Distinguishing random and fixed factors.

Eisenhart, C. 1947. The Assumptions Underlying the Analysis of Variance
Biometrics, 3: 1-21.

"The following parallel sets of questions serve to focus attention on the pertinent issues, and have been found helpful in answering the basic question of random versus fixed effects:

(1) Are the conclusions to be confined to the things actually studied (the animals, or the plots); to the immediate sources of these things (the herds, or the fields); or expanded to apply to more general populations (the species, or the farmland of the state) ?
(2) In complete repetitions of the experiment would the same things be studied again (the same animals, or the same plots); would new samples be drawn from the identical sources (new samples of animals from the same herds, or new experimental arrangements on the same fields); or would new samples be drawn from the more general populations (new samples of animals from new herds, or new experimental arrangements on new fields)?

Lawson, J. 2015. Design and Analysis of Experiments with R, Boca Raton, CRC Press

Experiment is an action where the experimenter changes at least one of the variables being studied and then observed the effect of his or her action(s). p 3.
When the purpose of experimentation is to study differences in the average response caused by differences in factor levels, the factors in the experiment are call *fixed factors.* P 142.
When the purpose of experimentation is to study the variance caused by changing levels of a factor, the factor is called a *random factor.* P142
Whereas the levels of fixed factors are specifically chosen by the experimenter, the levels of random factors are just samples of possible levels that could have been used. P142

Stroup, W.W. 2013. Generalized Linear Mixed Models. Boca Raton, CRC press. P271
P 38
Do each effect's levels represent a larger population of interest or are the levels observed in the study of explicit interest and hence the entire population?

Quinn G.P. and M.J. Keough 2002. Experimental Design and Data Analysis for Biologists. Cambridge University Press
p 276
There are two types of categorical predictor variables in linear models. The most common type is a fixed factor, where all the levels of the factor (i.e. all the groups or treatments) that are of interest are included in the analysis. We cannot extrapolate our statistical conclusions beyond these specific levels to other groups or treatments not in the study. If we repeated the study, we would usually use the same levels of the fixed factor again. Linear models based on fixed categorical predictor variables (fixed factors) are termed fixed effects models (or Model 1 ANOVAs). Fixed effect models are analogous to linear regression models