SMARTWARD

SATY

Brief

June 2025

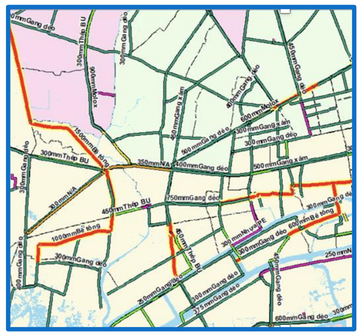
01 SmartWard Overview

SmartWard Basic Components

MULTI TENANT

Aktivmap

Management
Monitoring
Adaptability



GIS

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AMS

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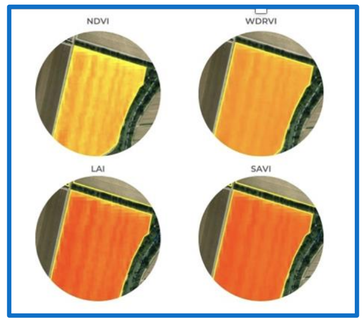
Optical image RS

Planet

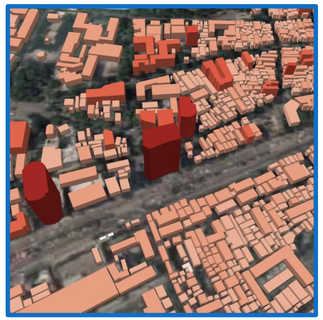
SAR RS

Synspective



NDVI

Planet



3D map

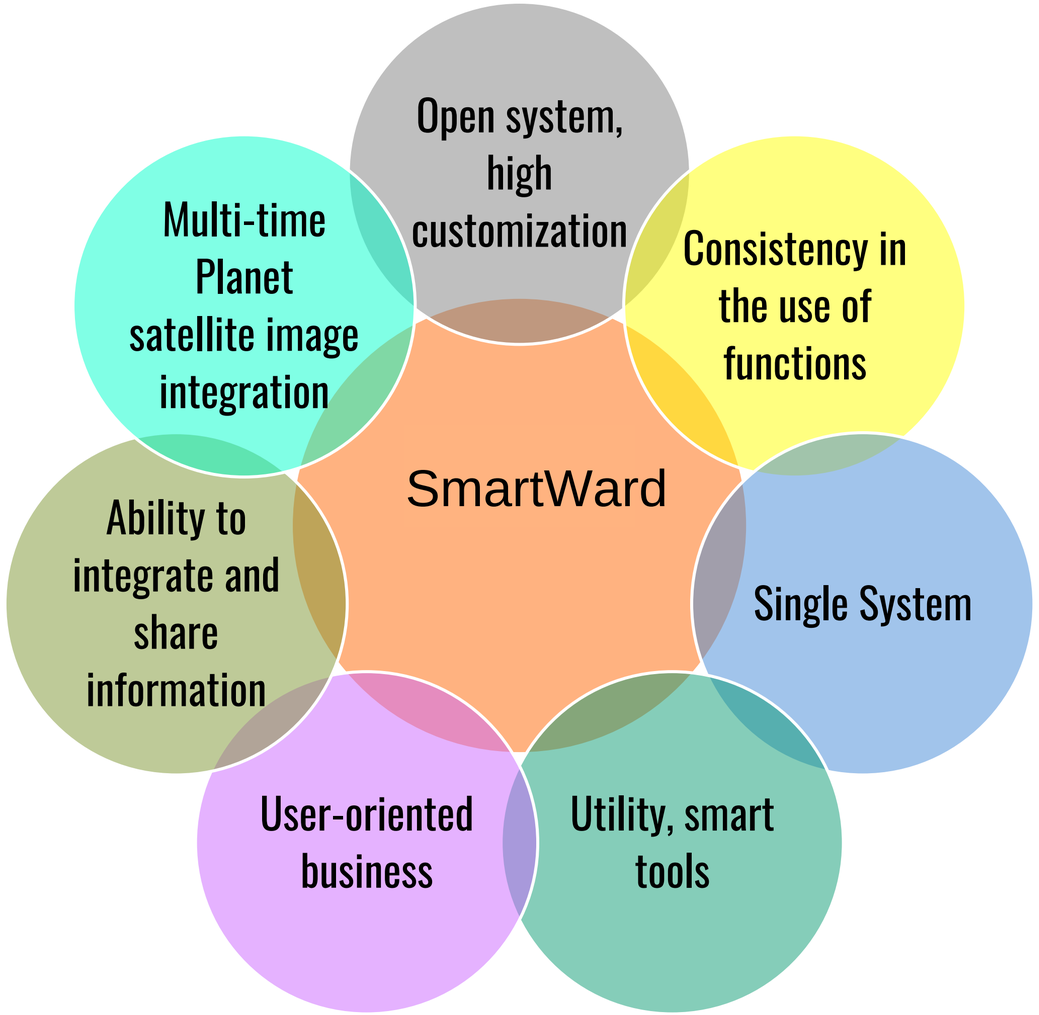
Intermap

SmartWard+ Management Solution

- Asset and infrastructure management
- Task Management
- Incident management
- Technical Profile Management
- Maintenance management
- Plan Management
- Planning management
- Statistics and reports
- Collect field reflections
- System Integration ...

SmartWard+ Combining EAMS and GIS

- SmartWard is a single system that includes full EAMS + GIS
- Manage GIS and non-GIS assets
- Support for operation – maintenance, statistics, asset inventory, reporting, periodic planning
- Supporting the planning and expansion of the asset network
- Better management of work and resources
- Management of backup material warehouses, allocation of operation and maintenance materials
- Centralized management of technical documents, concentration of knowledge and experience



SmartWard+ Fields of application

Hospital Management

Airport Management

Trees, lighting

Water supply and drainage

Telecommunications Management

Construction Management

SmartWard+ Fields of application

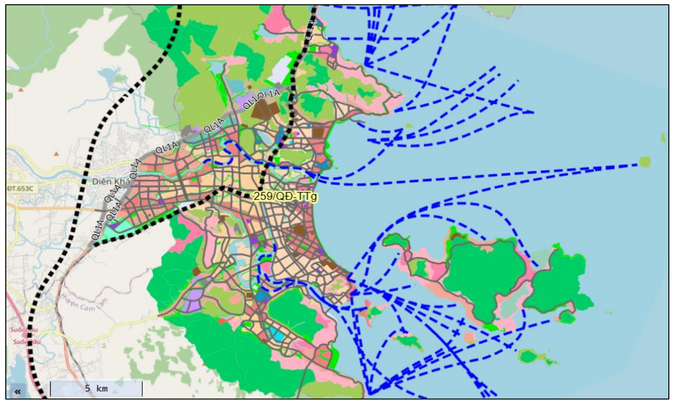
Biodiversity conservation

Agriculture

Resources and environment

Landslide Monitoring

Forest Fire Prevention



Planning publicity

02

SmartWard Solutions in the fields

- Urban infrastructure management: trees, lighting, water supply, drainage, construction, traffic
- publicity of the plan
- Management of asset leasing services
- Forest Fire Prevention
- Biodiversity conservation
- Reflect the scene on the mobile application
- Disaster Response
- Environmental Resources
- Digital maps and shared databases
- Industrial zone Management
- Agriculture
- Forest Monitoring
- Change Detection Solution
- Monitoring of landslides
- Subsidence monitoring of construction works (bridges)
- Monitoring the subsidence of dike works
- Mining Slide Monitoring

SmartWard+ Water Supply Infrastructure Management

- Intuitive, accurate and efficient management of water supply network system on a digital map
- Monitor water supply network operation:
  - Real-time flow monitoring, pressure, measurement indices
  - Support to detect leaks, water loss
  - Trouble warning when the measurement index exceeds the threshold or loses signal
- Asset maintenance and repair management: support for periodic maintenance planning, maintenance scheduling, repair history
- Water supply infrastructure incident management: receiving incidents, coordinating and handling incidents, monitoring progress and updating field reports, reports and assessments
- Dynamic, flexible and intuitive reporting and statistical tools: operational reports, water consumption statistics, loss rates, etc.
- Customer management and connection services: connection records, water use status, incident reports from residents
- Integration of multi-disciplinary data and other systems (ONMS, SCADA, Hydraulics, urban planning data, traffic/drainage data...)
- Dashboard
- Support tracking and monitoring of infrastructure with multi-time Planet satellite images
- Portal for data publicity, search, incident reception
- Reflecting the scene using mobile applications

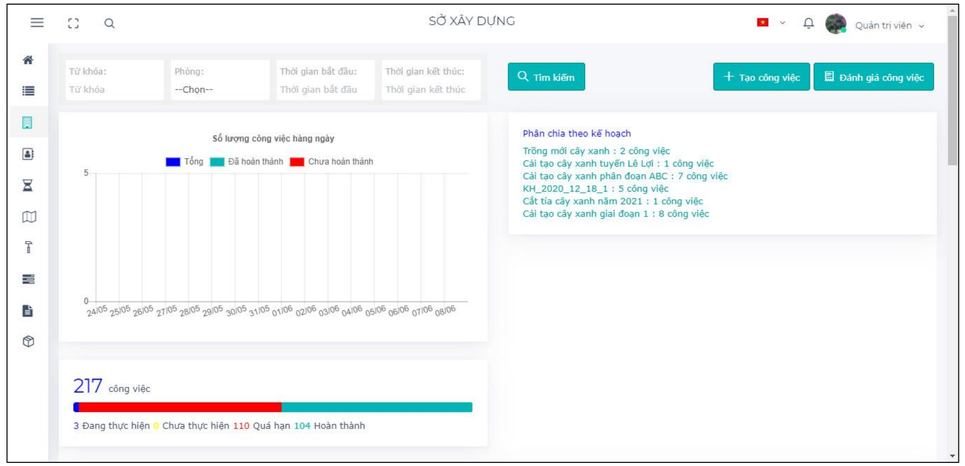
STT	Hình ảnh	Thông tin công việc	Quản lý/Quy trình	Thông tin ticket	Trạng thái ticket	Trạng thái công việc
1		WO-20560 Lắp đặt tài sản Cao 02/03/2020-02/03/2020 Mức ưu tiên: Cao	Người quản lý: Quản trị viên		Chưa có ticket	Đã phân công
2		WO-20555 Xử lý sự cố mạng lưới tài sản Cao 02/03/2020-03/03/2020 Mức ưu tiên: Cao	Xử lý sự cố mạng lưới tài sản Bước thực hiện: Kiểm tra sự cố mạng lưới Người quản lý: Trưởng phòng kĩ thuật mạng lưới	#20138 [Kiểm tra sự cố mạng lưới] Cao Người giao: Trưởng phòng kĩ thuật mạng lưới Người nhận: Nhân viên phòng kĩ thuật mạng lưới Mức ưu tiên: Cao	Đã phân công	Đã phân công
3		WO-20552 Xử lý sự cố tài sản Cao 02/03/2020-03/03/2020 Mức ưu tiên: Cao	Người quản lý: Tổ trưởng tổ sữa chữa		Chưa có ticket	Đã phân công

SmartWard+ Drainage Infrastructure Management

- Intuitive, accurate and effective drainage network management on a digital map
- Supervision of the operation of the drainage network
  - Monitor flow, water level, flow rate
  - Monitor rainwater and wastewater pumping stations
- Flood forecast and operation coordination: analysis of flood risk according to rainfall, support for proposal to open pumps, regulate lakes, close/open sewer gates
- Incident management and response to flooding: detect and handle sewer blockages, water overflows, sewer breaks, power outages of pumping stations; Recorded flooding due to feedback from residents
- Management of system maintenance and hygiene: making plans for maintenance, dredging, periodic inspections; management of cleaning teams
- Management of planning and investment in upgrading: analysis of network expansion needs; connection of zoning planning, drainage planning
- Environmental analysis and water quality monitoring: integrate an environmental monitoring system to monitor the quality of wastewater output, water quality at the discharge outlet
- Statistics – reporting – decision-making: reporting on the operation situation, flooding status, system capacity; breakdown, maintenance, investment statistics
- Integration of multi-disciplinary data and other systems (monitoring stations, urban planning, traffic/water supply, etc.)
- Dashboard
- Support tracking and monitoring of infrastructure with multi-time Planet satellite images
- Portal for data disclosure, search, incident reception
- Reflecting the scene using mobile applications

SmartWard+ Urban Tree Management

- Manage a unified and intuitive tree database on maps, statistics, make a list of each tree (species, age, height, trunk diameter, condition, etc.)
- Monitoring the condition and health of trees: monitoring the current status of growth, pests, tilted trees, root rot, broken branches, etc.; Updating Periodic Inspection Information
- Management of maintenance, pruning and care: planning and monitoring of pruning, watering and fertilizing; assign work to the construction unit, effectively supervise
- Management of new planting and replacement of trees: support to propose new planting locations, replacement of dead trees, management of nurseries, backup trees
- Management of units, human resources and maintenance equipment: Management of worker teams, forklifts, irrigation trucks, equipment
- Statistics, reports, analysis: report on the number of trees by type, age, area, analysis of tree density, development needs
- Operation Dashboard
- Integration of planning data and related infrastructure: synchronous with traffic planning, works, electricity – telecommunications, avoiding planting in the wrong location that hinders infrastructure
- Support tracking and monitoring of infrastructure with multi-time Planet satellite images
- Portal for data disclosure, search and receipt of feedback from people
- Reflecting the scene using mobile applications



SmartWard+ Urban Lighting Management

- Unified lighting database management, visual on the map, parameter management (lamp type (LED/HID), power, installation date, GPS location)
- Monitoring the operation of the lighting system: monitoring the on/off status, monitoring the operating status of the equipment
- Lighting control automation: integrated remote control system (SCADA, IoT), flexible on/off scheduling according to time
- Incident management and equipment maintenance: detect broken lights, short circuits, disconnections, routine maintenance planning
- Optimization of energy consumption: analysis of electricity consumption in each area and route; Support for suggesting replacing old lights with energy-saving lights
- Management of operating units, human resources and equipment: assign maintenance work, record time and costs; Track backup equipment, forklifts
- Statistics, reports, analysis: report on system status, maintenance schedule, power consumption, analysis of areas that need to be upgraded or expanded
- Dashboard
- Support tracking and monitoring of infrastructure with multi-time Planet satellite images
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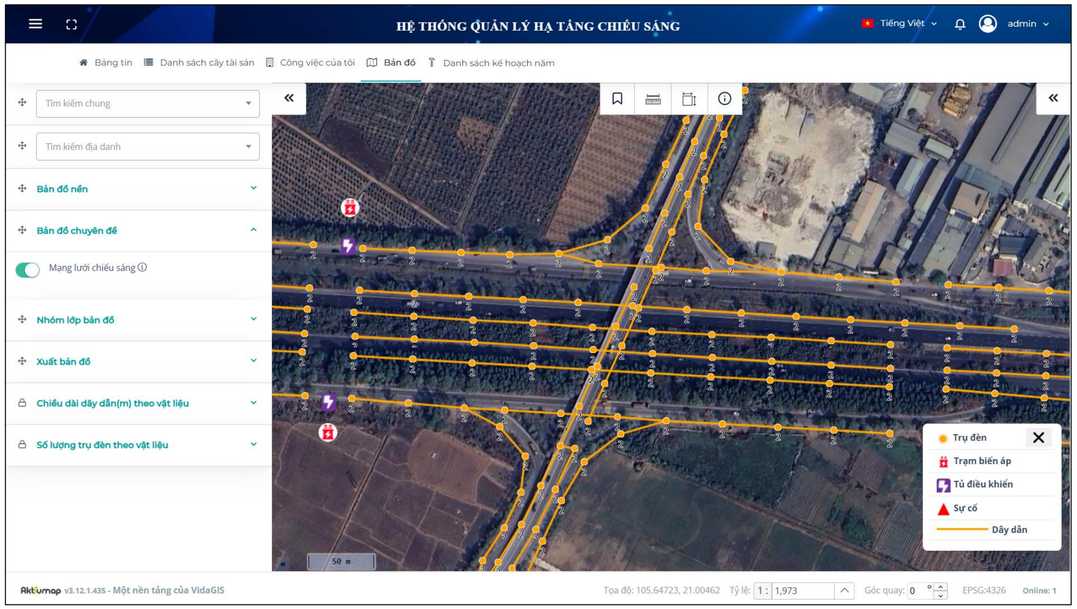
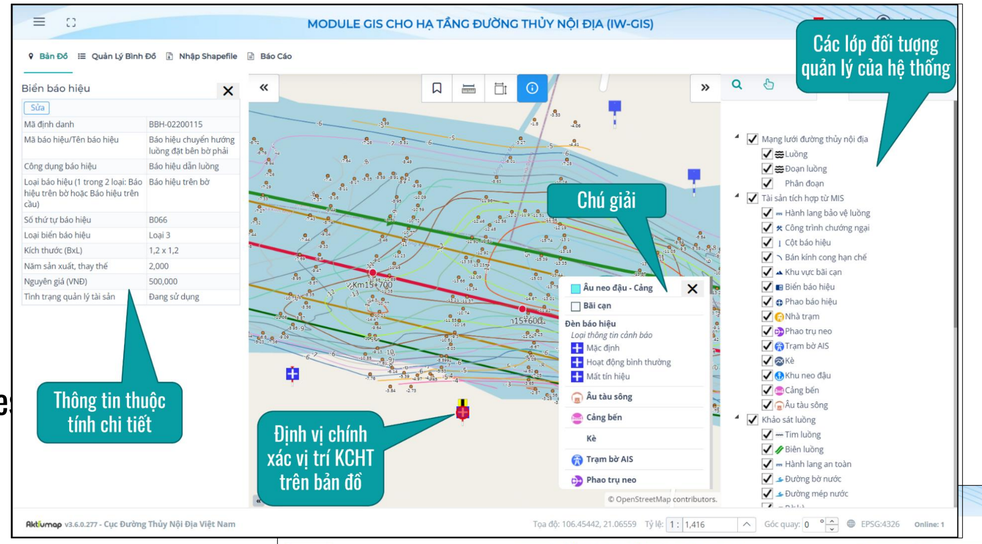
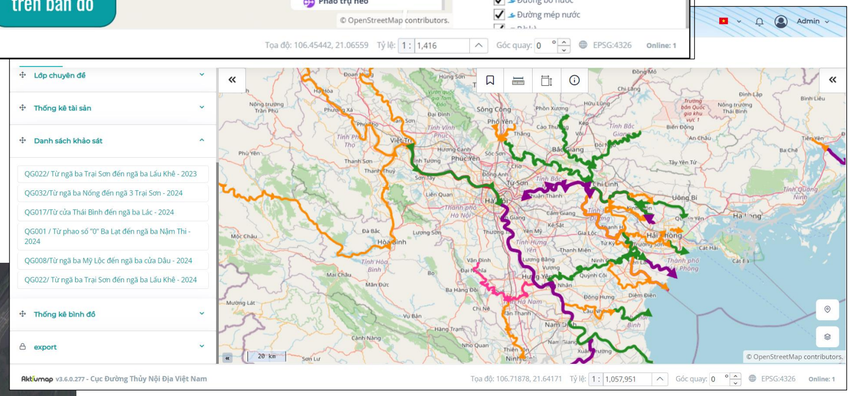


SmartWard+ Construction and Transport Infrastructure Management

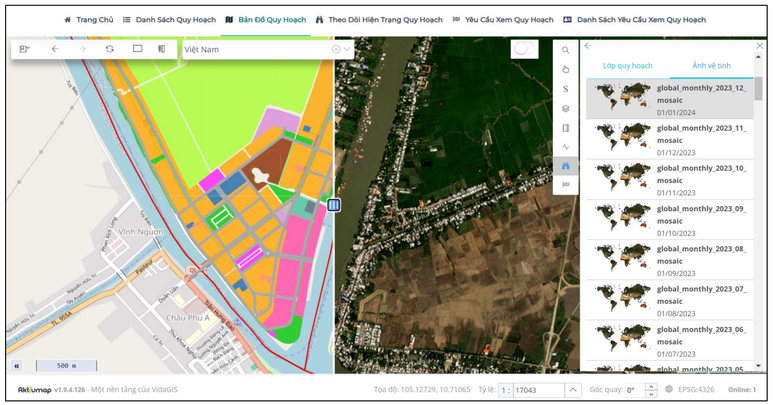
- Subjects of management: Infrastructure, transport, violations, traffic accident black spots, investment projects, houses, planning
- Intuitive, accurate and efficient asset management on digital maps
- Dynamic, flexible, and intuitive reporting and statistics tools
- Support to solve violations, fix problems
- Support for operation and maintenance of assets
- Support for making and tracking plans
- Supporting tracking and monitoring infrastructure control with multi-time Planet satellite image
- Support for calculating the area of site clearance
- Management of investment projects on construction, renovation and upgrading of transport infrastructure systems
- Integration of data and other systems
- Portal for data disclosure, search and incident reception
- Reflecting the scene using mobile applications

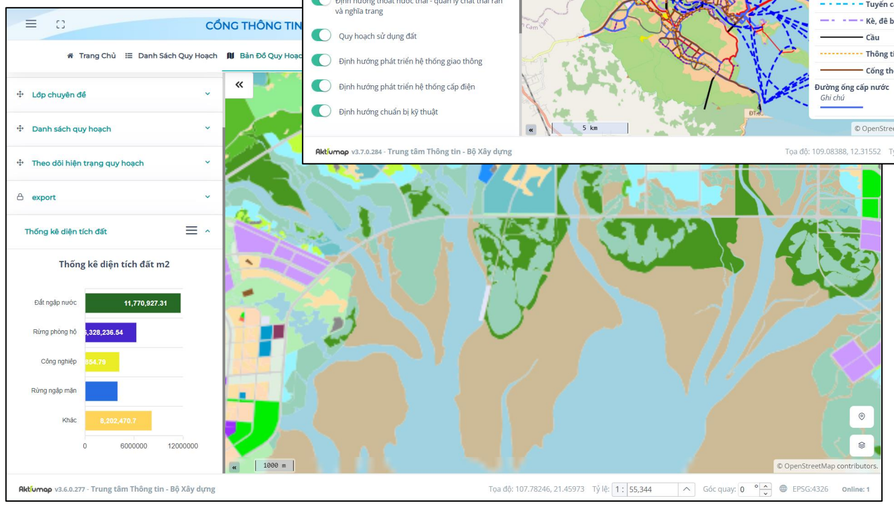




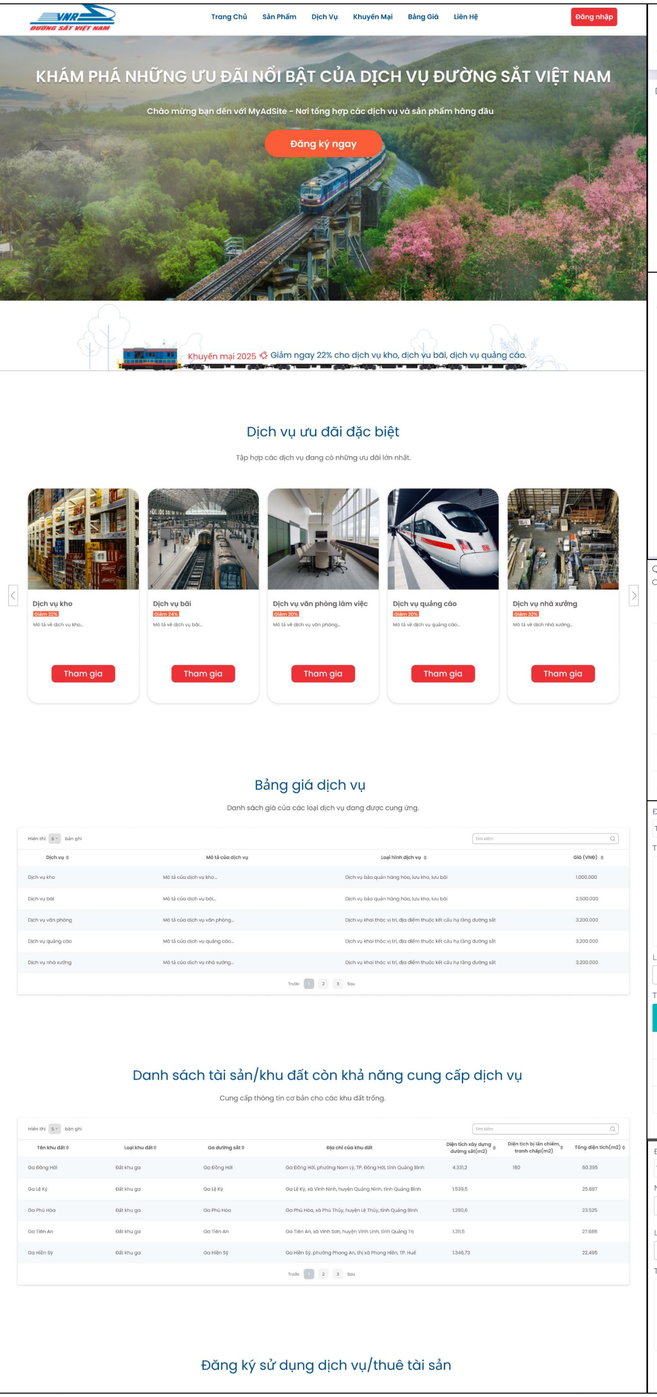
SmartWard+ Planning publicity

- As a centralized management system for planning for an industry from local to central, it can decentralize management
- Planning projects are managed according to tree structure, decentralized by provinces
- Planning projects are managed on a map basis in the form of vector data, separated into layers of planning information corresponding to management objects
- Management of metadata information of map-based planning projects
- The spatial location of each object on the map with detailed attribute information
- Multi-criteria planning data search engine
- Dynamic statistics on the map
- Monitoring the planning for the use of multi-time Planet imagery
- Planning publicity to people and businesses





SmartWard+ Planning publicity

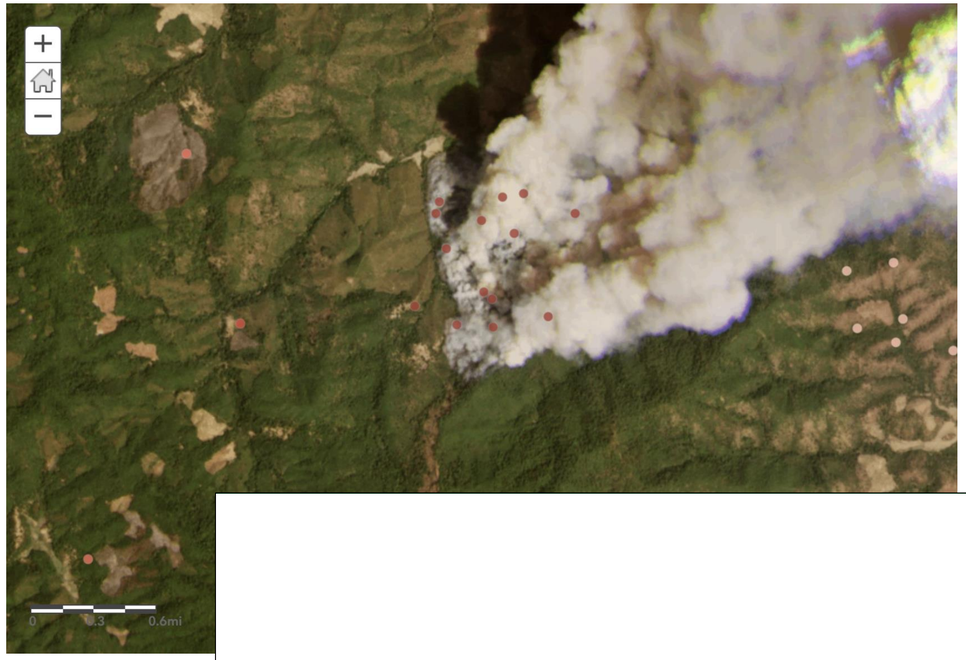


SmartWard+ Asset Rental Service ent

- Product and service introduction page and online asset rental service/registration page.
- Land base management: search by name, type of land, management unit; statistics on land fund area by land type, list of land establishments under management and exploitation
- Management of architectural assets: search by name, type of asset, management unit; List of architectural properties
- Customer management: manage customer information using the service, search for customers, export excel customer lists, interact with customers
- Management of types of rental services, service unit prices
- Asset exploitation contract management: manage contract information, search, excel export contract list, contract revenue statistics by unit and time
- Manage promotion information
- Detailed management of rental assets on the basis of GIS maps (floor plan to building to floors, rooms...)
- Support for annual planning: annual revenue and expenditure plans, estimated revenues and expenditures, list of expenditure allocation

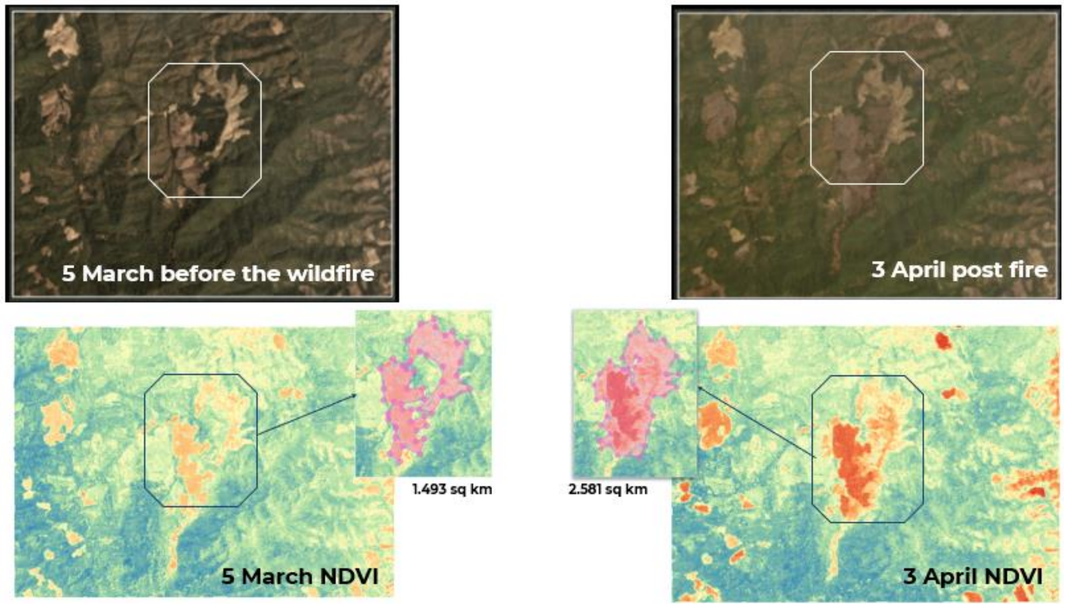
SmartWard+ Forest Fire Prevention

- Management of the current state of the forest
- Forest fire risk warning
  - Forecast of forest fires with daily frequency
  - Early warning of hotspots using thermal imaging
- Manage wildfire history on the timeline map
- Management of forest fire protection resources
- Receiving fire alarms and administering and handling forest fires



SmartWard+ Forest Fire Prevention

- Support damage assessment, investigation of fire causes, handling responsibility for using multi-time satellite images
- Statistics and reports include reports, assessments and summaries after firefighting
- Mobile app supports patrolling, information lookup, forest fire warning operations
- Real-time meteorological data integration

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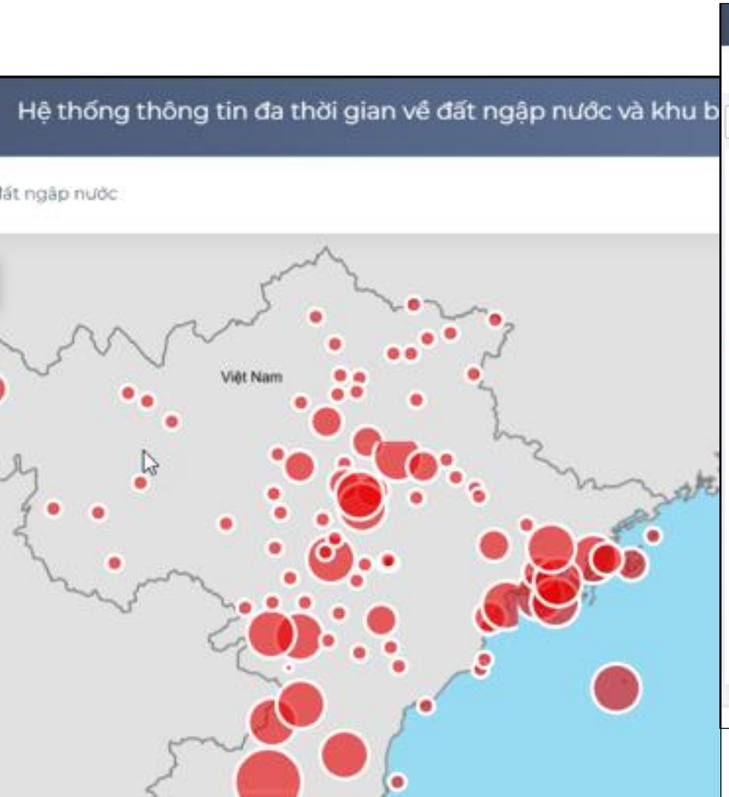
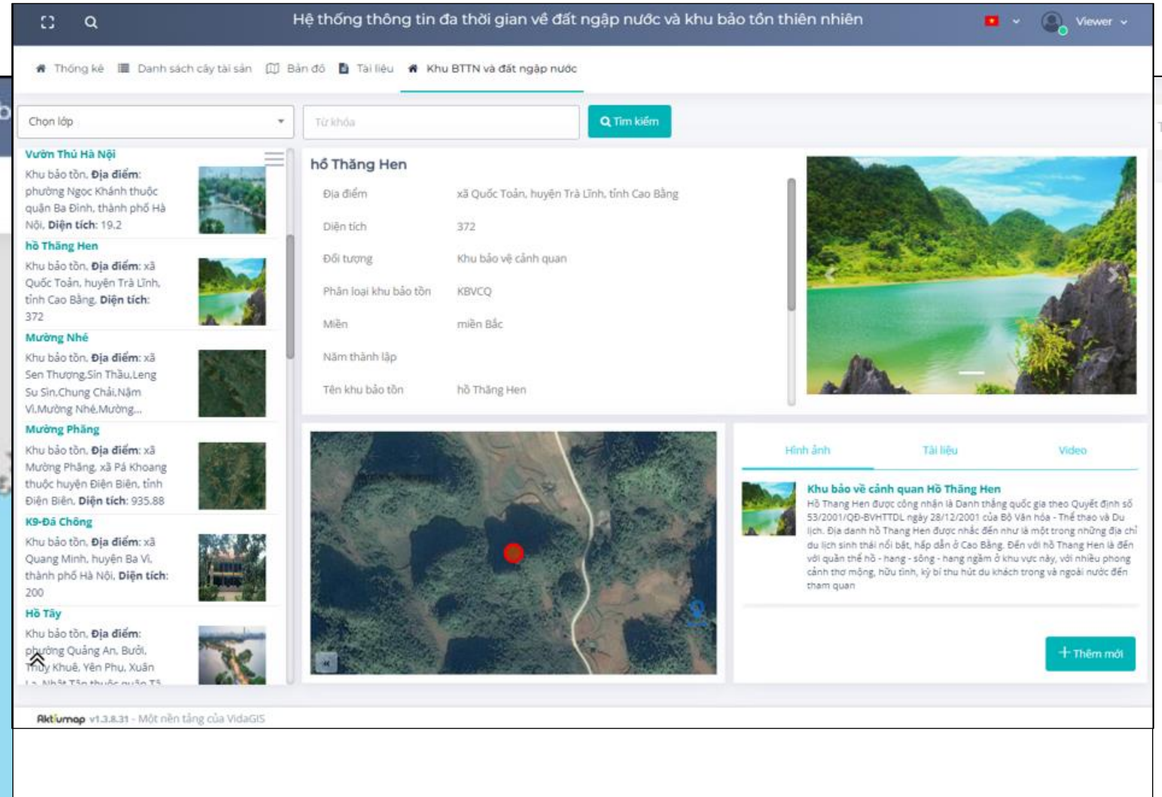
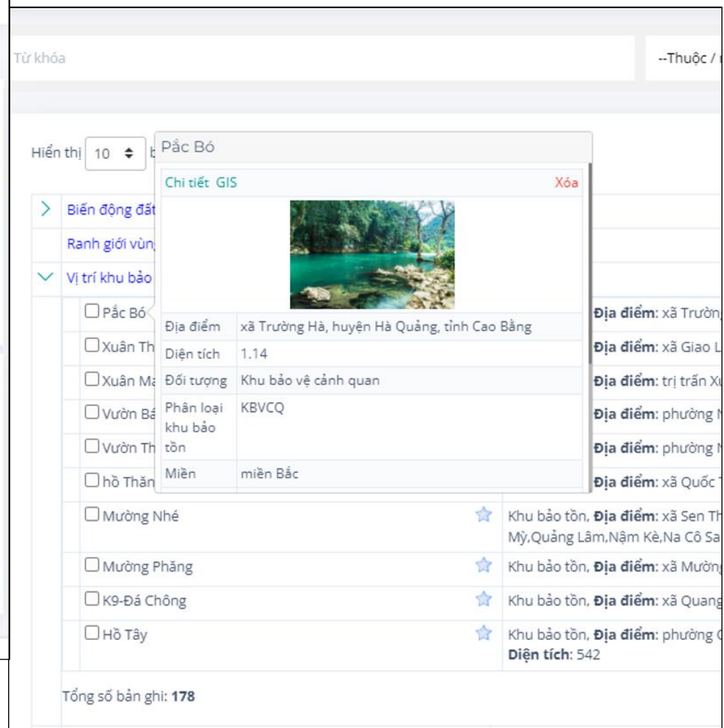
SmartWard+ Biodiversity Conservation

- Subjects of management: current status of forests and biodiversity conservation, forest planning and biodiversity conservation, forest developments and biodiversity conservation, violations
- Managing data on the location of biodiversity reserves, ecosystem, biodiversity conservation facilities, biodiversity monitoring systems, etc. on the map
- Managing the list of dynamic biodiversity conservation areas
- Using multi-time Planet photos to track forest and biodiversity developments in stages
- Archive of documents: manage the documents of each object; legal documents





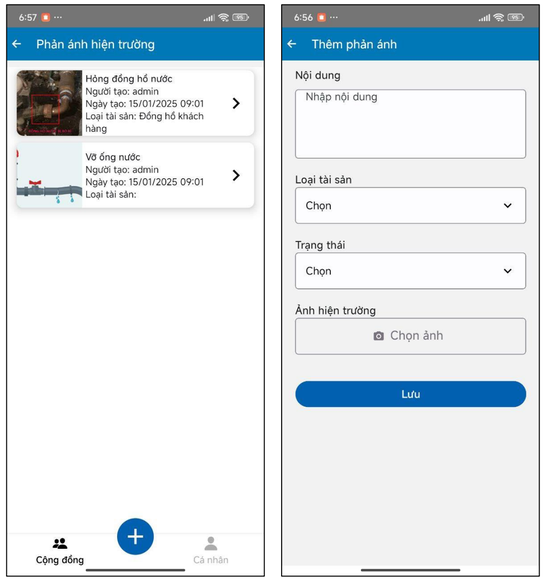


SmartWard+ Disaster Response

- Supporting decision-making for incident and natural disaster response management in the form of visual data aggregation, real-time impact maps to help make immediate warnings and recommendations for action; Use high-resolution satellite imagery when the area is inaccessible to monitor the situation on the ground
- Management and planning incident and natural disaster response : management of resources (human resources, vehicles, rescue equipment, evacuation houses, etc.); Develop response plans according to each scenario and region
- Monitoring of areas affected by natural disasters: Using multi-time remote sensing images to detect changes and developments of natural disasters, and localize affected areas in real time
- Assessment of damage and remediation after incidents, disasters and natural disasters: use remote sensing images to classify the extent and assess damage; surveying damage after natural disasters on people, houses, infrastructure, crops, etc.; management of remediation progress and allocation of resources; Collect field data via mobile app

SmartWard+ Disaster Response

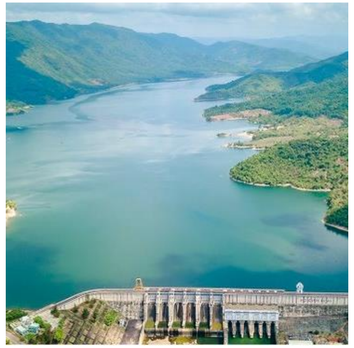
- Reports and statistics: incident and natural disaster response resource and plan, post-disaster losses; make quick reports, general reports on the incident situation
- Share real-time information with people: Update warnings, danger areas, safe routes, relief locations; citizen interaction (sending feedback, requesting help)
- Mobile app reflects the scene
- Integration with other systems and databases: connection of weather data, monitoring stations, surveillance cameras, IoT sensors, integration of population data, planning, infrastructure



SmartWard+ Environmental Resources

1. Water Resources Database

- Investigation and inventory of water resources
- Exploitation and use of natural resources
- Discharge
- Monitoring Station
- Planning



2. Geological and mineral databases

- Mineral Resource Inventory
- Mineral resource reserves
- Reports, statistics,
- License
- Planning

3. Environmental Database

- Environmental quality
- Biodiversity
- Environmental Monitoring
- Statistics and reports
- Environmental Planning

4. Hydrometeorological Database

- Hydrometeorological monitoring
- Hydrometeorological forecasts and warnings

5. Surveying and mapping databaseô

- National Surveying
- No image
- Geography, national topographic map
- National borders and boundaries
- Place name

6. Marine and island natural resources database

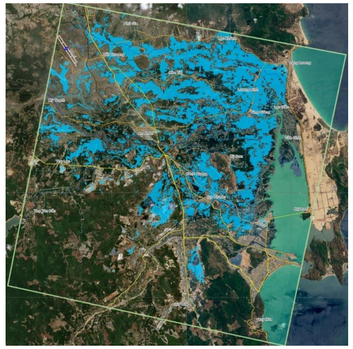
- Marine geology and minerals
- Marine biodiversity
- Marine Environment
- Islands
- Planning and plans

7. Climate Change Database

- Levels and trends
- Climate change scenario
- The impact of climate change
- Emissions Inventory

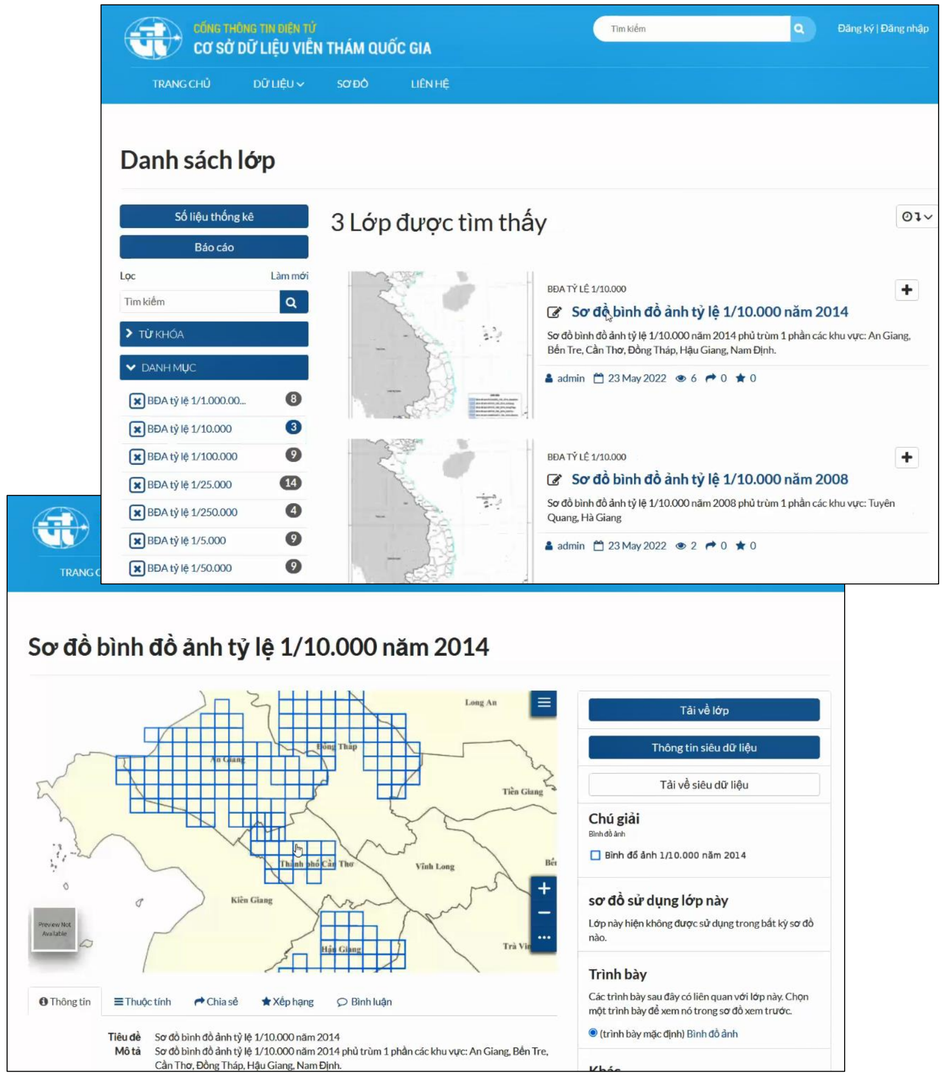
8. Remote sensing database

- Remote sensing metadata
- Remote sensing images



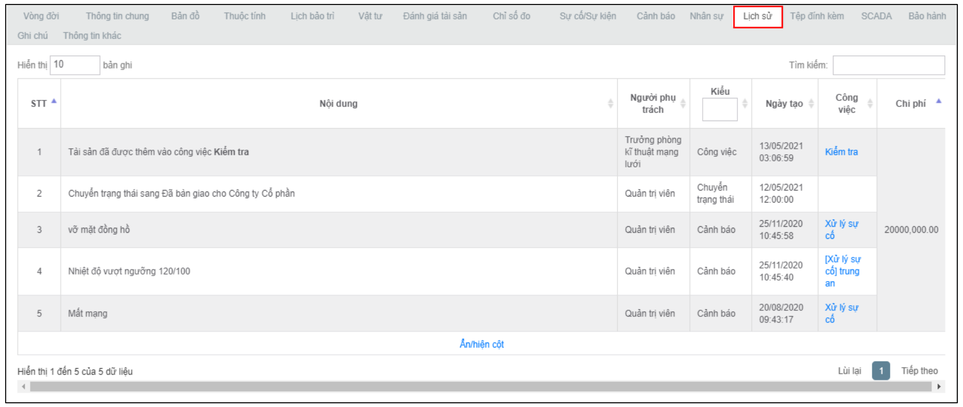
SmartWard+ Digital maps and shared databases

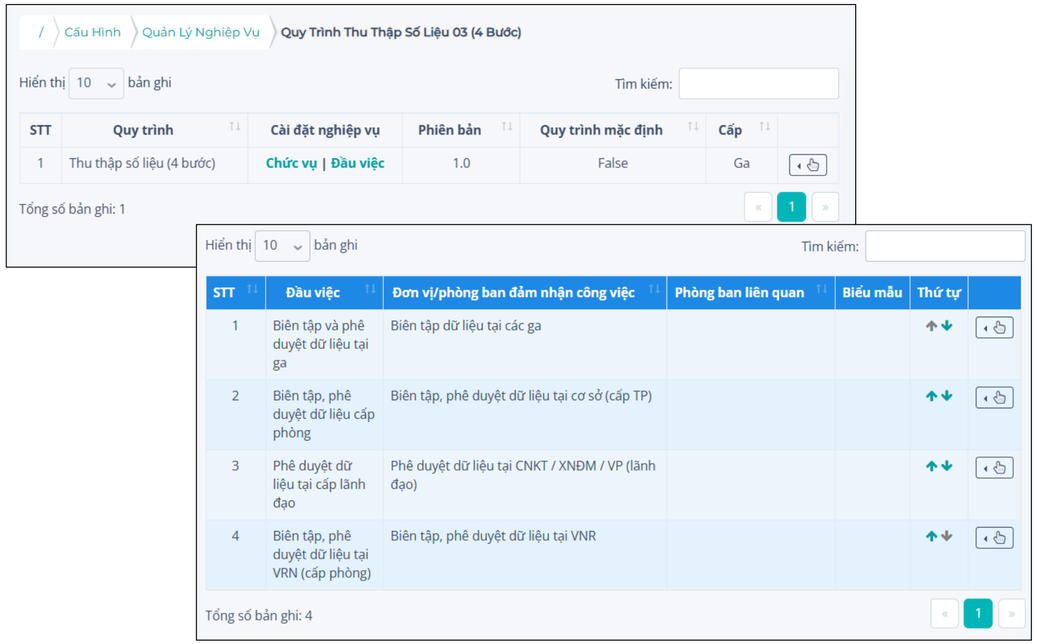
- Supporting the centralized and unified management and exploitation of multi-sectoral information and data; playing the role of a common geospatial infrastructure, integrating data from many sources and fields to serve urban management, traffic, planning, natural resources – environment, natural disaster prevention and control, etc., and at the same time serve as a foundation for the development of specialized digital maps (such as tourism, agriculture, investment promotion...) and digital map-based IT solutions
- Building and standardizing data: editing, digitizing and updating background data (topography, administration, hydrosystem, etc.), specialized data (traffic, planning, urban infrastructure, etc.), remote sensing data (raw image data, remote sensing metadata, remote sensing image products, etc.); Standardize data in standard formats and structures
- Organize photos by region and time: sort photos by map grid, by time range to serve quick queries
- Remote sensing image processing and analysis: implementation of NDVI, NDWI, NDBI indicators, land classification, monitoring of fluctuations, etc.
- Integration and synchronization of sectoral data (spatial + non-spatial data): multi-sectoral data interconnection (traffic, water supply and drainage, health, culture, security...); synchronization of planning, current status, and operation data



SmartWard+ Digital maps and shared databases

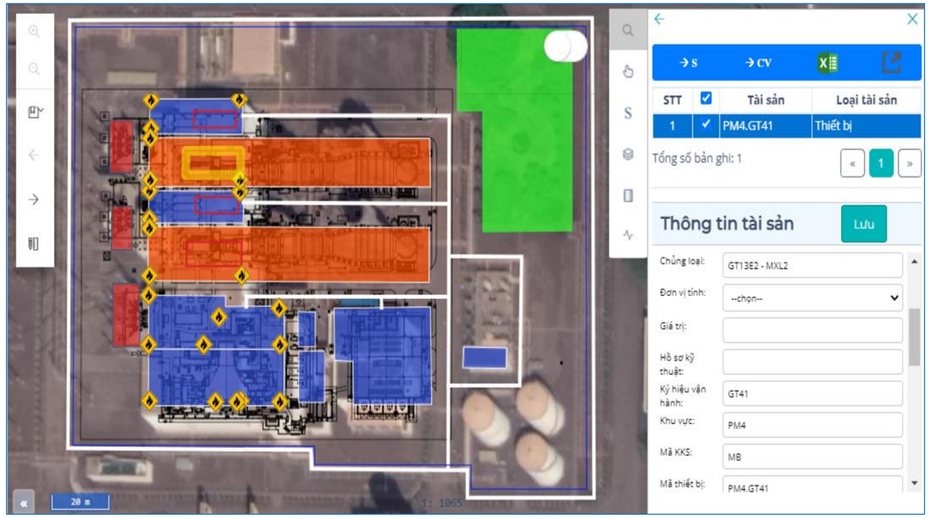
- Digital map data lifecycle management: track update history, data versions, creators/editors, data descriptions, to ensure data integrity and traceability
- Update and maintain thematic maps
- Access management and decentralization of data exploitation: establish access decentralization by user groups (agencies, managers, people, etc.); Data security and access control
- Sharing digital map data with other systems: interdisciplinary connections, real-time or periodic data sharing by API, providing map services to third parties
- Statistics, inventory, and monitoring of data use: monitoring the number of data layers, usage, and exploitation efficiency

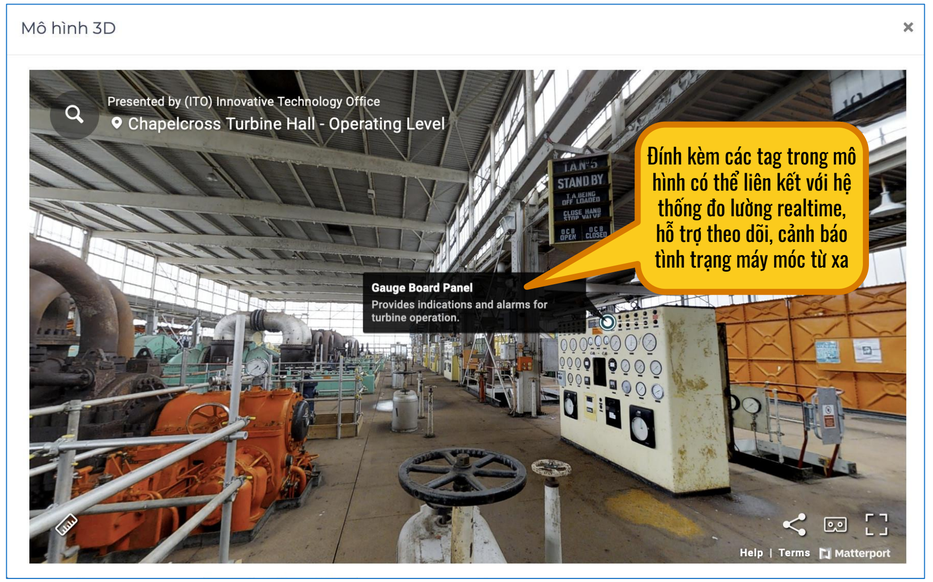




SmartWard+ Industrial zone Management

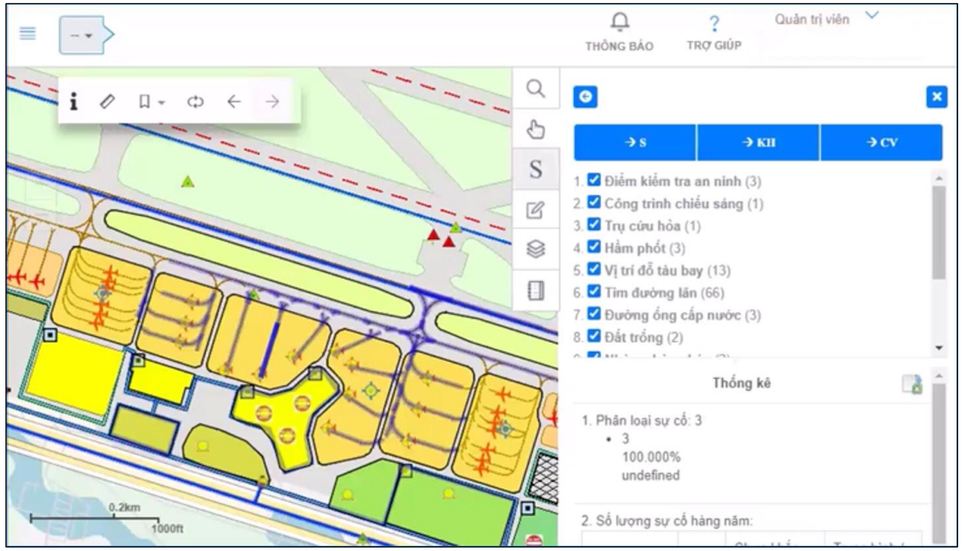
- Management of planning and technical infrastructure and industrial zone planning:
  - Site management, land lot boundaries, functional planning (factory land, technical infrastructure, trees, internal traffic...)
  - Management of water supply and drainage systems, electricity, lighting, telecommunications
  - Record problems, periodic maintenance schedules
  - Integrated 2D/3D maps, synchronized with planning data
  - Warning of violated planning areas
- Management of enterprises and investors in the industrial zone:
  - Enterprise database associated with the land lot space on the digital map
  - Managing land lease contracts, reminding contract terms, site use charts
- Environmental and safety monitoring in the industrial zone:
  - Integrated IoT system, monitoring sensor for real-time monitoring of environmental indicators (wastewater, exhaust gas, noise)
  - Threshold Warning, Pollution Level Map Display
  - Installing security cameras, heat maps to warn of fire protection





SmartWard+ Industrial zone Management

- Management of labor, housing, support services
  - General human resource database: number of employees, recruitment needs
  - Management of worker housing, canteens, garages, infirmaries...
- Investment promotion portal and industrial zone information disclosure
  - Look up information: land fund, available infrastructure, costs, investment incentives
  - Connecting investors, supporting decision-making to choose a location
- Reports, statistics, analysis: overall reports on land use, environment, enterprises, investment; analysis of development trends, management risks



SmartWard+ Agriculture

1. Crop Cultivation and Plant Protection Database

- Danh mục
- Cơ sở sản xuất/ kinh doanh TT&BVTV
- Tình hình sản xuất TT
- Quản lý đất trồng
- Phòng, chống dịch bệnh cây trồng
- Phân bón và thuốc bảo vệ thực vật
- Dữ liệu về KHCN trong TT&BVTT
- VBPL về TT&BVTT

2. Livestock and Veterinary Database

- Danh mục
- Cơ sở sản xuất/ kinh doanh CN&TY
- Tình hình sản xuất CN&TY
- Phòng, chống dịch bệnh
- Phân bón và thuốc bảo vệ thực vật
- Dữ liệu về KHCN trong TT&BVTT
- VBPL về CN&TY

3. Fisheries Database

- Danh mục
- Cơ sở sản xuất/ kinh doanh thuỷ sản
- Tình hình nuôi trồng và khai thác đánh bắt thủy sản
- Phòng, chống dịch bệnh
- Khu vực cấm khai thác thủy sản có thời hạn
- Dữ liệu về KHCN trong thuỷ sản
- VBPL về thuỷ sản

4. Irrigation Database

- Công trình thuỷ lợi
- Quy hoạch thuỷ lợi
- Tình hình thiên tai, sạt lở
- Dữ liệu về KHCN trong thuỷ lợi
- VBPL về thuỷ lợi

5. Forestry Database

- Danh mục
- Quản lý rừng
- Vi phạm trong khai thác rừng
- Dữ liệu về KHCN trong thuỷ lợi
- VBPL về thuỷ lợi

6. Agriculture – Forestry – Fisheries Quality Database

- Danh mục
- Cơ sở sản xuất/ kinh doanh sản phẩm nông – lâm – thủy sản
- Tình hình kiểm tra chất lượng nông – lâm – thủy sản
- Dữ liệu về KHCN trong chất lượng sản phẩm nông – lâm – thủy sản
- VBPL về chất lượng sản phẩm nông – lâm – thủy sản

7. Rural Development Database

- Cơ sở hạ tầng về phát triển nông thôn
- Tình hình phát triển nông thôn
- Dữ liệu về KHCN trong phát triển nông thôn
- VBPL về phát triển nông thôn

8. Agricultural Extension Database

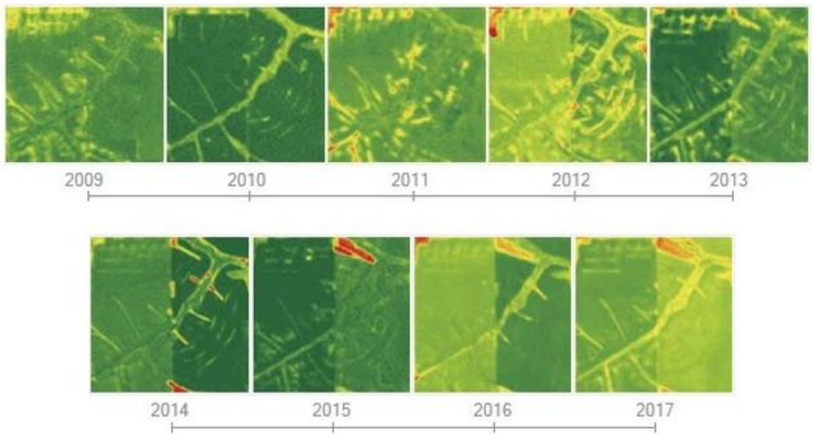
- Dữ liệu về chương trình khuyến nông
- VBPL về khuyến nông

9. Agricultural Seed Database

- Danh mục
- Cơ sở sản xuất/ kinh doanh giống nông nghiệp
- Tình hình sản xuất giống nông nghiệp
- Dữ liệu về KHCN trong phát triển giống nông nghiệp
- VBPL về giống nông nghiệp

SmartWard RS NDVI – Agriculture

- Agricultural Monitoring
  - Monitor the status of crops, understand the yield of the field.
  - Tools: large photo warehouses, help build maps, machine learning training, calculate image processing algorithms
  - Data analysis throughout the crop life cycle: from Early Season Planning > > Crop Management > Harvest
  - Continuous information with near-daily monitoring: Detect fluctuations with daily frequency to support decision-making at key stages of the crop development cycle



Năng suất trung bình hàng năm từ 2009- 2017

SmartWard RS NDVI – Agriculture

- Sustainable agricultural development
  - Optimize inputs: water, fertilizer…
  - Sustainable agricultural management: crop rotation, planting cover trees, etc.
  - Tracking, mapping even with small-scale farms.

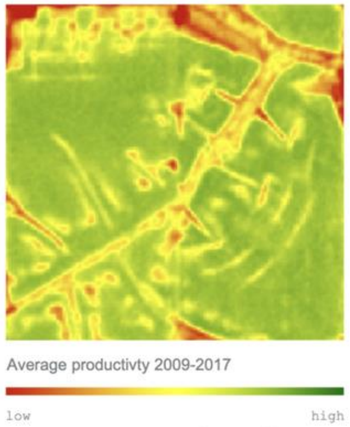
Mùa vụ- Pháp T4/2020

Mùa vụ- Pháp T8/2020

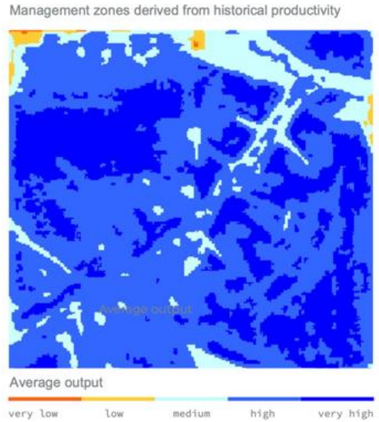
Mùa vụ- Pháp T11/2020

SmartWard RS NDVI – Agriculture

- Sustainable agricultural development
  - Crop yield management
  - Productivity Partition
  - Disease surveillance

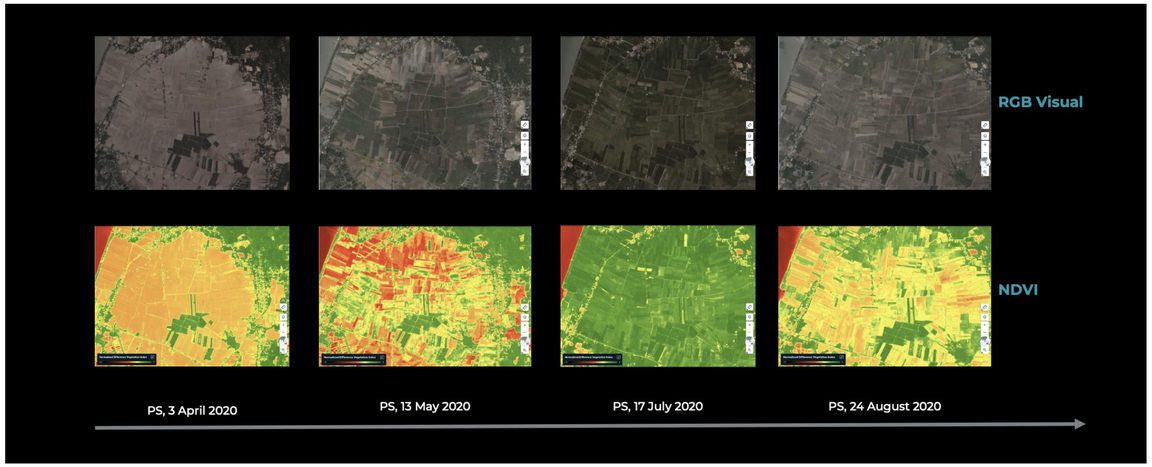


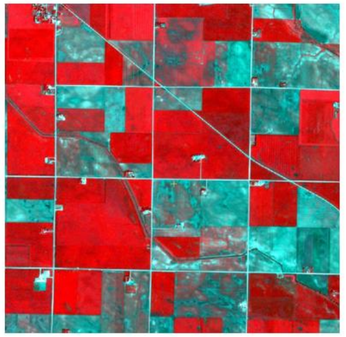
Quản lý năng suất cây trồng



Phân vùng năng suất

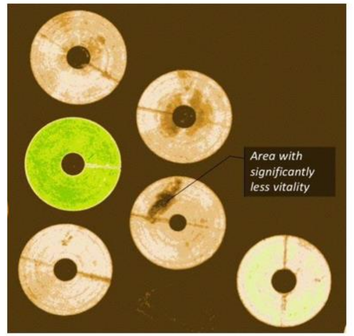
Giám sát dịch bệnh





Land Cover Change

Understand how land is being used, how it changes over time, and what is being grown



Vegetation Health

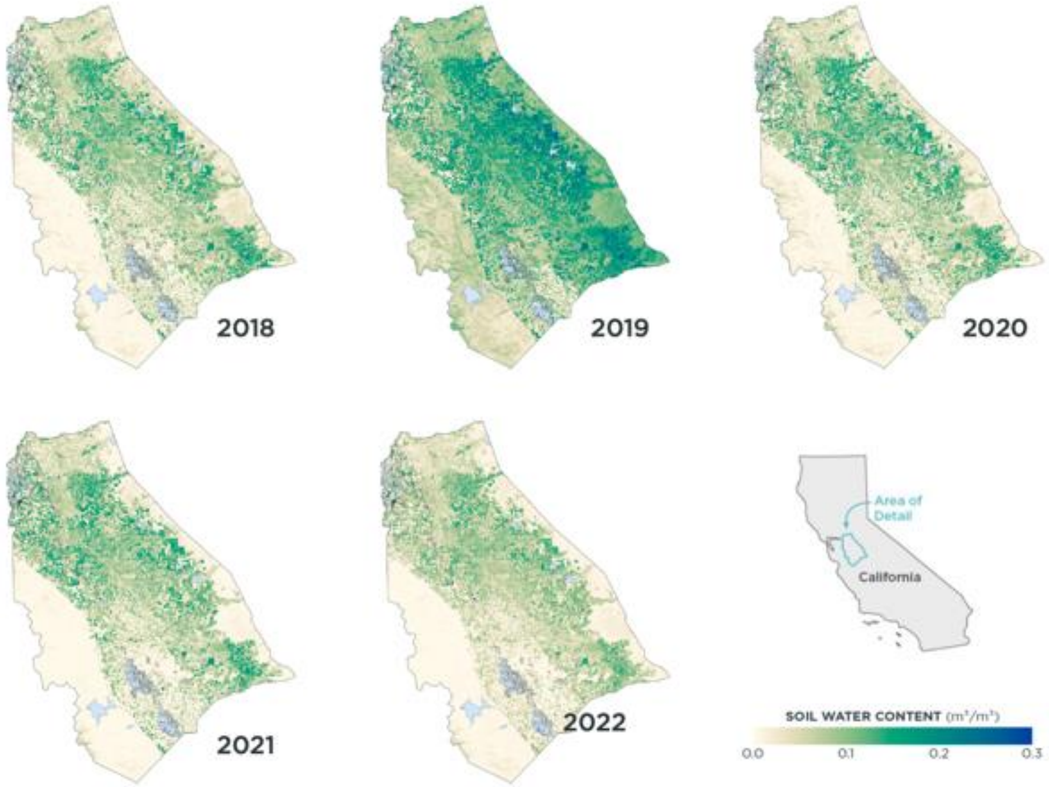
Detect crop anomalies and trends using vegetation indices that leverage near-infrared spectral band

Commercial Forestry

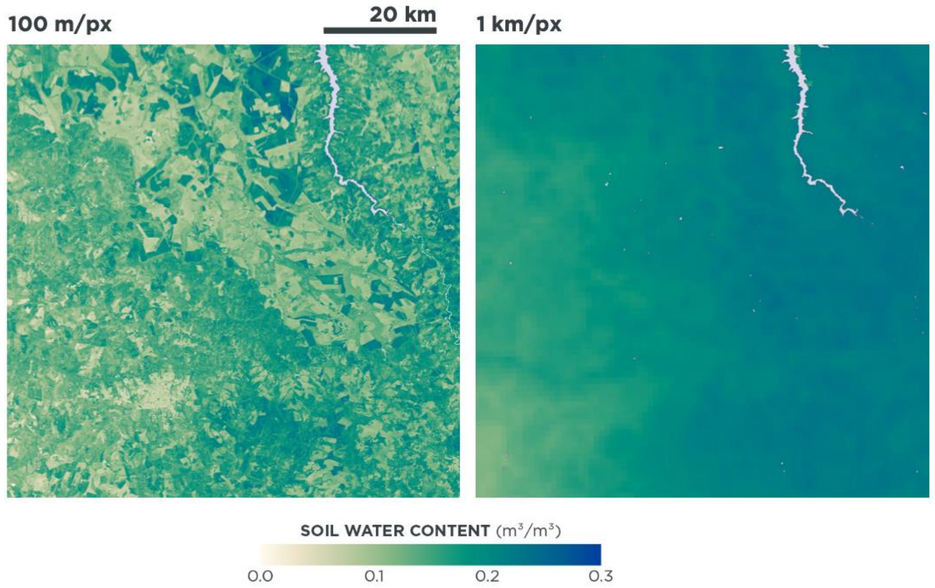
Estimate tree count, identify tree stress and disease, and monitor harvesting activities

SmartWard RS NDVI – Agriculture

- Sustainable agricultural development
  - Monitor Soil Water Content



Giám sát Soil Water Content từ T6/2018 - 2022 tại San Joaquin, Stanislaus,California.
2019 là năm duy nhất không bị hạn hán trong lịch sử kể từ 2012



Comparison of Planet's Soil water content (100m/px) and common sources (1km/px)

SmartWard RS NDVI – Forest Monitoring Solution

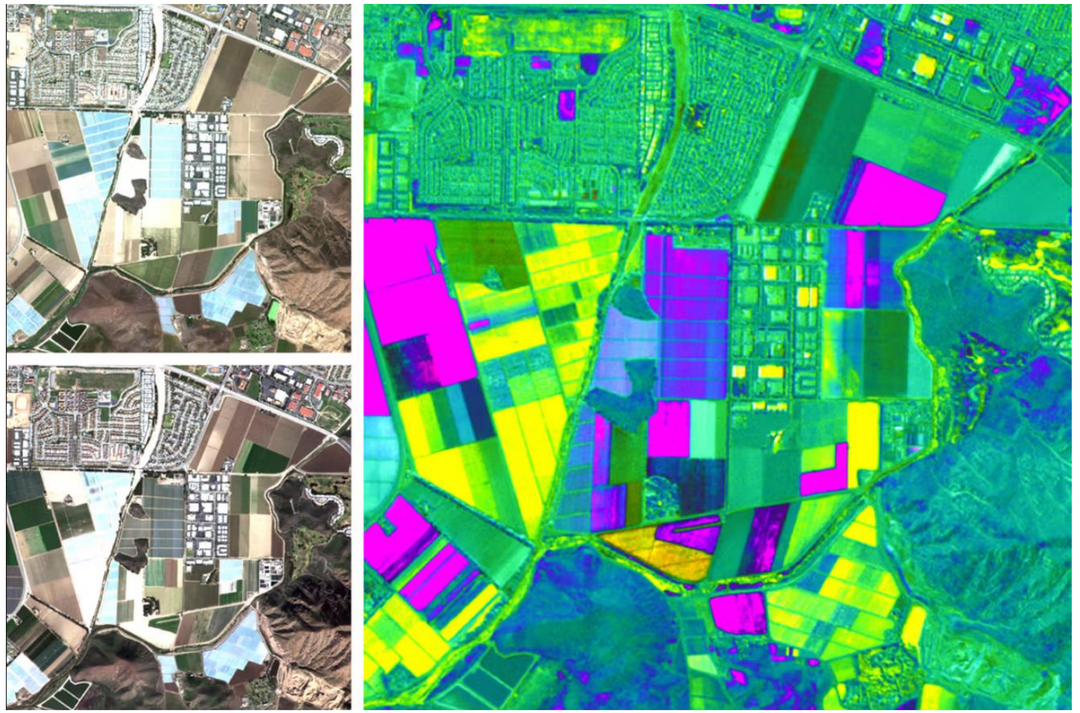
- Monitoring Forest Decline Using Multi-Time Planet Satellite Imagery

SmartWard RS NDVI – Forest Monitoring Solution

- Monitoring Forest Decline Using Multi-Time Planet Satellite Imagery
- Monitoring illegal activity in forests using multi-time Planet satellite imagery

SmartWard RS Optical - Change Detection Solution

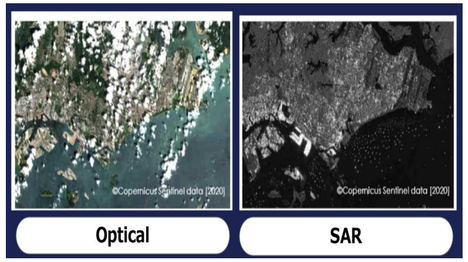
- Provides real-time or near-real-time image data, to track urban, industrial and rural changes
- Automatically detect new buildings or changing buildings
- Identifying, inspecting and warning works that violate the planning
- Check the legality of the work, compare it with the licensing document
- Detecting trends in the development of transport infrastructure and public works
- Benefit:
    - Supporting the timely detection of areas with rapid increase in construction density, avoiding planning disruption
    - Support to monitor the construction progress of large projects such as bridges, roads, new residential areas, areas with abnormally fast construction speed
    - Supporting construction inspectors to reduce the time for field inspections, optimizing management resources in handling construction violations

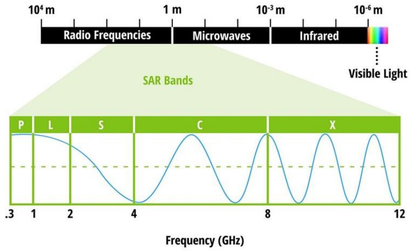


SmartWardRS - Landslide Monitoring Solution

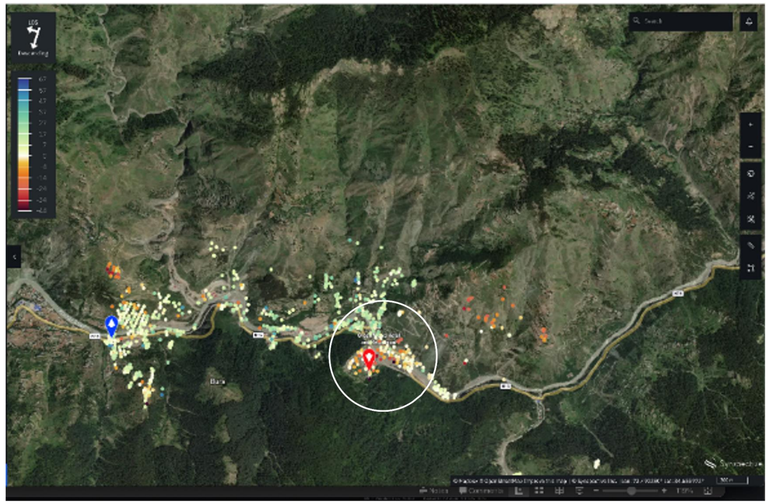
Use the Land Displacement Monitoring (LDM) solution to develop areas at risk of landslides in areas with steep terrain.

- Principle:
  - Synspective's radar image (SAR):
    - Image source: SAR X-band satellites developed by Synspective (Japan) (e.g. StriX-α, StriX-β)
    - Ground Resolution (GSD): ~1–3m
    - Shooting frequency: 14 times a day (with satellite), works in all weather conditions, day and night
    - Interferometric SAR (InSAR) data: Detection of ground displacement below centimetres, in the radar direction (line-of-sight)





  - Analyze the displacement of the ground surface over time through radar interference data, thereby detecting trends in subsidence, landslides, displacement and deformation of the ground over time
- Output:
  - Map of displacement speed (mm/year);
  - Time series;
  - Early Risk Warning
- Practical Application:
  - Early detection of areas showing signs of deformation, subsidence or landslide, especially in hilly, steep, or riverside areas
  - Continuous monitoring of high-risk areas to provide early warning and support response decisions
  - Supporting the planning and design of infrastructure works, helping to avoid dangerous areas.
- Advantages over traditional measurement:
  - Wide coverage, no need to place equipment in the field
  - Continuous monitoring over time (multi-temporal InSAR)
  - Easy integration into GIS systems and disaster risk management platforms



SmartWardRS - Subsidence Monitoring Solution for Traffic Works (Bridges)

Use a Land Displacement Monitoring (LDM) solution to monitor fluctuations and movements of the ground and infrastructure structures, including bridges.

- Ground elevation change analysis: Radar data will be processed to detect changes in bridge elevation, helping to identify signs of subsidence or abnormal movement
- Early warning and trend prediction: Through the analysis of trends of elevation changes over time, the system can warn of potential problems before they become serious hazards
- The system works continuously, providing real-time information about the movements of the bridge and the surrounding area
- Output: Map of displacement speed (mm/year); Time series; Early Risk Warning
- Practical Application:
  - Support in maintenanceand repair of works
  - Support early detection, intervention and mitigation of accidents
  - Monitor the stability of the ground before construction and during the construction of a new bridge or renovation of an old bridge

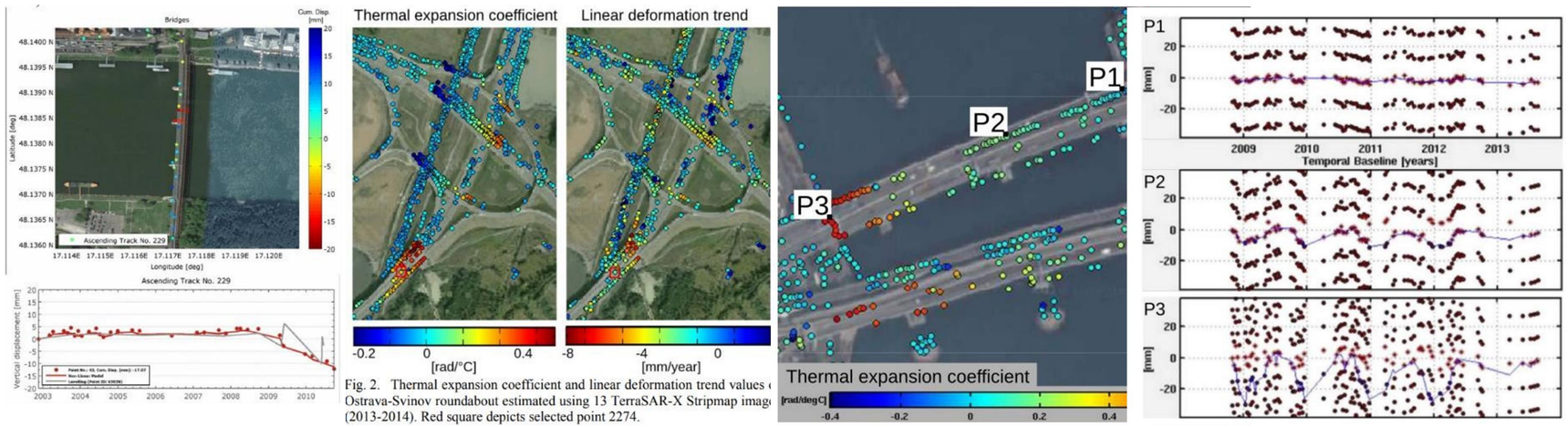
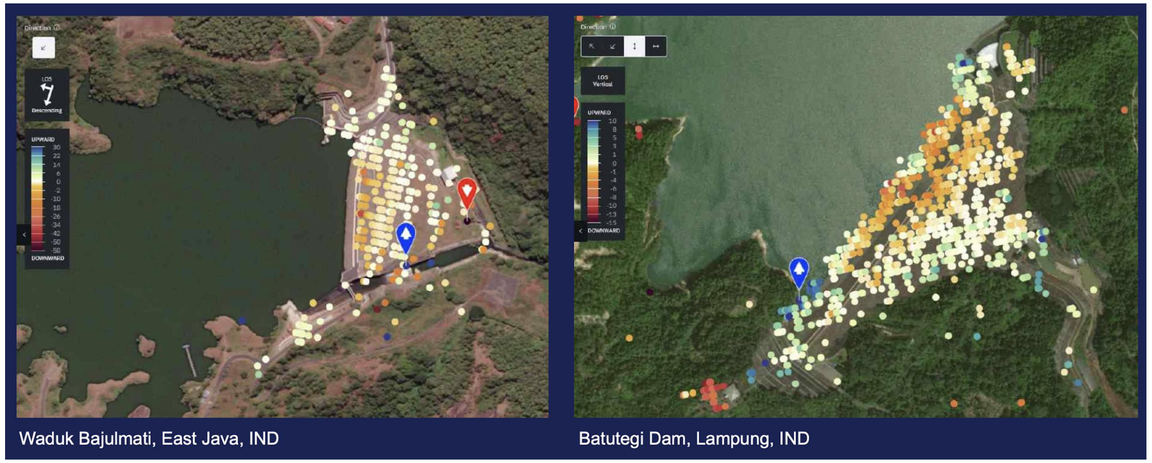


Fig. 2. Thermal expansion coefficient and linear deformation trend values Ostrava-Svinov roundabout estimated using 13 TerraSAR-X Stripmap imag (2013-2014). Red square depicts selected point 2274.

SmartWardRS - Dam subsidence monitoring solution

Using the Land Displacement Monitoring (LDM) solution to monitor the deformation of land and buildings over time, especially applied in monitoring the subsidence of buildings such as dams.

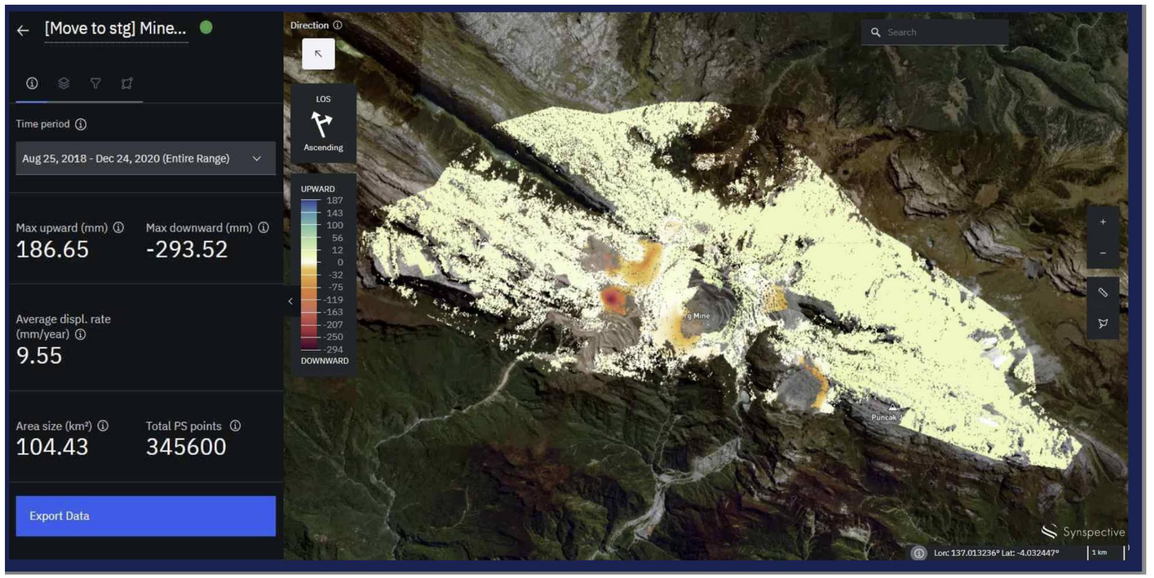
- Analyze the displacement of the soil surface over time through radar interference data, thereby detecting the tendency of subsidence and deformation in the ground structure over time
- Early Warning and Trend Prediction: Through the analysis of trends of ground change over time, the system can warn of potential problems before they become serious hazards
- Output: Map of displacement speed (mm/year); Time series; Early Risk Warning
- Practical Application:
  - Monitoring dam subsidence, proactively adjusting protection measures before incidents occur
  - Support in maintenance and repair of works
  - Monitoring the stability of the ground before construction and during the construction of a new building or renovation of an old building



SmartWardRS - Mining landslide Monitoring Solution

Use the Land Displacement Monitoring (LDM) solution to monitor the movement of soil and materials in the mine area.

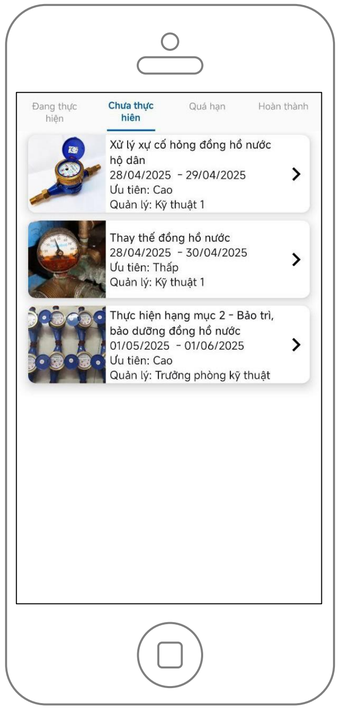
- Analyze the displacement of the soil surface over time through radar interference data, thereby detecting the tendency of subsidence and deformation in the ground structure over time
- Early Warning and Trend Prediction: Through the analysis of trends of ground change in the geology of the mine area over time, the system can warn of potential problems before they become serious hazards
- Output: Map of displacement speed (mm/year); Time series; Early Risk Warning
- Practical Application:
  - Stability Monitoring: Continuously monitor soil changes, detect signs of landslides early.
  - Early Warning: Provides warning of the risk of landslides, helping to adjust the mining plan.
  - Monitoring high-risk areas: Identify and monitor weak geological areas, and intervene in a timely manner.
  - Long-term forecasting: Predict long-term fluctuations, support sustainable mining strategies, and reduce environmental impact.

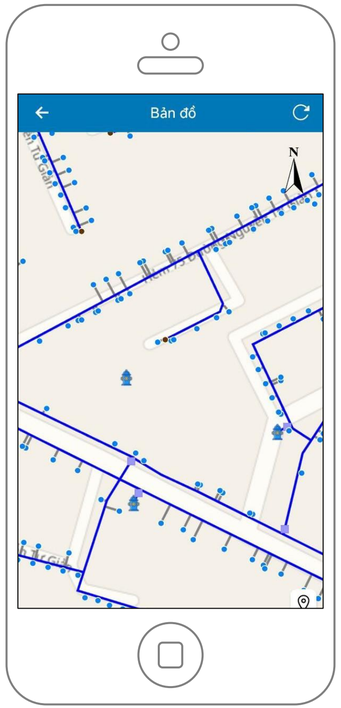


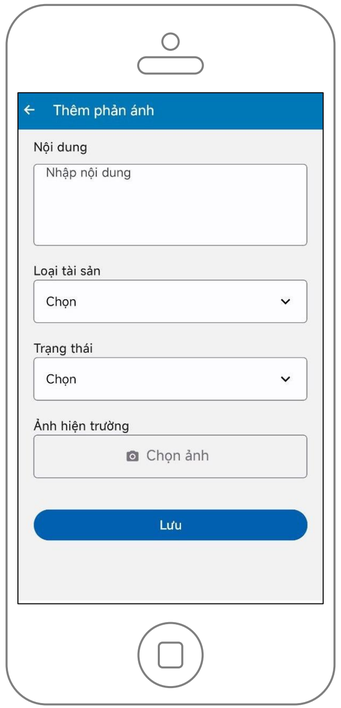
Giám sát trượt lở đất ở mỏ Grasberg Mine (IDN)

SmartWardMobile – Reflect the scene on the mobile app

- Asset and work volume aggregate dashboard
- Manage asset listings: search and view asset details
- Manage assets on the map: display data, background map, current location, map annotation
- Task management: job notifications, job listings, job details, job updates
- Scene reflection: update scene information, take photos of the scene
- User information: account, password, history







Thank you!

- GIS solution
- Map
- GIS database
- SDI
- SmartWard
- Satellite image
- Digital elevation model

planet.

Synspective

INTERMAP