

# Where next for Asia-Pacific collaboration in forestry education?

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# Outline

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- Where university forestry education has come from
- How AP-FECM has contributed to that
- Where it might be going
- How Covid has (or has not) changed this direction
- Some thoughts on the future

# Forestry education

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- Early education was focused heavily of the economic aspects of forestry, especially associated with economic liberalism, and focused on how to maximize the profit for landowners
- It resulted in the development of the *normal forest* concept, and tools such as the Faustmann formula, as well as a strong emphasis on inventory, growth and yield modelling, and maximization of productivity

# Forestry education

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- This worked fairly well where it originated, namely in the heavily degraded landscapes of Europe where new plantations could be readily established
- It was much less applicable in areas where large forest areas still existed, including in what were then the colonies of various European empires

# Forestry education

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- The early 1900s saw a rapid increase in the number of forestry schools in some parts of the world
- Most countries had training colleges for forestry technicians, and many universities established forestry programmes, particularly the US land-grant universities
- There was some resistance: when UBC was established, it was supposed to have a School of Forestry, but the inaugural President decided not to have one.

# Forestry education

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- The latter part of the 20<sup>th</sup> century saw the gradual broadening of many forestry programmes with a number of trends in forestry education evident:
  - A shift towards a more holistic understanding of forest ecosystems
  - A much greater emphasis on the social aspects of forests, including the management of both people and trees
  - Attention given to alternative valuation systems

# Forestry education in decline

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- However, by the end of the 20<sup>th</sup> century, many of the schools established over the previous 100 years were in crisis, with falling enrollments and very high costs
- This resulted in the closure of some schools, mergers and rebranding
- An AP-FECM survey of universities in the Asia-Pacific region in 2017 indicated that of the 87 universities offering forestry programmes, only 26 had distinct forestry units, while at 61, forestry was offered by combined units (e.g. 'Forestry and Landscape Architecture') or other units (e.g. 'Ecology')

# Has the decline reversed?

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- Recent years has seen a reversal of this decline in some places, but others continue to struggle
- Globally, demand for traditional forestry has been increasing, in line with increasing demands for forest products
- The broadening of the subject to include conservation and environmental sciences has also attracted more students



# Forestry education in transition

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## Example

- The University of Melbourne changed the name of their 'Master of Forest Ecosystem Science' to 'Master of Ecosystem Management and Conservation'. The result was an immediate increase in enrollment
- The new program is based on the principles of forestry, bushfire management, ecosystem function and climate change, but has more focus on community engagement, policy and governance, and new technologies
- We will hear more about this change during the meeting

# Forestry education in decline

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- The broadening of the subject has been accompanied by increased disciplinary diversity of those teaching forestry
- The downside is that many members of forestry faculties have never taken a course in forestry, and it is now a rarity to find an academic forester with professional forestry accreditation (such as *Registered Professional Forester*). Unaccredited faculty members argue that this does not matter.

# AP-FECM

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- The AP-FECM was established at a time when such trends were very apparent
- Some western universities were well-resourced but short of students, whereas some universities in Asia were over-stretched and lacking in capacity
- Knowledge transfer and, ultimately, exchange of students and faculty were seen as potential solutions

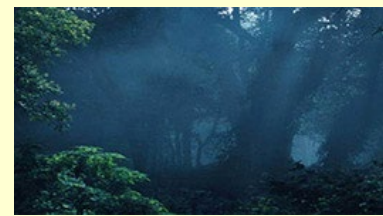
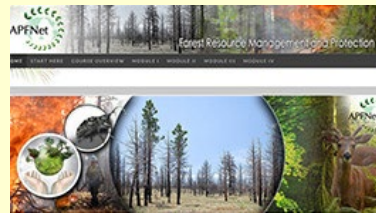
# AP-FECM

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The APFNet and AP-FECM adopted multiple approaches:

- Regular meetings that facilitated the exchange of knowledge
- Development of freely available online courses
- Exchange of students
- Scholarships for international students
- Examination of pedagogical methods
- Surveys of the current state of forestry education

# AP-FECM Online courses



# AP-FECM online courses

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- Sustainable forest management in changing world
- Forest governance, public relations, and community development
- International forestry issues, institutions and multi-lateral agreements
- Restoration of degraded forest ecosystems and forest plantation development
- Forest resource management and protection
- Plantation design and management
- Structure and composition of tropical forest ecosystems
- Ecological processes in tropical forests

# AP-FECM online courses

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- Geomatics in forestry: Data collection and management
- Climate modelling and forest applications
- Conservation in Asia: Challenges and opportunities
- Introduction to urban forestry in the Asia Pacific region
- Natural forest management in the tropics

# Awards for the AP-FECM Online courses



Open Innovation 2022



FAO – IUFRO 2019



CNIE 2016



# 2020

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- In early 2020, the COVID-19 pandemic struck, forcing massive change, some of which continues to today
- Many universities pivoted to online delivery of course materials, forcing faculty members to adopt new technologies
- Traditional experiential learning became almost impossible, although nimbler institutions were able to adapt

# 2020

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- Between February and April 2020, five of the courses were re-purposed, and taken by 1565 students from 32 universities in China
- September – December 2020, 1224 students from 135 universities in the Asia Pacific were involved

# Online delivery

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- Many students have expressed preference for face-to-face instruction, provided that it is safe
- For some, the possibility of following recorded lectures has proven attractive, a trend that was already apparent in some places pre-Covid
- Online delivery works for people who have day jobs, have responsibilities that keep them at home, who live in remote communities (provided that internet access works), and others

# Online delivery

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- Some materials may actually be better taught online, and many students are very familiar with using online resources to learn how to do something technical
- Even field skills can be taught online, although many believe that nothing so far devised beats the hands-on experience

# Online delivery



Screen grab from a video that used a drone to capture views that would be impossible in the field

# Online delivery



Bird's-eye view of a stream crossing, taken using a drone

# Online delivery

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Advantages of online delivery include:

- Not weather-dependent
- No distractions such as mosquitoes, snakes, or bears
- Larger audiences are possible
- Can integrate different views, diagrams and other materials
- 360° video, 3-d photography, virtual reality, augmented reality and other techniques offer a lot of scope

# Diversification of course delivery

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- The restrictions associated with Covid-19 have accelerated some of the nascent innovations in the education world
- As well as new pedagogical ways to deliver material to students, new forms of education are being developed and implemented, such as micro-certificates. These are ideally suited to skills acquisition
- Different types of graduate education are emerging – as a means to gain expertise and to provide a competitive edge





## UBC Faculty of Forestry

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## ONLINE MICRO-CERTIFICATE: CLIMATE VULNERABILITY & ADAPTATION

### What is the Climate Vulnerability and Adaptation (CVA) Micro-Certificate?

The Faculty of Forestry's Climate Vulnerability and Adaptation (CVA) Micro-Certificate is a flexible 8-week online program that provides forest professionals with an understanding of climate science, vulnerability assessments, adaptation development, and how it is applied to management and business case adaptation.

[WATCH THE 2022 MICRO-CERTIFICATES INFO SESSION](#)

### Why Choose the CVA Micro-Certificate?

Today, government and certification agencies are requiring more accountability in meeting climate change, and green industry standards. This has resulted in a surge in demand for working professionals who wish to advance their knowledge in the field of climate science, assessment and application of climate impacts and adaptation in a forestry context.

CVA offers science-based, practical, hands-on training for professionals, including those currently working and those seeking to gain additional skills to better their employment



**SHERI ANDREWS-KEY**  
Program Director

As a leader in climate adaptation and development across Canada, program director Sheri Andrews-Key shares how the CVA program brings science and theory into action, and offers professionals the experience needed

# Hybrid delivery

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- Hybrid systems are benefiting both students and faculty
- These already existed prior to Covid (e.g., recording lectures and making them available on Intranet sites)
- Online presentations from specialist guest lecturers can greatly enhance classes
- Similarly online seminars make it feasible to have speakers from all over the world, improving faculty knowledge
- Online and hybrid conferences are increasing the accessibility of scientific expertise, especially for participants from developing countries, but do have disadvantages

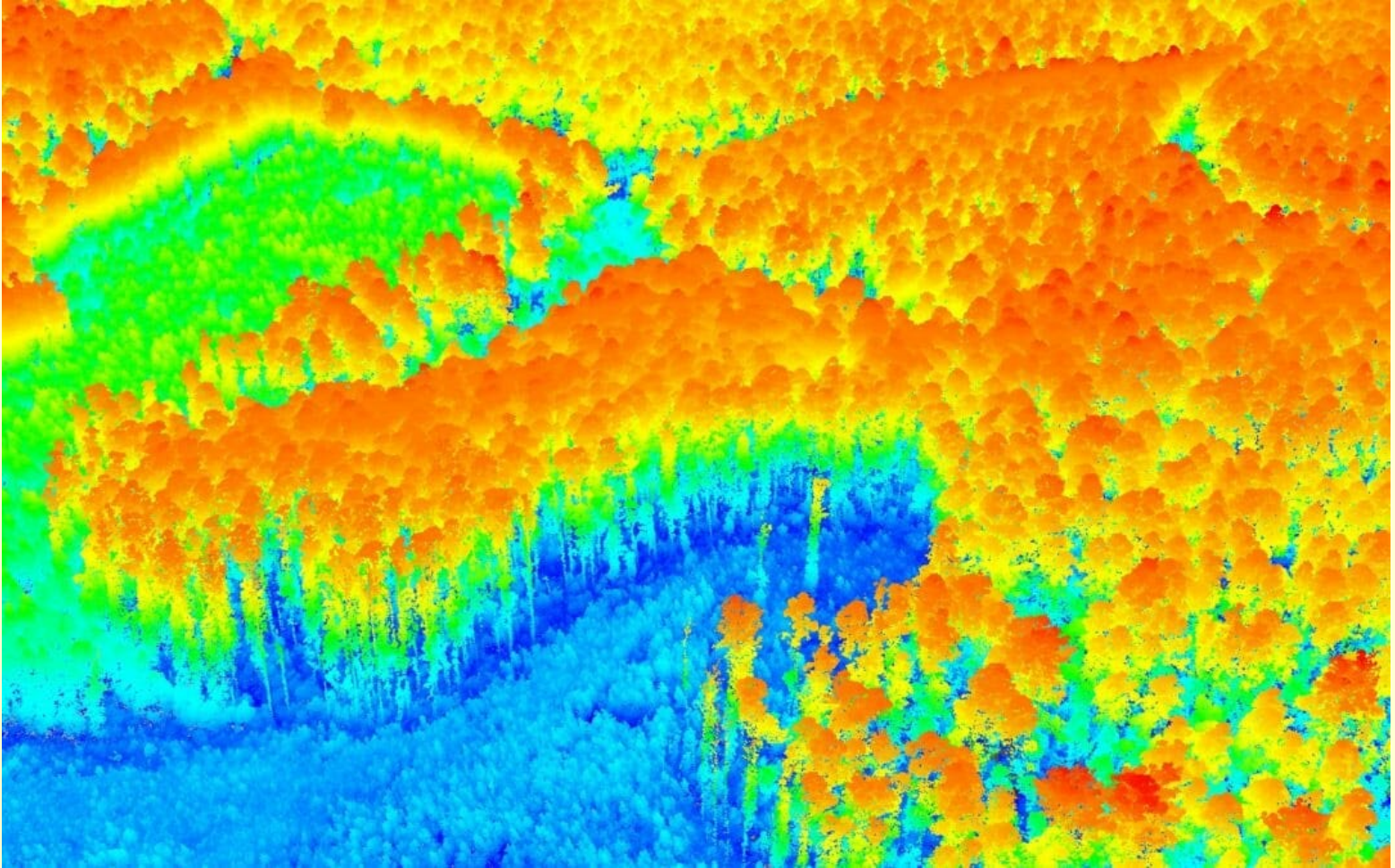
# New technologies

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Nitoslawski *et al.* (2021) have reviewed the use of new technologies in examining forest ecosystem resilience, including

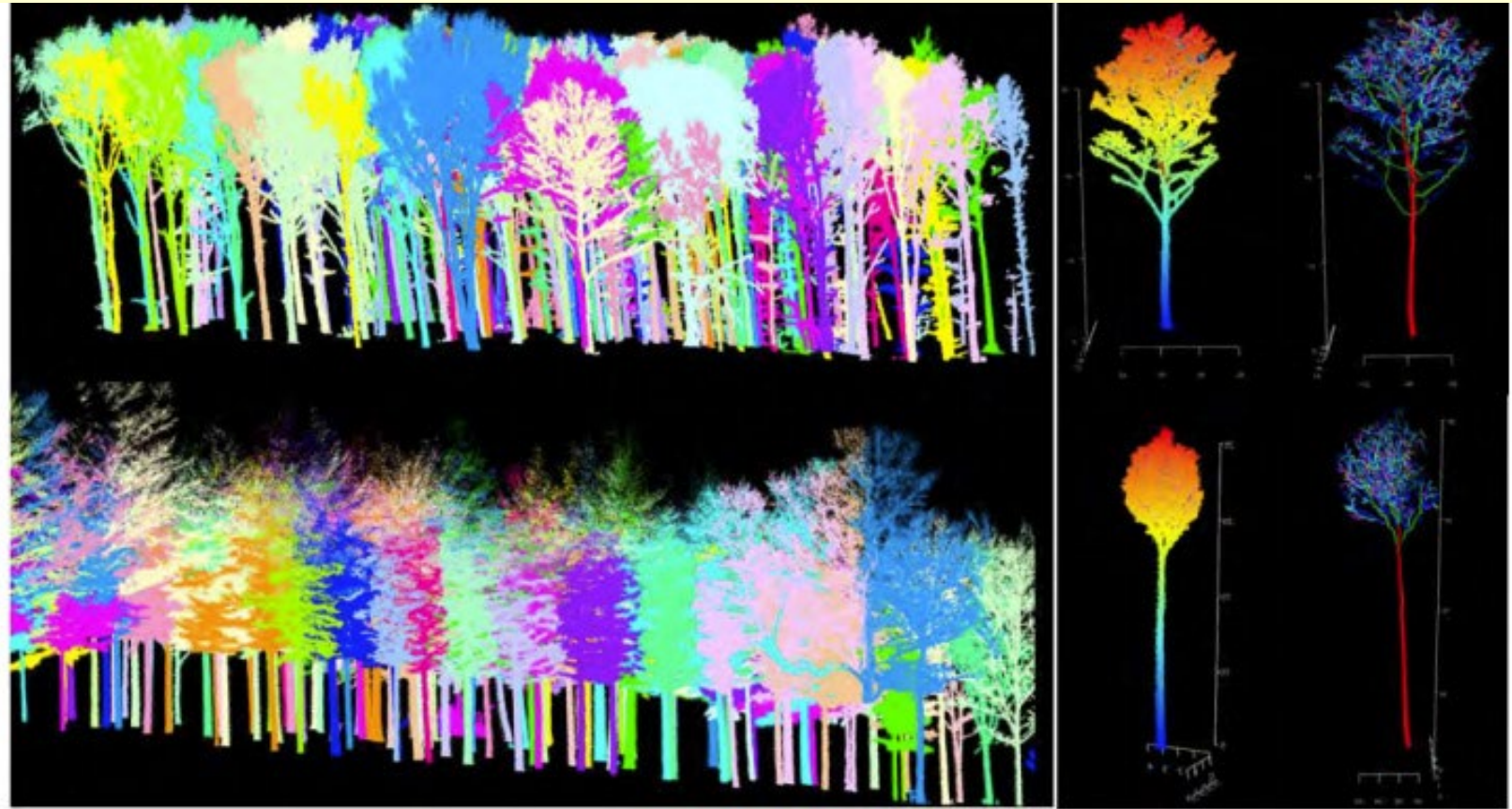
- Remote sensing, including machine learning
- Data fusion and 'big data'
- Virtual/augmented environments
- Automated workflows
- Use of social media and mobile tracking applications
- The Internet of things

# New technologies – remote sensing



LiDAR image from Victoria, Australia

# New technologies – remote sensing



High-density LiDAR imagery, Ontario, Canada, derived using Hovermap technology (© Emesent). This can operate in GPS-denied environments.

# New technologies – drones



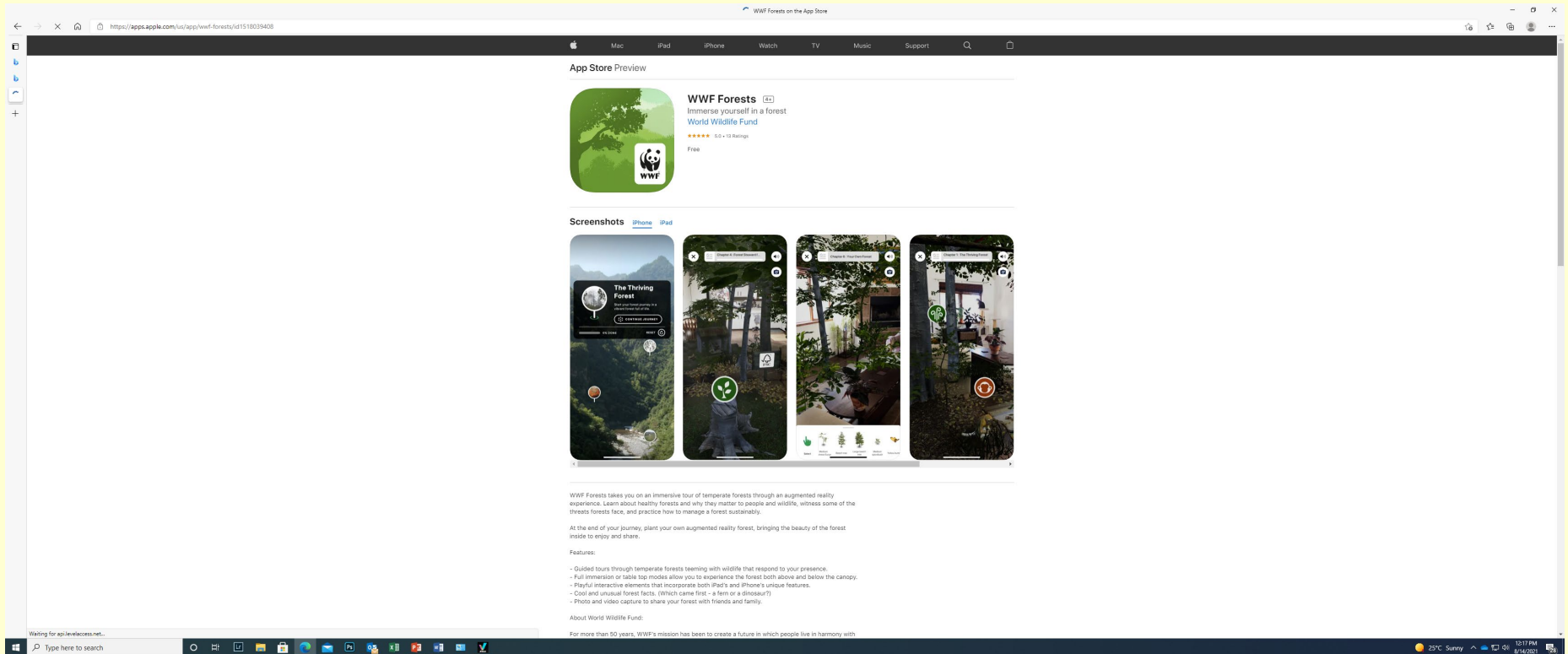
Drones are increasingly being used, including for LiDAR, and almost anyone can operate a simple drone to take photos. Operating a drone swarm as part of seeding program takes a lot more knowledge

# New technologies – big data



The Finnish EFFORTE project is combining terrain data, real-time weather, tree profile data and equipment data (such as how much the tires are sinking into the ground) to optimize harvesting.

# New technologies – augmented reality



WWF Forests is an augmented reality app used for educating the general public about temperate forests. Tools such as this could be readily applied to university education, skills training and many more applications.



# New technologies – automated workflows

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Maltezos *et al.* provide an example of automated workflows involving:

- Spatial Models (SMs) that ingest available time-series data and pre-process data
- SMs that calculate time-series of vegetation, soil and water indices from multispectral optical imagery
- SMs that create coloured composite images from image algebra  
SMs that extract change detection maps from time-series SAR data

The results are applied to forest health monitoring

# New technologies – tracking



Numbers of people visiting parks in Davao City Metropolitan Area from 3 September to 15 October 2022, obtained from Google Covid-19 Community Mobility Report. The baseline is the median values for relevant day of the week 3 Jan – 6 Feb 2020.

# New technologies – Internet of Things

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- The Internet of Things (IoT) provides the connections between many of the other technologies already mentioned
- Already in use in many places – such as forest fire hazard assessment
- It also provides the connections to other sites: for example ensuring logs that have already been harvested, scanned (internally and externally) and tagged are sent to the right mill, controlled by the real-time needs of the mill. At the mill, the equipment can be automatically optimized – and there are also possibilities of digital proof of chain of custody for piece of wood

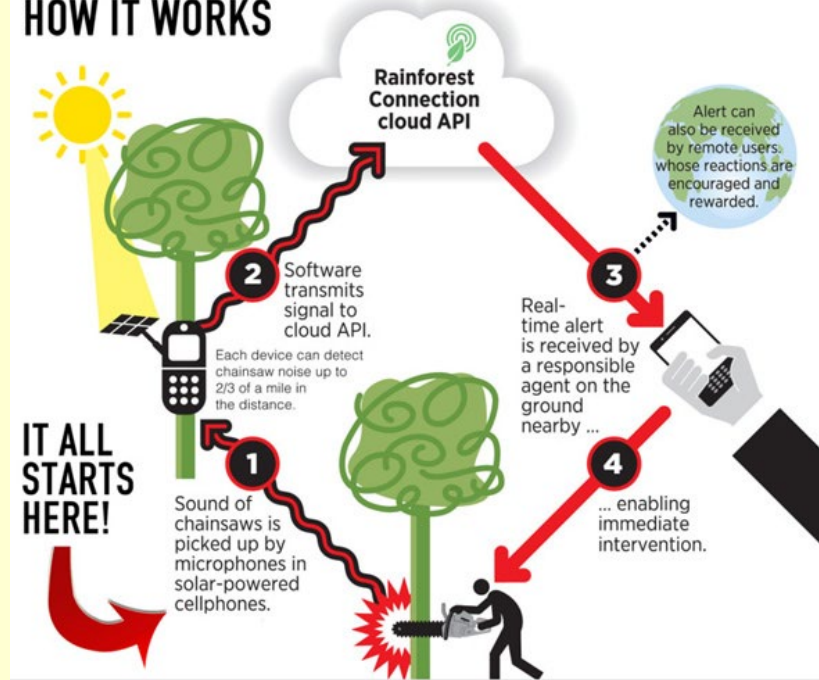
# New technologies – Internet of Things



**RAINFOREST CONNECTION** PLEASE NOTE: The physical placement of the Rainforest Connection (RFC) hardware shown here is intended for display purposes only. In this scenario, the hardware is low-mounted on an exposed tree trunk in order to enhance visibility. When properly installed higher in tree canopies, RFC hardware is well-obscured and considered virtually invisible.

Rainforest Connection has partnered with the Zoological Society of London since 2014 to install listening devices in rainforests in Cameroon

## RAINFOREST CONNECTION: HOW IT WORKS



How detection of illegal logging by the Rainforest Connection compares to detection by satellite imagery.



# Who will do this?

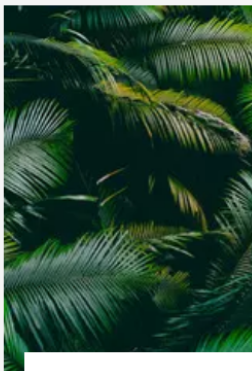
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- Developing, operating and maintaining such technologies will require very different sets of skills. Will it mean that foresters are no longer needed?
- Foresters will still be needed for most of the functions that they perform today. However, they will have a much wider range of tools available to them
- Many of the jobs done by technicians may be replaced (tree-planting, harvesting, logging-truck drivers), just as many mill-based jobs have already been replaced by automation

# Government and corporate engagement: One Trillion Trees initiative

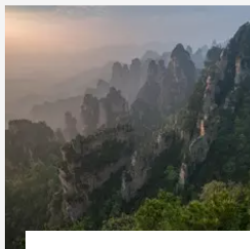
REGIONAL ENGAGEMENT

## Our work around the world



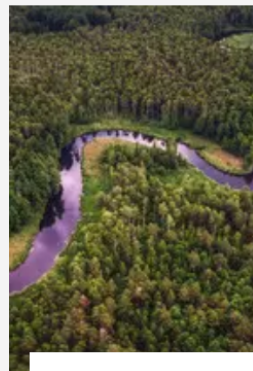
### INDIA

India has made bold commitments to restore 26 million hectares of deforested and degraded land and sequester 2.5 to 3 billion tons of CO2 equivalent through additional forest and tree cover...



### CHINA 中国

China will aim to plant and conserve 70 billion trees by 2030 as part of the global tree movement... 中国计划在2030年前种植和保育700亿棵树作为全球植树行动的一部分



### THE AMAZON BASIN

As the single largest tropical rainforest on the planet, home to 10% of the world's species and 30 million people, establishing a sustainable bioeconomy in the Amazon...



### UNITED STATES

The US Chapter of 1t.org has mobilized ambitious pledges to conserve, restore and grow trees from a diverse range of corporations, NGOs, and state and local governments...

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# General challenges facing forestry education

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- Capacity

# Budgets and resources

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- Maintenance of traditional research and teaching collections is a particular problem
- Very few xylaria now exist. Some have been digitized, but how do you smell a digital image?
- Arboretums, bambusetums, and botanical gardens in general are often under-resourced and deteriorating
- This is resulting in reduced taxonomic skills amongst faculty and students



# Geopolitical issues

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- APFNet and AP-FECM were established at a time when much of the world was excited about globalization
- The world has since changed, and many economies are becoming increasingly inward-looking
- The exchange of students is already experiencing difficulties, and there are increasing concerns about the sharing of knowledge
- Such moves are in direct conflict with AP-FECM's objectives

# Conclusions

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- Forestry education has evolved considerably over the past 300 years, and continues to evolve
- AP-FECM has been very successful in encouraging training and in providing knowledge exchange between member economies
- The online courses have been particularly valuable, and when re-purposed during COVID, provided a lifeline for many students
- In the future, we should build on strengths while exploring the use of new technologies