
A system-centric approach to infrastructure asset management planning

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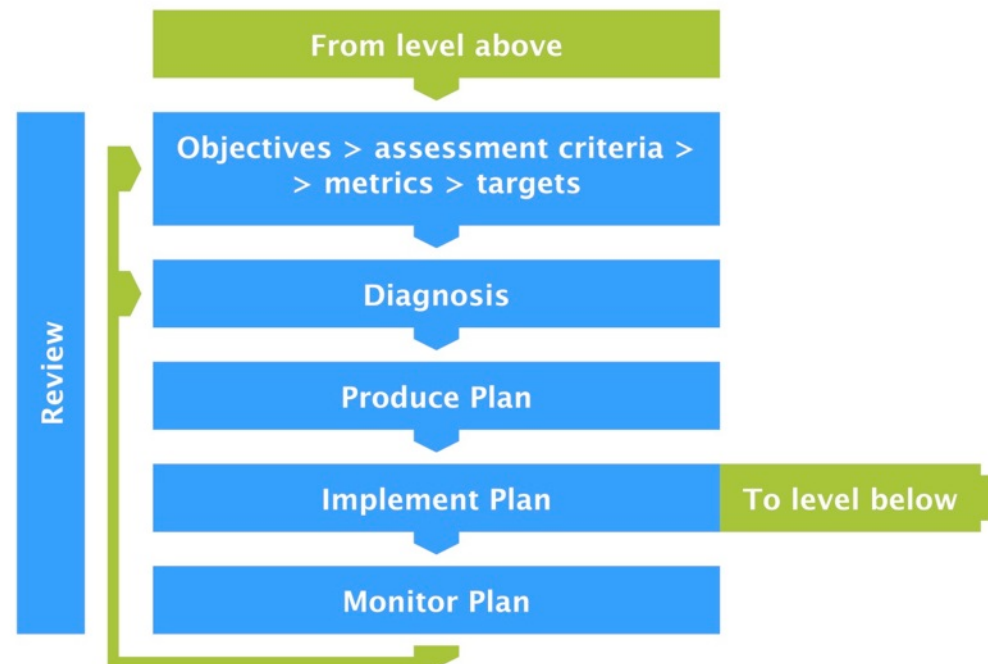
AAAREP» Urban water systems

- High levels of deferred maintenance and rehabilitation and overwhelming investment needs in urban water services infrastructure demand wise spending and innovative, efficient planning.
- Rather than component-centric AM approaches, the complexity of the problem must be addressed by system-centric methods that ensure the best possible compromise between performance, risk and financial effort.

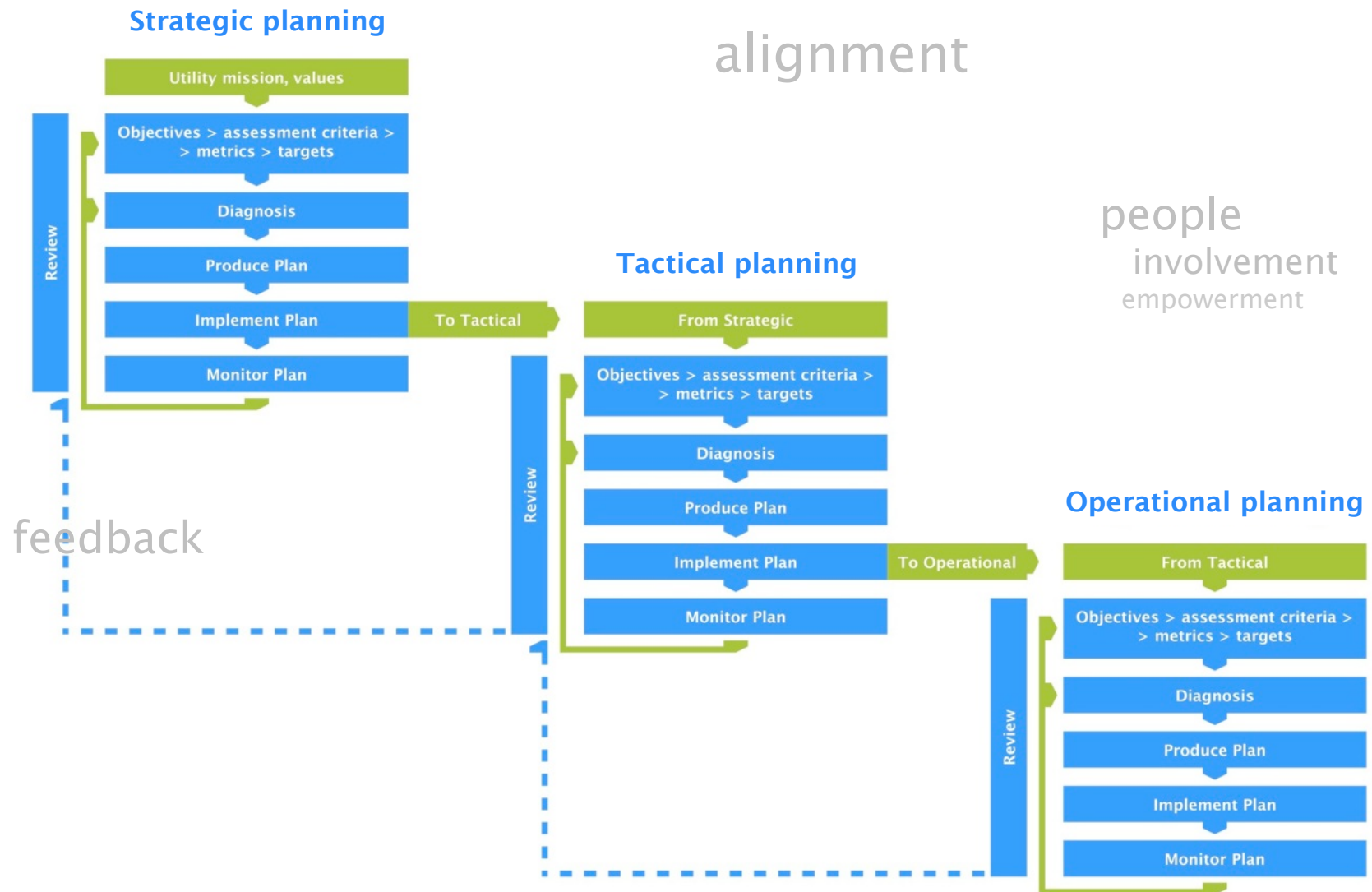
-the “*art of balancing performance, cost and risk in the long term*”.
 - Brown and Humphrey (2005)
- Systems, not collections of assets
- Long-term evaluation: as a whole, these infrastructures have an indefinite life

ANAREP» IAM at each planning level

- A PDCA loop

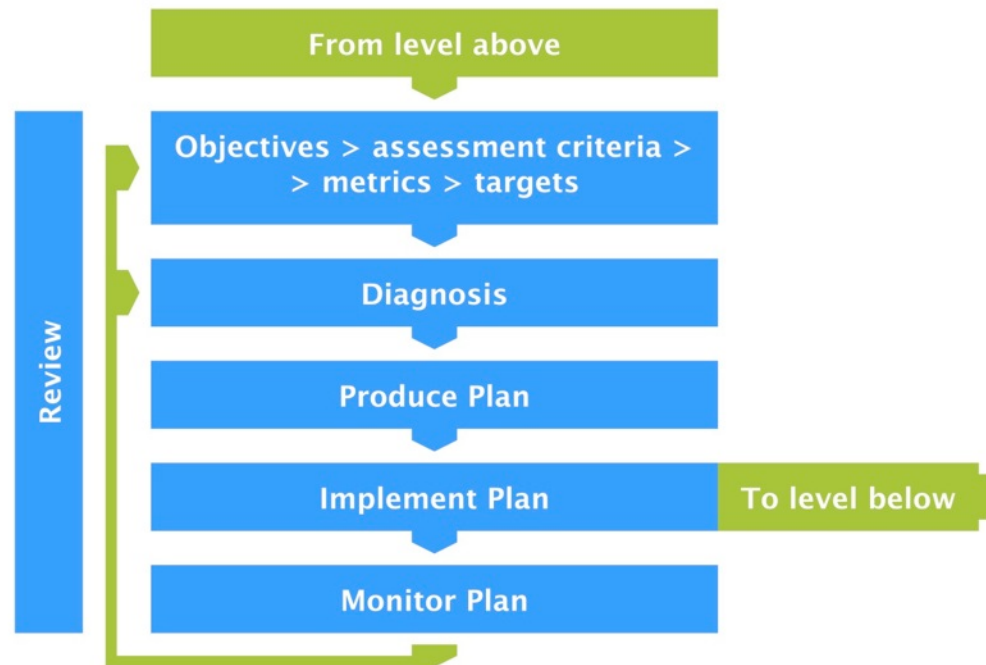


ANAREP» Through decisional levels...



ANAREP»

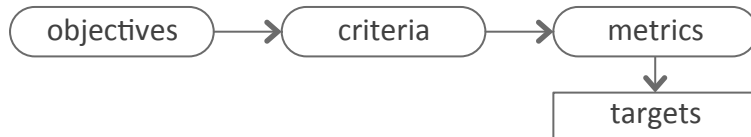
Focus: objectives -> metrics -> targets



- Time frames: planning horizon, analysis horizon

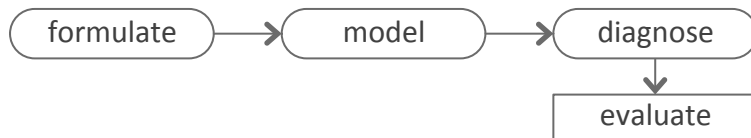
The planning process: problem-driven

define...



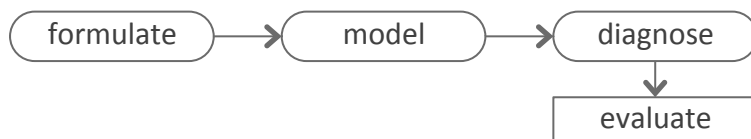
	<u>C 001</u>	<u>C 002</u>	<u>C 003</u>	<u>P 01</u>	<u>P 02</u>	<u>P 03</u>	<u>P 04</u>	<u>R 1</u>

for the current system...

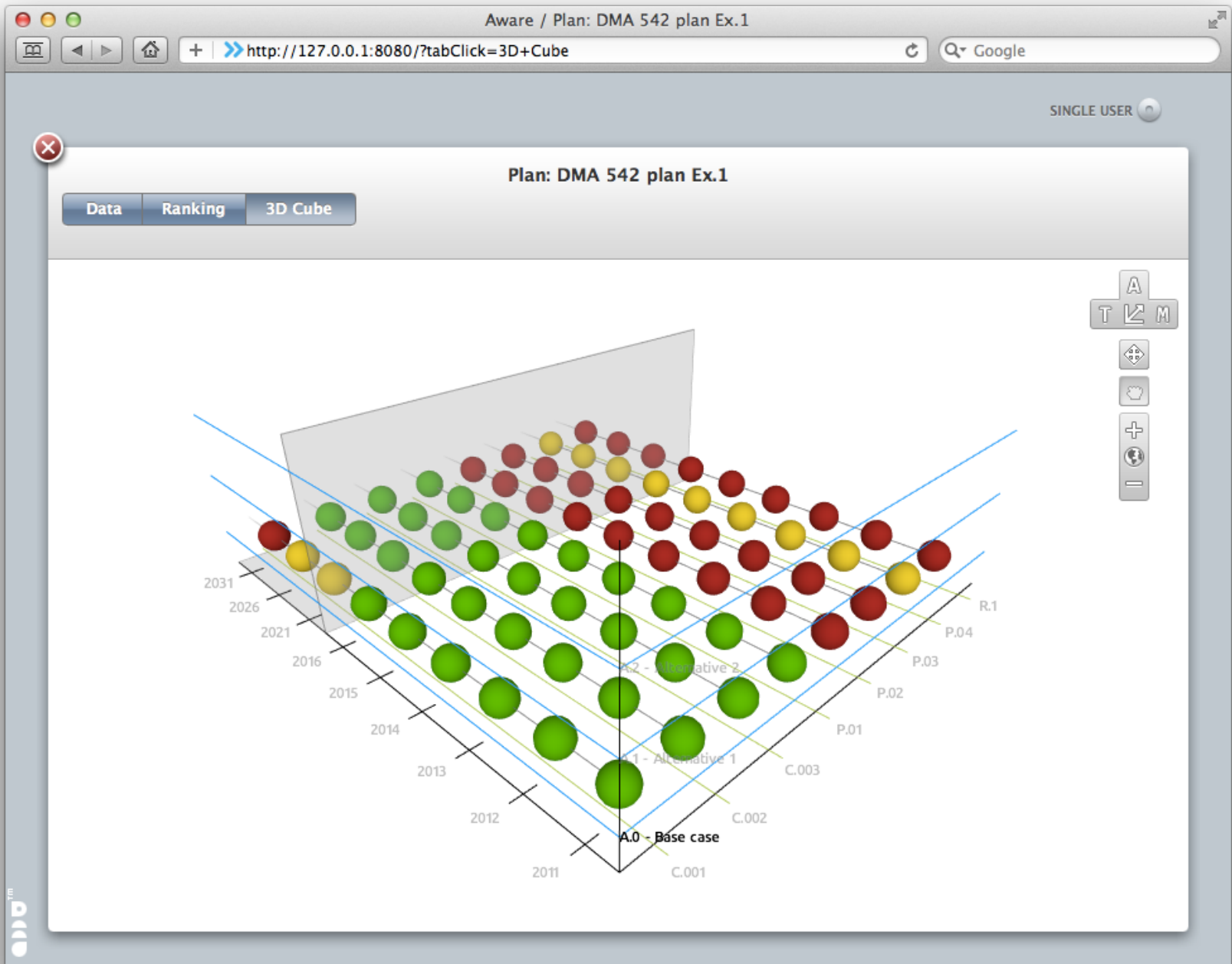


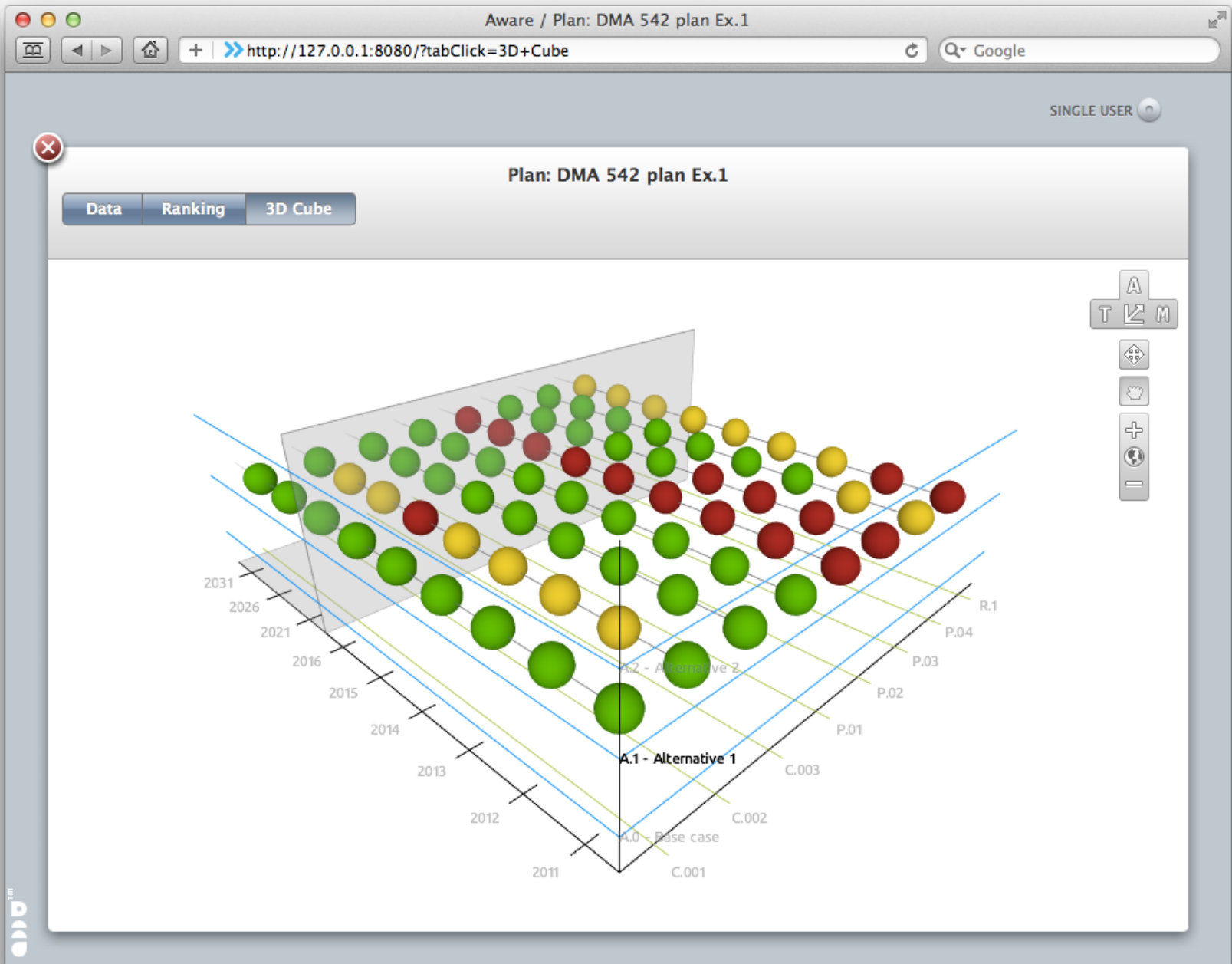
	<u>C 001</u>	<u>C 002</u>	<u>C 003</u>	<u>P 01</u>	<u>P 02</u>	<u>P 03</u>	<u>P 04</u>	<u>R 1</u>
<u>A.0</u>	●	●	●	●	●	●	●	●

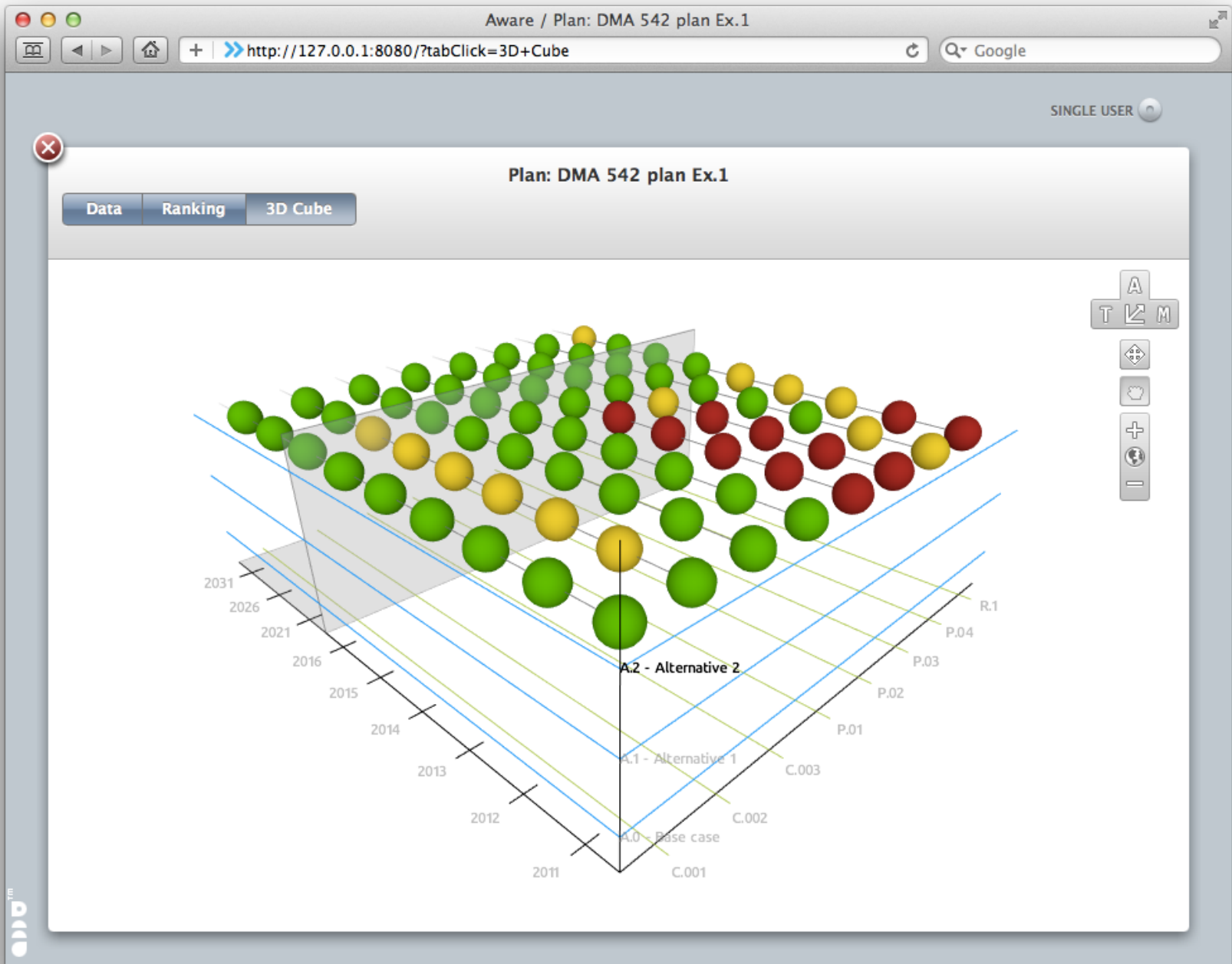
for each planning alternative...

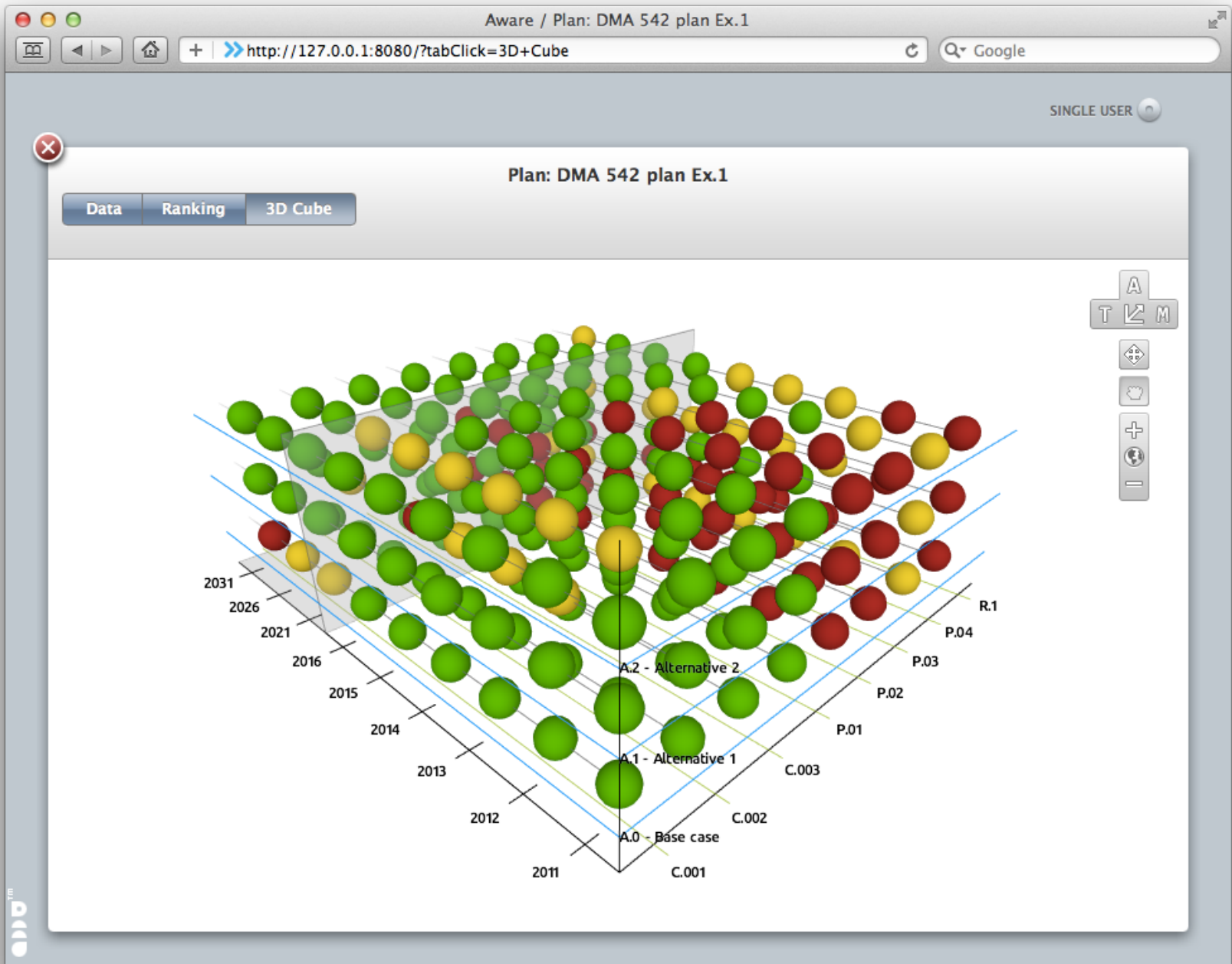


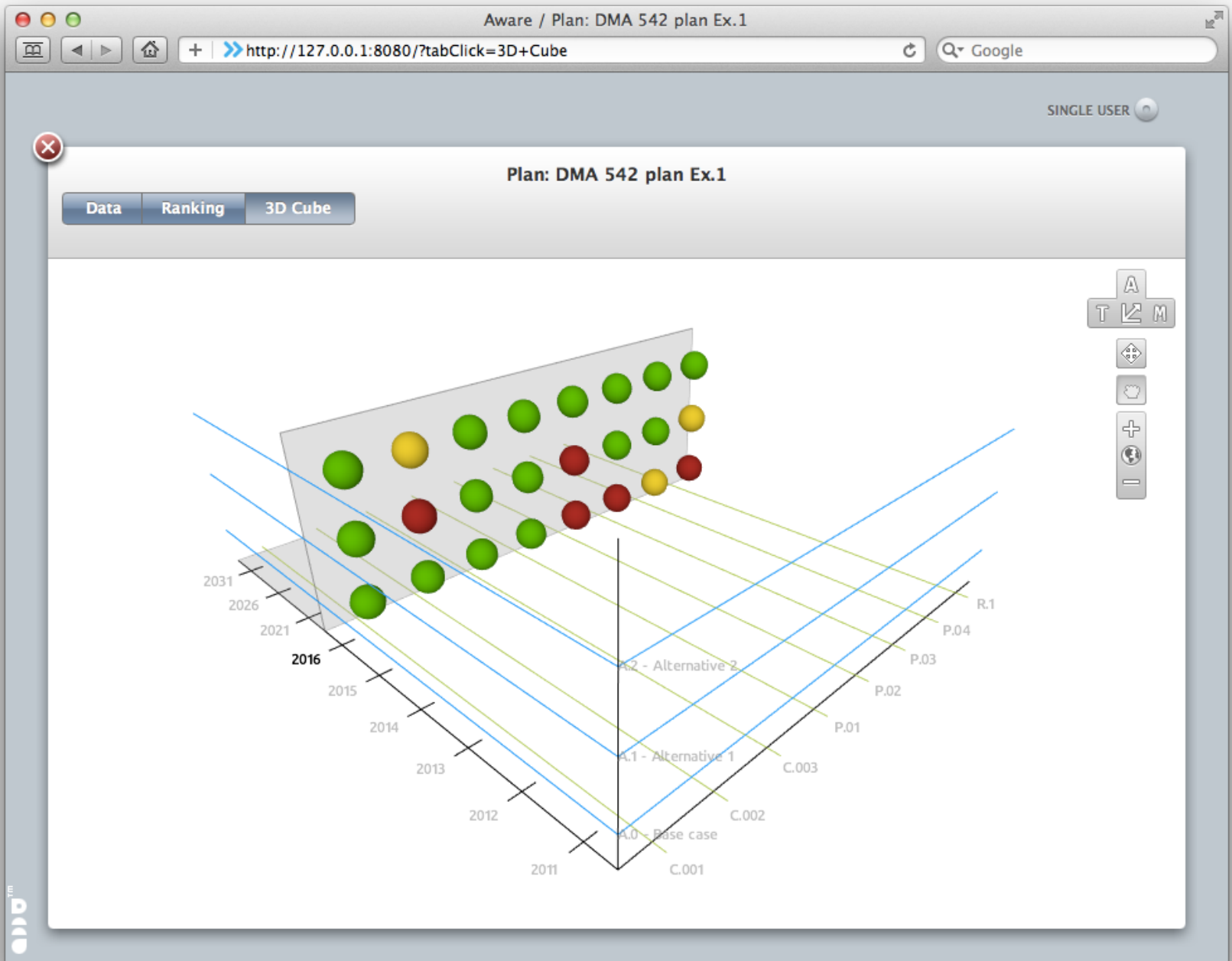
	<u>C 001</u>	<u>C 002</u>	<u>C 003</u>	<u>P 01</u>	<u>P 02</u>	<u>P 03</u>	<u>P 04</u>	<u>R 1</u>
<u>A.0</u>	●	●	●	●	●	●	●	●
<u>A.1</u>	●	●	●	●	●	●	●	●
<u>A.2</u>	●	●	●	●	●	●	●	●

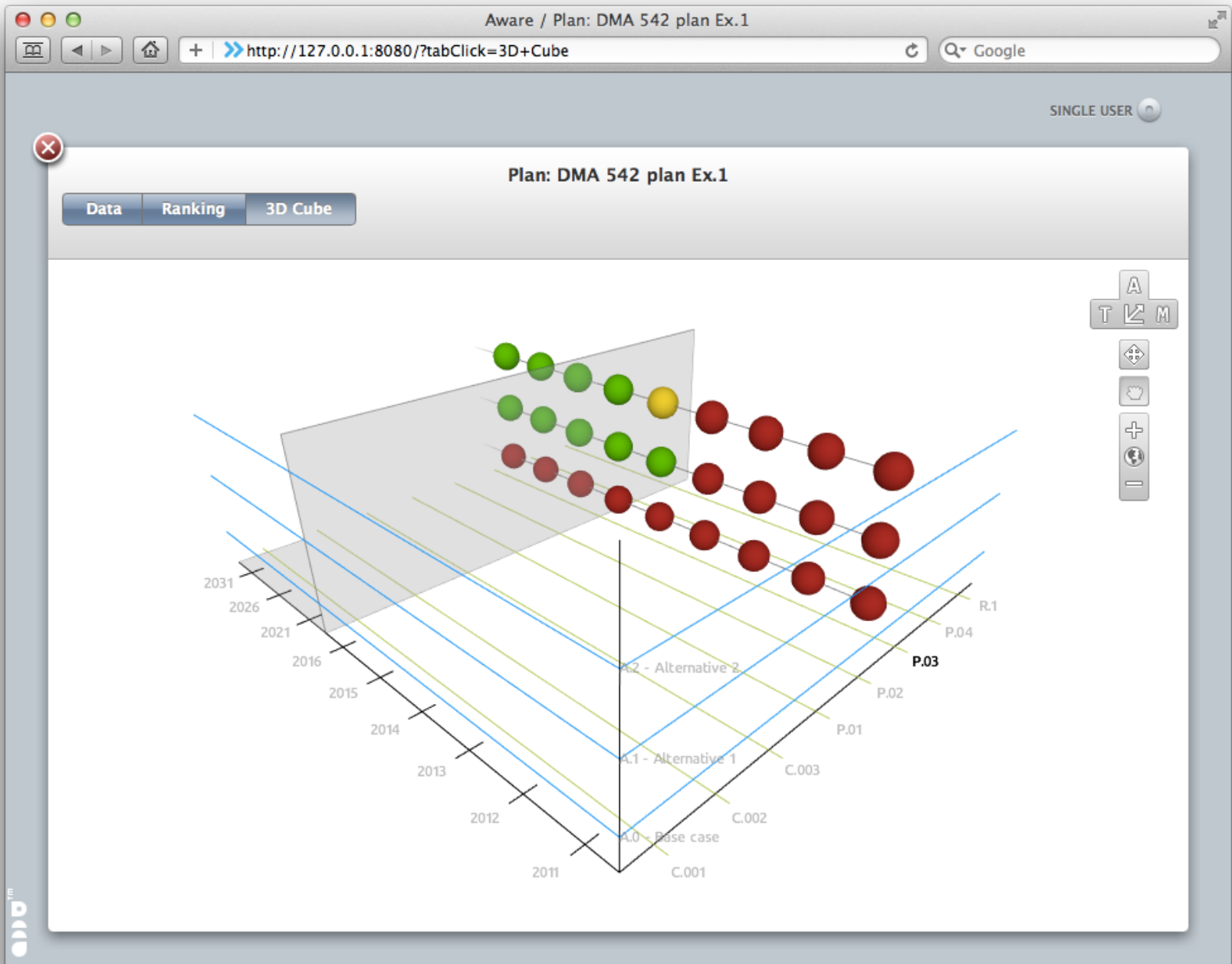






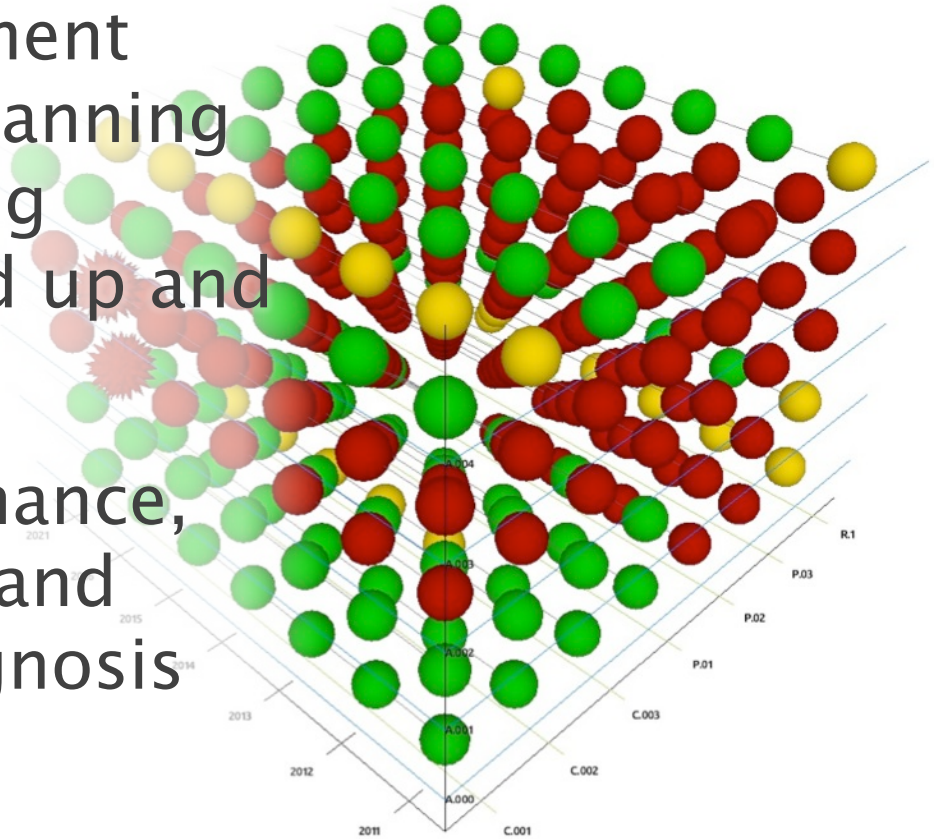






AWAREP» The AWARE-P software

- An organized assessment environment where planning solutions or competing projects are measured up and compared.
- A portfolio of performance, risk and cost metrics and analysis tools for diagnosis and sensitivity gain.



AWAREP» The AWARE-P software

- Integrates all the necessary data
- Oriented to system response
- Capable of system-level metrics and component-level metrics (within the system)

ANAREP» Current toolset

- NETWORK – model-enabled network analysis envmt.
 - PLAN – the central planning framework
-
- PI – Performance Indicators
 - PX – Performance Indices
 - FAIL – Poisson and LEYP, pipe failure prediction
 - CIMP – component importance (impact of its failure on nodal consumption).
 - UNMET – reduced service estimation.
 - IVI – Infrastructure Value Index

++Alternative 0 Statu quo

EDITNEW FOLDER

ADD FILEADD TABLE

Name	Type	Modified	Size
Alternative 0	Epanet INP File	2012/04/04	83 kB
Alternative 0 Comp Imp	Component Importance Table	2012/04/04	0 rows
Alternative 0 emergency	Epanet INP File	2012/04/04	83 kB
Alternative 0 emergency Pmin	Performance Index Table	2012/04/04	14251 rows
Alternative 0 Failure analysis	Failure Analysis Table	2012/04/04	11481 rows
Alternative 0 IVI	Cost Table	2012/04/04	459 rows
Alternative 0 PI	Performance Indicator Table	2012/04/04	45 rows
Alternative 0 Pmin	Performance Index Table	2012/04/04	14251 rows
Alternative 0 Risk	Risk Assessment Table	2012/04/04	457 rows
Failures database	Work Order Failures	2012/04/04	1959 rows
Pipes database	Work Order Pipe	2012/04/04	11481 rows

baseform

TimeSteps

On27 – Real losses per connection

SINGLE USER

Failure analysis: Alternative 2 Failure analysis

Summary

File name Alternative 2 Failure analysis

Folder Alternative 2

Owner single user

Size 11482 rows

Work Order Pipes [Pipes database A2 t5](#)

Work Order Failures [Failures database A2 t5](#)

OPEN IN DATA MANAGER

Model info

☐ Poisson
 ☒ LEYP

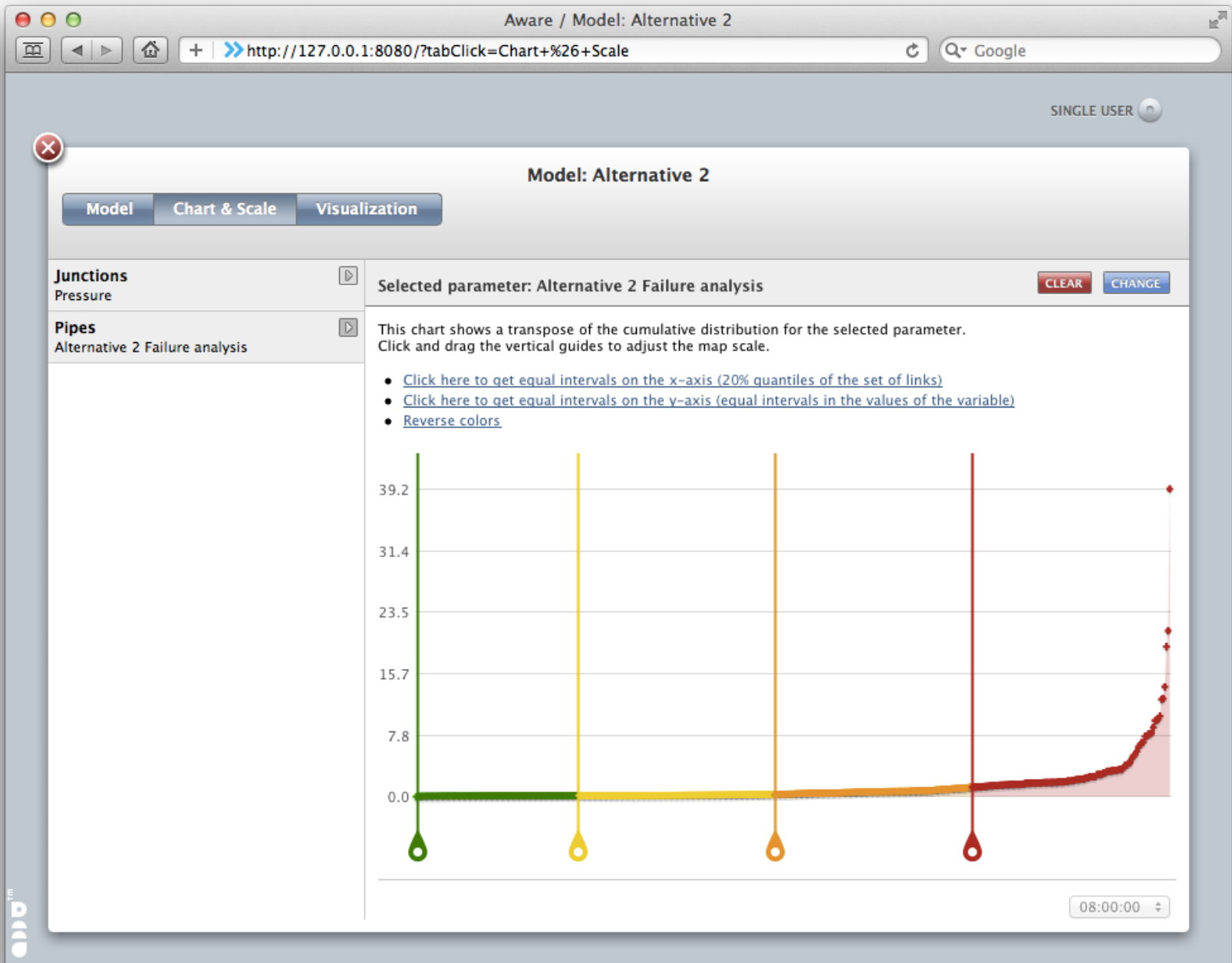
Year 2031

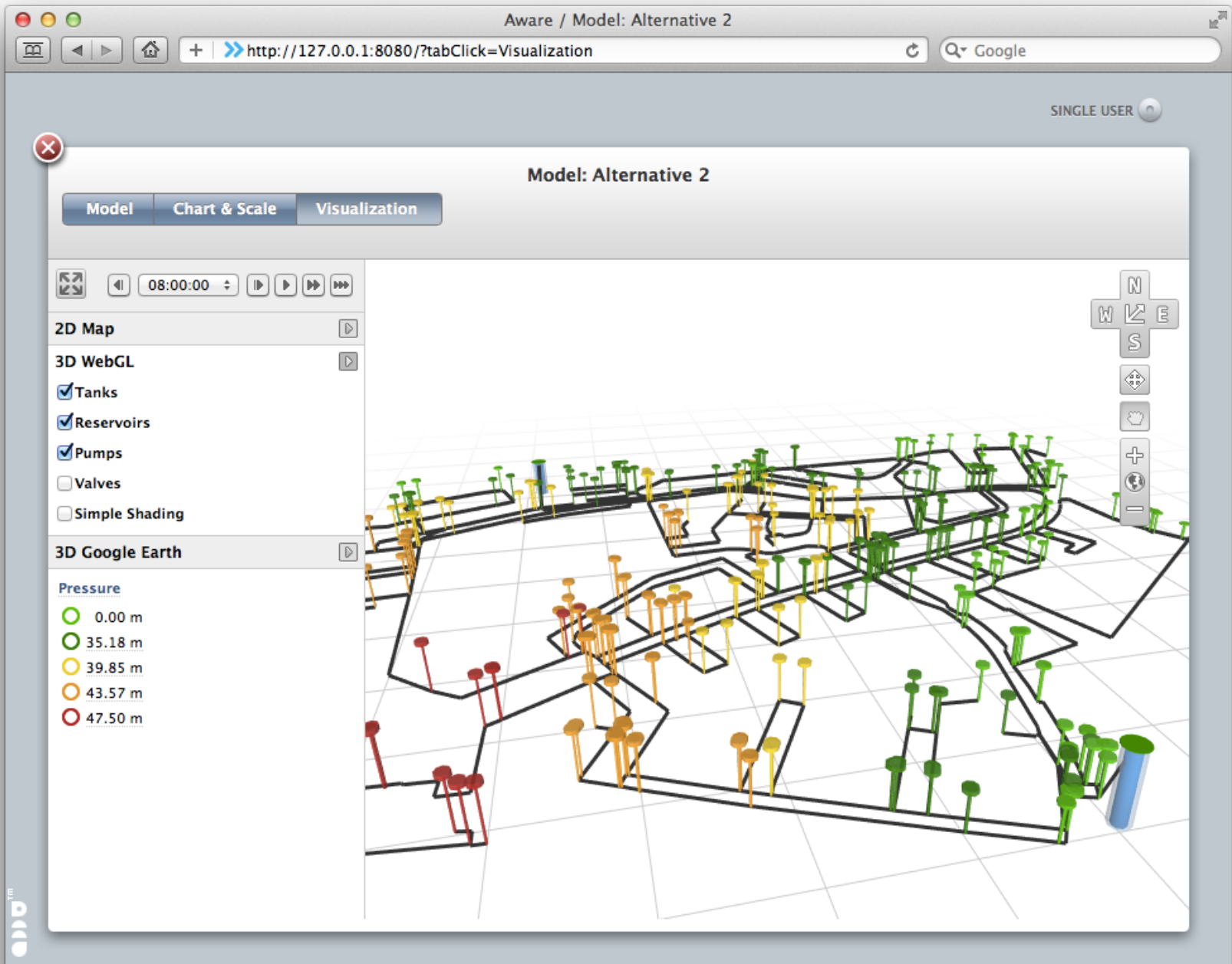
UPDATE

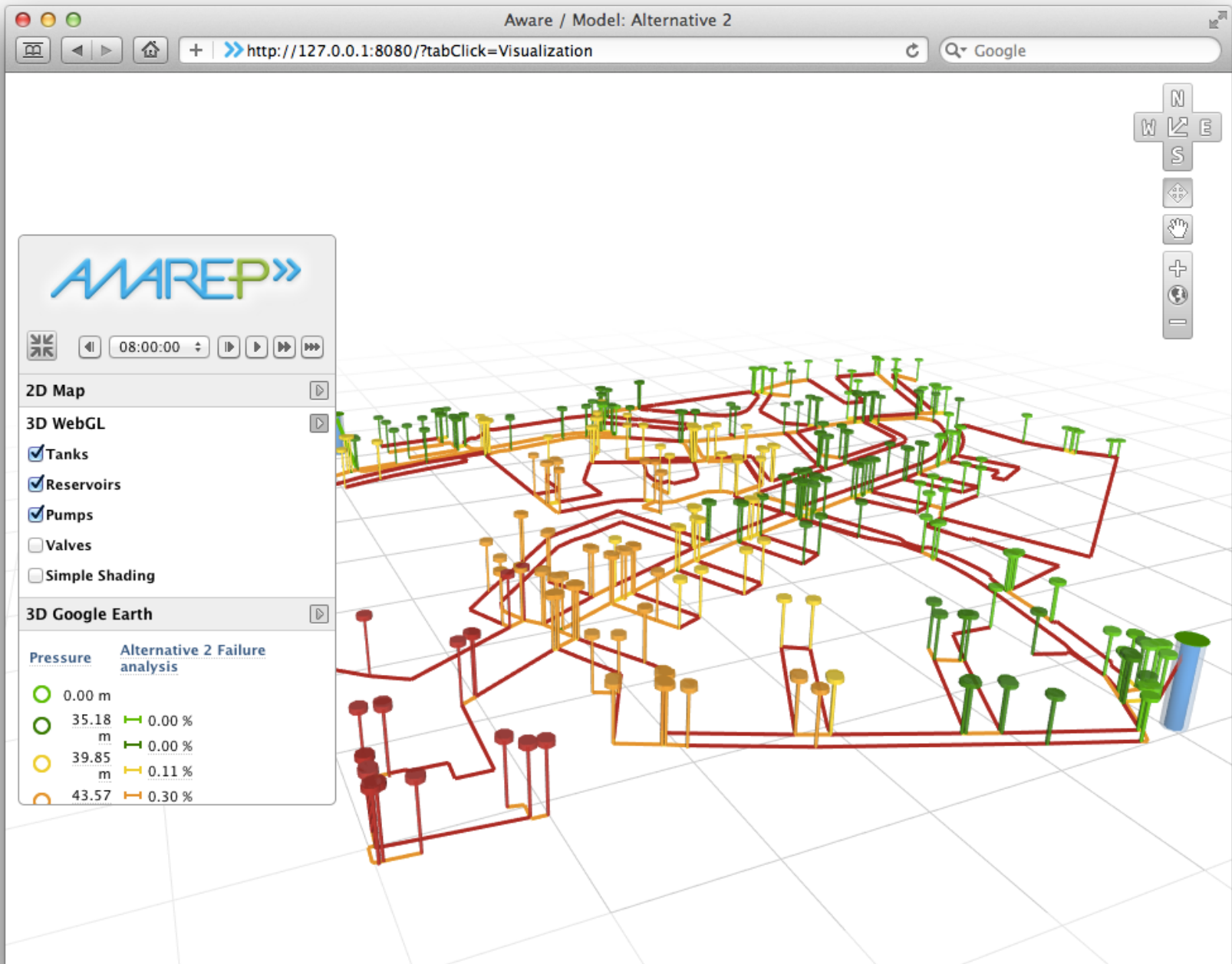
Material	α	δ	β_0	β_{diam}	β_{Len}	Fails. per year	Fails./km per year
FF	0.0000	0.0000	101.1552	-0.6617	-63.7024	0.00	0.00
	0.1284	0.1272	0.6123	0.1260	0.0543		
FG	0.0000	1.5410	-9.8545	0.0234	0.6342	1.20	0.48
	0.9999	0.5322	0.0039	0.3909	0.0302		
FD	6.9695	0.5402	-5.1167	-0.0007	0.3525	1.23	0.12
	0.0180	0.1375	0.0000	0.7223	0.0145		
PEA	5.8924	0.5759	-5.3204	-0.0043	0.5626	37.73	0.29
	0.0000	0.0000	0.0000	0.0000	0.0000		
FC	1.7160	0.7499	-4.2285	-0.0023	0.3578	187.72	1.70
	0.0000	0.0069	0.0000	0.0000	0.0000		
PVC	1.7441	0.7040	-5.3085	-0.0020	0.5652	59.23	0.52
	0.0000	0.0000	0.0000	0.0837	0.0000		

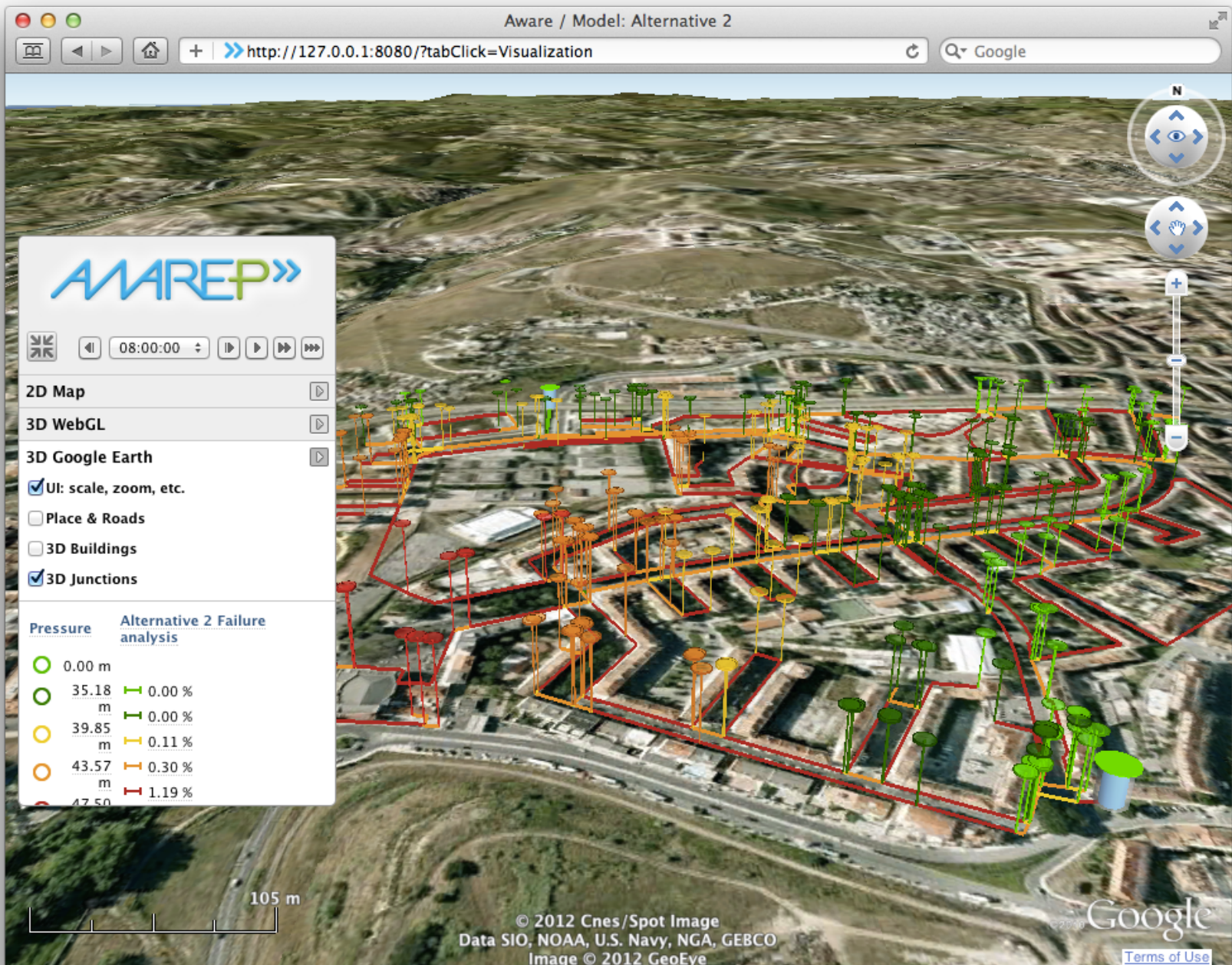
Pipe ID	Failure Rate	Failure Probability
815102	2.7346	91.0%
14180	3.3388	89.8%
11295	1.9259	83.8%
1123090	1.8222	81.8%
10711	1.8130	79.2%
11370	1.6338	77.2%
10922	1.5801	76.2%











AMAREP»



00:00:00 ÷



2D Map



3D WebGL



3D Google Earth



☒ UI: scale, zoom, etc.

☐ Place & Roads

☒ 3D Buildings

☒ 3D Junctions

Pressure

Velocity

 0.00 m	 4.10e-06 m/s
 51.92 m	 0.02 m/s
 53.42 m	 0.09 m/s
 54.44 m	 0.15 m/s
 55.13 m	 0.19 m/s

28 m

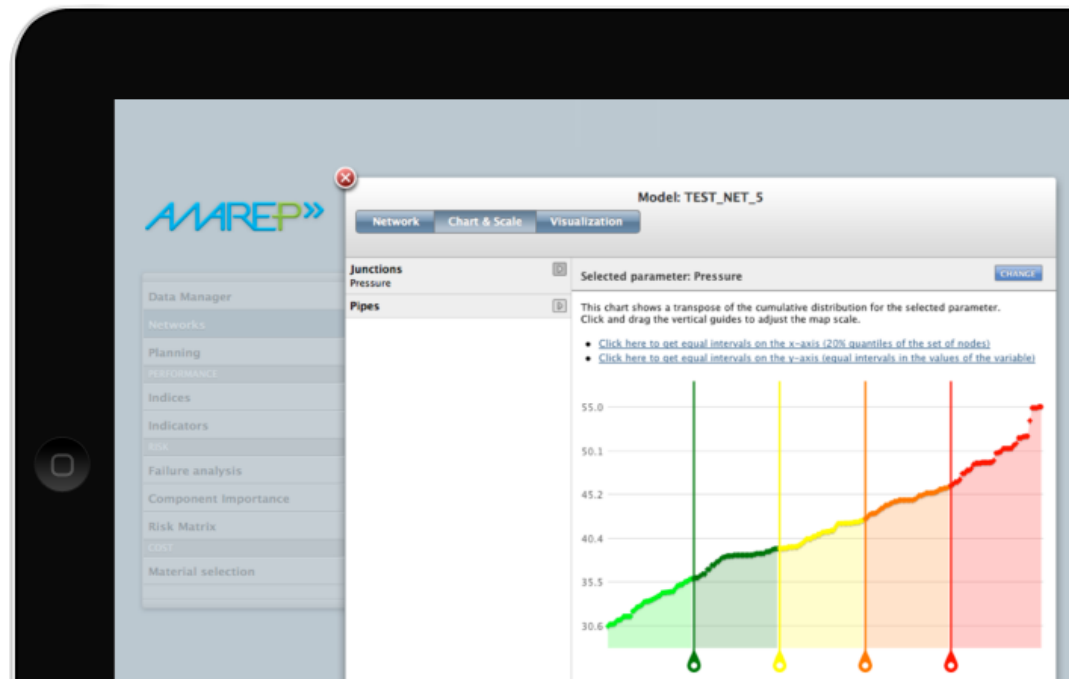
Buildings © 2008 3D Cities SA
© 2012 Cnes/Spot Image
Image © 2012 GeoEye

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GO

AAAREP» Technology, at a glance

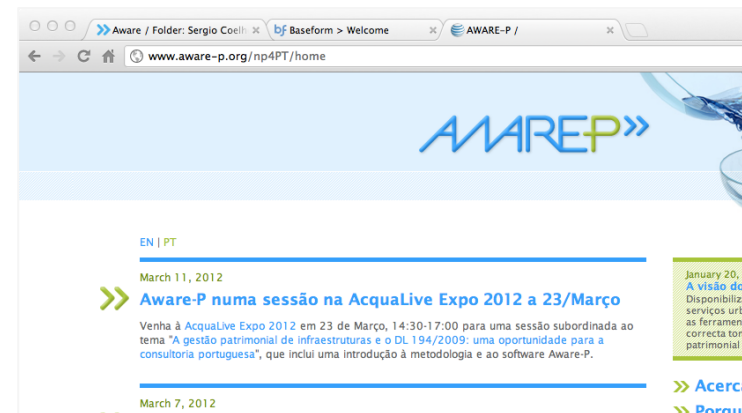
- Web-based
- Modular, made to grow
- Client-server
 - cloud / corporate / local
- Multi-user
- Multi-platform
 - PC, Mac, iPad, linux
 - Laptop, tablet
- Compatible with existing SI



AWAREP» For more info...

- The AWARE-P project:

www.aware-p.org



- The software:

www.baseform.org

