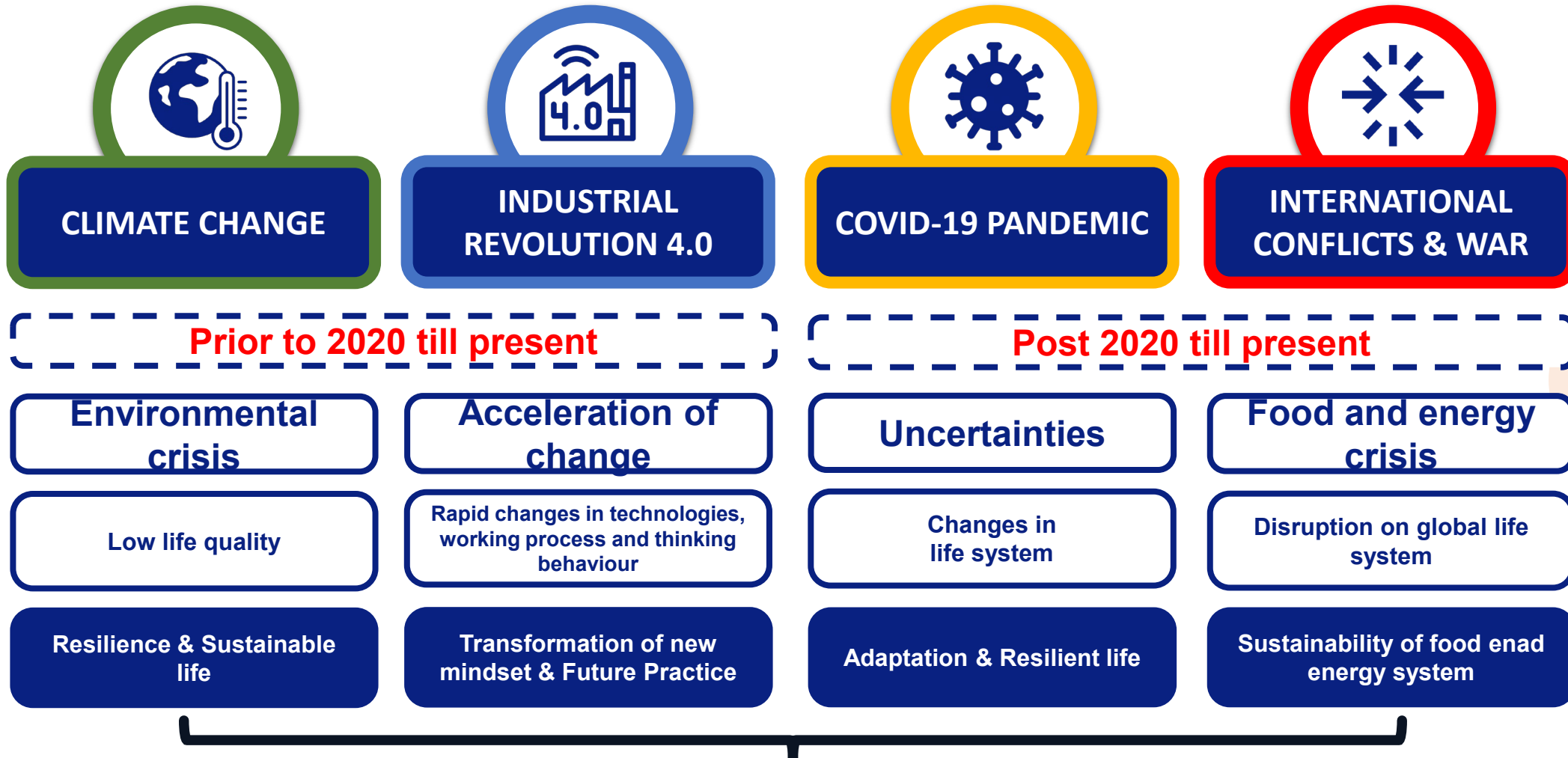
**Prof. = 34 (29.82 %)**

**Dr = 97 (85.08 %)**

**M.Sc = 17 (14.91 %)**

Education Level	Number of Student
Undergraduate	1,562
Master	220
Doctorate	78
<b>Total</b>	<b>1,860</b>

# Global Challenges: Great Disruption



**Transformation, Resiliency, and Sustainability**

# Background

- The Government of Indonesia (GoI) has ratified the Paris Agreement (PA) and has submitted its commitment to reduce greenhouse gas emissions, NDC and ENDC.

# INDONESIA'S FOLU NET SINK 2030

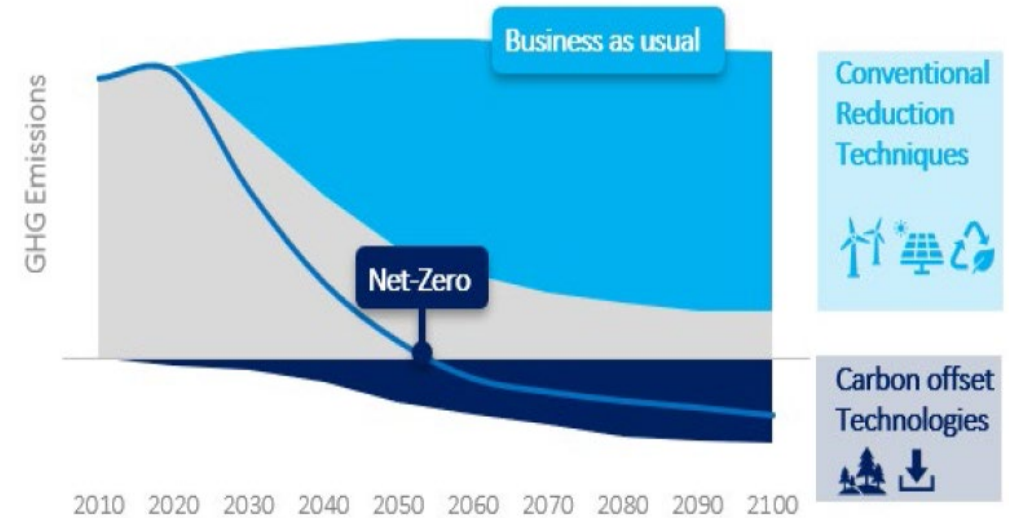
- Net FOLU Sink 2030 is a part of pathway in achieving net zero emissions and climate change mitigation .
- **Net FOLU sink 2030: A condition where the absorption level is already balanced or even higher than the emission level of the FOLU (forestry and other land use) sector in 2030.**



Source: Ministry of Environment and Forestry

# Background

- Indonesia must urgently **expand its forest industries** research and development capacity as part of a drive to a **low-carbon economy**.
- **Sustainable timber** will be a critical piece in the mix that will be required if we are to have a **low-carbon economy**.



## Biomass in a low-carbon economy

Biomass is a broad term covering all organic carbon-based materials including plants and animals. We use it here to refer to forests, crops grown for energy (e.g. willow and miscanthus) and organic wastes (e.g. food waste, agricultural residues and sewage).

Biomass can help tackle climate change in two ways:



1

Biomass growth *removes* carbon dioxide from the atmosphere and *stores* it for long periods of time in soils, trees and other plants.



2

When managed and harvested in a sustainable way, biomass can also be used to *reduce* fossil fuel emissions to the atmosphere.



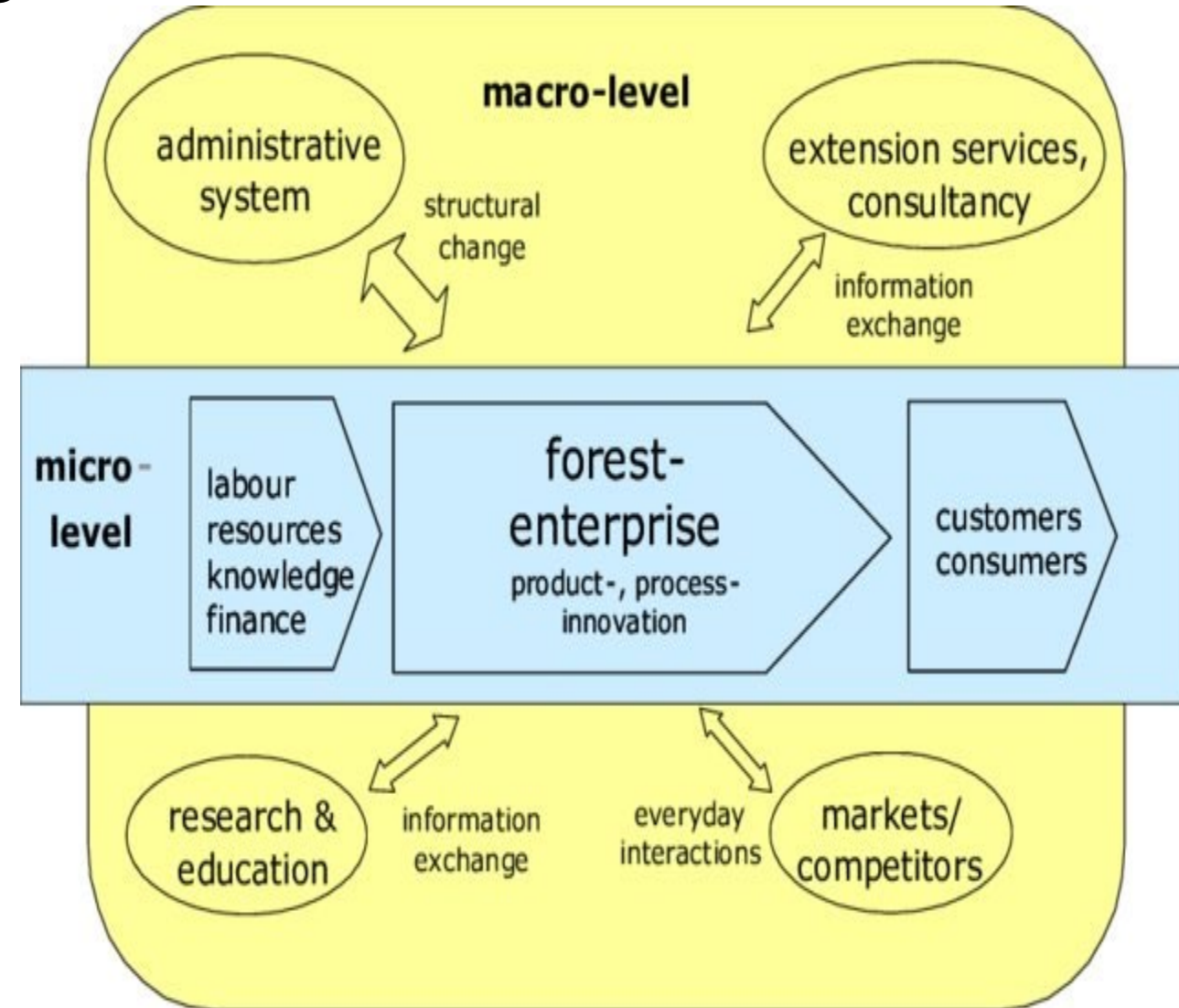
# Sustainable Forestry

- The greatest impact can be achieved when we substitute non-renewable-based products that come with a high GHG emissions price tag with **renewable and sustainable wood-based products**.
- We now have the opportunity to use leading-edge technology to increase the **economic viability** of the entire **supply chain** sustainably, which will complement the know-how we already have to manage our forests and the **life cycle**

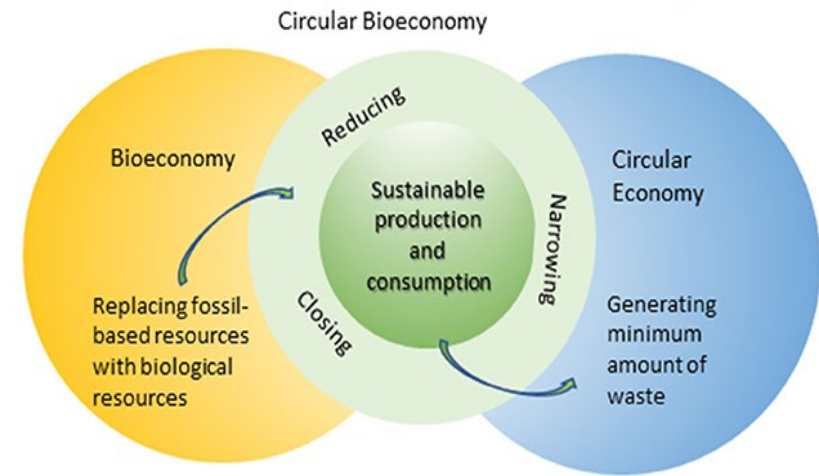
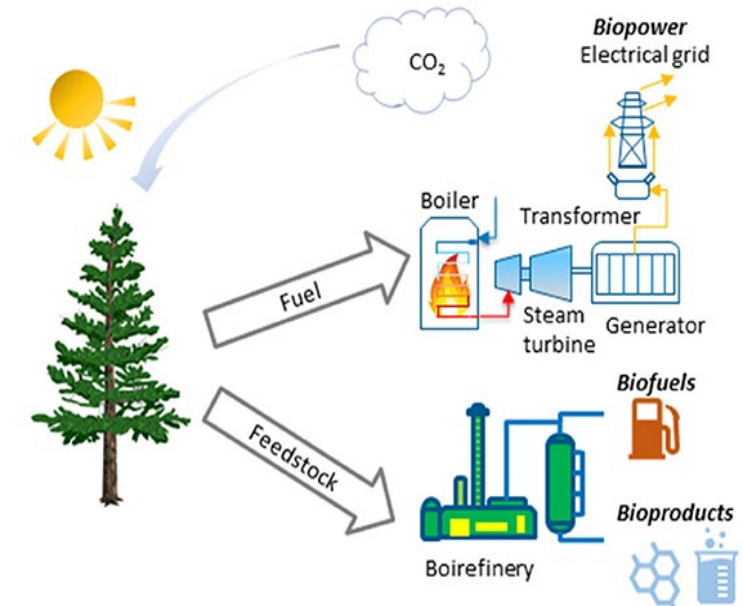
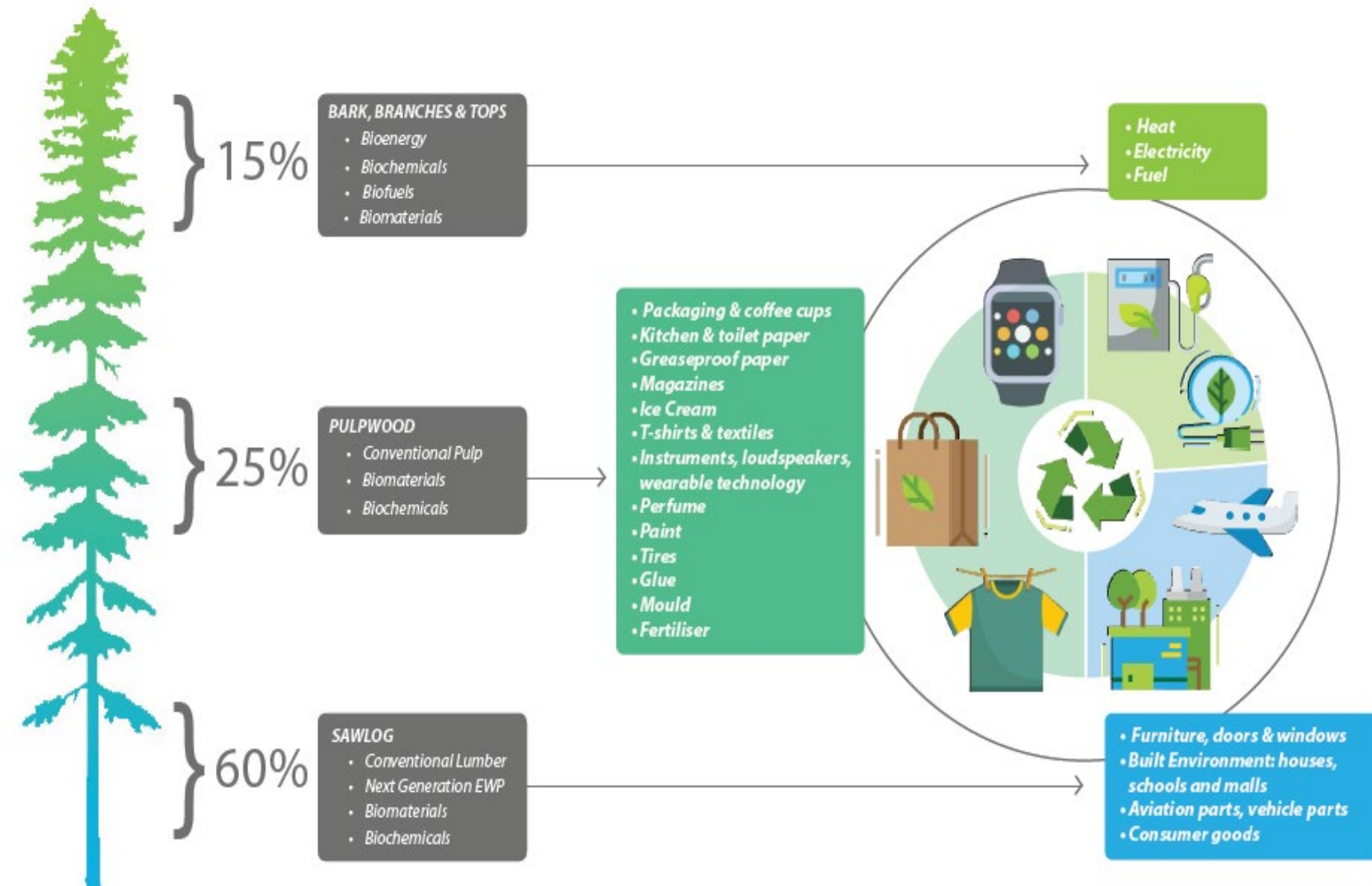


# Sustainable Forestry

- The **marriage of technology and sustainability** is the way of the future for all industries, including the Indonesian forest sector.
- **The forest industry**, through forest intensification, is among the few industries that can grow while **reducing its GHG emissions** and remain sustainable.
- Forests are part of the **carbon sink** and when we harvest trees and transform them into housing or products with a long service life, we **capture and sequester** carbon dioxide.



# Forest Bioeconomy: Value chain of Bioproducts from Forest Biomass





# Forest Future Industry

- Cities of the future will increasingly be built from **high-tech timber**. Buildings are generally **lighter**, can be constructed **faster** and provide **carbon sinks** with the **embodied carbon** in the timber
- What we need is the knowledge to grow sufficient volumes of timber sustainably, and transform that resource into the products we need to deliver a **zero-carbon future**.

## Sophistication of primary wood processing system



Development of a kiln-drying system for large timber



## Sophistication of reliable structural wood components and woody indoor space



Large panel products



Parallel cord wood truss



Development of measuring technology for comfort in woody interior spaces



Wood products with high fire-resistance



Wood for exterior use



Low-rise wood structure

# Design of IKN as Smart Forest City

## Infrastructure : Housing



(Source: Material provided by the Transition Team of OIKN, dated on 23 June 2022)

REFERENCE

# Infrastructure : Housing

Housing at KIPP 1A-1  
(230 towers, 9,443 units)



Vertical

Compact

Green

(Source: Material provided by the Transition Team of OIKN, dated on 23 June 2022)

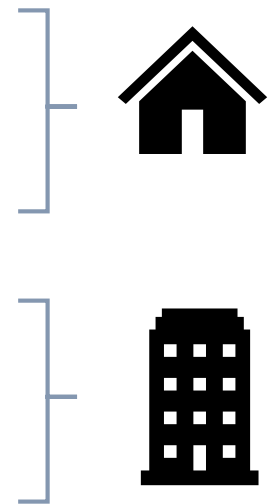
- KPI:** - Feasible, Safe, and Affordable Housing & Luxury: Medium: Simple =1:2:3 (house type ratio)  
 - Proper infrastructure, facilities & utilities, and an efficient housing financing system

REFERENCE

# Infrastructure : Housing

## Specification of Official House for Government Officials (The development will start in 2022-2024.)

No	Resident	Housing Type	Unit Area (m <sup>2</sup> )
1	Minister / High Level of Gov Officials	Landed House	580
2	Gov. Officials	Landed House	490
3	Echelon 1 / JPT Madya	Landed House	390
4	Echelon 2 / JPT Pratama	Flats	290
5	Echelon 3 / Administrator	Flats	190
6	Functional Officers and Other Staffs	Flats	98



(Source: Ministry of National Development Planning/BAPPENAS)

# Infrastructure : Housing

## Housing Type, Financial, and Provider

★=main

	Type of Housing	Location	Resident	Funding	Provider
1	- Rumah Negara ( <i>State House</i> ) - Rumah Dinas ( <i>Official House</i> )	★KIPP (gov. core area)	- ASN, - TNI, - Police	★APBN (state budget) - Private Business	★Government, - Society, - Private Business
2	Rumah Umum ( <i>Public House-rental/owned</i> )* <i>*management and market directly regulated by Housing Authority</i>	- KIPP - Non-KIPP	- Citizen (Non-ASN)	-Banking -Financial Institution	★Housing Authority by OIKN (as 'off-taker' of private developer as well)
3	- Rumah Komersial ** ( <i>Commercial House</i> ) - Rumah Swadaya ( <i>Self-Help House</i> )	- Non-KIPP	- Citizen (Non-ASN)	- Private Business - Financial Institution /Cooperative	- Private Business - Society

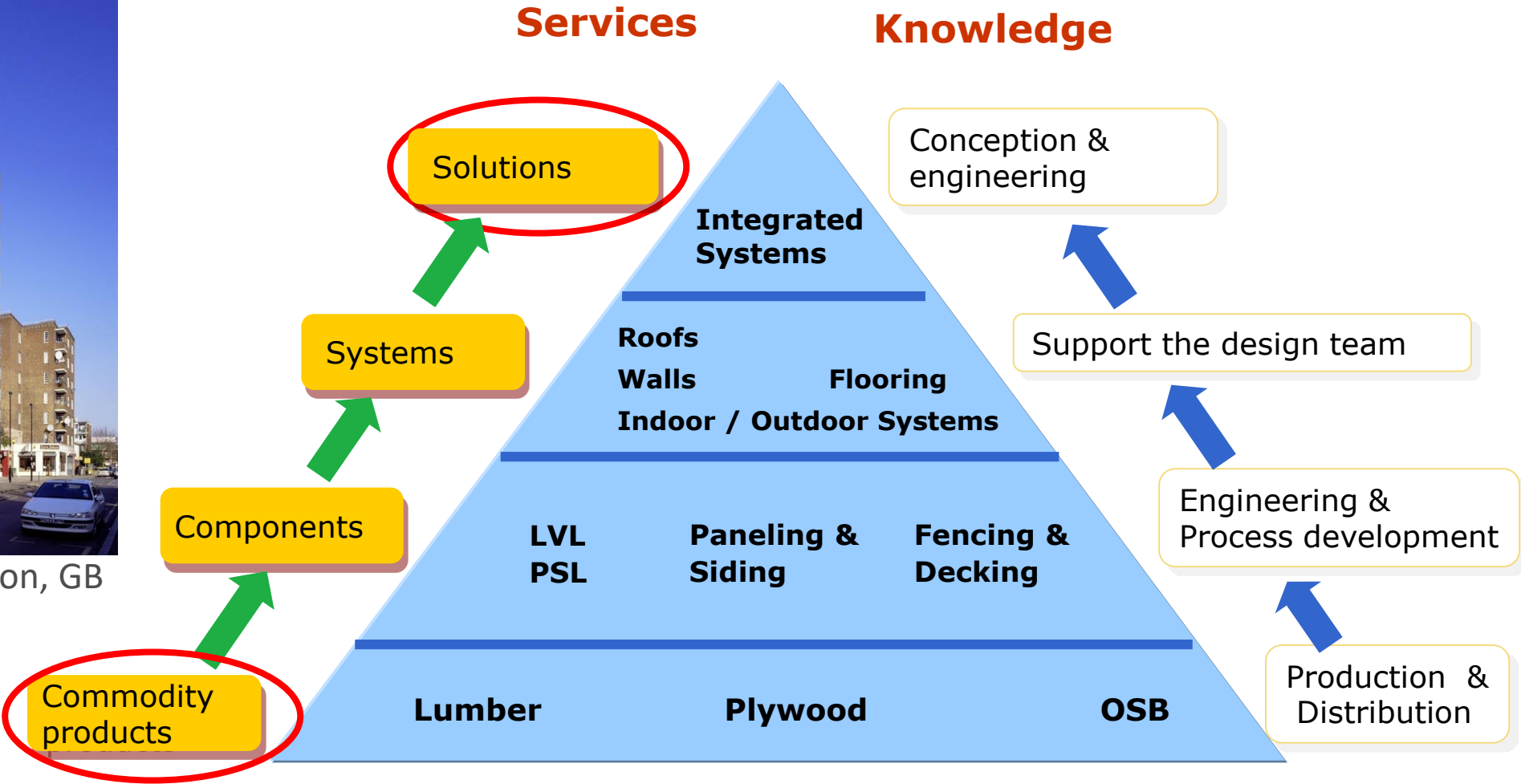
\*\*Commercial housing development can be integrated with Transit Oriented Development (TOD) area.

→'10min City'

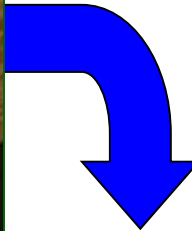
# From commodity products to building solutions



Murray Grove Building, London, GB  
World Tallest Wood Building



The definition in the wood industry is:  
EWP = Composite wood substitutes for solid wood



*Better use of small and low grade logs (all species)*

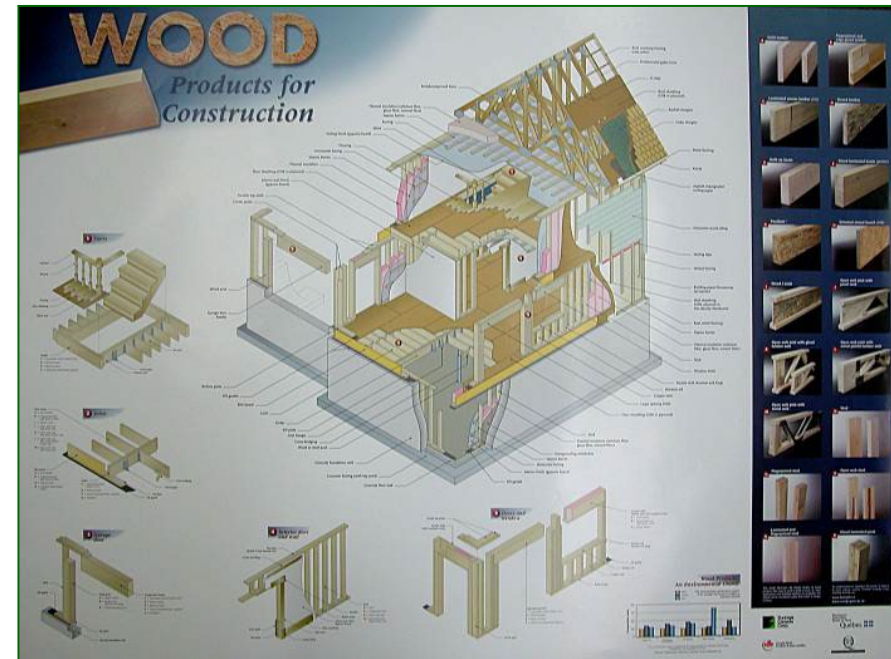
Veneer Strip Lumber



Laminated Veneer Lumber



Oriented Strand Lumber



Massive wood plates, X-lam (CLT)

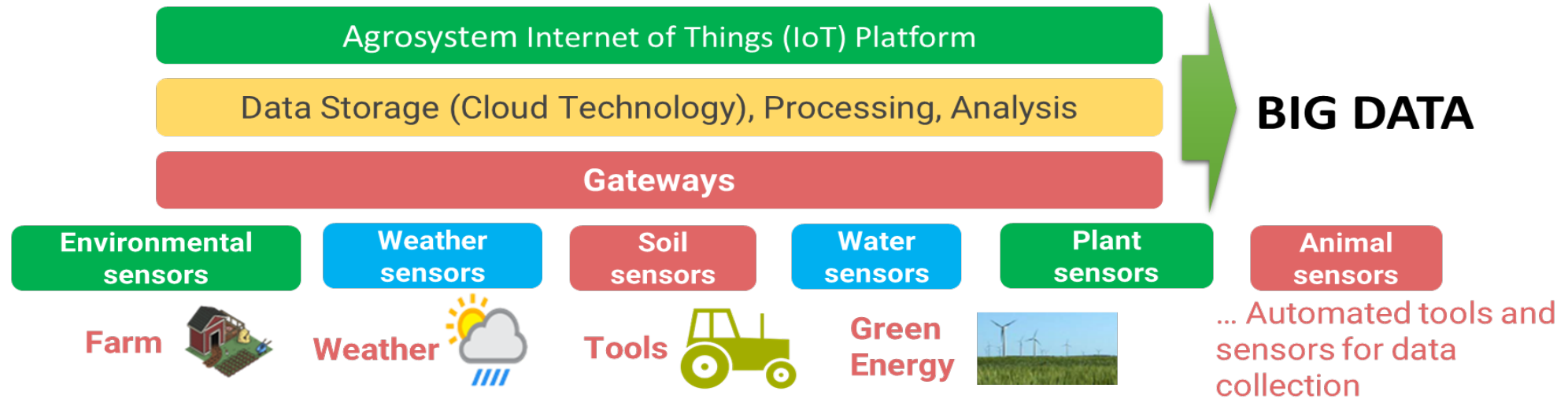
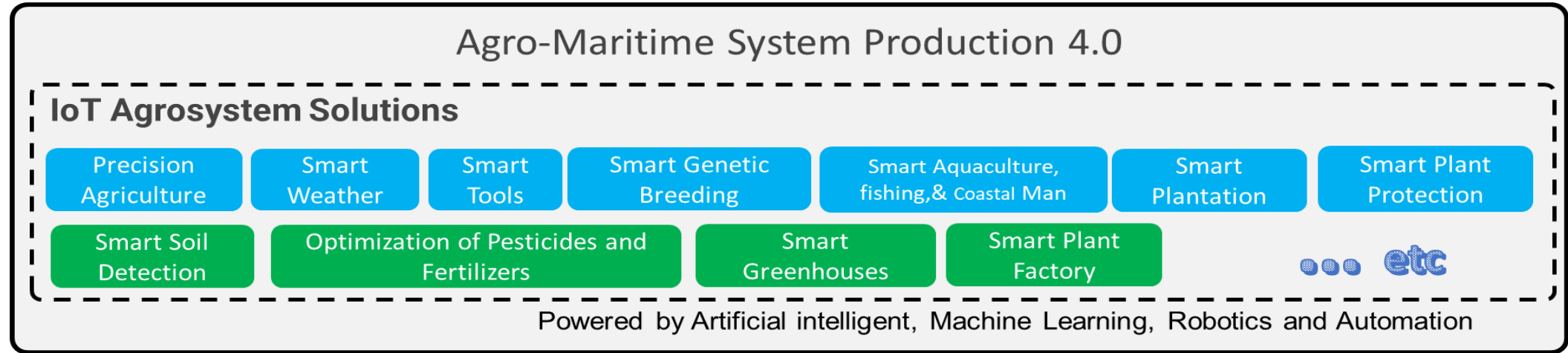


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# Role of Higher Education

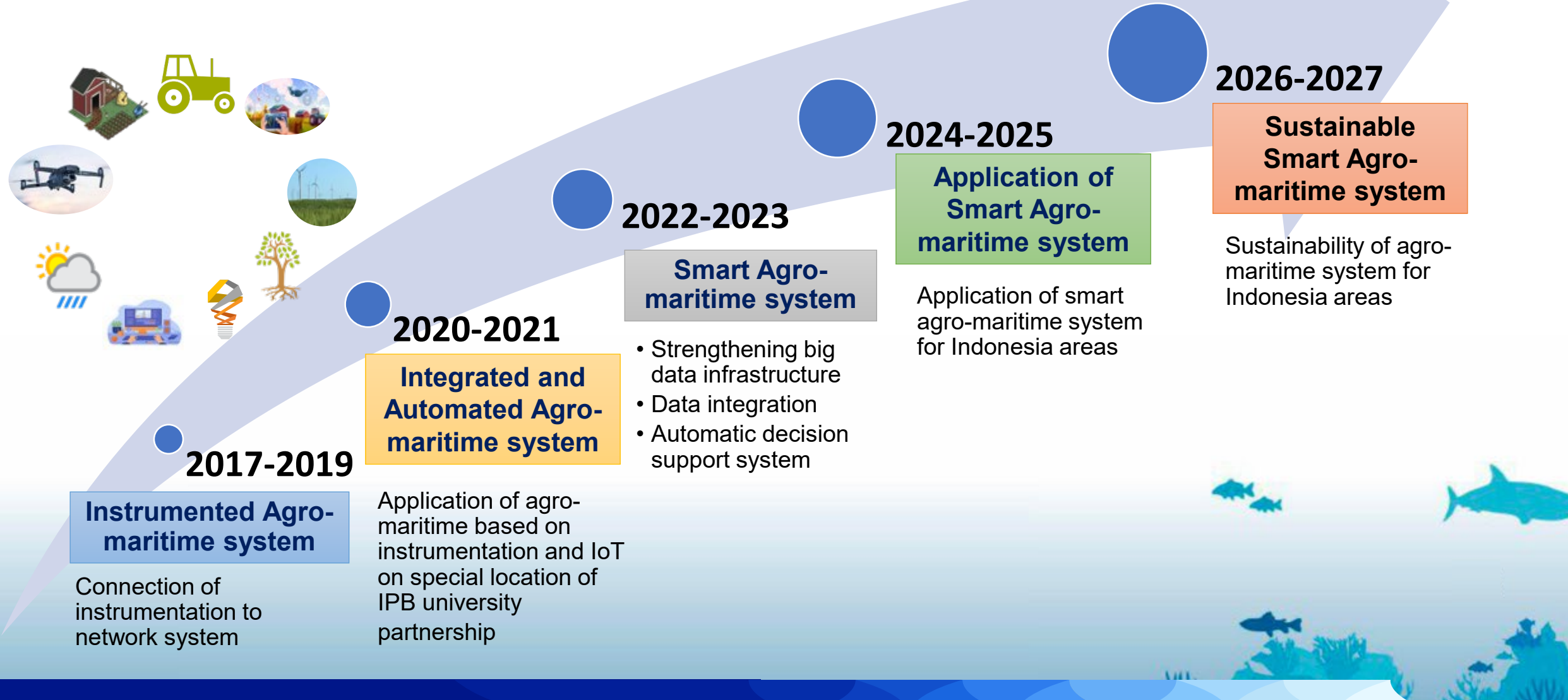
Research and Innovation

## Agro-Maritime 4.0 IPB





# Roadmap of Agro-Maritime 4.0 IPB University [2017-2027]



## 4 Scenarios for Future Higher Education

### 1. The 'future skill' university

emphasize graduate's **future skill development.**

**Learners in the workplace** would be the main type of student, choosing their portfolio of modules according to their personal skill needs

### 3. The lifelong higher learning scenario

### 2. The networked, university

shift from a "one-institution" model to a "multi-institutional" model.

students can **build their own curricula** based on their personal interests

### 4. The "My-University" scenario

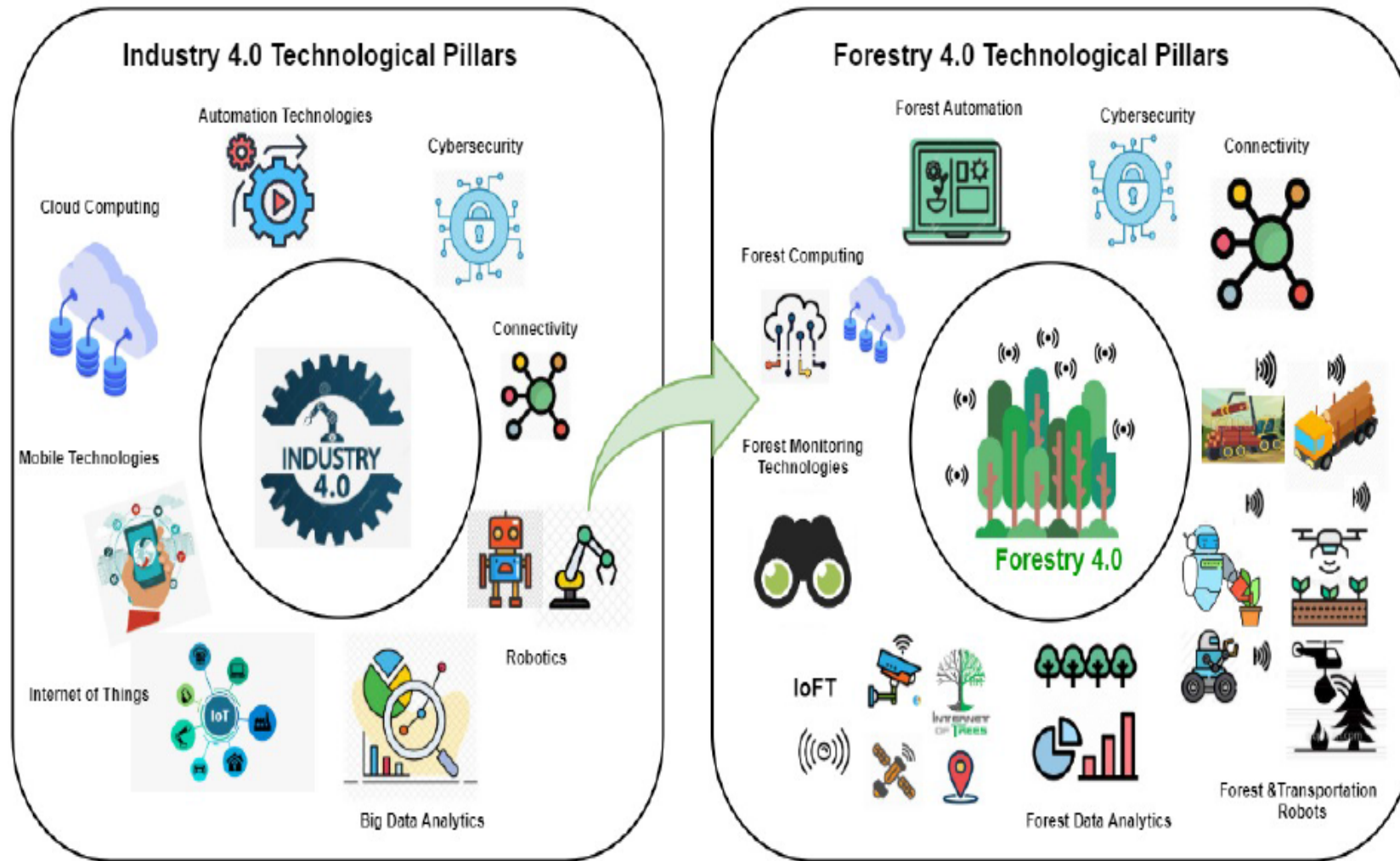


## Eight types of off-campus university learning

Source: Ministry of Education and Culture (2020)



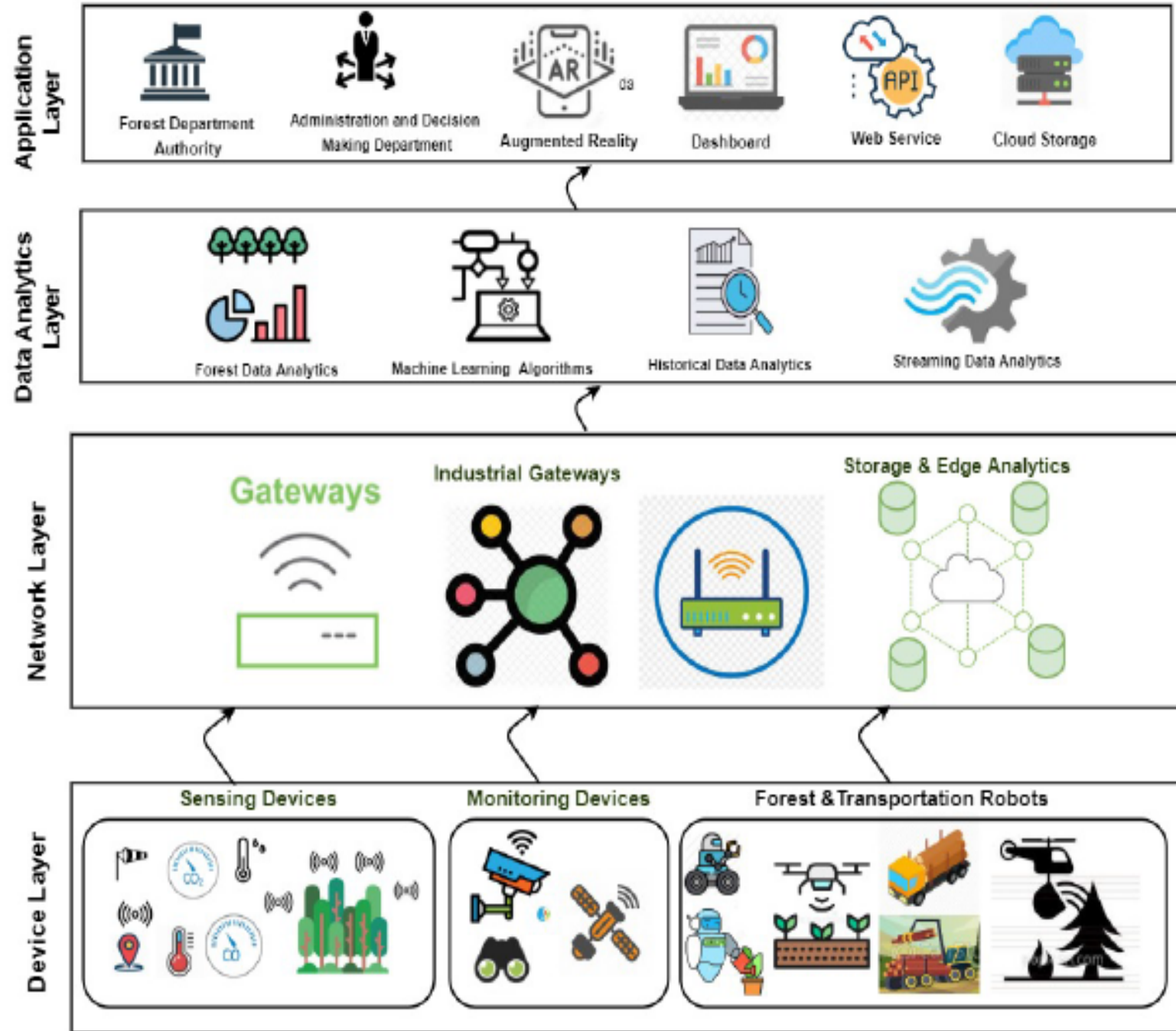
# Forestry 4.0



- **Forestry 4.0** was developed to create solutions for challenges affecting the forest industry, such as **labour shortages, high fibre-supply costs and forest connectivity**, as well as to improve our environmental performance.

# Forestry 4.0

- New computer technology such as **automation, cyber-physical systems, augmented and virtual reality, artificial intelligence** and **the Internet of things** will drastically change the forest industry for the better and ensure its **competitiveness**



# Application Forestry : 4.0

Application Technology 4.0	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
<b>Smart Forestry</b>															
<i>Forest resource inventory (tree based)</i>	√	√	√					√	√	√					
<i>Forest resource inventory (wildlife based)</i>	√	√	√					√	√	√					
<i>Forest boundary</i>		√	√	√				√		√					
<i>Forest product processing (small diameter wood)</i>				√			√			√	√			√	
<i>Forest product processing (non-timber forest products)</i>										√					
<i>Fire risk system</i>		√						√	√	√					
<i>Green/smart certifications</i>						√		√	√	√					
<i>Smart silvo pasture</i>		√	√	√						√					

<b>A</b> Sensors	<b>D</b> Artificial Intelligence (AI)	<b>G</b> Robotics	<b>J</b> Internet of Things	<b>M</b> Augmented Reality
<b>B</b> Remote Sensing	<b>E</b> Bioinformatics and chemoinformatics	<b>H</b> Big Data & analytics	<b>K</b> Automation	<b>N</b> Nano Technology
<b>C</b> Drone	<b>F</b> Blockchain and Traceability	<b>I</b> Cloud Technology	<b>L</b> 3D Printing	<b>O</b> BioTechnology

# Peat Restoration Research-INTPREP 1.0 & 2.0



Field Research in Riau & South Sumatera



GeoSLAM



Picarro



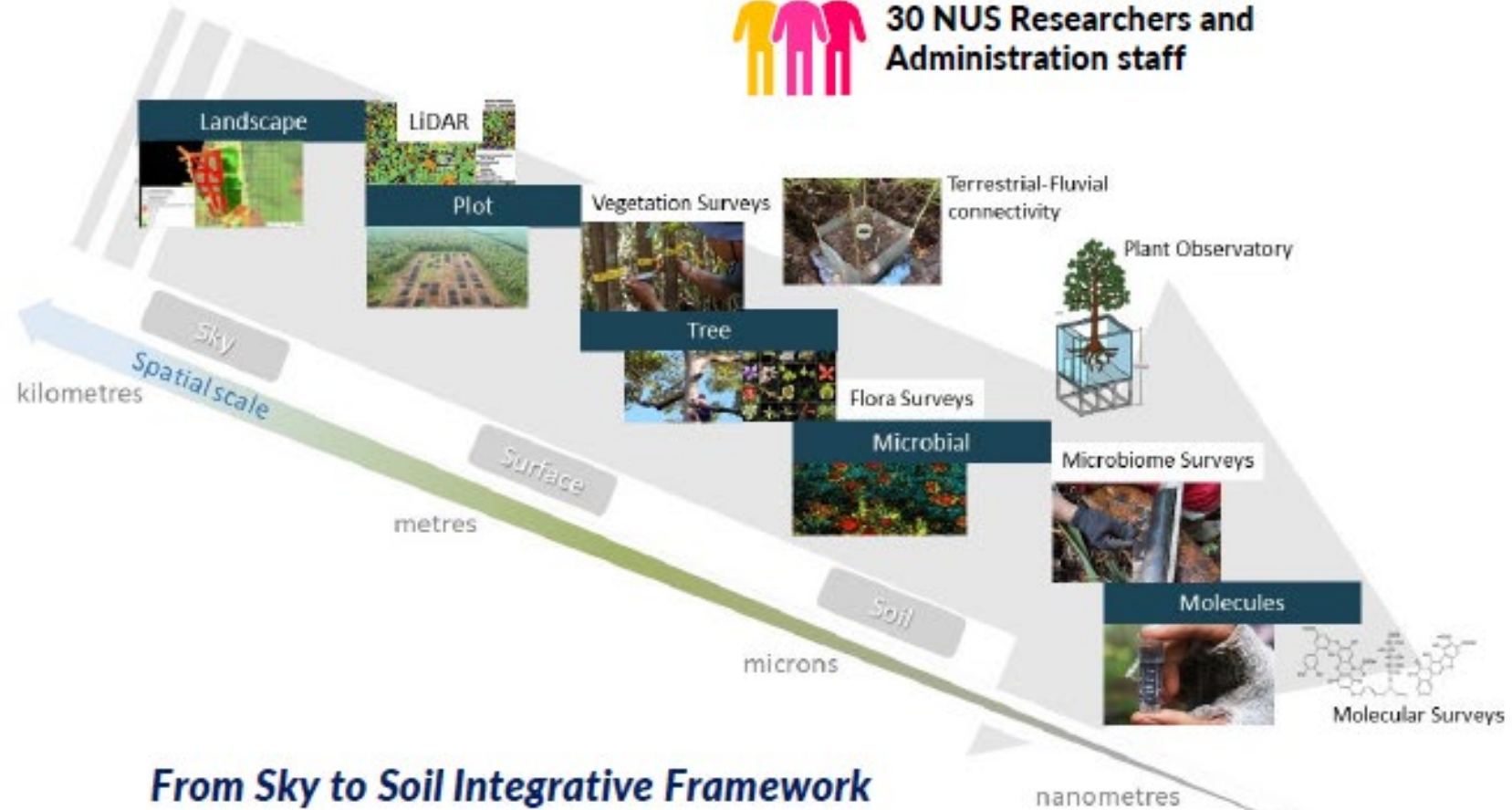
Li-COR Instrument



29 IPB Researchers and Administration staff



30 NUS Researchers and Administration staff

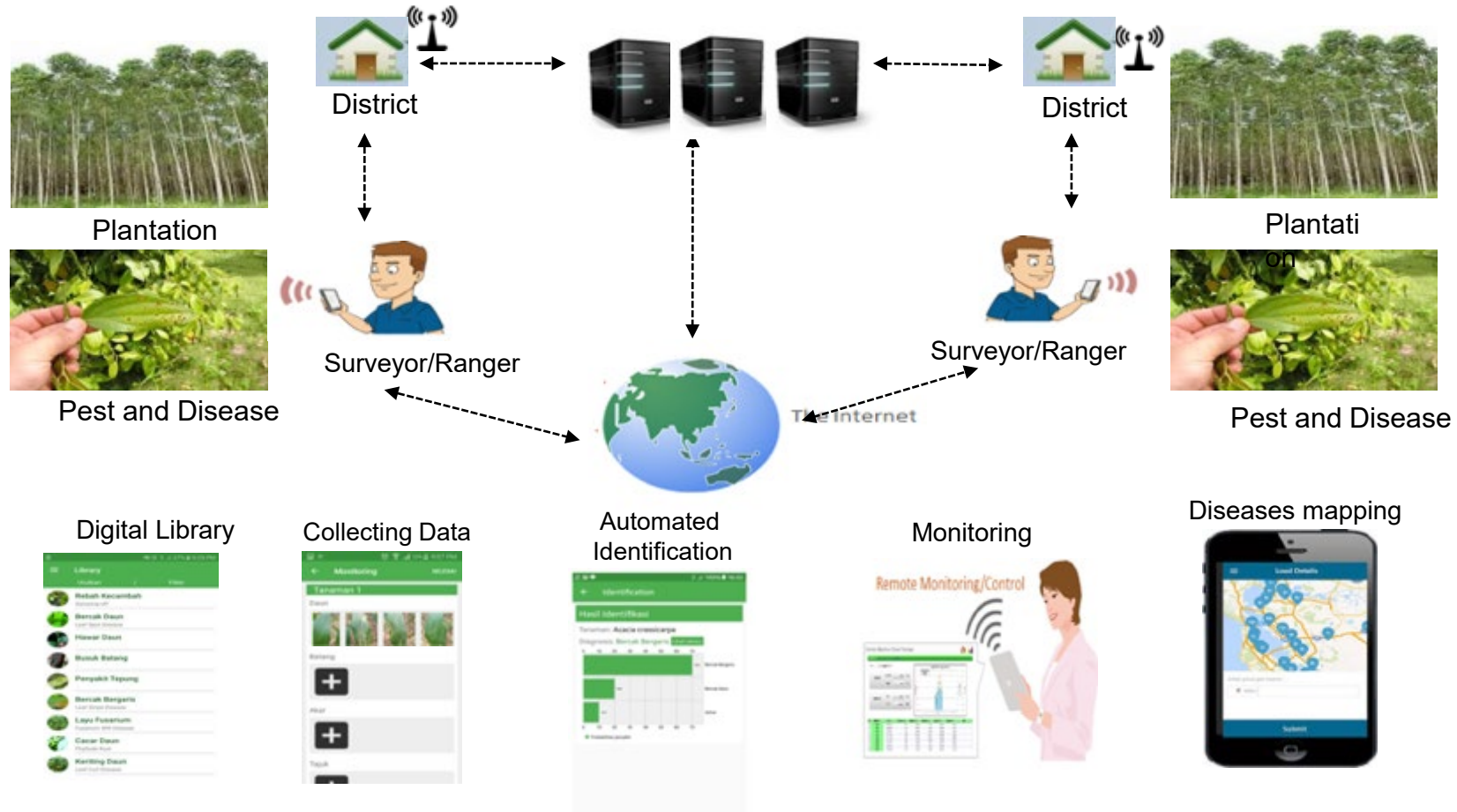


From Sky to Soil Integrative Framework



# SMART *Integrated Pest Management*

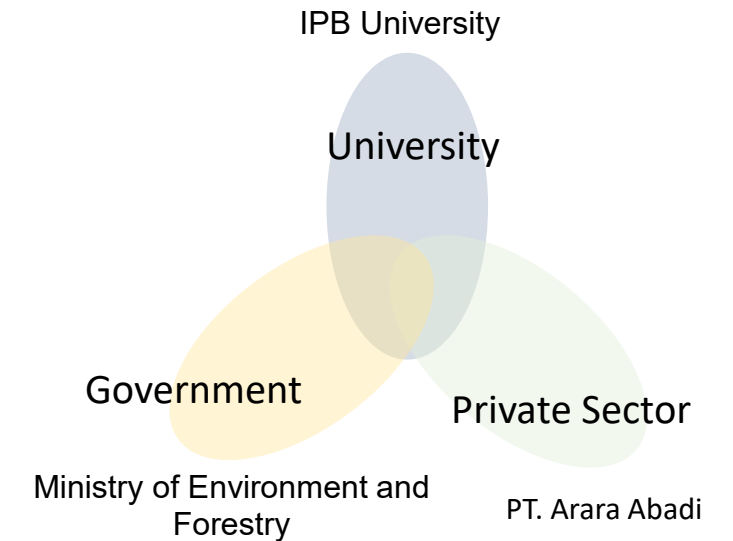
## Fast Pest Detector



### Superiority:

Development of *smart Internet of Thing (IoT)* to monitor plants' health

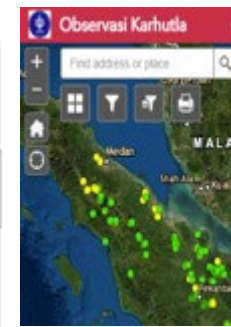
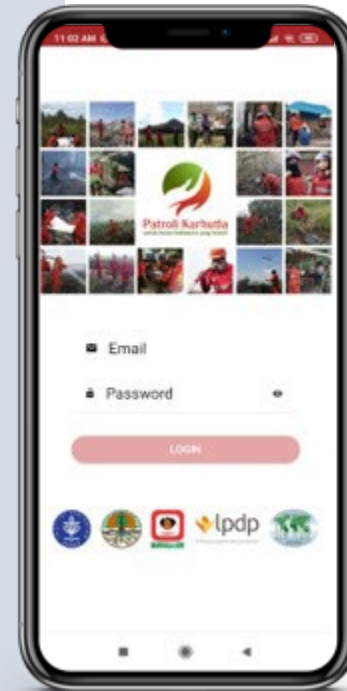
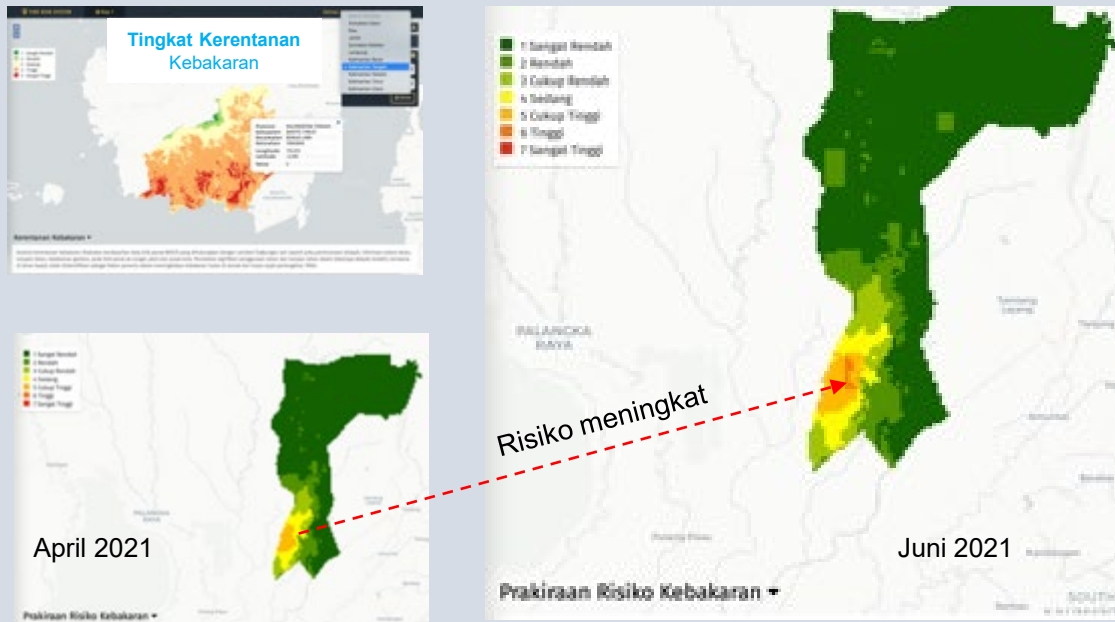
### Triple Helix Partnership



# Smart **Forest Fire** Prevention System

**FIRE RISK SYSTEM (FRS):**  
Forest Fire Prediction System  
<http://kebakaranhutan.or.id>

Mobile App Fire Prevention Patrol  
Forest & Land:



**Superiority :**

1. Manages 68 special parameters on forest and land fire prevention patrol
2. Forest and land fire prevention patrol real time monitoring

- ✓ Fire Risk System provide information on **land and forest fire vulnerability and risk prediction** for the next 6 month
- ✓ 1x1 km resolution on village level

Users:  
Sumatera and Kalimantan Forest and Land Prevention Patrol Team, District Head Operatiion Admin, Admin dan Kepala Balai Pengendalian Perubahan Iklim dan Kebakaran Hutan dan Lahan dan Admin di Direktorat Pengendalian Kebakaran Hutan dan Lahan (PKHL) KLHK





# Ecosystem Platform

## Smart Land Conversion Detection System



GOOD GROWTH PARTNERSHIP

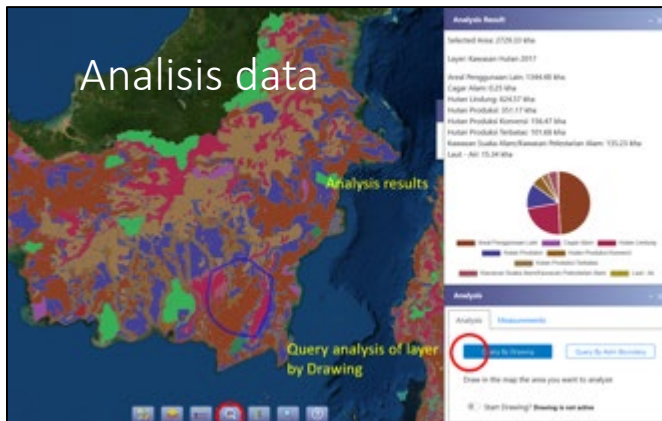


Platform Web-GIS provides:

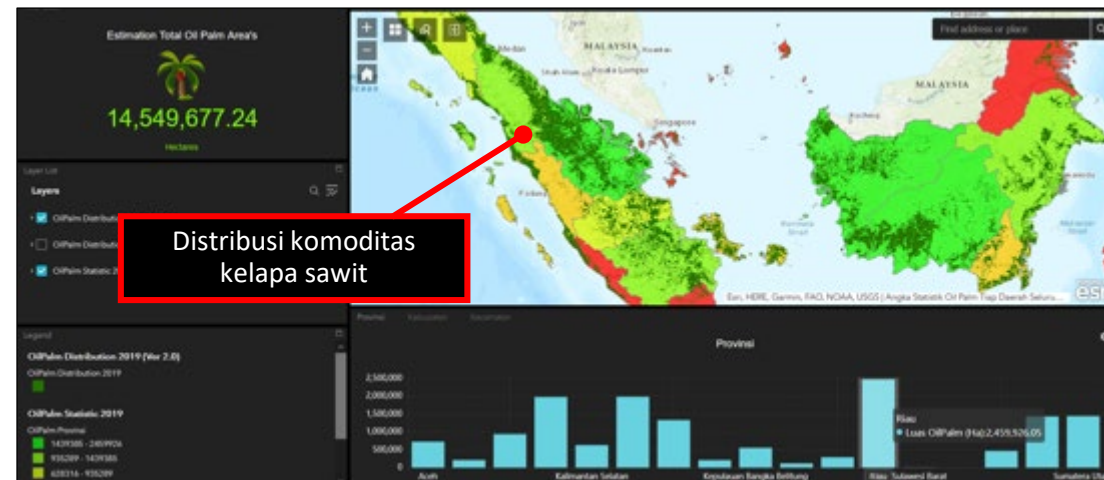
1. National strategic commodity distribution
2. Changes of land usage monitoring;
3. *Early Warning System* for vegetation cover changes per 8 days

EcoSystem Ver.2.0

<http://lulcc.ipb.ac.id/map/>

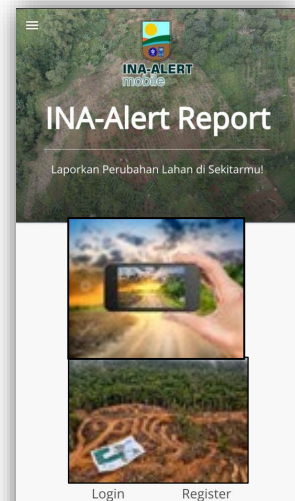


Monitoring Dashboard

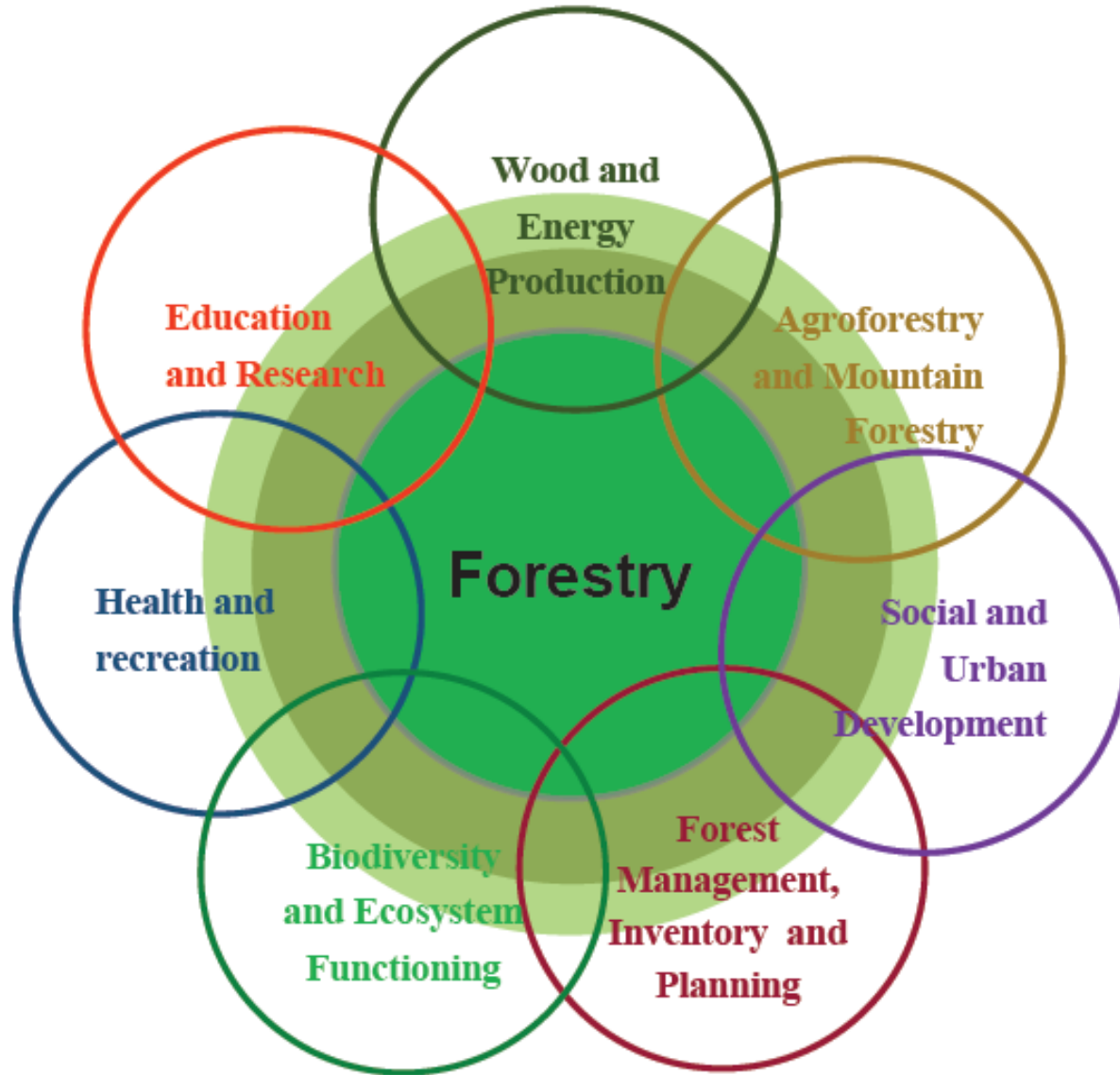


Distribusi komoditas kelapa sawit

INA-Alert mobile apps  
<http://lulcc.ipb.ac.id/ina-alert/apk/>  
Device for verification and collection of EcoSystem field datas



# Future Green Forestry Jobs



*Legend*

-  Traditional Green Forest Jobs
-  New-established Green Forest Jobs
-  Future Green Forest Jobs

# Creative Based Career

- Smart forest policy specialist
- IT – based Forestry – application designer, application management
- Online Forest and Management Business
- Technology and Machinery designer
- Non-Commodity Forest marketing
- Flex Forestry production and services system manager
- Natural disaster business
- Forestry graphic designer
- Forestry adventure, real time tourism
- Etc.

1	Forest Managers	9	Lecturers
2	Silviculturist	10	Eco-Socio Entrepreneur
3	Wood Working/NTFP's Factory Managers	11	Forest Policy Maker, Decision Maker
4	Forest Ecosystem Supervisor	12	Researchers
5	Forest Ranger	13	NGO
6	Forestry Technicians/Staff/Officer		
7	Senior Forestry Consultant		
8	Auditor – Forestry		

## FORESTRY CAREERS

CAREERCLIFF.COM

- Forest and conservation technicians
- Conservation scientists
- Foresters
- Biologists
- Zoologists
- Botanists
- Entomology
- Ecologists
- Forest and conservation workers
- Firefighter
- Geophysicist
- Seismologist
- Working for the federal government
- Ornithologist



# Green Jobs in the Forest Sector

7 Themes Areas	19 Fields of Activity
1. Wood & Energy Production	<ol style="list-style-type: none"><li>1. Wood + Wood Working Production</li><li>2. Pulp &amp; Paper, Composite &amp; Panel Products</li><li>3. Energy Production</li></ol>
2. Regional and Land Use Development	<ol style="list-style-type: none"><li>4. Agro-Forestry and Landscape,</li><li>5. Watershed &amp; Soil Bio-Engineering</li></ol>
3. Social & Urban Development	<ol style="list-style-type: none"><li>6. Urban Forestry and Arboriculture</li><li>7. Culture &amp; Forest</li></ol>
4. Forest Management, Inventory and Planning	<ol style="list-style-type: none"><li>8. Forest Inventory and Forest Monitoring</li><li>9. Planning, Governance, Sustainable Forest Management</li><li>10. Pest, Diseases and Forest Fires</li><li>11. Risk Management and Contingency Planning.</li></ol>
5. Biodiversity & Ecosystem Functioning	<ol style="list-style-type: none"><li>12. Biodiversity Conservation and Nature Protection</li><li>13. Climate Change</li><li>14. Forest Environment and Waters</li><li>15. Bioprospecting &amp; Myco-Forestry</li></ol>
6. Health & Recreation	<ol style="list-style-type: none"><li>16. Forest Eco-Theraphy</li><li>17. Recreation, Leisure and Sports</li></ol>
7. Education & Research	<ol style="list-style-type: none"><li>18. Education, Training &amp; Knowledge Transfer</li><li>19. Forestry Research</li></ol>

# Concluding Remark

- The future for forestry is **exciting and bright**. The forest sector is in a good position to make the **Sustainable Revolution** a reality.
- The Forestry 4.0 overarching goal of using technology to solve operational challenges while also **creating a green job for sustainable forest industry**.





**Thank You**

*Protect the Nature, Preserve the Future*