



Overview of Quantification Using ExSS

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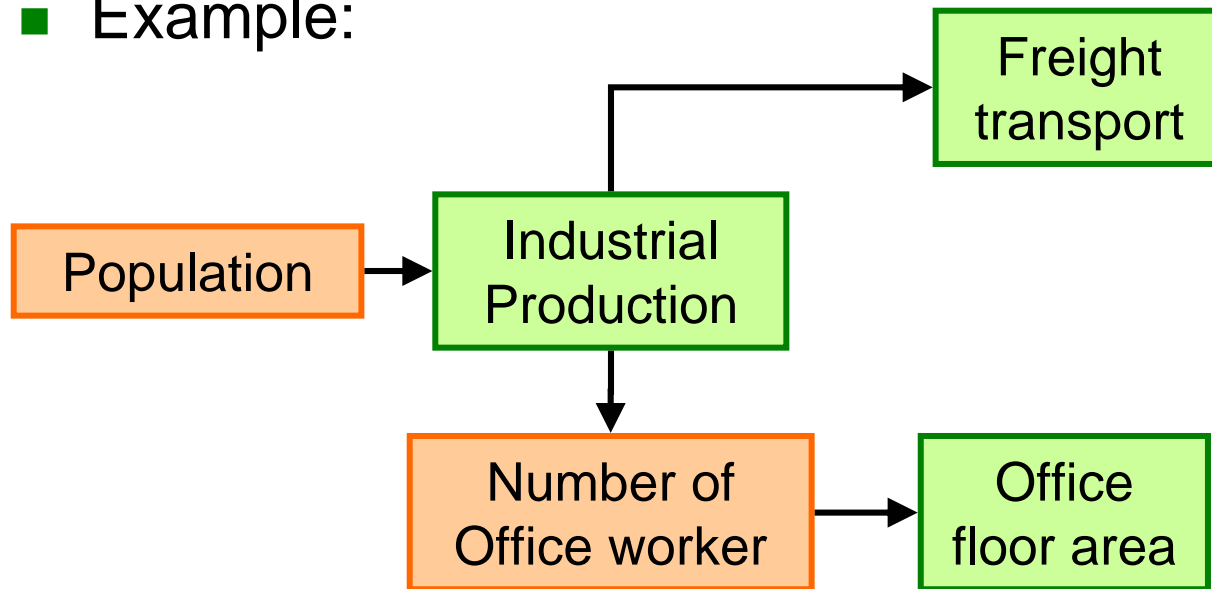
What's ExSS?

- Extended SnapShot tool
(extended from energy snapshot tool)
- Needs: We need future image of our society to discuss LCS
(population, economic structure, land-use etc)
- > Quantitative future snapshot
- > Extend the estimation target to estimation of Driving Force



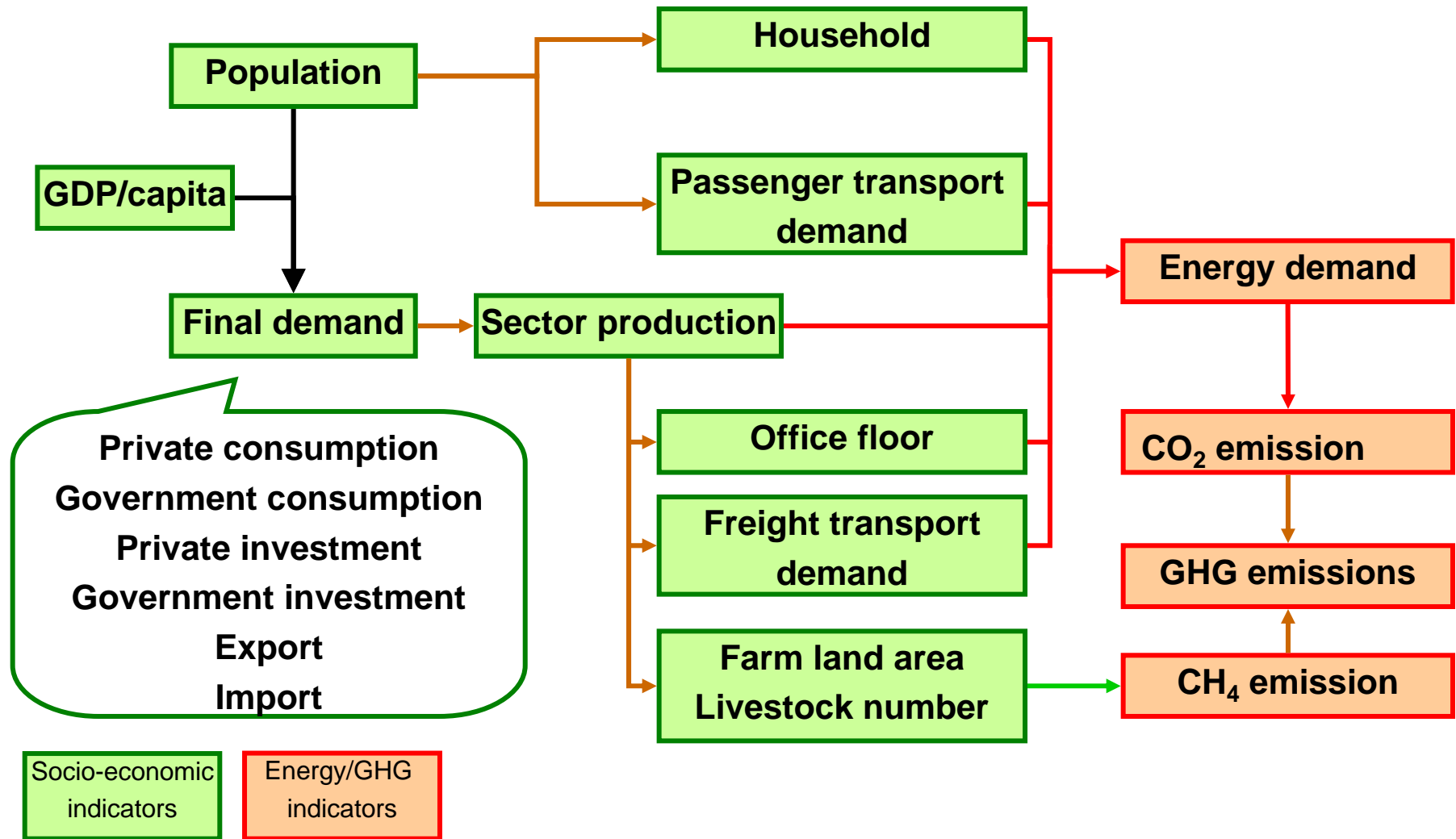
General Idea

- Activity level of each sector is related each other
- Example:



By formulating relationship between Indicators,
We can estimate Driving Forces simultaneously,
Under assumptions of future depictive image.

Structure of ExSS (early version)



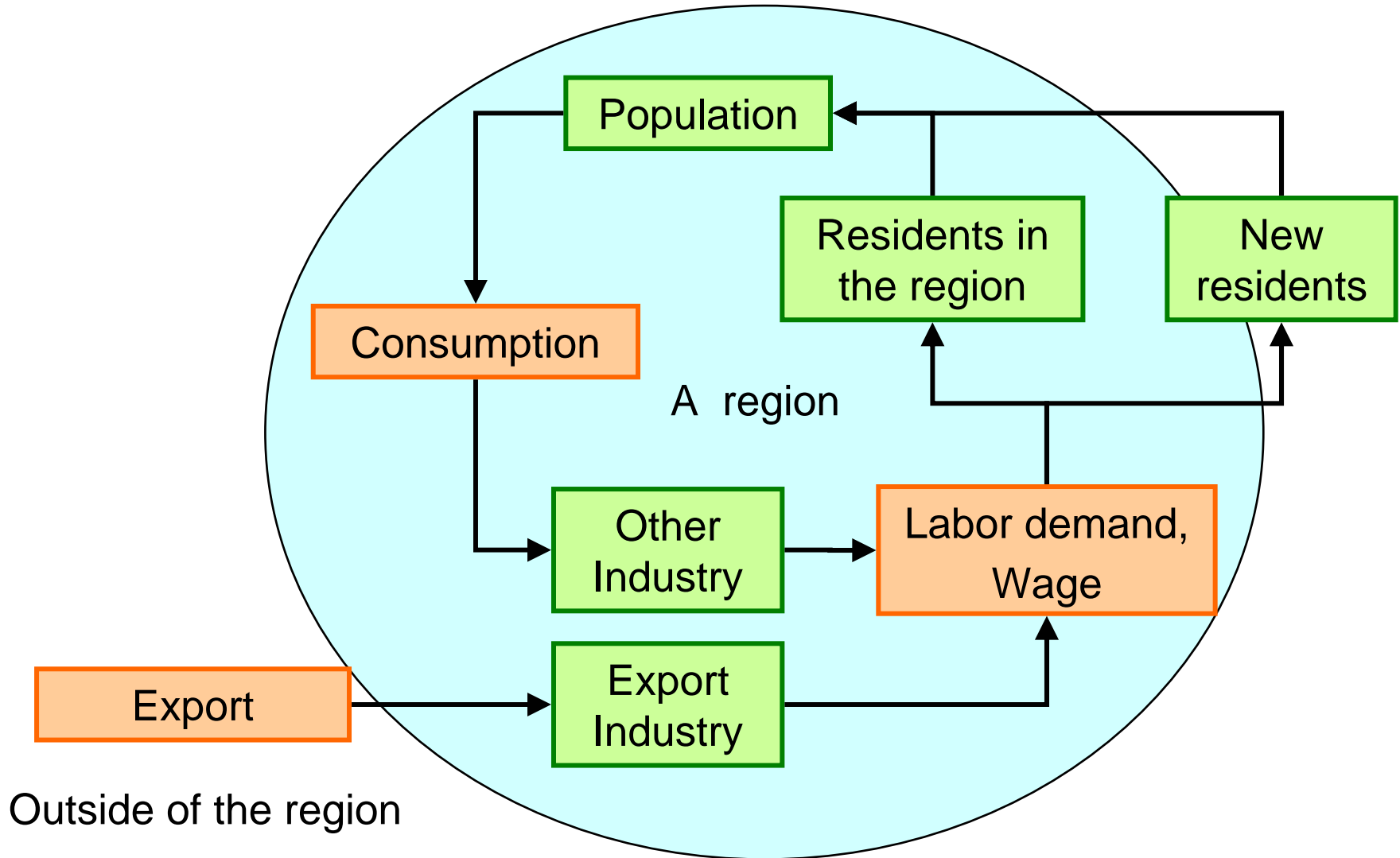
→ Both by EXCEL & GAMS.



Some problem of application

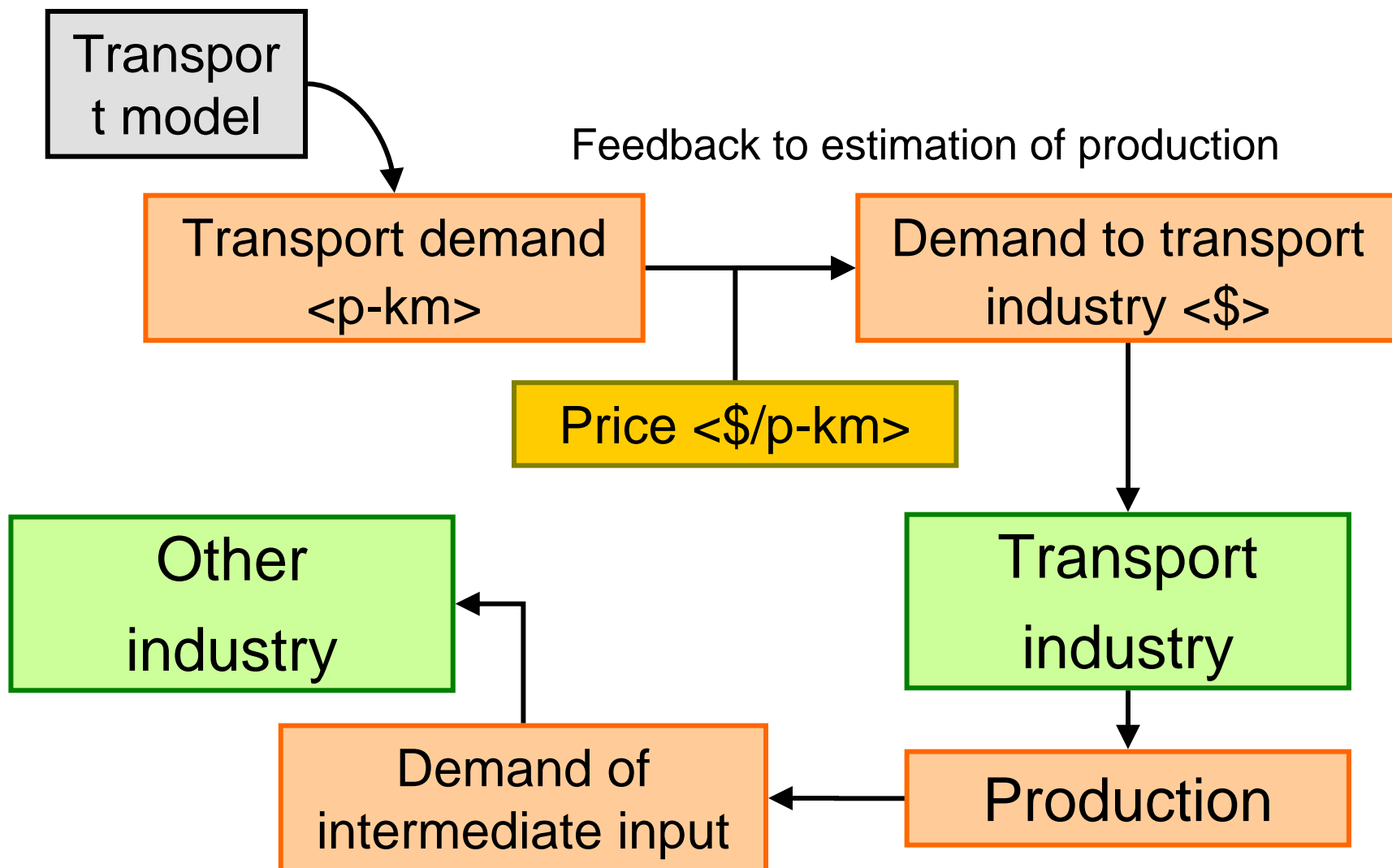
- Viewpoint of local development
 - Employment
 - Base industry (main export industry of the region)
 - >many municipalities try to attract investment of factories from outside of the region
- Transport & Energy industry
 - Energy demand (calculated by ESS) and production of energy industry
 - Transport volume (calculated by early ExSS) and production of transport industry

Export industry and population





Transport/Energy demand and Spillover



Let's solve them, simultaneously

Modeling policies are;

- To formulate those relationships in a set of simultaneous equations
- To use IO analysis to calculate spillover effect and feedback loop
- To find solution by numeric calculation program (GAMS)



Sample of GAMS window

```
gamside: C:\Documents and Settings\K-Gom\デスクトップ\chpexss\EXSSver9\20...
File Edit Search Windows Utilities Help
Popshare
Sets.gms dc_sets.gms equations.gms

Sets

*生活
age                *年齢の歳階級
/age1*age16/
age3c              *年齢三区分別 (旅客輸送モデルのため。0514は5歳-14歳)
/0514,1564,65/
agerap(age3c, age) *五歳階級と三区分別の対応
/0514.(age2, age3),1564.(age4*age13),65.(age14*age16)/
area              *居住地域
/area1*area8, kyt, osk, hyg, nra, wky/
sex               *性別
/m f /
work              *労働
/wk nw/
place             *地域内外の通勤関係
/in i n, i nout, out i n/
act               *活動種(時間の使い方)
/act1*act19/

*産業連関表とエネルギーサービス
all set           *ICとエネルギーサービス全て
/cl, ht, hw, k, em, hom, mycar, pd1*pd43, ni dtot, nhc, wge, pft, rv
pc, gc, gdp, gl, pl, zal ko, ex, i m dmp, tra, bus, car, tw, w k, bd
ft, sfv, lf, fr, fs, fa, i ndus/
esc(all set)      *エネルギーサービス
```

```
gamside: C:\Documents and Settings\K-Gom\デスクトップ\chpexss\EXSSver9\20...
File Edit Search Windows Utilities Help
Popshare
Sets.gms dc_sets.gms equations.gms

*生活**
*時間
eqTme(act)..      Tme(act)=
sum(sex, sum(area, sum(age, Pop(sex, area, age)*W(sex, area, age)*Tmeshare(sex, "w", act, s
sum(sex, sum(area, sum(age, Pop(sex, area, age)*(1-W(sex, area, age))*Tmeshare(sex, "nw",

*人口
eqPoptot..        Poptot = Poptwork/Wsum;
eqPop(sex, area, age).. Popt(sex, area, age) = Poptot*Popshare(sex, area, age);

*消費支出
eqFC..            Ftot("pc") = D*P*Q;

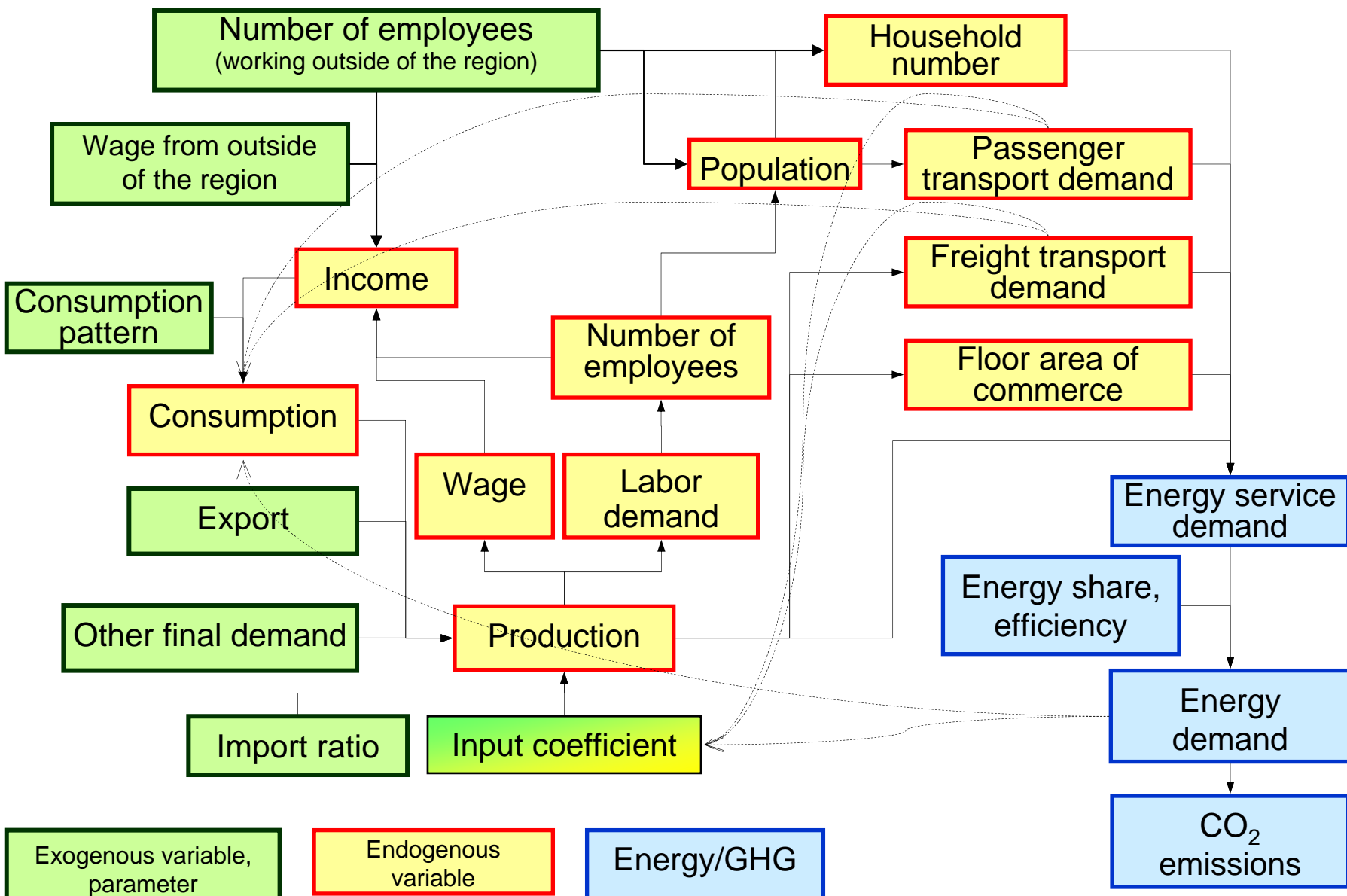
*産業**
*最終需要
eqFDv(pds, o_fds).. FDv(pds, o_fds) = FDv_exo(pds, o_fds);
eqFtot(o_fds)..   Ftot(o_fds) = Ftot_exo(o_fds);
eqFDv_pc_off(pds).. FDv_pc_off(pds) = FDv_exo(pds, "pc");
eqFD(pds)..       F(pds) = sum(fds, Ftot(fds)*FDv(pds, fds));

*逆行列と生産額・付加価値額
eqAnat(i, j)..   Anat(i, j) = Anat_target(i, j);
eqAnv(i, j, k).. sum(j, (Inat(i, j) - (1 - IMR(j)) * Anat(i, j)) * Anv(j, k)) = Inat(i
eqFC(i)..         FC(i) = sum(j, Anv(i, j) * ((1 - IMR(j)) * FC(j) + EX(j)));
eqAv(avs, pds).. Av(avs, pds) = FC(pds) * (1 - sum(i, Anat(i, pds))) * Avcv(avs, pds)

*労働と所得**
*就業人数
eqLHD(pds)..      LHD(pds) = FC(pds) * MLP(pds);
```



Structure of ExSS (recent version)





Another application of ExSS

Sensitivity analysis

- We can use it to define which assumption is important to the result (CO₂ emission), by changing parameters and exogenous variables.
(ex. growth rate of per capita GDP, export structure, demographic composition, etc)



Conclusion

- Advanced step of creating a SnapShot of a LCS is, consistent estimation of Driving Force
 - ExSS can consider various assumptions of future society (but needs huge amount of data and modeling skill)
- > We are making manual and template to use EXSS for LCS scenario.

Coming soon!!



Thank you