**Goal:** To support CEOS Carbon Science Mission by providing easy discovery of and access to carbon-related data resources in CEOS member agencies

**The Objectives:**
1) enable carbon community to easily find their interested data in the CEOS agency collections brokered by both CWIC and FedEO; 2) allow searching and accessing data within collections using CWIC and FedEO with keywords, spatial and/or temporal constraints; and 3) provide common discovery and access of all CWIC partner holdings targeting at the CEOS Carbon Community

**Summary of progresses since WGISS-48 in September 2019:**
- Public release of CWIC Carbon Portal and subsequent revisions. Current version is Version 1.1
- Collected new requirements and inputs from the CEOS and GEOSS carbon science community and responded to requirements:
  - Allowed searching of ECV and CDRs with additional filters
  - Enabled interoperability with Open Data Cube (ODC)
  - Released the white paper (architecture) on portal support to CEOS chair initiative
  - Improved performance by server-side proxy and caching, adopting the Accessibility Insights for Web tool, GCMD hierarchical search
  - Improved accessibility compliant to Web Content Accessibility Guidelines (WCAG) 2.0
  - Explored the possibility of repurposing the portal to support other CEOS initiatives (e.g., coastal initiative)

**Next steps:** Enhances the portal to support new requirements from CEOS, GEOSS, and Global Carbon Project; Enhances interoperation with Open Data Cube; Explores the support to other CEOS Initiatives.
Summary of Contributions to CEOS Carbon Community

• Closely collaborate with CEOS Carbon Task and Global Carbon Project in the development of the portal to ensure it is useful for the community

• Collaborators are involved in
  • Define requirements
  • Design, test, evaluation
  • Use in their studies
  • Provide feedbacks for refinement and improvement

• Revisions of the portal was released to CEOS carbon community for use in July 2019

• The portal has been highlighted in the home page of the Global Carbon Project with a live link (See the screen capture right)

• Enabled support to CEOS Chair Initiatives on Forest Initiative and Open DataCube connection
• Milestone 1: Demonstrated CWIC Carbon Portal at WGISS-48, Oct. 9, 2019
• Milestone 2: Released the white paper (architecture) on portal support to CEOS chair initiative, Jan. 2020
• Milestone 3: Released the version 1.1 of the portal, and deployed it in September 2020
• Progresses:
  • Testing and evaluation of the released portal
  • Collected new requirements and inputs from the carbon science community: Linking Open Data Cube (ODC)
  • Analyzed the new requirements and inputs to design the implementation approaches: Testing ODC API and designing metadata and data exchange interfaces with ODC
  • Implemented new requirements: Metadata harvesting at both collection and granule levels
  • Analyzed requirements from CEOS and VNSC for supporting the CEOS chair initiative
  • Prepared a white paper (architecture) to describe the feasibility and approaches for the portal to support the chair initiative.
  • Participated in GEO Week in November to integrate CWIC and the portal with GEOSS.
  • Improved performance of server-side proxy and caching logic for fetching contents under the Cross-Origin policy
  • Improved the portal accessibility by using the Accessibility Insights for Web tool
  • Improved efficiency by using the IndexedDB provided by web browser
  • Appended matching counter at each filter, including GCMD keywords
  • Improved performance of hierarchical GCMD keywords filter
  • Applied analytics by using the Google Analytics
  • Explored the possibility to repurpose the portable to support other CEOS initiative, such as CEOS Coastal Initiative
Performance Improvements

• Progress
  • Performance improvement - Local Cached CWIC and FedEO Collections
    o Both carbon-related and Full collections
    o Transfer compressed cached metadata to reduce network traffic
    o 15MB -> 2MB for Full CWIC
    o 280MB -> 29MB for Full FedEO
    o Changeable to use cached or on-demand searching
    o Exclude global is truly working
UI Improvements

- Progress
  - User interface improvement - Filter and keywords tag UI interaction
    - All selected filters are shown at the keywords tag area
    - Keyword tag manipulation
• Progress
  • User interface improvement – Showing Processing Progress Status Bar
    o Progress monitoring
    o Asynchronous image producing
    o Do not need to wait the portal usage until finishing producing
    o Can be performed multiple producing coincidentally
UI Improvements

- Progress
  - User Preference Setting - Initial Configuration
    - Set default initial Map Center and Zoom-level
    - Selectable default initial searching engine
    - Selectable individual products as well as Top-level category
• Progress
  • Support metadata from ODC – Prototyping with VODC
    o Vietnam Open Data Cube
    o Both Collection and Granule level
    o Totally 39 collections (6 for Tasks, 33 for products)
    o Supporting additional links

A New Portal Address

Totally 39 Vietnam Data Cube Collections

21 Granules for Cloud Coverage Details and Additional Links
White paper for GEO Chair Forest Monitoring Initiative

- White paper on architecture
  - Initial version on Dec. 1, 2019
  - Released on Jan. 14, 2020
  - Architecture Design following ISO/IEC 10746
Function improvement – Improved performance of server-side proxy and caching logic

- Transcoding Java version of servlets to Java 8 or higher
- Do not fork a process for external tool when invoking proxy request
- Efficient cache management, reduced response time, less memory usage on server-side
Finalizing version 1.0 of the portal

- Stability improvement – Finalizing version 1.0 of the portal
  - Deployed Version 1.0 in May 2020
  - Deployed Version 1.1 in September 2020
  - Clean up testing codes and console monitoring logs
  - Applied JavaScript minifier to deployment version only – making smaller and clear

Currently Version 1.1

Minified JavaScript Codes

No console log (except critical errors)
• Accessibility improvement – Checked Web Content Accessibility Guideline (WCAG) 2.1
  • Checked by using Accessibility Insights tool (compatible with WCAG 2.1)
    o Passed all checklist on FastPass
    o Checked in Assessment checklist
    o Adjusted higher color contrast ratio at each text content
    o Appended alternative message or title at each required element
  • Passed Nu Html Checker (v.Nu) tool
    o Checked HTML / CSS validation on source code level

Adjust higher contrast

Alternative Messages

Alternative Titles

Failed 0 on FastPass check

Failed 0 On Assessment report
Efficiency improvement – Stored pre-cached datasets into IndexedDB

- Pre-cached datasets are stored into client-side storage
- Do not use network traffic for pre-cached datasets after storing into IndexedDB
- Keeps up to date each stored dataset automatically at initial time

Enabling Prefetching Metadata

Totally 39 entries
Filter Matching Counter

- Function improvement – matching counter at each selected filter
  - Shows matching counter at the end of each selected filter
  - Helps end-user to understand how many entries belong to each selected filter
  - Shows accumulated count at any upward parent filter if a filter is selected

Checked Atmospheric Matching count: 248

Selected Filters

Yearly: 22
Daily: 229
• **Performance improvement – Improved hierarchical GCMD keywords filter**
  • Each keyword is representative of all children keywords
  • When all children keywords are selected, the parent keyword will become a representative keyword
  • Removes all marginal keywords which were reducing performance

*Only two GCMD keywords are used: “Atmosphere” – “Aerosols”*

*All children of “Aerosols” are selected*
• This demonstration is for Connectivity with Open Data Cube
• Demo Scenario:
  • Step 1) go to the portal URL

  [Link to Portal URL]

    https://gis.csiss.gmu.edu/carbon/cwicport/
    Or
    http://cloud.csiss.gmu.edu/carbon/cwicport/

    o Both are same service endpoint of the portal
    o Especially for the Africa Region, the following URL is initially customized for the region

    [Link to Portal URL]

    http://cloud.csiss.gmu.edu/carbon/africa/
Demo Scenario (Cont.):

- Step 2) Checked “Africa Regional DC” at Predefined of Catalog filter
  - Uncheck all other catalogs may be helpful to reduce total number of matching datasets

- Step 3) Click “Options” button, and set Spatial and Temporal restrictions
  - Spatial Range – type West 33.5, North: -3.0, East: 34.0, South: -3.5
  - You can also use Bbox drawing tool or upload a shape file
  - You will get totally 8 Results

Totally 8 Searching Results
Demo Scenario (Cont.):

- Step 4) Scroll down and click the title of “NDBI-NDVI-NDWI” entry
  - You will get totally 6 granule-level searching result
Demo Scenario (Cont.):

• Step 5) Check “Urbanization Query (LANDSAT_7, Tanzania, Max NDVI Pixel)” and then click “Retrieve Data” button
  - You will get a dialog box for “Confirming Retrieve Data”
Demo Scenario (Cont.):
- Step 6) Review the parameters, and click “GetFile” button
  - You will get a “Retrieve Data File” dialog box
  - After reached the end of the Progress Bar, you will get an image file link for downloading
Demo Scenario (Cont.):

Step 7) Download the image file and/or click “Add Layer”
- You will see the file name on the Layer selector, and the image will be shown on the base map
- You can see a statistical information by clicking a button which is on right-side of the image file name
Demo Scenario (Cont.):

- Step 8) Layer Manipulations
  - You can select a layer by clicking the name in the Layer menu
  - You can recall Get File dialog by clicking “Download” button in toolbar
  - You can change opacity by clicking “Layer Opacity” button
  - You can see statistical information and charts