

Web Interface Users' Manual

Prepared by Qiankun Zhao and Ximing Cai, University of Illinois at Urbana-Champaign for WLE project “*A generic ABM framework for complex ecosystem service analyses in WLE focal regions*”

This web interface is used to provide an easy way for non-technical users to run the coupled agent based model (ABM)- Soil and Water Assessment Tool (SWAT) model. To make it possible for users to explore the influence of incorporating decisions from different stakeholders in the same modeling exercise, this interface has split inputs of the model into several items, which will allow different users to start their own input cases, and set up inputs for the agents whom they represent (not necessary to set up input value for all agents) in their own input cases, then by combining several input cases together, the users can start a modeling case. A schematic diagram is shown as Figure 1.

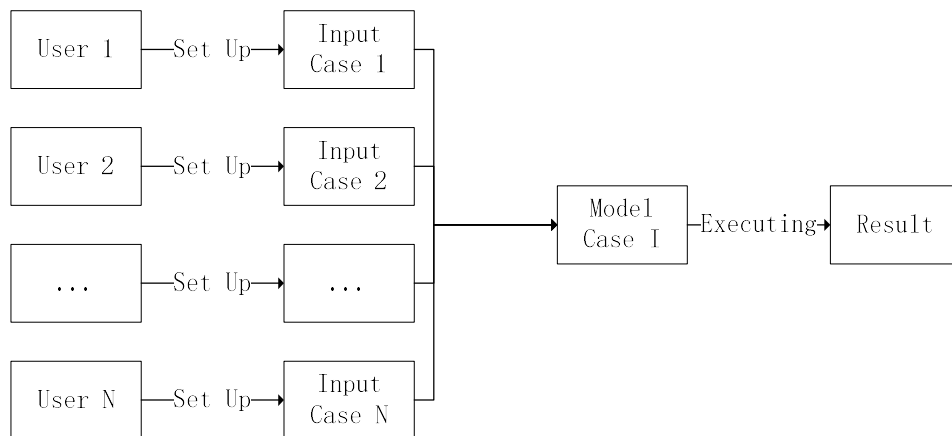


Figure 1. Schematic Diagram of Data Structure

1. Procedures to start running a model

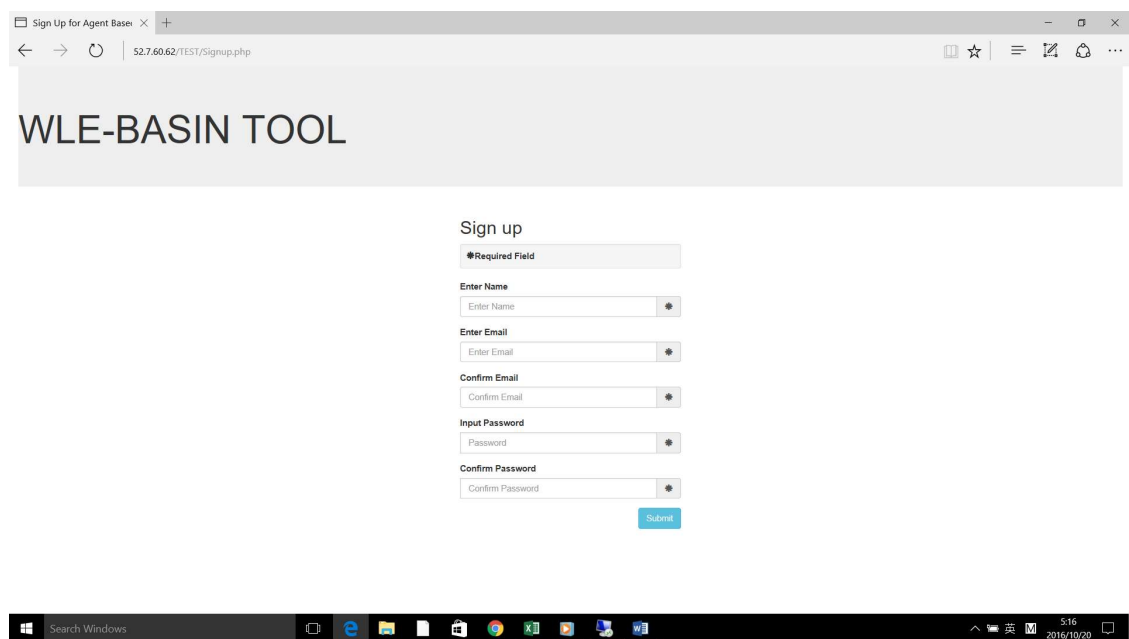
To start a model, a user should follow the following steps: (1) log in the system through the authentication system (sign up if first time user), (2) set up input cases using “Start an Input” function (users might also check back or further change their input cases using “View Inputs” function), (3) link input cases with model cases using “Start a Negotiation” or “Start a Scenario” and execute model, the difference between these two modes is explained as below. “Negotiation” means that the generated model case is make up of several input cases and users could use this to explore the influence of incorporating decisions from different stakeholders in the model, and “Scenario” means the generated model case is linked with only one input case, and therefore, one user could explore how the result will change with changing inputs. (4) After executing model, the model case will

be submitted to the server, and model will be executed using input data linked with this model case, users could check back to view their model result using “View Results” function or compare results from two different model case using “Compare Results” function.

The following sections provide more details on the procedures to use each of the functions.

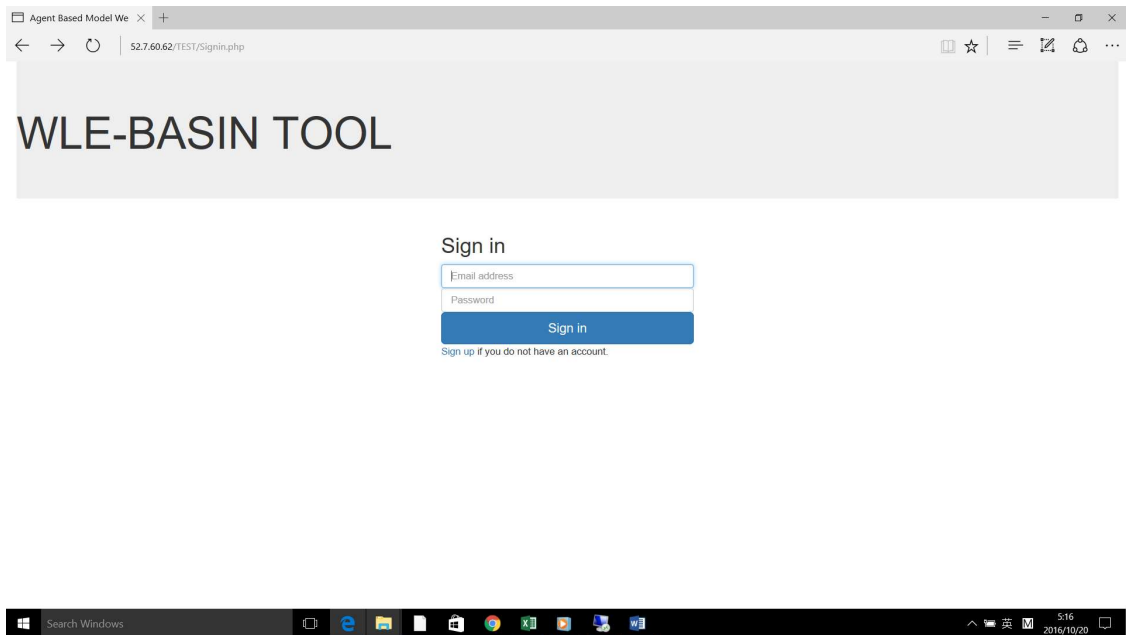
2. Authentication system

To use this system, users should set up an account and login to the system through the authentication system. The authentication system consists of two parts: a sign-up page and a sign-in page. Figure 2 shows the sign-up and sign-in pages.



The screenshot displays a web browser window with the title "Sign Up for Agent Base" and the URL "52.7.60.62/TEST/Signup.php". The page features a large header with the text "WLE-BASIN TOOL". Below the header, there is a "Sign up" section with a "Required Field" indicator. The form includes the following fields: "Enter Name", "Enter Email", "Confirm Email", "Input Password", and "Confirm Password". Each field has a small eye icon to the right, indicating a toggle for password visibility. A blue "Submit" button is located at the bottom right of the form. The Windows taskbar is visible at the bottom of the screen, showing the search bar, task view button, and several application icons. The system clock in the bottom right corner indicates the date as 2016/10/20.

(a) Sign-up Page



(b) Sign-in Page

Figure 2. Authentication System

3. Main Page

After login to the system, users are directed to the main page of the system, where the six main functions of the web interface have been listed. The main page is shown as Figure 3. By clicking buttons on the main page, users could start new input case, view and manage previous input cases, start a negotiation model, start a scenario model, view results and compare results.

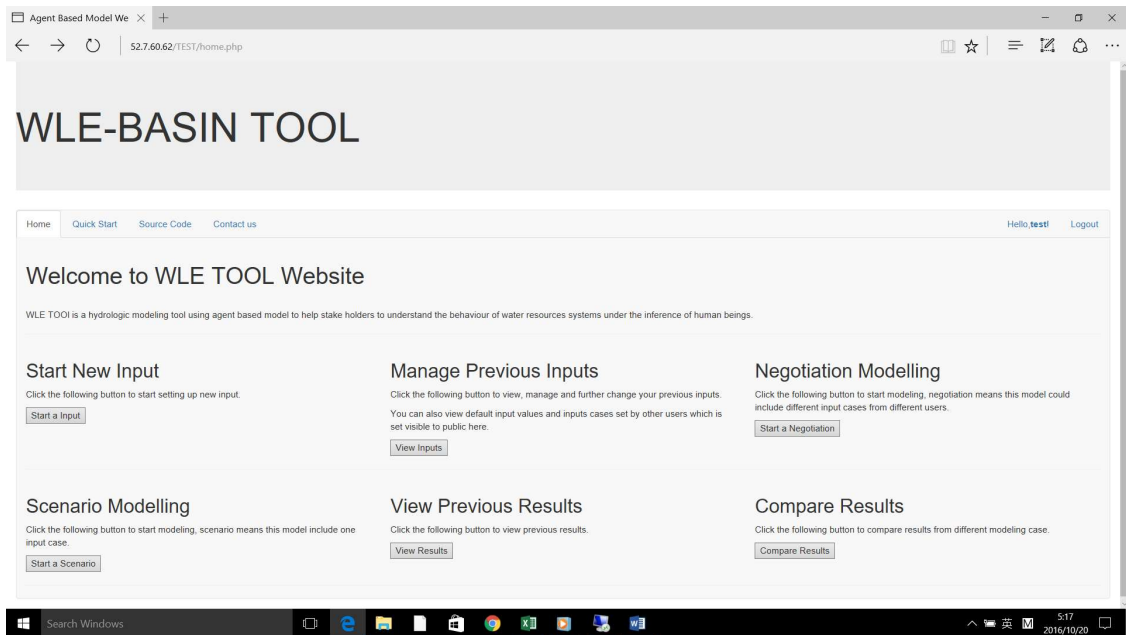
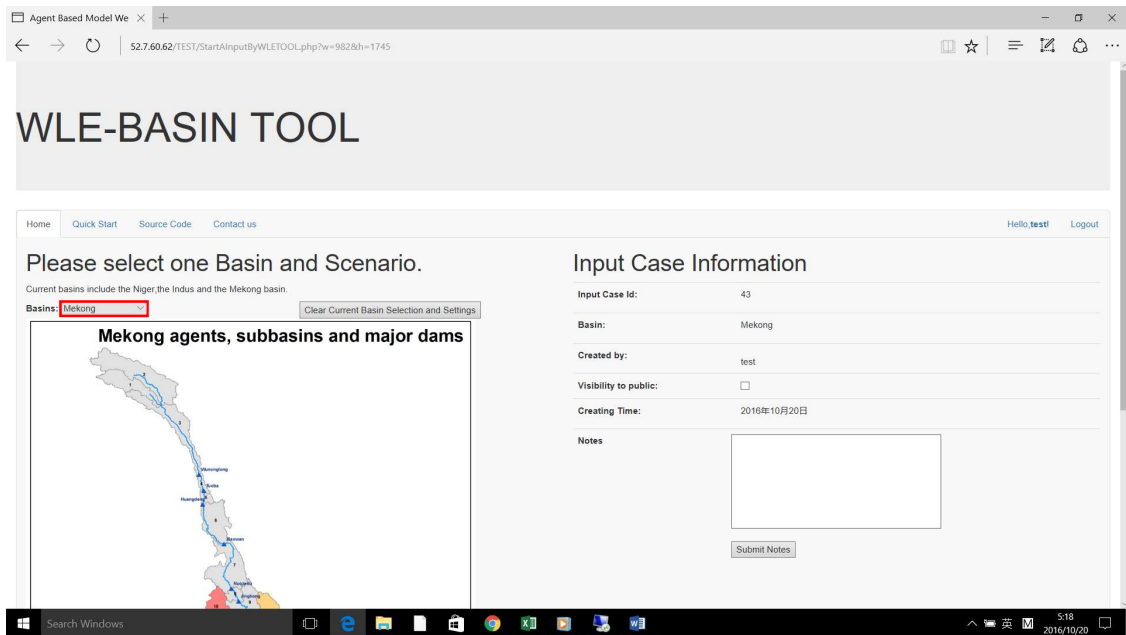


Figure 3. Main Page

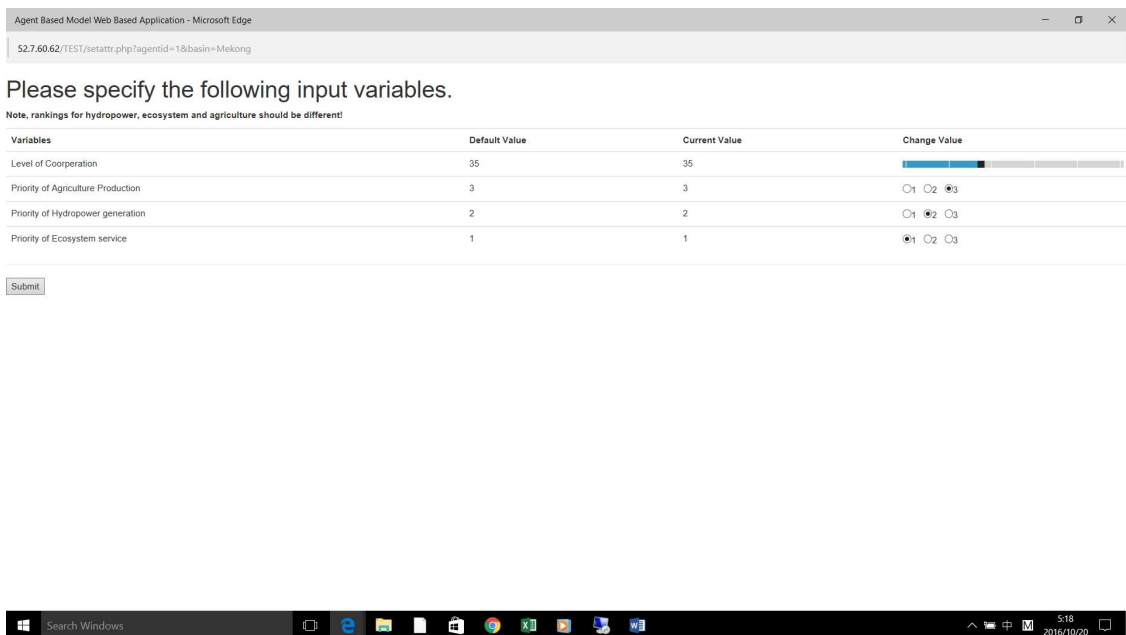
4. Start Input Case

The first step for setting up a model is to start an input case. By clicking “Start an Input” button on the home page, users could start their new input case. Users can select a basin to set up a model by clicking on basin options in a drop-down menu (mark in red in Figure 4(a)). Then, the map for selected basin will show up, with each part of the map linked with a corresponding agent Id. Users can leave some notes on the right part of the page to help them identify their input case if they want to retrieve the input case in the future.

Note it is quite important to remember the input case id for future use. Once a user clicks on the map, a new page will pop-out for the users to set values of input variables for the corresponding agent (shown in Figure 4(b)). For each of these variables, a brief description, a current value and an input field is provided. Users can use the slider bar or group of radio buttons provided to change the value, and the range of the value is limited by the slider bar or radio choices to ensure feasible input. User can click on the confirm button to save their settings and the server will save their settings to the database.



(a) Select Basin and Click Map



(b) Setting Up Inputs for Each Agent

Figure 4. Start A New Input Case

Note, here we require input ranking for ecosystem, hydropower generation and crop irrigation to be different. Therefore, if this requirement is not satisfied, a red warning will be on and users will be asked to specify the ranking again. Figure 5 shows this warning.

Agent Based Model Web Based Application - Microsoft Edge

52.7.60.62/TEST/setattr.php?agentid=1&basin=Mekong&fault=1

Please specify the following input variables.

Failed to set variable value, same ranking exists!

Note, rankings for hydropower, ecosystem and agriculture should be different!

Variables	Default Value	Current Value	Change Value
Level of Cooperation	35	75	<input type="range" value="75"/>
Priority of Agriculture Production	3	3	<input type="radio"/> 1 <input checked="" type="radio"/> 2 <input type="radio"/> 3
Priority of Hydropower generation	2	2	<input type="radio"/> 1 <input checked="" type="radio"/> 2 <input type="radio"/> 3
Priority of Ecosystem service	1	1	<input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3

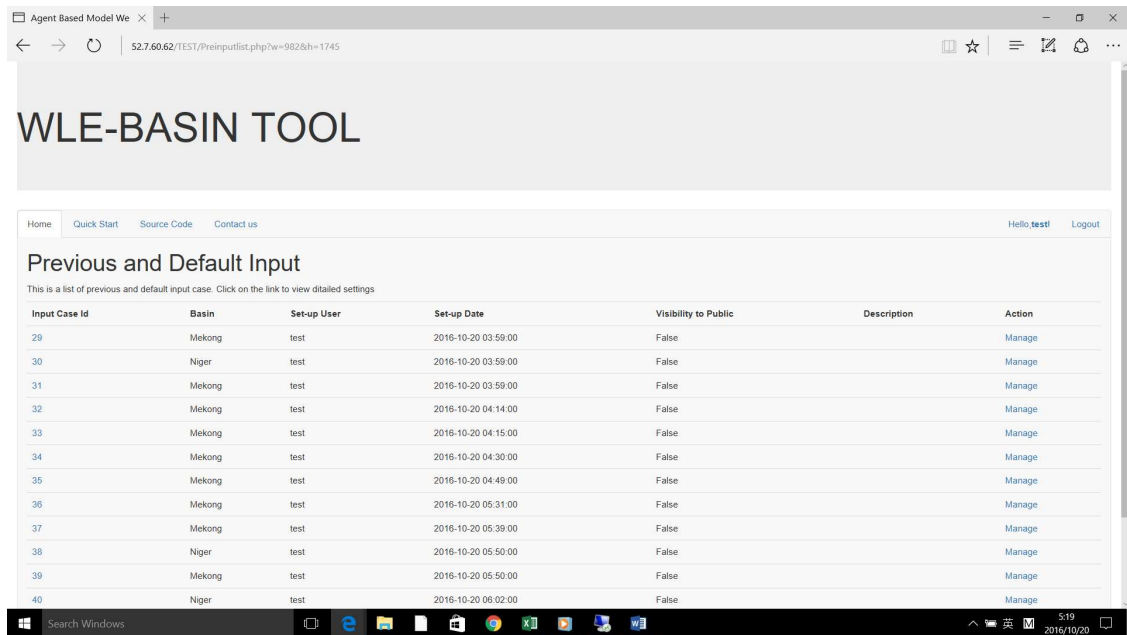
Search Windows 5:19 2016/10/20

Figure 5 Invalidity Warning

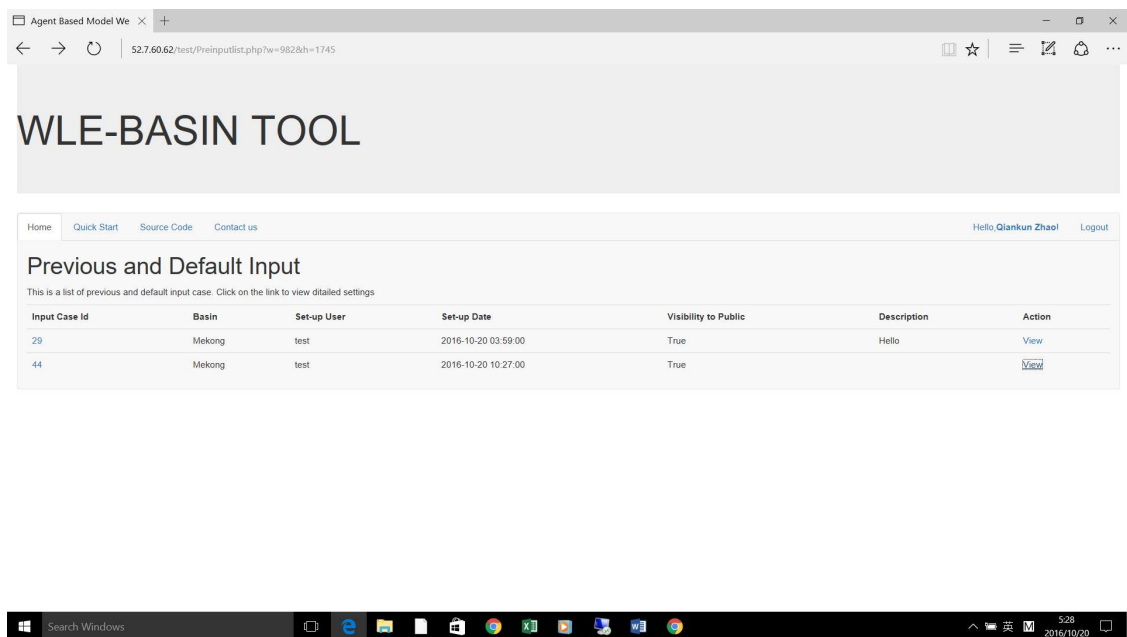
5. View Inputs

Users can also view and manage their previous inputs using this interface. By clicking “View Inputs” button on the home page, users could view their previous input cases and public input cases set up by others as shown in Figure 6. Note, users can only change their own inputs, therefore, there is only ‘View’ link (shown in Figure 6(b)) for public inputs, while the link is ‘Manage’ (shown in Figure 6 (a)) for users’ own inputs.

After clicking ‘View’ link, users can view others’ inputs too, as shown in Figure 7. By clicking each agent on the map, users’ specified value will be shown on the web page (marked red in Figure 7). Note, one user can view others’ input cases but cannot change them. After clicking ‘Manage’ link, the page will be redirected to Input Case page as shown in Figure 4.



(a) “Manage” Link for Self-Input Cases



(b) “View” Link for Others’ Input Cases

Figure 6. View Previous Inputs

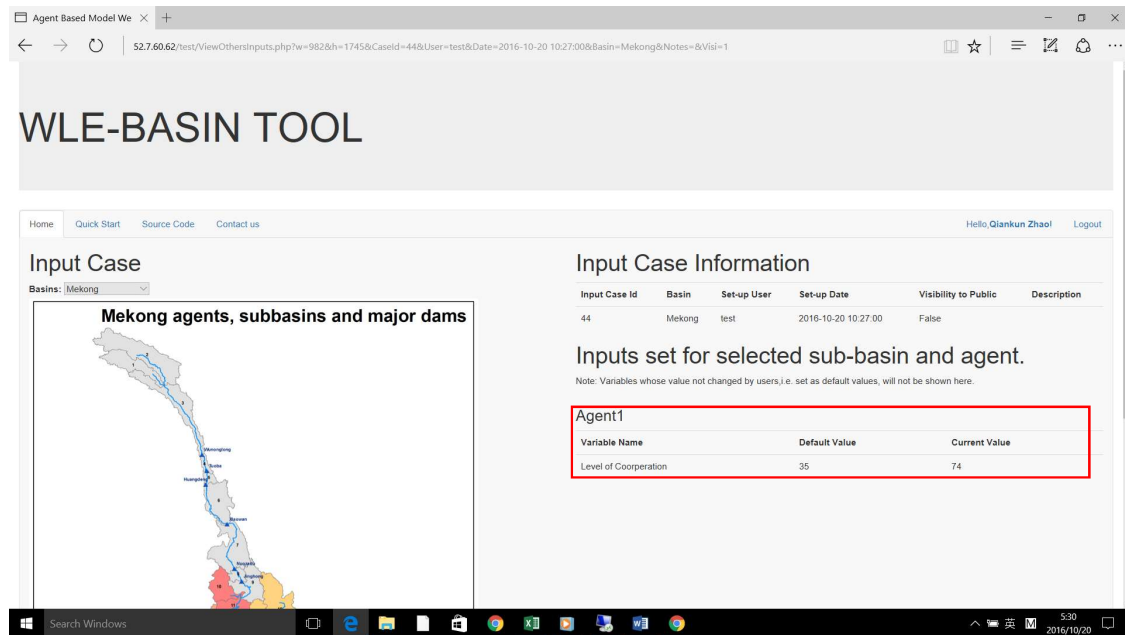


Figure 7. View others' inputs

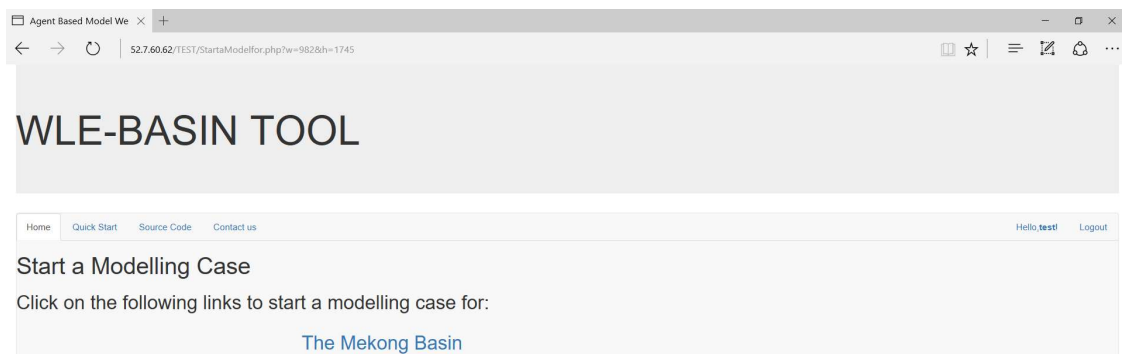
6. Set Up Model Case and Start Executing

As mentioned above, there are two ways, "Start a Negotiation" or "Start a Scenario", to set up model case and start executing. Note, it is important to remember the input case ID for future use.

6.1 Negotiation Mode

By clicking "Start a Negotiation" button on the home page, users could start a negotiation model. They should select a basin first (shown in Figure 8(a)), then add existing input cases to the model case before executing model (shown in Figure 8(b)). To add input cases to model case, users could select input cases from the drop-down menu (marked red in Figure 8(b)), and then the information of that selected input case will be shown on the web page (marked green in Figure 8(b)). By checking the information of selected input case, users can decide whether to include this input case in the model case or not, then by clicking button "add to modeling case", users can add the selected input case in the model case and the input case will be shown in the "Added input case list" (marked blue in Figure 8(b)). Finally, after adding all input cases, by clicking "Confirm Settings and Execute Model" (marked yellow in Figure 8(b)), the model case will be submitted and executed, and successful submission information in page shown in Figure 8(c).

The process for joining multiple input cases to one model cases is explained as follows. The server will go through the input cases linked with the model case in the sequence in which these input cases are added to the model case by the user. From the first input case, the server will write user specified input variable value for agents which has at least one variable with value different from the default value to the input file, and agents with all input variables which has the same value as default value will not be written in the input file. Then, the server will go through the second input case in the list, also write value of user specified input variables of changed agents in the input file, and leave input variables of unchanged agents aside. If there exist agents whose variable value have both been specified in the first case and second case, then, the value from second case will overwrite value from first case. This procedure will go on until all input cases have been included in the input file. And then, if there is still variable not specified by any input case, default value will be used. For example, if input case 1, case 2 and case 3 are added in a model case sequentially, and input case 1 has a default setting for China's priority (Agriculture priority, AG-1; Hydropower generation priority, HP-2; Eco-system services and health priority, ECO-3); input case 2 has a changed setting for China's priority (AG-2; HP-1; ECO-3); input case 3 has another changed setting for China's priority (AG-3; HP-2; ECO-1). Then, after going through input case 1, the input value will be unset as it is using default value, then when incorporating input case 2, value for China will be written in the file (AG-2, HP-1, ECO-3), and then when the server goes through case 3, the value gotten from case 2 will be overwritten to new value (AG-3; HP-2; ECO-1). Note, the overwriting is done agent by agent, therefore, one single agent will not mix decisions from different users and this also ensures the ranking of AG, HP and ECO valid.



(a) Select a Basin for Model Case

Agent Based Model We

52.7.60.62/TEST/RunAModelByWLETOOL.php?basin=Mekong&w=982&h=1745

WLE-BASIN TOOL

Home Quick Start Source Code Contact us Hello, test! Logout

Modelling case 61

Select input cases to be included in this modeling case.

Note: The value of earlier selected case will be used if different cases have overlap.

Input Cases: **Case 38 Set up by test at 2016-10-20 05:31:00** Add to Modeling Case

Input Case Id	Basin	Set-up User	Set-up Date	Visibility to Public	Description
38	Mekong	test	2016-10-20 05:31:00	False	

Added Input Case List

Input Case Id	Basin	Set-up User	Set-up Date	Visibility to Public	Description
31	Mekong	test	2016-10-20 03:59:00	False	

Confirm your settings and Excute model.

Please click on the "Confirm Settings and Execute model" button to confirm your settings, and to run the model using your settings to get the final result.

Confirm Settings and Execute model

Search Windows

5:21 2016/10/20

(b) Link Input Case with Model Case

Agent Based Model We

52.7.60.62/TEST/Submitted.php

WLE-BASIN TOOL

Home Quick Start Source Code Contact us Hello, test! Logout

Case Submitted!

You can return to the [home page](#) or [check status of your case!](#)

Search Windows

5:21 2016/10/20

(c) Submitted Successfully

Figure 8. Start Negotiation Model

6.2. Scenario Mode

By clicking “Start a Scenario” button on the home page, users could start a scenario model. They should select a basin first, then select an input case to start modeling.

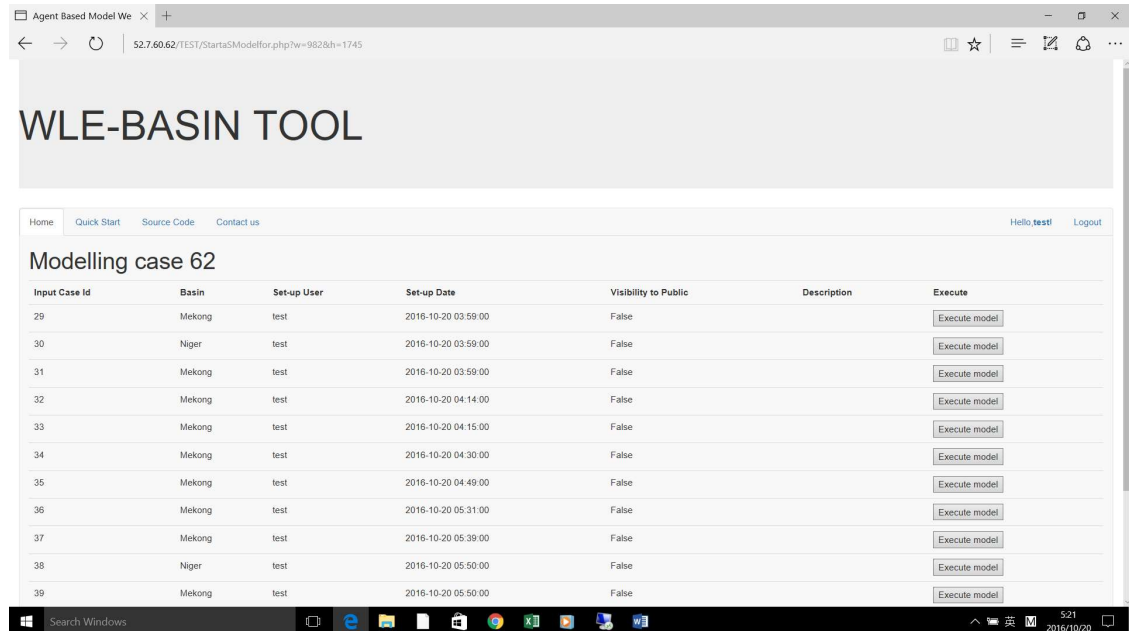
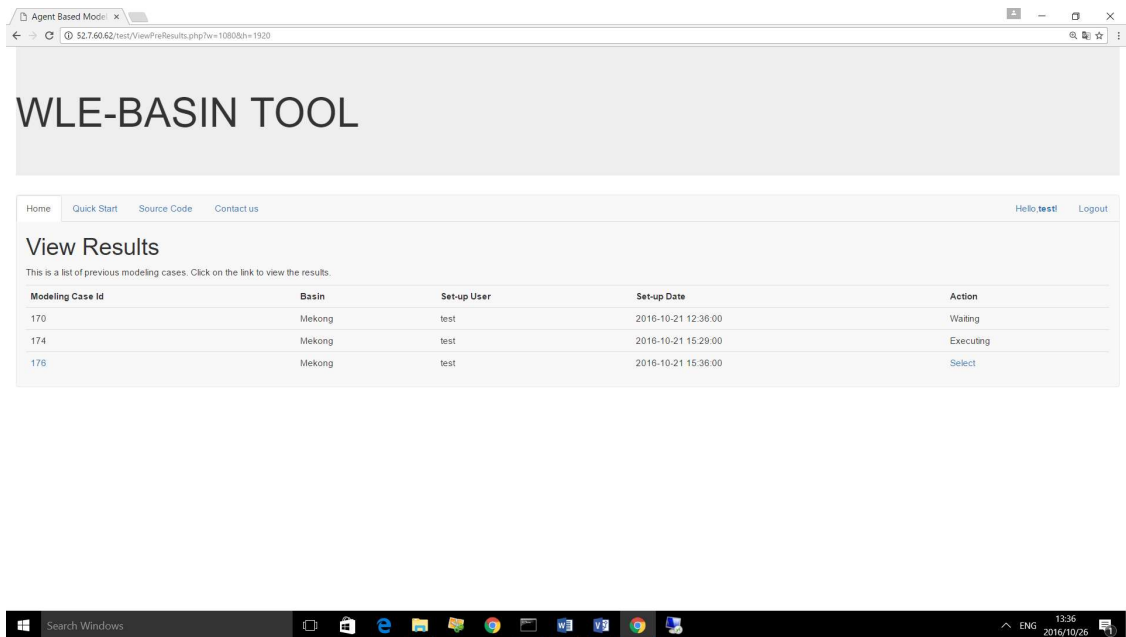


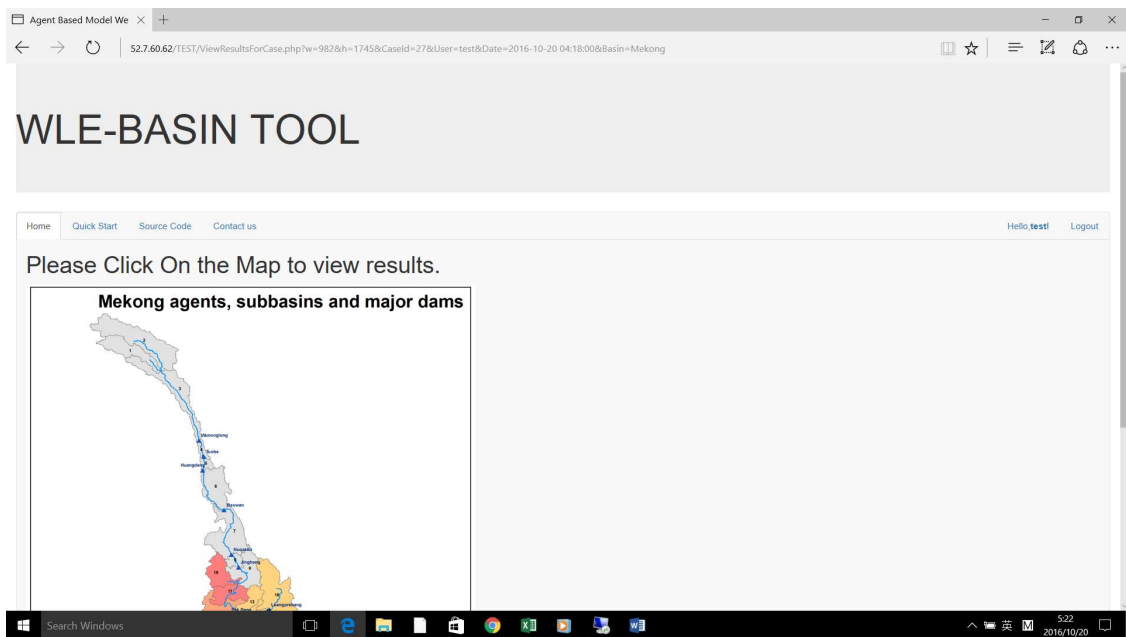
Figure 9. Start Scenario Model

7. View Result

After executing the model, users could check back in the main page to view the results. By clicking “View Result” button on the home page, users could view previous model result. In the “View Result” page, users can view the information of their model case, and also the current execution status of their model case in the “Action” column of the table. “Waiting” means their model case have been submitting and is waiting in a queue, “Executing” means their modeling is being executed now, and will be finished in a later time, and “View Result” means their model have been successfully executed and results are ready to view. They should select a model case first by clicking “View Result” link (shown in Figure 10(a)), and then click on the map to view result for a specific agent (shown in Figure 10(b)). An example of visualized result is shown in Figure 11.



(a) Select a Model Case



(b) Click on Map to View Results for Each Agent

Figure 10. View Results

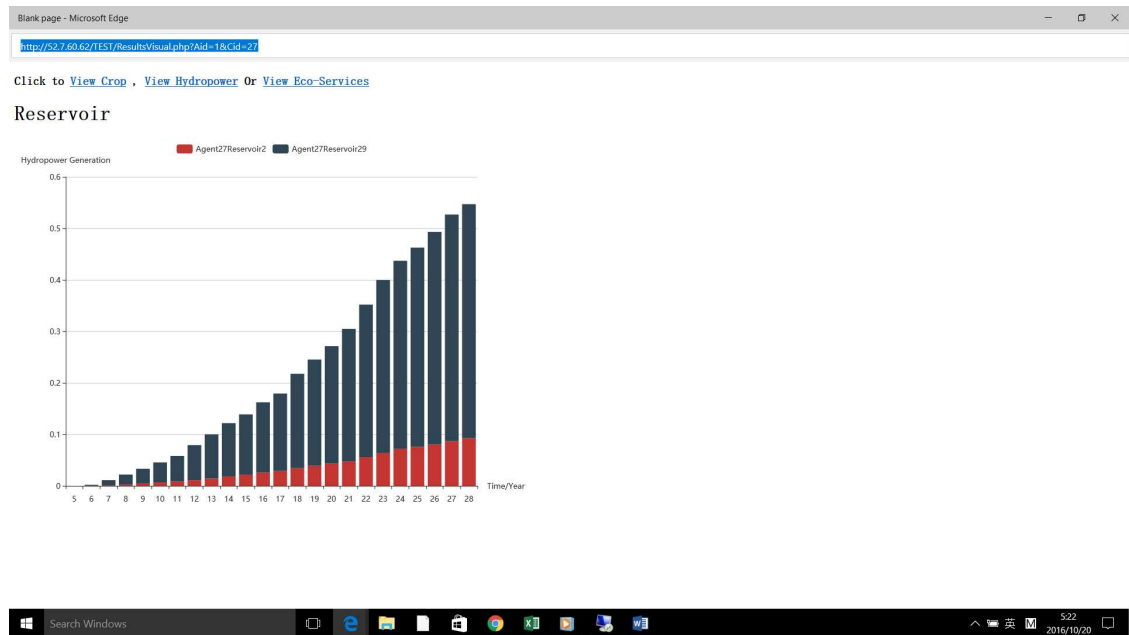


Figure 11. Visualized results

8. Compare results

By clicking “Compare Results” button on the home page, users could compare two previous model results. They should select two model cases first as shown in Figure 12, then click on the map to view result for a specific agent (same as Figure 9(b)). An example of visualized result is shown in Figure 13.

Agent Based Model We

52.7.60.62/TEST/ViewPreResults.php?C=0&w=982&h=1745

WLE-BASIN TOOL

Home Quick Start Source Code Contact us Hello, test! Logout

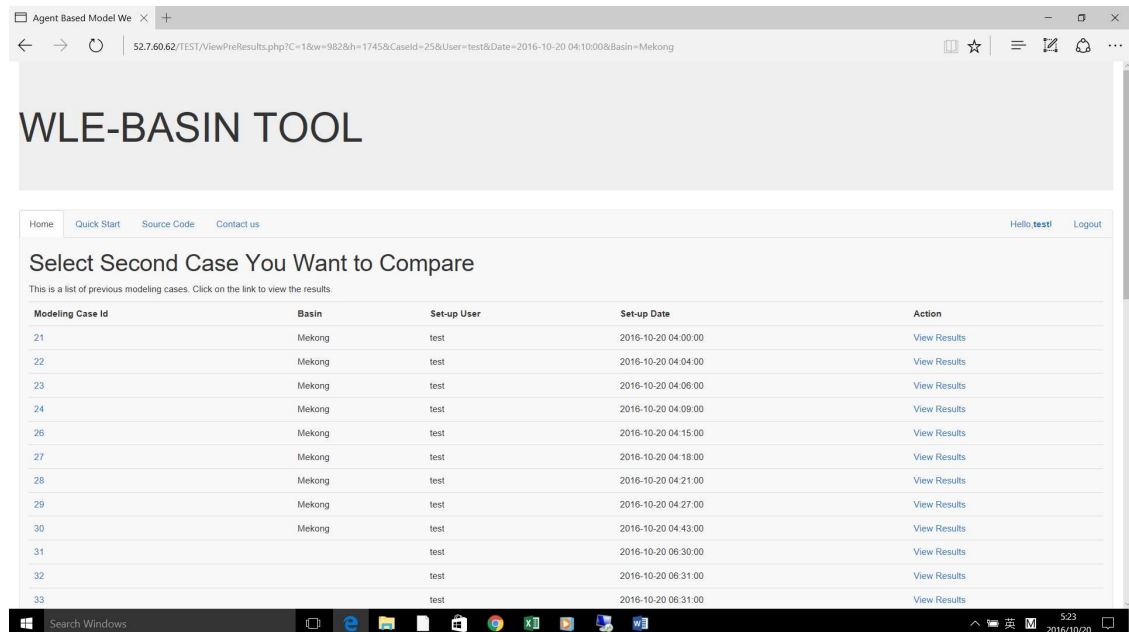
Select First Case You Want to Compare

This is a list of previous modeling cases. Click on the link to view the results.

Modeling Case Id	Basin	Set-up User	Set-up Date	Action
21	Mekong	test	2016-10-20 04:00:00	View Results
22	Mekong	test	2016-10-20 04:04:00	View Results
23	Mekong	test	2016-10-20 04:06:00	View Results
24	Mekong	test	2016-10-20 04:09:00	View Results
25	Mekong	test	2016-10-20 04:10:00	View Results
26	Mekong	test	2016-10-20 04:15:00	View Results
27	Mekong	test	2016-10-20 04:18:00	View Results
28	Mekong	test	2016-10-20 04:21:00	View Results
29	Mekong	test	2016-10-20 04:27:00	View Results
30	Mekong	test	2016-10-20 04:43:00	View Results
31		test	2016-10-20 06:30:00	View Results
32		test	2016-10-20 06:31:00	View Results

Windows taskbar: Search Windows, 5:23, 2016/10/20

(a) Select the first case to compare



(b) Select the second case to compare

Figure 12. Select two case for compare results

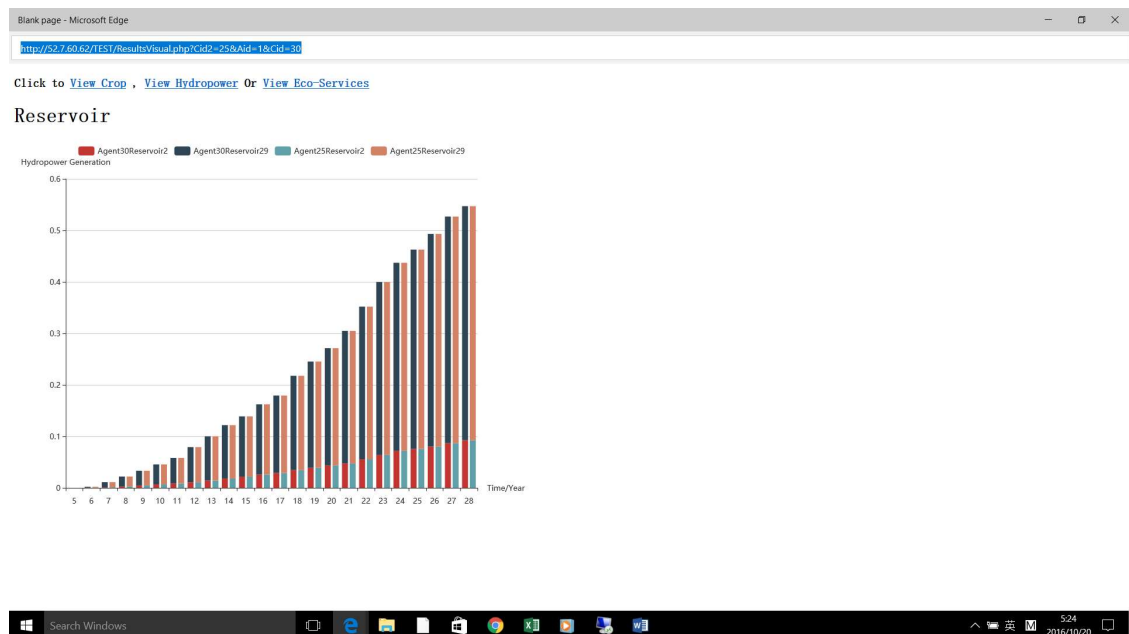


Figure 13. Compare Result Visualization